Author: Ng, Woot Tsuen

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THE PENNSYLVANIA STATE COLLEGE

THE GRADUATE SCHOOL

DEPARTMENT OF HOME ECONOMICS

NURSERY SCHOOL STUDY NUMBER 4

NUTRITIONAL STATUS OF NURSERY SCHOOL

CHILDREN FROM LOW INCOME FAMILIES

A Thesis

by

WOOT TSUEN NG

Submitted in partial fulfillment of

the requirements for the degree of

MASTER OF SCIENCE

AUGUST, 1937

ACCEPTED *Edith Pitt Chace*
Director of Home Economics

APPROVED *Pauline Beery Mack*
Director of Home Economics Research

APPROVED *Phyllis K. Sprague*
Associate Professor of Home Economics

ACKNOWLEDGMENT

I N T R O D U C T I O N

The present study is the fourth in a series of investigations on the nutritional status of pre-school children from families of low income level, conducted by graduate students in the Department of Home Economics at The Pennsylvania State College. The first study was begun in February, 1936, by Providencia Urgell (M. S. in Home Economics, The Pennsylvania State College, June, 1936) (1), who studied the nutritive status of the nursery school children in Lytle Addition Federal Emergency Nursery School, together with a control group from other families of low income level. She found that the nursery school children were superior in nutritive status, after they had been in the school about three months, to their status on entering, and also to that of the control group measured at the same time. The only difference in environmental circumstances between the two groups was the fact that the nursery school children were fed at the Federal Emergency School during the mid-morning, at mid-day, and at mid-afternoon, under the direction of a trained dietitian.

The second study was a continuation of the first, this being carried on during the Summer and early Fall of 1936, by Mary Leonie Malley (2), who used some of the same children, and other children from the same types of families as controls, for the purpose of comparing how much progress the children continued to make following the measurements by Urgell. She showed that, after a three-month and again after a six-month lapse of time, the nursery school children were superior to the control group. In the majority of points for which measurements were made, she

found also that the nursery school children had improved since the time of the previous measurements. Exceptions to this will be mentioned later in this report.

The third study was carried on for the purpose of comparing 22 children from the nursery school at The Pennsylvania State College, coming from families of medium and high income levels, with the pre-school children in the Federal Emergency nursery School and the control groups of low income level, in order to find the differences in nutritional status between the two groups of children. This was carried on during the Spring and Summer of 1936, by Anne Theresa O'Brien (3).

In the present study, the work with the children at the Lytle Addition Federal Emergency Nursery School was continued, and the nursery school children, together with controls, were measured at approximate three-month intervals during the school year 1936-7. The measurement periods came during November, 1936, February-March, 1937, and June, 1937.

An additional feature was added to the work of the previous investigation during the last three-month period, in that the author visited the nursery school each day during the meal preparation and meal serving time, and kept quantitative records of the kinds and amounts of foods consumed by each child at the school.

E X P E R I M E N T A L   P R O C E D U R E

HOME CARE OF CHILD

In order to have a detailed study of the child's home care, home diets, physical home, family education, and family income, visits were made at all of the homes, and the mothers of all of the children were interviewed in order to obtain the information outlined in the outline reprinted below. This information was secured for the purpose of finding the diets which the children received, together with the family income and other facts which might have a bearing on the nutritional status of the children.

The home visit questionnaire follows:

HOME CARE RECORD OF CHILD

FAMILY

CASE NO.

ADULTS:

CHILDREN:

MOTHER'S NATIONALITY:

FATHER'S NATIONALITY:

FAMILY INCOME

NUMBER OF WAGE EARNERS IN FAMILY:

OCCUPATIONS OF WAGE EARNERS:

MONEY INCOME:

SOURCES OF MONEY INCOME:

ADDITIONAL INCOME (gifts, charity, etc.)

FAMILY RATING ON BASIS OF INCOME:

EDUCATION OF ADULT MEMBERS OF FAMILY:

FAMILY RATING ON BASIS OF EDUCATION OF ADULT MEMBERS:

PHYSICAL HOME

(Rating Scheme for Physical Home)

SIZE OF HOME (Number of rooms _____)

    1 point for each room up to 12 _____

    (Note whether roomers or not)

FURNITURE

    10 points for entirely adequate furniture (in good condition)
for the size of the house; number of points adjusted downward
at discretion of grader; 6 points is the maximum to be given
if furniture is adequate, but not in good condition _____

CLEANLINESS

    10 points if interior is immaculate in every detail; number of
points to be adjusted downward at the discretion of the
grader _____

POSSESSION OF A CENTRAL HEATING PLANT - 10 points _____

POSSESSION OF CONVENIENT COOKING EQUIPMENT - 5 points _____

POSSESSION OF SATISFACTORY REFRIGERATOR - 5 points _____

POSSESSION OF A WORTHWHILE MUSICAL INSTRUMENT - 5 points _____

ORNAMENTATION WITHIN THE HOUSE - Maximum 5 points _____

SLEEPING ACCOMMODATIONS FOR CHILD -

    Sleeps alone - 8 points _____

    Sleeps with one other child - 7 points _____

Sleeps with one adult - 6 points _____

Sleeps with two other children - 4 points _____

Sleeps with three other children - 1 point _____

EXTERIOR OF HOUSE WELL KEPT - Maximum 10 points _____

POSSESSION OF ADEQUATE YARD FOR PLAY - Maximum 10 points _____

POSSESSION OF GRASS AND FLOWERS - Maximum 5 points _____

POSSESSION OF GARDEN - Maximum 5 points _____

TOTAL POINTS ON FAMILY HOME _____

FAMILY RATINGS ON BASIS OF HOME _____

CHILD'S HOME CARE

Case Number:

Sleeping Arrangements:

Hours of Sleep at Home:

Time of Arising in Morning:

Hours of Rest at Home:

Number of Windows in Child's Bedroom:

Number of Windows Open When Child Sleeps:

Number of Times Child Is Bathed a Week:

Comments on Child's Clothing:

Self-Help in Dressing, Washing, Toileting:

Child's Diet at Home:

Cod-liver Oil or Other Rich Sources of Vitamin D:

CLASSES OF FOODS INCLUDED IN CHILD'S HOME DIET

Family Consumption of Types of Food Per Week

Case Number:

Flour, meal, and other cereals:

Potatoes:

Dried peas, beans, and nuts:

Tomatoes and citrus fruits:

Leaf, green, and yellow vegetables:

Dried Fruits:

Other vegetables and fruits:

Fats:

Sugars:

Lean meat, poultry, and fish:

Eggs:

Milk:

COMMENTS:

RATING OF FAMILIES AND HOMES

Family Rating on Basis of Income

An arbitrary rating scale of income levels, devised jointly by A. Pauline Sanders and Portia Bricker Harvey for human nutrition studies of their own which were begun at The Pennsylvania State College before the first of the nursery school series was reported, was used in this work. This scale is as follows:

Class A - 1 -- $10,000 or above

      A - 2 --   7,500 to 10,000

      A - 3 --   5,000 to 7,500

Class B - 1 --   4,000 to 5,000

      B - 2 --   3,000 to 4,000

      B - 3 --   2,500 to 3,000

```
Class C - 1 --  2,000 to 2,500

      C - 2 --  1,500 to 2,000

      C - 3 --  1,000 to 1,500
```

Class D -- Income of below $1,000, exclusive of families on
direct relief.

Class E -- Income of families on direct relief alone.

Family Rating on Basis of Education of Parents

The families of the various children included in this study were
rated as follows on the basis of the education of their parents:

Class A -- Both parents college graduates;

Class B -- One parent a college graduate;

Class C -- Both parents high school graduates;

Class D -- One parent a high school graduate; and

Class E -- Neither parent a high school graduate.

Family Rating on Basis of Physical Home

The rating scheme used to evaluate the physical homes of the
children is that given in the questionnaire presented above. This
rating scheme was devised by Providentia Urgell for use in the first
of the studies of this series. The scheme was planned to include those
points about the physical home which were believed to have a direct
bearing on the well-being of a young child.

In evaluating homes by means of the point system just mentioned,
the following arbitrary classes were set up:

Class A -- 100 to 86 points;

Class B -- 85 to 71 points;

Class C -- 70 to 51 points;

Class D -- 50 to 26 points; and

Class E -- 25 points or below.

MEASUREMENT TO DETERMINE
NUTRITIONAL STATUS

The following measurements were made three times on the group of children included in this report:

Weights: anthropometric observations; X-rays of hand, foot, elbow, knee, shoulder, and femur; percentage of haemoglobin (grams per 100 c. c.) in the blood; capillary wall strength; and footprints.

Anthropometric Studies

The following anthropometric instruments, purchased from the Anatomical Shop at Western Reserve University, and recommended by Dr. Wingate Todd, were used:

(1) An anthropometer, used either as a stadiometer or as a large-size sliding caliper;

(2) Small sliding calipers;

(3) Spreading calipers;

(4) Flower's craniometer; and

(5) Reserve head-spanner.

Twenty-six body measurements were taken with these instruments as follows:

(1) Weight

(2) Standing Height

(3) Horizontal Height

(4) Sitting Height

(5) Stem End

(6) Suprasternal Height

(7) Tip of Acromion Height

(8) Cristal Height

(9) Anterior Iliac Spine Height

(10) Knee Height

(11) Tibial Length

Flexed Tibial Length

(12) Acromial Breadth

(13) Cristal Breadth

(14) Trochanteric Breadth

(15) Transverse Chest

(16) Entire Arm Length

(17) Upper Arm Length

(18) Forearm Length

(19) Hand Length

(20) Chest Girth

(21) Head Length

(22) Head Breadth

(23) Head Height

(24) Interpupillary Distance

(25) Suprasternum to Head Top

(26) Head Circumference

Headline

Hairline

Roentgenographic Appraisement of Skeletal Status

The same method of making and evaluating roentgenograms was used as that of Malley (2), and of O'Brien (3). The description given below is quoted from these sources:

"The following roentgenogram negatives were made of each child by the use of a General Electric Model F portable shock-proof X-ray unit. The anterior-posterior and lateral aspects of the hand, foot, elbow, and knee were taken, as well as the anterior-posterior position of the shoulder and the femur. Films (8 X 10 inches) enveloped in cardboard holders, were used for making the first four negatives, while the last two were made by the use of films placed in 14 X 17 inch Rayspeed casettes, these being lined with high-speed luminescent screens. The exposure times were selected according to previous trials which showed the time required to give a standard density of the blacks, greys, and whites of the films, as shown by the use of an aluminum density gauge number 20, prepared under the supervision of Todd at Western Reserve University. This was calibrated to show a density ladder identical with that on roentgenogram number 8592 in the Western Reserve files.

"In making the anterior-posterior hand picture, the child was seated at a convenient height facing the X-ray table, it having been found by various trials that a seated position for the first film tended to dispel fear from the mind of the person being studied. The hand was then placed, palm downward, on one-half of the film holder, the other half of the film being covered with a lead plate. In the lateral aspect of the hand, the ulnar border was made to rest on the film holder, with the palm inclined toward the envelope. The hand pictures were made with

the long axis of the hand extending the longer dimension of the film, thus enabling the lower end of the radius and the ulna to be included in the picture.

"The child was next seated on the X-ray table, with the sole of the foot placed on one-half of the cardboard film holder, the long axis of the foot being in the longer dimension of the 8 X 10 film. In the lateral roentgenogram of the foot, the dorsiflexed foot was so placed that its fibular side lay directly on the plate. Whereas the calcaneum is not visible in the anterior-posterior view, it is plain in the lateral aspect.

"In progressing from the elbow to the knee, the child's position was adjusted slightly, while he was still on his back, so that the lateral aspect of the flexed knee was placed on about two-thirds of the film in the transverse direction, the film being centered just above the tibial tubercle. The child was then rolled over onto the stomach so that the patella could be placed directly in contact with the film holder for the anterior-posterior picture. A typical knee roentgenogram is shown in Figure 1.

"As mentioned above, a 14 X 17 inch casette was used instead of cardboard holders for the shoulder and femur, in order to shorten exposure time, the film being divided between these two pictures. In taking the shoulder, the child was placed prone with the left shoulder on the casette and the face turned away from this shoulder, with the arm parallel with the body, and palm downward. The femur was taken with the child lying on his back on the casette, with the patella upward. The iliac crest was completely included in this roentgenogram.

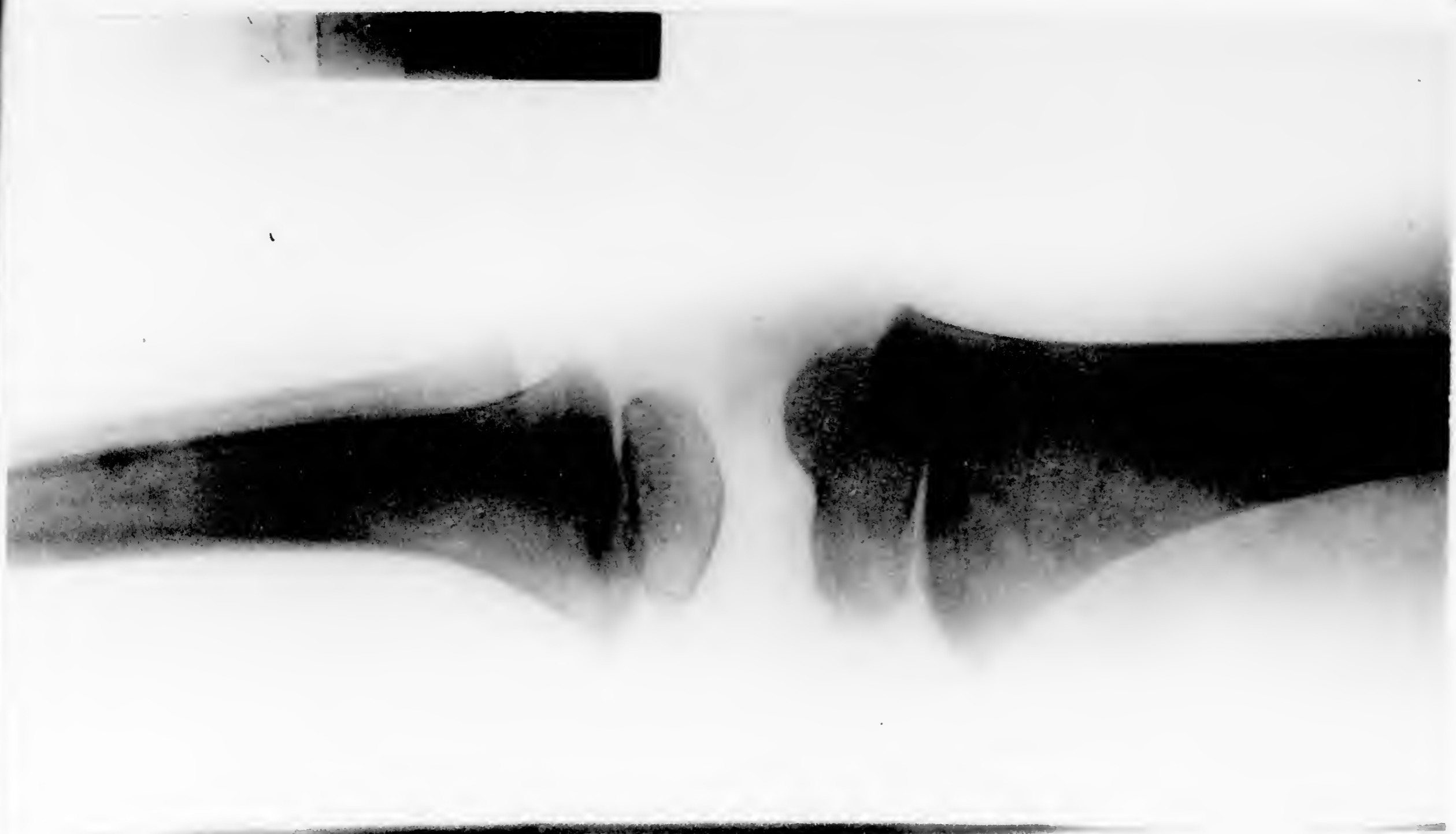"The roentgenograms were evaluated for the following purposes:

Figure I

(1) to determine the bone age of the child on the basis of
ossific centers or epiphyses;

(2) to determine bone age from bone penetration, by comparison
with standards;

(3) to note the presence and positions of scorings and scars.

"Study of Ossific Centers. The ossific centers were located and
recorded in order to find out the child's bony developmental stage as
far as this factor is concerned. As a result of an intensive study of
roentgenograms of normal children covering a period of many years, Todd
and his co-workers have determined the time of appearance in young
white American males and females of the more important ossific centers.
In each case, the presence or absence of the centers ordinarily present
in a child of the age in question was noted and recorded. The ossific
centers which were considered in the study were as follows:

```
                          (Hamate             )
                          (Capitate           )
                          (Lunate             )
                          (Triquetrum         ) ------- carpals
                          (Navicular          )
                          (Multangular Majus  )
       Hand        (13)-(Multangular Minus  )
                          (Metacarpals   1, 2, 3, 4, 5 )
                          (1st phalanges 1, 2, 3, 4, 5 )
                          (2nd phalanges 1, 2, 3, 4, 5 ) --- fingers
                          (3rd phalanges 1, 2, 3, 4, 5 )
                          (Distal radius
                          (Distal ulna
```

		(Talus
		(Calcaneous
		(Navicular
		(Cuboid
		(Medial cuneiform
		(Middle cuneiform
Foot	(13) —	(Lateral cuneiform
		(Metatarsals 1, 2, 3, 4, 5)
		(1st phalanges 1, 2, 3, 4, 5)
		(2nd phalanges 1, 2, 3, 4, 5)
		(3rd phalanges 1, 2, 3, 4, 5)
		(Distal fibula
		(Distal tibia

		(Capitulum
Elbow	(3) —	(Medial epicondyle
		(Proximal radius

		(Patella
Knee	(3) —	(Proximal tibia
		(Proximal fibula

| Hip | (2) — | (Head of the femur |
| (femur) | | (greater tuberosity of the femur |

| Shoulder | (2) — | (Head of the humerus |
| | | (Greater tuberosity of the humerus |

"Below is a copy of Todd's chart called 'Time of Appearance of Ossification Centers,' which served as the key to the various epiphyseal

ratings reported below. It will be noted that males and females differ

in order of appearance of center of ossification according to this chart.

TIME OF APPEARANCE OF OSSIFICATION CENTERS

Brush Foundation, Inc.   September, 1934

(Dr. T. Wingate Todd)

Male - White

Birth

(6) 1. calcaneous
2. talus
3. femur, distal
4. tibia, prox.
5. humerus, head
6. cuboid

2 mos.

(3) 7. capitate
8. hamate
11. lat. cuneiform

3 mos.

(3) 13. femur, head
12. capitulum
9. tibia, distal

6 mos.

(1) 10. fibula, distal

7 mos.

(2) 14. gt. tuber. humerus
15. radius, distal

10 mos.

(1) 16. triquetrum

11 mos.

(2) 17. 3 F. - 1 phal.
21. 1 T. - 2 phal.

12 mos.

(3) 19. 2 F. - 1 phal.
18. 4 F. - 1 phal.
20. 1 F. - 2 phal.

13 mos.

(3) 22. 3 T. - 1 phal.
30. 2 metacarpal
40. medial cuneiform

14 mos.

(3) 23. 4 T. - 1 phal.
24. 2 T. - 1 phal.
25. 3 T. - 2 phal.

15 mos.

(3) 28. 3 metacarpal
45. 2 T. - 2 phal.
27. 5 F. - 1 phal.

16 mos.

(2) 26. 4 T. - 2 phal.
29. 4 metacarpal

18 mos.

(4) 44. 2 F. - 2 phal.
32. 3 F. - 2 phal.
33. 4 F. - 2 phal.
31. 5 metacarpal

20 mos.

(2) 46. 1 T. - 1 phal.
    41. middle cuneiform

21 mos.

(4) 35. 3 F. - 3 phal.
    36. 4 F. - 3 phal.
    42. navicular of foot
    34. 5 T. - 1 phal.

22 mos.

(2) 43. 1 metacarpal
    39. 1 metacarpal

23 mos.

(1) 37. 1 F. - 1 phal.

2 yrs.

(2) 51. 5 F. - 2 phal.
    52. lunate

2 yrs. - 2 mos.

(1) 38. 2 metatarsal

2 yrs. - 5 mos.

(2) 49. 2 F. - 3 phal.
    50. 5 F. - 3 phal.

2 yrs. - 11 mos.

(2) 54. 3 metatarsal
    47. fibula, prox.

3 yrs. - 1 mo.

(2) 63. gt. trochanter femur
    48. patella

3 yrs. - 3 mos.

(1) 59. 4 metatarsal

3 yrs. - 4 mos.

(1) 53. 5 T. - 3 phal.

3 yrs. - 7 mos.

(2) 57. 3 T. - 3 phal.
    58. 4 T. - 3 phal.

3 yrs. - 8 mos.

(2) 60. 5 metatarsal
    55. 2 T. 3 phal.

3 yrs.-10 mos.

(1) 62. radius, prox.

4 yrs. - 2 mos.

(1) 56. mult. majus

4 yrs. - 4 mos.

(1) 64. navic., hand

4 yrs. - 8 mos.

(1) 65. mult. minus

5 yrs.

(3) 66. med. epicondyle
       humerus
    67. ulna, distal
    61. 5 T. - 2 phal.

TIME OF APPEARANCE OF OSSIFICATION OF CENTERS

Brush Foundations, Inc.   September, 1934

(Dr. T. Wingate Todd)

Female - White

Birth

(6) 1. calcaneous
2. talus
3. femur, distal
4. tibia, prox.
5. humerus, head
6. cuboid

2 mos.

(3) 7. capitate
8. hamate
11. lat. cuneiform

3 mos.

(3) 13. femur head
12. capitulum
9. tibia, distal

4 mos.

(1) 14. gt. tut. humerus

6 mos.

(2) 10. fibula, distal
15. radius, distal

7 mos.

(3) 21. 1 T - 2 phal.
17. 3 F - 2 phal.
18. 4 F - 1 phal.

8 mos.

(3) 19. 2 F - 1 phal.
20. 1 F - 2 phal.
22. 3 T - 1 phal.

9 mos.

(3) 25. 3 T - 2 phal.
23. 4 T - 1 phal.
40. medical cuneiform

12 mos.

(2) 33. 4 F - 2 phal.
32. 3 F - 2 phal.

13 mos.

(2) 31. 5 metacarpal
44. 2 F - 2 phal.

14 mos.

(8) 43. 1 metacarpal
46. 1 T - 1 phal.
34. 5 T - 1 phal.
35. 3 F - 3 phal.
36. 4 F - 3 phal.
42. navicular of foot
41. middle cuneiform
39. 1 metatarsal

15 mos.

(2) 37. 1 F - 1 phal.
51. 5 F - 2 phal.

17 mos.

(2) 49. 2 F - 3 phal.
50. 5 F - 3 phal.

19 mos.

(1) 38. 2 metatarsal

21 mos.

(1) 53. 5 T - 3 phal.

22 mos.

(1) 54. 3 metatarsal

23 mos.

(1) 48. patella

2 yrs.

(5) 52. lunate
57. 3 T - 3 phal.
58. 4 T - 3 phal.
47. fibula, prox.
63. gt. trochanter femur

2 yrs. - 2 mos.

(2) 55. 2 T - 3 phal.
59. 4 metatarsal

2 yrs. - 5 mos.

(1) 60. 5 metatarsal

2 yrs. - 8 mos.

(1) 56. mult.majus

2 yrs. - 9 mos.

(1) 66. med. epicondyle
humerus

3 yrs.

(2) 62. radius, prox.
65. mult. minus

3 yrs. 2 mos.

(1) 64. navic., hand

4 yrs. - 6 mos.

(1) 67. ulna, distal

5 yrs.

(1) 61. 5 T - 2 phal.

"A Study of Bone Penetration. A set of 40 standards for hand (male), 35 for hand (female), 38 for knee (male), and 35 for knee (female) were purchased from the Anatomical Laboratory at Western Reserve University for purposes of assaying the ages of the children in the study on the basis of bony penetration. In preparing these sets of standards, Todd and his co-workers have selected from a large group of normal children roentgenograms for various ages of white American males and females, these believed to represent the standard degree of progress for the age in question.

"Standards for hand and knee were selected at three month intervals through one year and three months, then at six-month intervals through to sixteen years and 3 months for female (hand and knee); male (knee)

through 17 years and 9 months and male (hand) through 18 years and 9 months.

"The hand and knee of each child in the study were evaluated as to bone age based on penetration, by comparison with the Todd Standards. When standards for elbow, foot, shoulder, and hip later become available, the roentgenograms of these members will then be evaluated on this basis also.

"In assaying an X-ray negative for bony penetration by the Todd technique, such points as the following are considered in comparing the case films with standards; contours of the bone ends and epiphyses, the length and breadth of bones, and cartilagenous interosseous intervals.

"In studying the hand, the shafts and epiphyses of the long bones, the bony maturation of the carpals, and the appearance of the distal end of the radius are among the points considered in matching the films under consideration with the standards.

"In the knee, one depends to a considerable extent upon studying the bony differentiation of the epiphyses of the femur and upon the contours of the ends of the femur and tibia, and to a lesser degree upon the ossification of the patella.

"Aside from comparing the hand and knee with the standard series of films, the radius and ulna were studied for change in bone ends. A concave bone end was taken to indicate that the bone was not growing, a healthy growing bone being convex in contour. Billowing was assumed to show that the bone was taking on beginning convexity. A dense band at the end of the bone denoted growth interference.

"Scars and Scorings. An attack of disease, a severe, gastro-intestinal upset, colds, fevers, and other disturbing influences may produce temporary cessations of bone growth, calcium being deposited more thickly at the ends of the bones at these times than normally. When normal growth is resumed, the thickened mineral deposit remains for a time as a scar or a scoring. These two marks of nutritional disaster differ from each other in that the term "scar" is generally applied to a dense marking which extends entirely across the bone, and is more particularly observable on the larger bones. The term, "scoring" on the other hand is applied to bands, somewhat less dense, these being the relics of minor nutritional disturbances . Scorings are less pronounced than scars usually not extending across the full width of a bone.

"Since the tibia and radius normally grow at about the rate of 10 millimeters, and the femur at the rate of 15 millimeters a year, it was found to be possible to determine the approximate time when disturbances in bone growth had occured, by studying roentgenograms of representative parts of the bony skeleton."

The X-ray of knee reproduced in Figure 1 shows typical scars and scorings.

Haemoglobin in the Blood

The amount of haemoglobin in the blood was determined by the Newcomer method in terms of grams of haemoglobin per 100 c.c. of blood. In this method, slightly more than 0.05 c.c. of blood was obtained by pricking the finger with a sharp spring blood lancet. Exactly 0.05 c.c. of this was measured by means of a calibrated

micropipette into 10 c.c. of approximately 0.1 N hydrochloric acid.
The blood was rinsed out of the pipette thoroughly by sucking up the
acid and blowing it out several times. The combination of blood and
hydrochloric acid was allowed to stand for 25 minutes, at the end of
which time it was matched in a colorimeter of the Duboscq type against
a standard Newcomer plate with a factor of 0.252. The following formula
was used in computing the grams of haemoglobin per 100 c.c. of blood:

$$\text{Percentage of haemoglobin (Grams per 100 c.c.)} \quad \frac{0.252}{\text{Reading of unknown}} \quad X \quad 501 \text{ (dilution factor)}$$

Measuring Capillary Wall Strength

A Delldorf Capillary Resistometer was used on the skin of the inner
part of the upper arm, in order to determine capillary wall strength.
This was found by establishing the least negative pressure needed to
give a standard red color which the operator learned through experience
to recognize.

Vaseline was rubbed onto the area of the arm to which the vacuum
cup of the instrument was applied. A vacuum of 35 centimeters as
registered on the gauge was used for the initial trial, the vacuum
being increased by gradual stages until the standard break was obtained.

A skin area about midway between the forward part of the arm pit
and the anterior part of the elbow joint was used. Adjoining areas on
the skin were subjected to the test until an end-point was reached.

Evaluating Muscle Tone by Footprints

Footprints were used to secure an arbitrary rating for muscle tone by comparing sitting and standing prints with standards. Four arbitrary standards were used for evaluating these footprints. Standard number A is classed as good, B as medium, C as poor, and D as very poor. These were numbered 1, 2, 3, and 4 in the order named:

The following footprint solution was used in making these footprints:

Tincture of Ferric chloride (U. S. P.) . . . . 55 c.c.

Ethyl alcohol (95 per cent.) . . . . 45 c.c.

Glycerine . . . . 10 c.c.

METHOD OF CALCULATING IRON CONTENT OF DIET

The iron content of the food eaten by each child while in the nursery school was estimated in the following manner. The recipes used by the dietitian were calculated in terms of iron grams. The iron figures for milk and egg were taken from Rose's Laboratory Manual; those for meat and fish from Sherman's Chemistry of Food and Nutrition. The iron content of the vegetables EP was computed from the percentages given in the U. S. D. A. circular No. 205 on "Iron Content of Vegetables and Fruits" (1931); the AP values were computed by using the percentage of refuse as given for each item in U. S. D. A. circulars No. 50 and 146. Exceptions to the latter were peas and spinach, which were calculated from Rose's Laboratory Manual. The cereal products were taken from Sherman's Food Products.

The dietary intake of the children was tabulated in the following classes: milk, meat, egg, fish, vegetables, and fruits and cereals. The total iron intake of each child for the week was determined. The servings of food eaten were weighed and the percentage of total food prepared which each child ate was calculated. The iron value of the portions was then summarized for each child.

During the period for which iron is reported in numerical terms, namely - for the three-month period just previous to the June, 1937, nutritional measurements - the author was present at the nursery school while the meal was being prepared, and weighed the foods which were prepared, and served.

PRESENTATION OF DATA

The data secured during the interviews and by means of the laboratory tests on nutritional status are given in tabular form, as follows:

TABLE I   RATINGS OF FAMILIES ON BASIS OF FAMILY INCOME,

PHYSICAL HOME, AND EDUCATION OF PARENTS;

TABLE II   ANTHROPOMETRIC MEASUREMENTS;

TABLE III   SUMMARY OF OSSIFIC CENTER STATUS;

TABLE IV   SUMMARY OF BONE PENETRATION STATUS;

TABLE V   EVALUATION OF ROENTGENOGRAMS;

A - for X-rays taken in November, 1936

B - for X-rays taken in February, 1937

C - for X-rays taken in June, 1937

TABLE VI   HAEMOGLOBIN STATUS OF CHILDREN;

TABLE VII   CAPILLARY WALL MEASUREMENTS; and

TABLE VIII FOOTPRINT EVALUATIONS.

T A B L E   I

RATINGS OF FAMILIES ON BASIS OF FAMILY INCOME, PHYSICAL HOME, AND EDUCATION OF PARENTS			
Child's Number	Family Income Rating	Rating of Physical Home	Rating of Education of Parents
2	D	D	E
3	C-3	D	E
4	D	D	E
5	D	E	E
6	D	E	E
7	D	E	E
8	D	E	E
9	D	D	E
10	C-3	C	E
11	C-3	D	D
13	C-3	C	E
14	C-3	C	E
15	D	C	E
16	D	C	E
17	D	C	E
18	D	C	E
19	C-2	B	E
20	D	D	E

Child's Number	Family Income Rating	Rating of Physical Home	Rating of Education of Parents
21	D	C	E
C26	D	E	E
C28	D	E	E
C30	D	D	E
C34	D	C	E
C35	D	C	E
C36	D	C	E
C37	D	C	E
C39	E	D	E
C40	C-3	E	E
C41	C-3	C	E
001	D	C	E
002	D	C	E
003	D	D	E
004	D	C	E
005	D	C	D
006	D	C	E
007	D	C	D
009	D	D	E
0012	D	C	E
0013	D	C	E
0014	D	C	E
0015	D	C	D

Child's Number	Family Income Rating	Rating of Physical Home	Rating of Education of Parents
0016	C-2	B	D
0018	D	C	E
0019	D	C	E
0020	C-3	C	C
W3	D	C	E
W4	D	C	D
W5	D	C	E
W6	D	D	E
W7	D	C	E
W8	D	C	E
W9	D	D	E
W11	D	D	E
W12	C-3	C	C
W14	D	D	E
W16	B-3	A	A
W17	D	A	A
W18	D	D	E
W19	D	D	C
22	C-3	D	E
23	C-3	C	D
C38	D	C	E
0011	D	D	E
W1	C-3	D	E

ANTHROPOMETRIC MEASUREMENTS

NURSERY SCHOOL CHILDREN, (PART A), NOVEMBER,1936

Case No.	Standing Height	Horizontal Height	Sitting Height	Stem End	Suprasternal Height	Tip of Acromion Height	Cristal Height	Anterior Iliac Spine Height	Knee Height	Tibial Length Flexed
6	98.5	101.5	54.5	57.9	76.5	77.5	54.5	52.2	28.5	20.4
18	98.8	102.6	57.3	62.1	76.4	76.5	57.9	52.8	23.4	20.7
15	84.0	90.2	47.6	53.0	67.2	65.9	50.2	48.8	21.5	20.3
9	92.6	96.6	51.3	54.3	73.0	73.0	55.0	52.0	24.6	19.1
C37	93.0	97.2	53.9	57.4	70.2	69.9	54.8	47.0	22.3	17.5
17	97.2	101.6	54.7	60.8	75.6	75.1	57.7	52.9	26.4	20.5
2	93.0	99.1	54.7	59.6	70.7	72.3	53.8	48.5	26.2	17.7
13	90.5	93.5	52.6	57.5	69.0	67.2	57.3	44.5	24.2	17.9
C38	38.2	91.8	51.8	55.7	68.9	66.3	49.8	44.2	22.5	17.8
004	86.6	89.7	49.2	54.0	66.2	66.1	48.5	46.2	21.9	20.0
21	93.4	97.8	55.3	59.9	71.9	71.8	53.5	47.1	24.1	19.5
003	87.0	92.0	49.7	53.7	66.1	64.1	50.0	45.1	22.3	18.2
19	89.8	93.5	54.1	57.6	69.0	68.0	49.9	43.8	23.6	21.2
11	97.4	99.6	53.4	56.2	74.7	73.6	54.9	59.1	28.8	19.7
002	92.4	94.6	55.3	58.3	69.3	71.4	52.3	42.0	25.0	21.8

T A B L E II
(Continued)

NURSERY SCHOOL CHILDREN, (PART B),NOVEMBER, 1936

Case No.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochanteric Breadth	Transverse Chest	Entire Arm Length	Upper Arm Length	Forearm Length	Hand Length	Chest Girth	Head Length
6	20.2	25.7	16.3	18.7	14.8	45.8	19.8	14.6	11.5	58.1	14.1
18	20.4	26.2	17.6	18.6	15.9	42.1	15.9	14.6	12.0	47.8	14.8
15	19.6	21.6	15.2	16.6	12.5	38.4	15.2	12.7	10.7	48.5	11.1
9	19.0	21.8	16.0	17.7	15.5	39.1	14.2	13.7	11.4	55.8	14.3
C37	17.4	24.0	16.0	17.9	13.5	37.9	14.9	13.3	9.8	56.9	15.3
17	20.0	23.4	17.0	18.2	14.5	40.8	15.6	15.6	10.4	60.3	14.4
2	17.2	24.3	16.5	15.8	13.7	42.0	16.3	14.0	10.8	60.3	13.9
13	17.0	24.9	16.2	18.2	13.2	37.5	14.0	13.6	10.5	55.5	13.7
C38	17.0	23.0	16.2	17.0	14.3	36.8	14.0	13.5	9.5	57.4	14.2
004	19.2	23.6	15.9	17.0	13.6	35.8	13.7	12.9	9.7	56.9	12.7
21	19.1	26.2	18.7	19.1	16.0	38.4	13.9	14.0	10.7	60.3	14.4
003	18.2	22.3	15.4	16.5	12.3	35.7	14.0	12.8	10.1	55.7	13.0
19	20.8	25.5	17.4	18.5	15.6	38.4	15.6	13.3	10.3	59.1	15.0
11	19.5	20.7	15.5	18.5	13.3	42.2	17.0	14.5	11.1	51.0	16.7
002	21.4	21.9	16.1	17.9	13.1	38.4	16.4	13.2	10.2	54.0	16.6

NURSERY SCHOOL CHILDREN (PART C), NOVEMBER, 1936

Case No.	Head Breadth	Head Height	Interpu- pillary Distance	Supra- sternum to head top	Head Circumference Head Line	Hair Line	Weight	Comments on Weight
6	9.8	7.9	5.4	26.7	50.8	48.8	34.25	Satisfactory
18	10.9	7.6	5.1	23.1	49.8	49.8	37.50	satisfactory
15	9.6	7.9	5.3	20.5	48.0	47.8	25.50	Satisfactory
9	10.4	8.4	5.2	21.0	49.8	49.0	33.00	Satisfactory
C37	10.4	7.8	5.6	23.0	52.3	51.4	31.75	Satisfactory
17	11.4	7.2	5.2	23.5	52.7	52.0	34.50	Satisfactory
2	10.2	8.9	5.3	22.8	50.1	49.5	31.25	Satisfactory
13	10.1	8.0	5.6	20.4	48.3	48.3	36.00	Satisfactory
C38	10.0	8.1	5.8	19.4	49.5	48.2	29.75	Satisfactory
004	10.6	8.7	5.3	20.3	47.6	47.0	28.00	Satisfactory
21	12.0	8.4	5.1	20.6	51.4	51.4	37.00	Satisfactory
003	10.3	10.1	5.2	20.2	49.5	47.6	27.75	Satisfactory
19	10.5	8.1	5.2	22.8	52.7	49.8	33.50	Satisfactory
11	10.6	7.95	5.3	21.3	50.0	49.0	34.50	Satisfactory
002	10.4	7.4	5.0	22.5	49.6	49.0	38.50	15.7 percent over weight

CONTROLS (PART A), NOVEMBER,1936

Case No.	Standing Height	Hori-zontal Height	Sitting height	Stem End	Supra-sternal Height	Tip of Acromion Height	Cristal Height	Anterior Ilian Height	Knee Height	Tibial Length Flexed
4	103.4	105.6	58.9	59.6	79.0	80.5	59.5	53.0	26.1	20.7
0012	108.3	109.0	55.6	58.5	83.6	82.7	62.2	60.4	30.2	25.8
14	97.9	100.0	54.0	58.9	74.9	73.8	55.8	48.6	25.3	21.3
23	103.1	104.2	57.0	60.0	80.5	79.0	62.0	54.3	27.0	24.0
0013	96.6	99.0	53.1	57.0	57.4	72.3	-55.4	54.3	26.5	20.3
10	93.6	96.8	52.8	58.0	72.2	69.0	53.0	47.9	20.4	22.1
C39	93.2	97.5	53.6	54.9	71.2	71.6	53.1	47.9	24.8	17.5
0018	98.8	100.2	55.2	58.1	77.7	76.0	59.6	52.1	27.5	19.2
005	92.3	94.7	54.4	56.2	71.2	70.9	53.0	46.2	24.7	18.5
W1	83.6	86.1	50.7	64.2	62.7	63.8	48.6	41.6	19.8	17.0
0019	89.9	90.6	50.1	60.7	70.2	71.4	55.3	47.7	22.7	17.4
5	87.3	90.2	53.2	57.1	66.4	68.4	46.4	41.4	23.4	16.1
0014	88.3	91.5	58.1	56.1	65.2	66.9	50.5	45.0	22.2	16.5
0020	89.4	90.1	53.8	64.4	69.2	69.0	48.8	44.2	22.9	14.8
0016	91.2	93.9	52.7	53.3	69.0	68.9	49.6	49.4	29.9	14.6
007	94.9	97.5	54.5	58.6	72.9	71.2	52.4	50.0	23.4	21.0
0015	81.8	86.3	48.9	61.9	60.9	60.3	43.7	38.6	18.2	14.1
C26	83.0	84.3	53.2	53.9	63.3	63.0	41.0	38.4	21.3	18.5
W3	86.7	90.3	54.1	58.2	65.2	65.6	47.6	43.2	21.8	15.8

CONTROLS (PART B), NOVEMBER, 1936

Case No.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochanteric Breadth	Transverse Chest	Entire Arm Length	Upper Arm Length	Forearm Length	Hand Length	Chest Girth	Head Length
4	20.2	25.3	18.1	20.1	16.3	45.1	17.3	15.2	12.0	59.7	16.0
0012	24.2	24.1	16.3	18.7	12.3	45.4	19.1	15.3	11.5	55.8	14.6
14	20.9	23.3	17.3	20.0	15.0	40.6	15.1	14.8	10.8	54.4	14.0
23	23.1	26.0	17.5	17.7	13.9	43.0	16.0	15.0	12.0	55.8	15.0
0013	20.0	22.2	16.2	16.7	14.0	41.0	14.4	16.5	11.0	53.3	15.8
10	18.2	23.1	16.1	17.2	14.4	38.6	13.4	15.0	10.6	23.0	58.4
-C39	17.4	23.8	16.1	16.9	12.1	40.4	16.5	12.9	10.1	55.8	15.7
0018	18.9	22.6	13.4	17.0	13.2	39.4	15.8	14.3	10.6	54.6	13.4
005	18.0	22.0	16.3	20.2	13.8	38.1	16.3	12.9	10.6	53.3	13.9
W1	16.2	21.6	40.9	15.8	11.5	34.5	12.6	12.5	9.4	48.2	15.4
-0019	16.8	20.8	14.4	15.8	12.3	35.3	13.0	11.7	8.6	53.3	13.0
5	15.7	21.0	14.5	17.4	13.9	36.4	14.2	12.9	10.6	50.0	16.1
0014	15.3	21.5	15.7	16.0	13.2	36.5	12.7	14.0	9.4	55.8	14.6
0020	13.8	22.7	15.4	16.9	13.9	36.8	14.5	12.3	9.6	55.8	13.6
-0016	13.7	22.4	15.0	16.0	12.8	36.0	14.2	12.5	10.1	55.8	13.9
-007	20.8	22.4	16.1	17.4	12.6	38.2	15.3	12.2	11.2	55.8	15.5
-0015	13.3	20.0	14.6	15.3	11.7	30.8	12.7	11.5	9.7	55.3	12.8
C26	17.5	18.0	14.1	16.2	12.2	35.2	13.0	12.9	10.0	48.0	14.5
W3	15.5	18.8	12.9	15.5	13.1	34.1	13.0	12.6	10.6	51.5	16.9

- Measured October 26, 1936

TABLE II
(Continued)

CONTROLS (PART C), NOVEMBER, 1936

Case No.	Head Breadth	Head Height	Interpupillary Distance	Supra-sternum To head Top	Head Circumference Head Line	Hair Line	Weight	Comments on Weight
4	11.3	8.1	5.7	23.5	53.6	53.6	37.5	Satisfactory
0012	10.3	9.1	5.0	23.6	53.3	50.6	33.0	Satisfactory
14	11.2	8.9	5.3	20.7	52.8	51.9	39.0	Satisfactory
23	14.3	8.5	5.2	22.0	49.3	48.6	36.0	Satisfactory
0013	9.9	7.6	5.0	20.7	54.6	50.8	31.0	Satisfactory
10	11.0	8.1	5.1	22.0	50.8	49.8	35.0	Satisfactory
-C39	9.8	9.1	5.6	20.3	50.0	48.6	32.5	Satisfactory
0018	10.2	8.35	5.4	21.8	49.5	49.0	32.5	Satisfactory
005	10.9	8.4	5.4	22.7	48.2	47.9	31.0	Satisfactory
W1	10.5	8.7	5.2	18.9	48.2	47.6	26.0	Satisfactory
-0019	10.0	8.8	5.3	19.2	49.5	49.0	27.0	Satisfactory
5	10.0	9.5	4.9	21.8	49.0	48.0	29.5	Satisfactory
0014	10.3	715	4.9	22.0	49.5	48.2	27.5	Satisfactory
0020	10.3	8.6	5.5	20.4	49.7	49.5	30.0	Satisfactory
0016	11.0	7.4	5.0	22.7	49.8	49.8	29.0	10.7 percent underweight
-007	10.6	7.5	5.7	22.2	54.6	50.8	34.0	Satisfactory
0015	9.5	8.2	5.1	20.8	47.6	45.7	22.0	10.8 percent underweight
C26	10.4	8.7	4.2	20.5	46.8	45.5	23.75	Satisfactory
W3	10.0	6.7	5.1	21.3	49.3	49.0	27.75	Satisfactory

- Measured October, 1936

NURSERY SCHOOL CHILDREN (PART A), FEBRUARY, 1937

Case No.	Standing Height	Horizontal Height	Sitting Height	Stem End	Suprasternal Height	Tip of Acromion Height	Cristal Height	Anterior Ilian Spine	Knee Height	Tibial Length Flexed
9	96.0	99.1	53.7	57.0	76.8	76.6	55.5	52.5	28.1	24.1
C37	95.9	97.2	53.2	58.8	72.2	71.9	51.2	48.9	24.4	19.1
15	89.1	92.2	48.9	55.4	68.2	69.0	51.4	47.9	23.9	20.8
2	96.6	99.6	55.5	59.6	73.9	74.8	58.2	51.4	28.2	22.3
13	93.7	95.3	53.6	59.4	71.9	71.4	52.4	47.9	25.1	23.1
17	100.1	102.8	58.0	61.3	77.1	76.8	57.8	53.0	28.2	25.2
0018	102.4	103.9	57.7	61.1	78.9	80.7	59.4	55.1	28.6	26.4
0019	91.9	94.4	50.9	53.6	70.4	70.2	53.3	49.5	26.4	24.1
C38	89.8	92.1	52.0	57.0	67.7	68.3	48.9	45.8	23.9	19.1
004	88.4	90.9	51.5	54.1	67.4	68.7	49.2	45.9	21.9	20.0
21	95.2	99.3	54.6	60.9	72.6	73.3	50.9	47.5	24.5	20.4
0020	92.4	94.5	52.7	53.1	69.6	70.6	51.6	55.4	23.8	20.3
002	94.5	96.5	55.6	58.6	71.7	72.2	51.7	48.3	23.9	22.3
003	90.1	92.5	50.7	54.7	69.0	68.7	52.0	47.7	24.2	21.3
0015	83.9	86.6	49.9	53.4	63.4	64.2	45.1	43.3	21.5	19.9
19	94.4	96.7	55.1	59.0	72.9	72.6	51.8	46.3	24.6	22.4
W3	88.5	91.9	56.1	59.1	67.3	66.0	49.7	42.4	22.4	17.1
007	94.9	97.5	54.5	58.6	72.9	71.2	52.4	50.0	23.4	21.0

NURSERY SCHOOL CHILDREN (PART B), FEBRUARY, 1937

Case NO.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochan- teric Breadth	Trans- verse Chest	Entire Arm Length	Upper Arm Length	Fore- arm Length	Hand Length	Chest Girth	Hand Length
9	23.3	20.7	13.3	18.1	14.1	40.1	14.3	14.4	11.4	22.5	16.3
C37	19.1	20.2	14.2	17.7	14.1	39.7	15.2	19.9	19.3	17.2	12.4
15	20.6	20.0	14.8	17.5	13.3	39.1	15.1	13.9	10.9	49.5	11.2
2	21.4	19.3	13.9	16.6	14.2	41.9	16.4	14.7	10.9	59.3	16.0
13.	22.5	19.2	12.6	17.9	12.5	41.0	16.3	14.2	10.7	54.6	10.9
17	24.8	22.9	16.8	19.8	13.6	43.7	19.0	13.9	11.6	55.9	16.5
0018	25.6	21.9	15.6	19.1	13.8	42.4	17.9	14.7	10.7	55.9	17.0
0019	23.4	25.0	14.8	17.2	11.7	36.6	13.4	13.3	9.8	54.6	15.8
C38	18.7	18.7	14.7	17.7	14.4	37.2	14.1	13.3	10.7	22.0	15.2
004	19.4	22.2	14.4	18.0	12.1	37.4	14.9	12.8	10.0	50.2	14.8
21	20.2	19.0	16.3	18.3	14.4	38.9	14.6	13.3	10.4	55.9	15.5
0020	19.3	20.0	15.9	18.6	14.7	38.4	14.2	14.4	10.8	57.2	15.1
002	22.0	20.1	14.2	18.1	13.1	39.5	14.8	14.8	10.6	55.9	16.8
003	21.2	20.5	14.3	17.9	12.0	39.6	15.7	14.0	10.6	50.1	16.3
0015	19.4	18.6	12.5	15.4	11.5	32.7	12.2	10.9	9.9	52.7	14.2
19	21.3	23.8	17.1	18.1	14.2	41.2	16.8	14.1	11.7	53.3	15.5
W3	17.0	19.0	13.1	15.5	12.7	35.0	13.4	12.5	10.5	54.6	16.7
007	20.8	22.4	16.2	19.3	12.6	43.7	18.1	14.6	11.3	53.3	16.8

NURSERY SCHOOL CHILDREN (PART C), FEBRUARY, 1937

Case No.	Head Breadth	Head Height	Interpupillary Distance	Supra-sternum To head Top	Head Circumference		Weight	Comments on Weight
					Head Line	Hair Line		
9	9.9	8.1	5.1	19.2	50.8	48.3	33.50	Satisfactory
C37	10.4	7.4	5.2	21.9	52.1	51.5	34.00	Satisfactory
15	10.1	8.0	5.3	20.6	50.1	48.2	36.75	26.7 percent overweight
2	10.2	6.6	5.0	22.1	50.2	49.2	33.50	Satisfactory
13	10.2	7.4	4.9	21.0	48.9	47.6	36.00	16.1 percent overweight
17	11.6	7.4	5.2	22.8	51.5	51.2	36.00	Satisfactory
0018	10.1	6.9	5.3	21.5	50.2	49.5	24.50	36.5 percent underweight
0019	10.0	6.8	5.1	21.1	49.5	48.9	28.50	Satisfactory
C38	10.5	7.9	4.8	20.1	48.9	48.3	31.00	Satisfactory
004	10.1	8.4	4.5	20.0	46.9	45.7	27.75	Satisfactory
21	10.7	6.4	5.1	20.3	51.5	50.8	37.50	Satisfactory
00020	11.0	7.6	5.2	21.3	50.8	50.2	34.25	Satisfactory
002	10.6	7.2	5.3	22.8	50.8	50.25	34.00	Satisfactory
003	10.1	7.6	4.9	22.8	49.5	46.9	30.00	Satisfactory
0015	9.0	7.1	4.9	18.6	54.1	52.0	23.50	Satisfactory
19	9.7	7.55	5.1	21.8	51.5	50.2	35.00	Satisfactory
W3	9.2	6.1	5.0	20.4	50.8	49.5	28.50	Satisfactory
007	10.4	7.6	5.4	22.4	53.3	49.5	33.00	Satisfactory

T A B L E II
(Continued)

CONTROLS (PART A), FEBRUARY, 1937

Case No.	Standing Height	Horizontal Height	Sitting Height	Stem End	Suprasternal Height	Top of Acromion Height	Cristal Height	Anterior Iliac Spine Height	Knee Height	Tibial Length Flexed
7	114.8	117.7	59.8	66.0	91.4	91.7	70.5	64.6	33.8	29.3
4	103.4	105.6	58.9	59.6	79.0	80.5	59.5	53.0	26.1	20.7
0012	108.3	100.0	55.6	58.5	83.6	82.7	62.2	60.4	30.2	25.8
38	108.4	111.3	61.1	64.9	84.8	85.7	63.4	59.2	31.3	26.6
W7	99.4	102.7	57.2	58.1	77.1	76.9	59.4	53.4	27.4	23.9
18	100.1	104.3	58.4	62.1	77.7	77.2	57.4	51.7	25.3	23.5
6	101.6	103.7	56.0	59.3	79.7	79.6	58.2	52.3	29.8	25.0
14	99.5	102.9	55.2	59.0	77.5	75.3	56.7	53.7	26.3	22.7
0013	99.5	100.5	53.2	59.0	76.6	76.1	57.4	55.5	26.6	24.25
10	96.4	98.5	55.2	58.0	75.5	75.2	55.9	52.4	27.3	24.2
C39	97.2	99.1	55.0	58.8	74.7	73.1	55.0	49.2	25.7	24.1
W8	91.4	94.2	52.6	56.0	70.5	69.2	52.3	44.6	26.5	21.9
W6	95.9	99.7	54.7	60.5	74.9	75.0	56.4	49.5	24.5	21.8
005	95.8	97.5	53.3	56.0	73.5	74.9	55.4	47.8	26.6	25.0
5	88.8	92.1	52.8	56.9	67.8	69.7	46.2	42.8	24.8	20.8
0014	92.2	94.6	54.2	57.2	69.6	69.5	50.7	45.4	23.2	22.0
C26	85.2	87.5	50.7	53.9	65.4	65.9	47.8	44.0	23.4	19.8
W4	86.9	88.6	50.5	56.1	64.7	63.9	47.9	43.9	22.9	18.9
W5	86.2	89.2	49.4	54.6	66.0	64.4	45.0	41.0	21.2	18.7
W9	85.0	89.2	50.0	53.7	65.4	66.4	46.2	44.1	23.8	22.6

CONTROLS (PART B), FEBRUARY, 1937

Case No.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochanteric Breadth	Transverse Chest	Entire Arm Length	Upper Arm Length	Forearm Length	Hand Length	Chest Girth	Head Length
7	29.1	24.7	16.9	21.2	13.6	52.6	22.8	17.9	13.7	61.0	16.9
4	20.2	22.3	18.1	20.1	16.3	45.1	17.3	15.2	12.0	59.7	16.0
0012	24.5	24.1	16.3	18.7	12.3	45.4	19.1	15.2	11.5	55.8	14.6
U8	25.9	22.5	15.9	19.8	14.8	46.6	17.5	16.0	12.2	57.2	17.5
W7	23.9	23.6	15.7	18.9	14.5	43.7	16.9	16.5	11.3	54.6	15.8
18	23.1	22.4	17.0	19.0	13.3	42.6	16.6	16.2	10.4	55.9	13.5
6	24.6	25.4	15.9	18.4	15.1	46.8	20.0	14.5	11.8	58.4	16.5
14	22.5	21.9	15.7	19.3	13.6	44.7	17.8	15.5	11.2	50.8	16.0
0013	23.4	24.8	16.3	17.3	14.6	42.1	17.6	14.4	11.4	52.1	17.4
10	23.5	23.5	17.2	18.8	14.0	41.3	16.7	14.4	11.8	54.6	15.7
C39	23.5	22.5	16.8	18.6	12.4	39.2	15.4	13.6	11.2	52.1	14.0
W8	21.8	21.8	14.2	17.7	13.2	39.6	15.7	14.2	10.1	52.7	15.0
W6	21.6	22.9	14.8	19.6	14.4	39.6	14.6	14.6	9.7	55.9	15.2
005	24.3	20.4	16.4	18.0	12.3	40.9	17.6	14.3	9.6	52.1	16.6
5	20.7	20.0	16.1	17.6	12.4	36.7	13.1	13.0	10.4	50.8	17.1
0014	21.1	22.35	15.8	17.1	13.2	38.0	15.3	13.4	10.7	57.2	15.7
C26	19.0	19.4	13.7	16.2	11.5	36.5	15.3	13.2	9.8	54.0	16.1
W4	18.5	17.5	13.5	14.9	13.6	35.2	11.5	12.3	10.2	50.8	16.0
W5	18.4	20.8	13.5	17.1	13.7	36.1	13.8	13.1	9.9	52.7	14.4
W9	21.8	20.3	13.5	17.3	12.4	36.5	13.8	13.8	9.0	49.5	16.2

T A B L E II
(Continued)

CONTROLS (PART C), FEBRUARY, 1937

Case No.	Head Breadth	Head Height	Interpupillary Distance	Suprasternal To head Top	Head Circumference Head Line	Hair Line	Weight	Comments on Weight
7	10.30	7.4	5.4	24.1	50.2	50.0	44.00	Satisfactory
4	11.34	8.1	5.7	23.5	53.6	53.6	37.50	Satisfactory
0012	10.30	9.1	5.0	23.9	53.3	50.8	33.00	Satisfactory
U8	9.90	7.7	5.1	22.6	50.8	49.5	40.00	Satisfactory
W7	10.30	6.9	5.1	22.0	51.2	50.2	38.00	Satisfactory
18	10.50	7.2	5.2	22.4	50.2	49.5	37.00	Satisfactory
6	9.70	8.3	5.6	23.1	50.8	50.2	34.50	Satisfactory
14	10.90	6.7	5.3	21.3	52.1	49.5	39.00	Satisfactory
0013	11.30	7.4	5.25	21.3	54.0	53.3	32.00	Satisfactory
10	11.50	7.1	5.4	21.5	54.6	50.2	36.00	Satisfactory
C39	10.40	8.2	5.0	21.7	48.9	48.3	33.00	Satisfactory
W8	9.20	7.3	5.1	21.9	48.5	48.3	30.00	Satisfactory
W6	10.20	7.7	5.5	21.0	49.5	48.9	39.00	Satisfactory
005	10.30	7.7	5.0	21.7	48.3	46.9	33.00	Satisfactory
5	10.20	8.4	4.9	21.9	49.5	48.3	31.00	Satisfactory
0014	11.20	7.3	5.4	24.0	50.8	49.5	28.00	Satisfactory
C26	9.20	9.6	4.3	20.4	48.6	46.9	25.00	Satisfactory
W4	9.50	7.2	5.2	19.9	50.8	50.2	28.50	Satisfactory
W5	10.30	8.2	4.6	19.3	48.3	47.6	26.25	Satisfactory
W9	10.30	7.2	5.1	20.6	48.3	47.6	26.50	Satisfactory

NURSERY SCHOOL CHILDREN (PART A), JUNE, 1937

Case No.	Stand-ing Height	Hori-zontal Height	Sit-ting Height	Stem End	Supra-sternal Height	Tip of Acromion Height	Cristal Height	Anterior Ilian Spine Height	Knee Height	Tibial Length Flexed
C37	97.3	98.0	56.4	57.1	75.8	75.0	56.3	54.0	27.0	23.5
W6	99.5	101.6	54.6	59.4	76.3	76.7	56.2	53.5	27.0	22.9
15	92.9	95.2	50.1	53.2	72.4	72.0	54.0	51.8	25.6	22.4
2	98.2	100.2	57.7	58.7	74.8	75.2	56.1	53.4	25.0	23.8
13	96.6	97.8	54.6	57.7	75.9	75.1	54.6	50.5	26.1	22.9
0018	104.5	104.9	59.3	58.3	81.7	81.5	60.5	56.6	28.3	25.6
0019	95.3	96.3	52.4	53.3	74.7	74.1	54.0	51.6	27.2	23.3
C38	92.6	95.6	55.9	57.7	70.8	71.7	52.2	48.4	25.3	22.5
21	99.0	101.0	57.3	59.3	76.0	76.4	56.5	45.8	25.9	20.9
004	90.6	92.8	49.1	55.3	69.4	69.1	51.8	48.0	24.6	22.1
0020	95.5	96.9	55.1	58.6	74.2	74.6	54.2	48.2	26.1	22.1
003	92.7	94.2	51.8	54.8	72.5	73.8	54.6	50.9	25.0	21.8
W9	87.0	88.1	49.9	52.9	67.7	67.2	48.8	47.4	23.6	20.5
W5	89.1	91.6	52.5	54.9	67.5	67.8	51.3	46.8	23.7	20.8
007	96.7	97.5	53.8	56.0	74.7	73.9	56.0	53.9	26.0	23.5
W4	90.0	90.6	53.2	56.7	68.5	68.7	48.7	45.9	22.3	20.3

NURSERY SCHOOL CHILDREN (PART B), JUNE, 1937

Case No.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochanteric Breadth	Transverse Chest	Entire Arm Length	Upper Arm Length	Fore-arm Length	Hand Length	Chest Girth	Head Length
C37	23.1	21.7	16.3	19.2	13.5	41.5	19.2	14.0	10.0	54.6	16.7
W6	22.7	21.6	14.1	12.5	18.8	42.7	16.3	14.8	10.1	57.8	16.2
15	21.8	20.3	14.4	17.2	12.0	41.4	15.4	14.0	11.9	45.7	15.5
2	22.9	22.4	15.2	18.1	12.5	42.3	17.0	14.6	11.2	50.8	16.4
13	22.8	23.1	16.0	20.5	13.0	40.0	15.6	14.0	10.8	57.2	15.7
0018	24.9	22.0	14.9	18.3	12.9	43.1	17.2	14.8	11.5	52.1	15.8
0019	22.9	20.7	14.5	17.3	12.6	39.0	16.5	14.1	10.2	49.5	16.5
C38	22.1	21.1	16.1	18.4	13.8	39.4	15.6	13.8	10.4	52.7	16.2
21	20.1	23.2	17.7	19.9	13.3	41.3	16.3	14.3	11.3	55.9	14.1
004	20.5	19.8	14.4	18.0	12.1	37.4	14.9	12.8	10.0	50.2	14.8
0020	21.5	22.4	15.8	19.7	13.6	40.0	16.5	12.9	11.6	54.6	15.9
003	21.6	22.1	14.3	17.9	12.0	39.6	15.7	14.0	10.6	50.1	16.3
W9	19.9	20.5	14.5	16.9	13.0	38.3	15.3	12.6	10.7	50.2	16.2
W5	19.6	20.3	15.9	17.3	11.9	34.0	15.0	12.5	10.9	54.0	14.9
007	23.1	22.5	16.0	18.4	12.3	42.5	15.8	15.8	11.9	52.7	17.2
W4	19.5	15.7	13.3	16.7	12.1	38.7	15.2	13.4	10.3	53.3	17.3

NURSERY SCHOOL CHILDREN (PART C), JUNE, 1937

Case No.	Head Breadth	Head Height	Interpupillary Distance	Suprasternum To head Top	Head Circumference Head Line	Hair Line	Weight	Comments on Weight
C37	11.0	7.3	5.4	23.0	51.5	50.8	35.50	Satisfactory
W6	9.5	7.8	5.0	20.5	49.5	48.9	39.00	23.8 percent overweight
15	11.0	8.3	5.1	20.7	49.5	48.3	27.00	Satisfactory
2	10.3	7.7	5.4	22.1	48.9	46.9	33.00	Satisfactory
13	10.5	7.6	5.0	21.0	48.3	46.9	39.00	Satisfactory
0018	11.5	7.6	4.9	23.5	50.2	48.9	33.75	Satisfactory
0019	10.1	7.6	4.8	21.5			29.75	Satisfactory
C38	10.2	7.3	5.1	21.0	49.5	47.6	32.00	Satisfactory
21	15.2	7.4	5.7	22.3	50.2	49.5	40.50	Satisfactory
004	10.1	8.4	4.5	20.1	46.9	45.7	30.00	Satisfactory
0020	10.5	7.5	5.0	21.8	50.2	48.9	32.00	Satisfactory
003	10.1	7.6	4.9	22.8	49.5	46.9	30.50	Satisfactory
W9	10.1	8.2	5.1	19.9	49.5	48.3	28.50	Satisfactory
W5	10.1	8.3	4.6	20.7	48.3	47.6	28.50	Satisfactory
007	10.2	6.8	4.9	22.6	52.1	49.5	36.00	Satisfactory
W4	9.1	7.9	5.1	21.4	50.8	49.5	30.00	Satisfactory

T A B L E II
(Continued)

CONTROLS (PART A), JUNE, 1937

Case No.	Standing Height	Horizontal Height	Sitting Height	Stem End	Suprasternal Height	Tip of Acromion Height	Cristal Height	Anterior Iliac Spine Height	Knee Height	Tibial Length Flexed
7	116.8	116.5	60.9	65.4	92.4	91.9	70.0	69.1	33.4	29.7
4.	107.5	108.9	55.6	59.2	82.7	80.4	62.8	60.1	29.0	26.6
0012	110.9	111.7	56.0	61.1	87.1	88.9	69.3	65.3	35.1	26.7
5	92.1	93.3	53.1	57.7	69.5	69.7	54.8	46.0	23.2	21.0
6	103.4	103.3	56.3	59.4	80.7	81.2	61.1	58.5	31.2	26.2
23	106.9	109.7	57.5	60.7	84.7	83.4	64.6	58.5	30.9	27.8
14	102.2	103.9	56.9	59.6	79.1	79.3	59.2	56.0	28.3	24.7
0013	102.6	103.1	54.4	57.5	80.0	79.6	61.1	57.7	28.6	25.1
9	98.8	100.7	51.5	57.1	77.6	77.1	58.0	55.6	30.2	23.9
10	99.5	100.5	54.1	57.6	77.7	77.2	60.1	52.2	27.2	22.2
C39	96.9	107.0	55.0	57.2	75.2	74.3	57.1	52.6	26.5	23.4
005	98.6	101.2	54.7	54.2	75.7	77.1	58.7	52.0	26.9	24.6
8	109.1	113.1	61.6	65.9	88.3	87.5	66.5	62.9	31.5	25.3
0014	95.6	97.1	56.1	57.5	71.5	71.0	52.3	49.3	24.0	21.8
W18	88.4	89.7	50.1	52.4	66.8	67.1	49.4	45.0	23.9	21.6
W11	89.3	92.3	51.7	55.4	68.6	67.2	49.6	44.6	24.0	21.8
C26	88.1	91.0	51.2	51.3	68.4	67.8	47.8	46.4	23.0	21.0
W15	94.0	95.8	55.5	58.9	70.1	69.2	52.0	46.5	25.6	21.5
W17	85.0	87.7	52.0	53.0	65.6	64.4	47.0	40.7	20.7	19.1
W16	87.9	88.1	50.0	52.7	67.4	67.1	47.4	42.9	23.1	20.8
W14	89.7	92.7	53.9	56.2	69.3	68.9	47.5	45.0	24.0	20.7
W12	82.5	85.5	49.4	53.9	62.4	61.9	45.7	42.4	21.0	18.3
W19	81.2	83.1	48.5	50.0	62.2	62.3	46.5	42.9	20.7	18.9

T A B L E II
(Continued)

CONTROLS (PART B), JUNE, 1937

Case No.	Tibial Length	Acromial Breadth	Cristal Breadth	Trochan-teric Breadth	Trans-verse Chest	Entire Arm Length	Upper Arm Length	Fore-arm Length	Hand Length	Chest Girth	Head Length
7	29.3	25.1	15.8	20.5	14.1	53.3	21.6	17.8	14.3	59.7	16.6
4	26.3	23.6	17.3	20.0	13.6	46.4	18.1	15.2	12.6	55.9	16.9
0012	26.6	21.2	13.1	18.5	12.4	47.4	20.1	15.8	12.1	54.6	16.8
5	20.1	22.1	15.2	15.8	11.8	40.8	17.2	14.0	10.5	48.3	17.0
6	25.8	24.6	15.8	18.5	13.6	46.7	18.6	16.5	12.2	53.3	16.0
23	27.2	23.5	15.6	19.3	12.6	45.0	16.7	15.4	12.3	54.6	16.6
14	23.7	23.2	15.4	20.1	12.8	42.7	16.6	15.8	10.7	55.9	17.3
0013	24.9	18.6	11.1	16.7	12.7	44.0	17.7	14.5	11.6	53.3	17.5
9	23.9	22.9	14.7	19.5	12.5	43.0	17.1	15.9	10.9	54.6	16.6
10	21.4	23.2	14.0	18.1	13.2	41.7	15.9	14.7	10.6	54.6	17.2
C39	22.5	21.5	16.8	18.6	12.4	39.2	15.4	13.6	11.2	52.1	14.0
005	22.6	17.9	13.5	17.9	9.5	41.3	17.7	14.5	10.4	54.0	16.3
U8	25.0	21.1	14.3	18.3	13.0	47.5	20.9	13.8	12.8	54.6	17.5
0014	20.5	17.1	14.3	17.5	12.5	39.2	15.1	13.9	10.7	55.9	16.4
W18	21.0	20.6	14.8	16.5	13.0	35.9	14.2	13.0	9.5	50.8	16.2
W11	21.1	20.3	14.9	18.4	12.7	37.7	15.4	12.7	11.1	52.1	14.8
C26	20.5	20.5	14.1	16.7	12.0	39.0	15.0	12.7	10.6	46.9	15.8
W15	20.5	22.0	14.4	17.8	12.8	40.0	15.8	14.4	10.4	54.4	17.5
W17	18.0	21.0	15.3	17.0	11.0	35.1	13.8	11.7	8.8	54.0	16.7
W16	20.3	22.0	11.4	16.5	11.4	37.6	15.5	13.0	10.2	48.3	15.4
W14	20.5	22.1	16.3	17.7	13.6	38.5	14.9	13.5	10.7	52.1	15.5
W12	17.9	20.7	15.3	17.7	12.9	34.4	12.9	11.7	9.5	57.5	14.7
W19	18.3	20.6	13.2	16.8	11.4	33.5	13.6	12.0	9.1	47.6	15.3

CONTROLS (PART C), JUNE, 1937

Case No.	Head Breadth	Head Height	Interpupillary Distance	Supra-sternum to head Top	Head Circumference		Weight	Comments on Weight
					Head Line	Hair Line		
7	10.2	7.6	5.6	23.5	50.2	48.3	44.25	11.5 percent underweight
4	10.5	8.1	5.6	23.3	51.5	49.5	39.0	Satisfactory
0012	9.4	7.7	4.7	22.3	49.5	49.0	35.00	10.2 percent underweight
5	10.5	7.6	4.7	20.9	49.5	48.3	30.00	Satisfactory
6	9.4	8.0	5.0	21.9	49.5	46.9	34.50	Satisfactory
23	10.2	8.6	5.0	22.1	49.5	48.9	39.00	Satisfactory
14	10.2	7.1	5.2	21.9	52.1	50.2	40.00	Satisfactory
0013	9.5	7.5	5.5	21.5	52.1	49.5	34.00	Satisfactory
9	9.6	8.2	4.8	21.2	50.2	49.5	35.00	Satisfactory
10	11.8	7.5	5.4	20.7	50.8	50.2	36.00	Satisfactory
C39	10.4	8.2	5.0	21.7	48.9	48.3	34.00	Satisfactory
005	8.5	7.2	4.7	21.7	49.5	49.5	31.00	Satisfactory
U8	9.0	8.15	5.0	22.0	51.5	51.2	40.00	Satisfactory
0014	9.2	7.6	5.4	22.5	49.5	48.3	28.50	18 percent underweight
W18	10.1	8.3	4.6	20.4	49.5	47.8	28.00	Satisfactory
W11	10.2	8.6	4.8	21.0	46.6	46.4	30.50	Satisfactory
C26	9.5	8.4	4.3	20.4	47.6	45.7	25.75	Satisfactory
W15	10.5	7.3	4.9	22.5	52.7	50.8	33.25	Satisfactory
W17	9.6	7.5	4.4	19.3	50.2	47.6	30.00	Satisfactory
W16	10.6	8.2	4.9	19.8	45.7	45.7	28.00	Satisfactory
W14	10.9	7.7	5.5	21.5	48.3	46.9	31.00	Satisfactory
W12	11.2	8.6	4.7	19.1	48.3	47.6	29.00	Satisfactory
W19	9.7	9.2	4.5	18.8	45.7	45.7	23.00	Satisfactory

KEY TO TABLE III

A. -- Nursery School Children

B. -- Control Children

C. -- Control Children Dropped from Nursery School, but
   Continued in the Study

D. -- Control Children Who Never Attended Nursery School

SUMMARY OF OSSIFIC CENTER STATUS

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937

*Average Bone Age Compared with Chronological Age Based on Ossific Centers.

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	-7.31	+4.75	-8.42	- 6.0	- 7.44	- 7.31
B		-17.28	-5.43	-11.08	-10.6	- 9.09
C				-13.0	-13.37	-12.44
D		-17.28	-6.02	- 9.66	- 9.87	- 6.76

Average Number of Ossific Centers Missing for Ossific Center Age

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	7.54	10.75	6.63	7.80	7.47	6.15
B		7.28	5.83	3.33	3.75	5.55
C			8.0	2.2	3.0	2.33
D		7.28	5.73	4.0	3.12	7.0

Average Number of Ossific Centers Missing for Chronological Age

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	10.0	9.75	10.2	12.84	11.92	9.2
B		14.0	9.7	9.34	8.15	7.52
C			8.00	7.2	7.56	5.12
D		14.0	9.2	6.33	6.37	9.76

*
 - Indicates retardation of growth
 + Indicates advancement of growth

TABLE III.   SUMMARY OF OSSIFIC CENTER STATUS

KEY TO TABLE IV

A. - Nursery School Children

B. - Control Children

C. - Control Children Dropped from Nursery School,
but Continued in the Study

D. - Control Children Who Never Attended Nursery School

SUMMARY OF BONE PENETRATION STATUS

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
	*Average Bone Age Compared with Chronological Age Based on Penetration					
A	-3.44	+ 2.5	-2.55	-2.1	-1.81	-2.53
B		-12.71	-5.16	-4.12	-4.77	-2.18
C			-3.0	-3.5	-4.94	- .33
D		-12.71	-5.0	-4.58	-5.5	-3.46

* - Indicates retardation of Growth

\+ Indicates advancement of Growth

TABLE IV   SUMMARY OF BONE PENETRATION STATUS

T A B L E V, A

EVALUATION OF ROENTGENOGRAMS

NOVEMBER 1936

	CHRONOLOGICAL AGE	AGE BASED ON OSSIFIC CENTERS	COMPARISON WITH CHRONOLOGICAL AGE	NUMBER OF OSSIFIC CENTERS MISSING FOR (1) Ossific Center Age	(2) Chronological Age	NUMBER OF PREVIOUSLY MISSING OSSIFIC CENTERS APPEARING SINCE LAST X-RAY	HAND	KNEE	AGE BASED ON PENETRATION	COMPARISON WITH CHRONOLOGICAL AGE
	4-6-6	5-0 yrs.	Advanced 6 mos.	6	3	4	5 yrs.-6 mos.	5 yrs.-0 mos.	5-3	Advanced 8 mos.
	4-6-0	23 mos.	Retarded 2 yrs-7 mos.	5	33	5	2 yrs-11 mos.	3 yrs- 9 mos.	3-4	Retarded 1 yr.2 mos.
	3-9-12	2 yrs- 2 mo.	Retarded 1 yr.7 mos.	7	19	7	3 yrs- 0 mos.	3 yrs- 6 mos.	3-3	Retarded 6 mos.
	3-9-12	2 yrs.	Retarded 1 yr.9 mos.	19	27	3	1 yr- 5 mos.	2 yrs- 6 mos.	1-10.5	Retarded 1 yr. mos.
	3-6-29	3 yrs.	Retarded 6 mos.	7	8	4	3 yrs- 6 mos.	3 yrs- 6 mos.	3-6	Advanced 1 mo.
	3-3-23	2 yrs- 11 mo.	Retarded 4 mos.	22	25	4	2 yrs- 5 mos.	4 yrs- 3 mos.	3-4	Advanced 1 mo.
	3-3-21	4 yrs- 6 mo.	Advanced 1 yr. 3 mos.	10	10	6	2 yrs- 6 mos.	4 yrs- 0 mos.	3-3	Satisfactory
	3-3-20	2 yrs.	Retarded 1 yr. 3 mos.	6	14	4	3 yrs- 0 mos.	2 yrs- 6 mos.	2-8	Retarded 7 mos.
	2-7-27	18 mos.	Retarded 1 yr. 1 mo.	5	19	8	2 yrs- 2 mos.	2 yrs- 7 mos.	2-4.5	Retarded 2.5 mos.
	2-7-24	1 yr. 7 mos.	Retarded 1 yr.	2	14	1	2 yrs- 0 mos.	2 yrs- 2 mos.	2-1	Retarded 6 mos.
	2-7-1	2 yrs. 5 mos.	Retarded 2 mos.	8	8	13	3 yrs- 0 mos.	2 yrs- 6 mos.	2-8	Advanced 1 mo.
	2-4-20	2 yrs.	Retarded 4 mos.	7	9	6	2 yrs- 0 mos.	4 yrs- 1 mo.	2 yrs.- 15 das.	Retarded 4 mos.
	2-3-27	2 yrs. 5 mos.	Advanced 2 mos.	2	2	6	2 yrs- 11 mos.	2 yrs- 6 mos.	2-8.5	Advanced 4.5 mos.
	2-3-12	2 yrs. 5 mos.	Advanced 3 mos.	0	4	9	2 yrs- 0 mos.	4 yrs- 0 mos.	3 yrs. 5 mos.	Advanced 1 yr. 2 mos.
	2-0-27	18 mos.	Retarded 6 mos.	11	22	First X-ray	1 yr- 7 mos.	2 yrs- 3 mos.	1 yr. 10 mos.	Retarded 2 mos.

Total number of Epiphyseal Centers Missing for Ossific Center Age 117

Average number of Epiphyseal Centers Missing for Ossific Center Age 7.8

Total Number of Epiphyseal Centers Missing for Chronological Age 203

Average Number of Epiphyseal Centers Missing for Chronological Age 13.5

Total Number of Previously missing Ossific Centers Appearing since last X-ray 77

Average Number of Previously Missing Ossific Centers Appearing since last X-ray 5.6

Average Bone Age Compared with Chronological Age Based on Ossific Centers. Bone Age Retardation 7.06 months

Average Bone Age Compared with Chronological Age Based on Penetration. Retardation 2.3 months

	CHRONOLOGICAL AGE	AGE BASED ON OSSIFIC CENTERS	COMPARISON WITH CHRONOLOGICAL AGE	(1)	(2)		HAND	KNEE	PENETRATION	COMPARISON
	5-5-26	3 yrs.	Retarded 2 yrs. 7 mos.	2	14	4	3 yrs 6 mos.	5 yrs 6 mos.	4-6	Retarded 1 yr. 2 mos.
	5-5-7	4 yr- 6m.	Retarded 11 mos.	3	3	2	4 yrs- 1 mo.	4 yrs- 6 mos.	4-3.5	Retarded 1 yr. 1.5 m
	4-4-23	2 yrs. 5 mos.	Retarded 1 yr. 11 mos.	3	8	3	3 yrs- 6 mos.	4 yrs- 0 mos.	3-8	Retarded 8 mos.
	4-0-20	3 yrs. 2 mos.	Advanced 18 mos.	1	3	3	4 yrs- 9 mos.	4 yrs-11 mos.	4-10	Advanced 10 mos.
	3-11-29	3 yrs.	Retarded 11 mos.	5	6	1	3 yrs- 0 mos.	3 yrs- 0 mos.	3-0	Retarded 11 mos.
	3-6-23	4 yrs. 2 mos.	Retarded 1 yr. 4 mos.	5	11	4	3 yrs- 0 mos.	3 yrs- 3 mos.	3-1.5	Retarded 4.5 mos.
	3-6-6	2 yrs. 2 mos.	Retarded 1 yr. 4 mos.	4	10	3	2 yrs- 6 mos.	3 yrs- 6 mos.	3-6	Retarded 6 mos.
	3-4-9	2 yrs. 6 mos.	Retarded 11 mos.	7	12	4	2 yrs- 3 mos.	2 yrs- 9 mos.	2-6	Retarded 10 mos.
	3-2-5	2 yrs. 5 mos.	Retarded 9 mos.	5	10	First X-ray	3 yrs- 3 mos.	3 yrs- 9 mos.	3-6	Advanced 4 mos.
	2-10-10	2 yrs. 5 mos.	Retarded 5 mos.	3	6	First X-ray	2 yrs- 3 mos.	2 yrs- 5 mos.	2-4	Retarded 6 mos.
	2-9-2	23 mos.	Retarded 5 mos.	0	2	First X-ray	2 yrs- 6 mos.	2 yrs- 6 mos.	2-6	Retarded 1 mo.
	2-6-26	23 mos.	Retarded 7 mos.	2	6	10	3 yrs- 0 mos.	2 yrs- 6 mos.	2-9	Advanced 3 mos.
	2-6-5	3 y. 1 m.	Advanced 7 mos.	4	6	First X-ray	2 yrs- 11 mos.	2 yrs- 11 mos.	2-11	Advanced 5 mos.
	2-5-5	22 mos.	Retarded 7 mos.	10	16	First X-ray	2 yrs- 0 mos.	2 yrs- 5 mos.	2-0	Retarded 5 mos.
	2-4-23	2 y. 5 m.	Advanced 1 mo.	5	5	First X-ray	3 yrs- 1 mo.	2 yrs- 5 mos.	2-5	Advanced 4 mos.
	2-2-17	19 mos.	Retarded 6 mos.	3	13	First X-ray	1 yr- 9 mos.	2 yrs- 1 mo.	1-10	Retarded 4 mos.
	2-1-13	23 mos.	Retarded 2 mos.	4	11	4	2 yrs- 1 mo.	2 yrs- 0 mos.	2 yrs. .5 mos.	Satisfactory
	1-10-6	1 yr.	Retarded 10 mos.	5	28	First X-ray	1 yr- 7 mos.	1 yr- 4 mos.	1-5.5	Retarded 4.5 mos.

Total number of Epiphyseal Centers missing for Ossific Center Age (not including children over 5 years of age) 66 4.1

Average number of Epiphyseal Centers missing for Ossific Center Age (not including children over 5 years of age) 151

Total number of Epiphyseal Centers missing for Chronological age (not including children over 5 years of age) 151

Average number of Epiphyseal Centers missing for Chronological age (not including children over 5 years of age) 9.4

Total number of Previously missing Ossific Centers appearing since last X-ray (not including children over 5 years of age) 37

Average number of Previously missing Ossific Centers appearing since last X-ray (not including children over 5 years of age) 4.1

Average Bone Age Compared with Chronological Age Based on Ossific Centers (Not including children over 5 years of age) . Bone Age Retardation 9.0

Average Bone Age Compared with Chronological Age Based on Penetration (not including children over 5 years of age). Retardation 2.1

T A B L E V, B

EVALUATION OF ROENTGENOGRAMS — FEBRUARY, 1937

Total Number of Epiphyseal Centers Missing for Ossific Center Age 117
Average Number of Epiphyseal Centers Missing for Ossific Center Age 6.5
Total Number of Epiphyseal Centers Missing for Chronological Age 315
Average Number of Epiphyseal Centers Missing for Chronological Age 11.5
Total Number of Previously Missing Ossific Centers Appearing since last X-ray. 50
Average Number of Previously Missing Ossific Centers Appearing since last X-ray. 2.8

Average Bone Age Compared with Chronological Age Based on Ossific Centers
Bone Age Retardation 7.4 months

Average Bone Age Compared with Chronological Age Based on Penetration
Retardation 2.5 months

Total Number of Epiphyseal Centers Missing for Ossific Center Age 73
(not including Children over 5 years of age)
Average Number of Epiphyseal Centers Missing for Ossific Center Age 4.06
(not including Children over 5 years of age)
Total Number of Epiphyseal Centers Missing for Chronological Age 146
(not including Children over 5 years of age)
Average Number of Epiphyseal Centers Missing for Chronological Age 9.12
(not including Children over 5 years of age)
Total Number of Previously Missing Ossific Centers Appearing since last X-ray. (not including children over 5 years of age) 21
Average Number of Previously Missing Ossific Centers Appearing since last X-ray. (not including children over 5 years of age) 2.1

Average Bone Age Compared with Chronological Age Based on Ossific Centers (not including children over 5 years of age)
Bone Age Retardation 11.9 months

Average Bone Age Compared with Chronological Age Based on Penetration (not including children over 5 years of age).
Retardation 5.0 months

T A B L E V, C

EVALUATION OF ROENTGENOGRAMS - JUNE, I937

KEY TO TABLE VI

A. -- Nursery School Children

B. -- Control Children

C. -- Control Children Dropped from Nursery School, but

Continued in the Study

D. -- Control Children Who Never Attended Nursery School

AVERAGE HAEMOGLOBIN STATUS OF CHILDREN

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	–	13.46	11.04	10.85	10.55	12.78
B	–	11.30	10.49	9.35	10.28	11.98
C	–	–	10.97	10.94	10.41	11.98
D	–	11.30	10.49	11.16	10.03	11.68

TABLE VI   HAEMOGLOBIN STATUS OF CHILDREN

CURRENT SCHOOL CHILDREN

	MARCH 1936	MAY 1936 (1)	AUGUST 1936	NOVEMBER 1936	FEBRUARY 1937	JUNE 1937

CONTROL CHILDREN

(1) grams of haemoglobin per 100 cc. blood

KEY TO TABLE VII

A. -- Nursery School Children

B. -- Control Children

C. -- Control Children Dropped from Nursery School, but
Continued in the Study

D. -- Control Children Who Never Attended Nursery School

AVERAGES OF CAPILLARY WALL MEASUREMENTS

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	29.85	41.47	53.47	58.66	56.94	55
Average Reaction	4+	4+	4+	0	0	0
B	--	26.54	56.95	55.38	58.75	55
Average Reaction	--	4+	4+	2+	1+	0
C	--	--	40	55	59.4	55
Average Reaction	--	--	4+	0	1+	0
D	--	26.5	57.7	63.5	58.1	55
Average Reaction	--	4+	4+	1+	0	0

TABLE VII   CAPILLARY WALL MEASUREMENTS
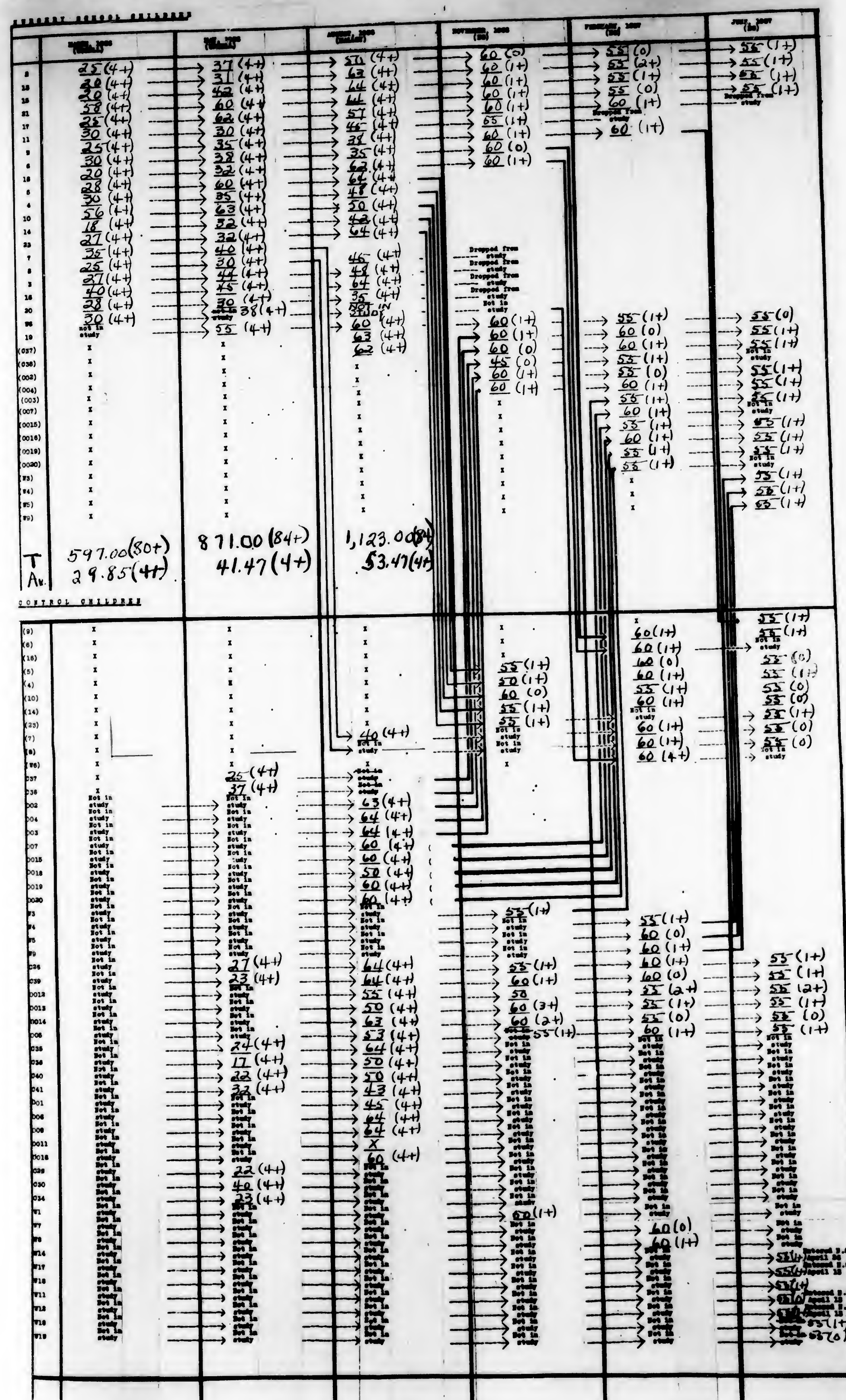
KEY TO TABLE VIII

A. -- Nursery School Children

B. -- Control Children

C.-- Control Children Dropped from Nursery School, but

Continued in the Study

D. -- Control Children Who Never Attended Nursery School

AVERAGE OF FOOTPRINTS

	March 1936	May 1936	August 1936	November 1936	February 1937	June 1937
A	2.25	--	2.19	2.53	2.27	2.75
B	--	--	2.16	2.33	1.90	1.91
C	--	--	1.0	2.20	1.88	1.60
D	--	--	2.13	2.42	1.10	2.15

TABLE VIII — FOOTPRINTS (CLASS)
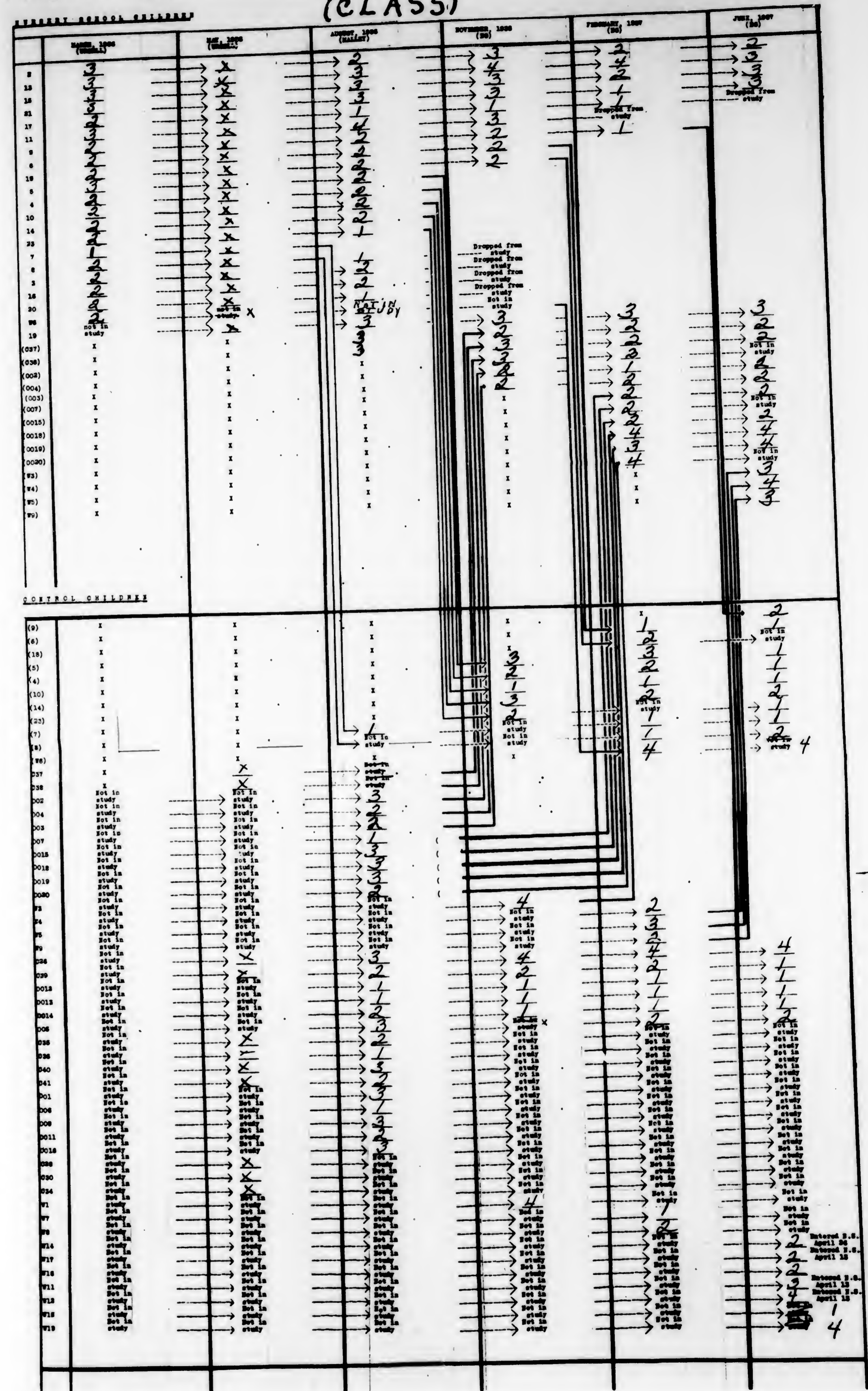
DISCUSSION OF DATA

HOME AND FAMILY RATINGS

The ratings of the families of the children in the study on the basis of income, education of parents, and physical home may be summarized from the beginning of this series of studies as follows:

MARCH NURSERY SCHOOL CHILDREN, 1936

Cash Income Level Rating

Classes A-1 to C-2	– no families
Class C-3	– 6 families
Class D	– 14 families
Class E	– no families

Physical Home Rating

Classes A and B	– no families
Class C	– 9 families
Class D	– 7 families
Class E	– 4 families

Rating on Basis of Education of Parents

Classes A to C	– no families
Class D	– 2 cases
Class E	– 18 cases

MARCH CONTROLS, 1936

None

MAY NURSERY SCHOOL CHILDREN, 1936

Cash Income Level Rating

Classes A-1 to C-1	– no families
Class C-2	– 1 family
Class C-3	– 6 families
Class D	– 14 families

Physical Home Rating

Class A	– no families
Class B	– 1 family
Class C	– 9 families
Class D	– 7 families
Class E	– 4 families

Rating on Basis of Education of Parents

Classes A to C	– no cases
Class D	– 2 cases
Class E	– 19 cases

MAY CONTROL CHILDREN, 1936

Cash Income Level Rating

Classes A to C-2	– no families
Class C-3	– 2 families
Class D	– 8 families
Class E	– 1 family

<u>Physical Home Rating</u>

Classes A to B	– no families
Class C	– 6 families
Class D	– 2 families
Class E	– 3 families

<u>Rating on Basis of Education of Parents</u>

Classes A to D	– no cases
Class E	– 11 cases

<u>AUGUST NURSERY SCHOOL CHILDREN, 1936</u>

<u>Cash Income Rating</u>

Classes A-1 to C-1	– no families
Class C-2	– 1 family
Class C-3	– 6 families
Class D	– 14 families

<u>Physical Home Rating</u>

Class A	– no families
Class B	– 1 family
Class C	– 11 families
Class D	– 6 families
Class E	– 3 families

<u>Rating on Basis of Education of Parents</u>

Classes A to C	– no cases
Class D	– 2 cases
Class E	– 19 cases

AUGUST CONTROL CHILDREN, 1936

Cash Income Rating

Classes A-1 to C-1	- no families
Class C-2	- 1 family
Class C-3	- 3 families
Class D	- 19 families
Class E	- 1 family

Physical Home Rating

Class A	- no families
Class B	- 1 family
Class C	- 16 families
Class D	- 4 families
Class E	- 3 families

Rating on Basis of Education of Adult Members

Classes A to B	- no cases
Class C	- 1 case
Class D	- 4 cases
Class E	- 19 cases

NOVEMBER NURSERY SCHOOL CHILDREN, 1936

Cash Income Level Rating

Classes A to C-1	- no families
Class C-2	- 1 family
Class C-3	- 2 families
Class D	- 12 families

Physical Home Rating

    Classes A to B   - no families

    Class C   - 7 families

    Class D   - 2 families

    Class E   - 2 families

Rating on Basis of Education of Parents

    Classes A to C   - no families

    Class D   - 1 family

    Class E   - 10 families

NOVEMBER CONTROL CHILDREN, 1936

Cash Income Level Rating

    Classes A-1 to C-2   - no families

    Class C-3   - 4 families

    Class D   - 8 families

    Class E   - 1 family

Physical Home Rating

    Classes A to B   - no families

    Class C   - 8 families

    Class D   - 3 families

    Class E   - 2 families

Rating on Basis of Education of Parents

    Classes A to C   - no families

    Class D   - 1 family

    Class E   - 12 families

FEBRUARY NURSERY SCHOOL CHILDREN, 1937

Cash Income Level Rating

    Classes A-1 to C-1   - no families

    Class C-2   - 1 family

    Class C-3   - 2 families

    Class D   - 15 families

Physical Home Rating

    Class A   - no families

    Class B   - 1 family

    Class C   - 14 families

    Class D   - 3 families

Rating on Basis of Education of Parents

    Classes A to B   - no families

    Class C   - 1 family

    Class D   - 2 families

    Class E   - 15 families

FEBRUARY CONTROL CHILDREN, 1937

Cash Income Level Rating

Classes A to C-2	- no families
Class C-3	- 2 families
Class D	- 17 families
Class E	- 1 family

Physical Home Rating

Classes A to B	- no families
Class C	- 10 families
Class D	- 5 families
Class E	- 5 families

Rating on Basis of Education of Parents

Classes A to C	- no families
Class D	- 2 families
Class E	- 18 families

JUNE NURSERY SCHOOL CHILDREN, 1937

Cash Income Level Ratings

Classes A-1 to C-1	- no families
Class C-2	- 1 family
Class C-3	- 2 families
Class D	- 13 families

Physical Home Rating

Class A	- no families
Class B	- 1 family
Class C	- 12 families
Class D	- 3 families

Rating on Basis of Education

Classes A to B	- no cases
Class C	- 1 family
Class D	- 2 families
Class E	- 13 families

JUNE CONTROL CHILDREN, 1937

Cash Income Level Ratings

Classes A to B-2	- no families
Class B-3	- 1 family
Class C-3	- 4 families
Class D	- 16 families
Class E	- 1 family

Physical Home Rating

Class A	- 2 families
Class B	- no families
Class C	- 8 families
Class D	- 7 families
Class E	- 5 families

Rating on Basis of Education of Parents

Class A	- 2 families
Class B	- no families
Class C	- 2 families
Class D	- 2 families
Class E	- 16 families

In order to have the ratings under discussion on a numerical basis for purposes of comparison of the nursery school group with the controls for each of the periods at which measurements were made, the letter ratings were translated into numerical ratings as follows:

Income Level Ratings:

A-1 was changed to 1; A-2 to 2; A-3 to 3; B-1 to 4; B-2 to 5; B-3 to 6; C-1 to 7; C-2 to 8; C-3 to 9; D to 10; and E to 11.

Physical Home Ratings:

A was changed to 1; B to 2; C to 3; D to 4; and E to 5.

Educational Ratings:

A was changed to 1; B to 2; C to 3; D to 4; and E to 5.

When the numbers corresponding to the letter ratings were substituted, as mentioned the following averages for the nursery school and control groups were obtained:

	Average Income Ratings	Average Home Ratings	Average Rating on Parents' Education
MARCH, 1936			
Nursery School	9.7	3.7	4.9
No controls	X	X	X
MAY, 1936			
Nursery School	9.6	3.6	4.9
Controls	9.9	3.6	5.0
AUGUST, 1936			
Nursery School	9.6	3.5	4.9
Controls	9.8	3.3	4.7

	Average Income Ratings	Average Home Ratings	Average Rating on Parents' Education
NOVEMBER, 1936			
Nursery School	9.7	3.3	4.9
Controls	9.7	3.5	4.9
FEBRUARY, 1937			
Nursery School	9.7	3.1	4.7
Controls	9.9	3.7	4.9
JUNE, 1937			
Nursery School	9.7	3.1	4.7
Controls	9.6	3.5	4.3

The data just presented show that the nursery school groups and the corresponding control groups were well matched throughout with respect to cash income of the family, type of physical home, and education of parents.

ANTHROPOMETRIC MEASUREMENTS

The anthropometric data for the series of nursery school studies
of which this is a part are being recorded for the use of those who
may continue in this work. At present, there are no norms for children
of this age, and the best that can be done until more data are
available is to evaluate the children as to whether they are over or
under-weight on the basis of their age, height, and hip width. This
was done by the use of Pryor Standards (4) which involves the use of
the height and hip width to determine the proper weight of children
of various ages. If a child was less than 10 per cent. over or under
the Pryor weights, its weight was recorded as satisfactory. If it
was 10 per cent. or more under or over these standards, the amount of
under or over-weight was recorded. (See Table II, Part C.)

A summary of the weight status of the children, including the
data on this subject from the study of Malley (2) are summarized
below. Standard anthropometric instruments were not available for the
first study of this series (1).

AUGUST, 1936

Nursery School Children

19 children (90.4 per cent. of the group) were satisfactory
in weight; and

2 children (9.5 per cent.) were underweight.

75.

Control Children

18 children (75 per cent. of the group) were satisfactory in weight; and

6 children (25 per cent.) were under-weight.

NOVEMBER, 1936

Nursery School Children

14 children (93.3 per cent. of the group) were satisfactory in weight; and

1 child (6.6 per cent. of the group) was over-weight.

Control Children

17 children (89.4 per cent. of the group) were satisfactory in weight; and

2 children (10.5 per cent.) were under-weight.

FEBRUARY, 1937

Nursery School Children

15 children (83.3 per cent. of the group) were satisfactory in weight;

2 children (11.1 per cent.) were over-weight; and

1 child (5.5 per cent.) was under-weight.

Control Children

20 children (100 per cent. of the group) were satisfactory in weight.

JUNE, 1937

Nursery School Children

15 children (93.7 per cent. of the group) were satisfactory in weight; and

1 child (6.2 per cent.) was over-weight.

Control Children

    19 children (86.3 per cent. of the group) were satisfactory

       in weight; and

    3 children (13.6 per cent.) were under-weight.

When the various measurements for nursery school and for control children were considered for August, 1936, November, 1936, February, 1937, and June, 1937, the following was found.

The nursery school children were under-weight in 4.2 per cent., over-weight in 5.6 per cent., and correct in weight 90.1 per cent. of the cases. The controls were under-weight 12.9 per cent., over-weight in none, and correct in weight in 87 per cent. of the cases.

EVALUATION OF ROENTGENOGRAMS

The work of Malley (2) showed the following concerning the skeletal status of the children in her study.

(1) The federal emergency nursery school children were advanced in August, 1936, as compared with May of the same year, although not significantly, with respect to average number of centers missing for the ossific center age.

(2) They were significantly improved during the three-month period from May to August, 1936, with respect to the average number of centers missing compared with the chronological age.

(3) They were less retarded in ossific center age in August than in May, 1936, although not significantly so.

(4) They were significantly improved with respect to the comparison of their bone penetration age (from the Todd standards) in August as compared with May, 1936.

An examination of Tables III and IV with their appended keys, will fail to show significant trends after August because the number of children entering and leaving nursery school had become so considerable by November, that a finer subdivision of cases seemed advisable to consider average changes in status from one period to the next, rather than gross averages. This has been done in Table IX.

TABLE IX

CHANGES IN SKELETAL STATUS OF CHILDREN IN STUDY

Groups	No. of Cases	Average Change Ossific Center Age Compared with Chronological Age	Average Change in Number of Ossific Centers Missing		Average Change in Bone Penetration Age
			(1) for ossific center age	(2) for chronological age	
All Children in Nursery School, August, 1936	18	-0.1 month	0.8	1.7	-.06 month
All Controls, August, 1936	6	-4.7 months	2.1	1.9	-0.5 month
All Controls who had never attended Nursery School previously, August, 1936	16	-4.7 months	2.1	+2.0	-1.0 month
Controls who had previously attended Nursery School August, 1936	1	0	+2.0	+2.0	-3.0 months
All Children in Nursery School, November, 1936	16	+0.9 month	0.4	+1.1	-1.0 month
All Controls November, 1936	16	-1.1 month	0.5	0.8	0.3 month

TABLE IX (Continued)

CHANGES IN SKELETAL STATUS OF CHILDREN IN STUDY

Groups	No. of Cases	Average Change Ossific Center Age Compared with Chronological Age	Average Change in Number of Ossific Centers Missing (1) for ossific center age	(2) for chronological age	Average Change in Bone Penetration Age
Controls who had never attended Nursery School previously, November, 1936	11	-1.5 month	0.8	0.6	0.3 month
Controls who had previously attended Nursery School November, 1936	5	-0.4 month	2.2	1.8	0
All children in Nursery School February, 1937	19	0.0 month	+0.4	1.5	-1.7 month
All Controls, February, 1937	13	-0.2 month	+0.6	+1.8	+0.3 month
All Controls who had never attended Nursery School February, 1937	1	+0.6 month	0.3	0.3	+1.7 month
Controls who had previously attended Nursery School February, 1937	1	+1.4 month	1.5	+1.5	+0.3 month

TABLE IX (Continued)

CHANGES IN SKELETAL STATUS OF CHILDREN IN STUDY

Groups	No. of Cases	Average Change Ossific Center Age Compared with Chronological Age	Average Change in Number of Ossific Centers Missing		Average Change in Bone Penetration Age
			(1) for ossific center age	(2) for chronological age	
All Children in Nursery School, June, 1937	16	-0.8 month	+0.7	+0.6	-0.5 month
All Controls, June, 1937	15	-0.3 month	+0.6	1.0	-1.3 month
Controls who had never attended Nursery School, June, 1937		-2.6	0.6	1.0	2.0 months
Controls who had previously attended Nursery School	9	+2.0 months	0.6	1.0	0.0

A study of the previous table will show the following:

In general, the entire nursery school group is somewhat further advanced than the entire control group with respect to the ossific center age compared with the chronological age; for the six test periods under discussion.

Without exception, the part of the controls who had previously attended nursery school averaged higher than those who had never attended the school, with respect to ossific center age compared with chronological age.

Where any difference in ossific centers missing for ossific center age was found, this difference was in behalf of the nursery school children.

No significant differences appeared in the number of ossific centers for the chronological age, nor for bone penetration age compared with chronological age in the various groups studied.

The controls were found to be much further advanced in skeletal status in the author's study than was found by Malley, and it is believed that the visiting nurse who is a staff member at the federal emergency nursery school had encouraged the mothers through home visits in the neighborhood, to buy more milk, and to make other improvements in the diet.

HAEMOGLOBIN TESTS

It was found by Urgell (1) that the children in the Lytle Addition Federal Emergency Nursery School in May, 1936, averaged 13.46 grams of haemoglobin per 100 c.c. of blood, with no child below 12.98. This average was significantly higher than that of a control group for the same period, which averaged 11.3 grams of haemoglobin per 100 c.c. of blood. The children had been fed a noon-day meal at the nursery school, with midmorning fruit juice, milk, and cod-liver oil, and mid-afternoon milk and toast, for a three-month period previous to the time of the measurements. The noon-day meal had consisted of a varied menu, including milk, bread, fresh or canned vegetables, and fruits, with meat three to four times a week.

At the end of the next three-month period (August, 1936), Malley (2) found that the average of the nursery school children had dropped to 11.0 grams of haemoglobin per 100 c.c. of blood, a highly significant decline when analyzed by the method of Love for comparing paired differences. The controls at the August period likewise fell significently to 10.49 grams of haemoglobin per 100 c.c. of blood, the latter value being significantly lower than the nursery school children for the same period. This was attributable either to a change in the home diet of the children (many of the control children coming from the same families as the nursery school children), or to a change in the menu at the nursery school, or to both causes. An analysis of the diet reported by the dietitian to Malley failed to reveal changes in the over-all

weekly iron content of the diet through that period, although the diet as reported was made out in advance and was sometimes subject to last-minute changes because of market conditions or budget limitations.

During the period from August to November, 1936, the nursery school children suffered another drop in haemoglobin, coming to 10.85 grams of haemoglobin per 100 c.c. of blood, with the control group falling to 9.35 grams per 100 cc. The dietitian had, because of finances eliminated meat from the diet of the federal emergency nursery school group except for once or possibly twice a week, and had given small attention to the iron content of the diet during this time.

At this point, the author and the director of this study consulted the dietitian and planned with her to increase the iron content of the diet, especially serving meat or fish three to four times a week. The author went to the school each day during the period, and recorded the weights of raw food prepared for the mid-day meal, and recorded the amounts of food given to each child each day at meal-time, and at mid-morning and mid-afternoon. The analysis of the average iron given each week to the nursery school children, together with its food source is shown in Table X.

As a result of the increase in iron in the diet at the school during this three-month period, the average haemoglobin of the nursery school group was 12.78 grams per 100 c.c. of blood, as compared with 11.98 for the control group. One reason which may account for the improvement in the haemoglobin status of the control group (although this is definitely lower than the nursery school average) was this. The visiting

TABLE X

AVERAGE IRON PER CHILD PER WEEK

(for Period from March 22 to June 18, 1937)

Date	Milk	Meat	Egg	Fish	Vegetable and Fruit	Cereal
March 22-25	.00436	.00116	.00182	.00443	.00710	.00057
March 29-April 2	.00512	.00171	.00024	0	.01072	.00262
April 5-9	.00517	.00256	.00033	.00023	.00412	.00325
April 12-16	.00507	.00321	.00004	.00012	.00676	.00250
April 19-23	.00538	.00169	.00138	.00036	.00666	.00194
April 26-30	.00560	.01935	.00062	.00035	.00579	.00248
May 3-7	.00500	.00264	.00160	.00058	.00954	.00184
May 10-14	.00587	.00170	.00055	.00036	.01012	.00186
May 17-21	.00525	.00422	.00052	0	.00527	.00222
May 24-28	.00586	.00102	.00165	.00042	.00613	.00176
June 1-4	.00460	.00285	.00040	0	.00381	.00167
June 7-11	.00541	.00304	.00063	0	.00636	.00186
June 14-18	.00663	.00217	.00142	.00043	.00634	.00193
Average for Period	.00533	.00364	.00086	.00081	.00682	.00204

nurse carried to the mothers in the neighborhood the advice which had been given to the dietitian about increasing iron in the diet of the nursery school children, since she felt that this point was worthy of attention by the mothers.

CAPILLARY TESTS

The nursery school children, as will be seen in Table VII, improved in capillary wall strength from March, 1936, until November, 1936, at which time they gave an average negative break at the limit of vacuum of which the instrument was capable (55 to 60 mm. of mercury). The control children were inferior to the nursery school children up until August, 1936, at which time they gave the same average response as the nursery school children. This may be accounted for by the garden foods available in most of the families during the summer months, or to the education on diet given by the visiting nurse, or both causes.

In November, 1936, and in February, 1937, the control group was slightly poorer than the nursery school children in the capillary test, but was equal to the nursery school group again in June. The fact that the controls were better during the winter of 1936-7 than during the winter of 1935-6 (although not quite so good as the nursery school group in either case) indicates that education on child diet which had come to the neighborhood from which these children were drawn as a result of this

series of studies, had caused the controls to receive a better home diet than previously. The fact that, in June, 1937, both groups were the same in this regard appears to indicate that a combination of education of mothers and foods from early home gardens improved the control children in capillary wall strength until they were as good as the nursery school children in this regard.

(Note: The 4+, 1+, etc. mentioned in the Key to Table VII as the type of reaction denotes the severity of the capillary break, and has been defined by Logan (5).)

FOOTPRINTS

Investigators are not agreed as to the significance of footprint tests, although it has been shown in studies in this laboratory that there appears to be an association between the amount of the foot touching the floor in young children and their general nutritional status.

Without attempting to interpret the meaning of the findings, the data on footprints have been recorded in Table VIII. There appears to be little difference between the average of the footprint ratings of the nursery school and the control children.

SUMMARY

This is a report of a study of the nutritional status of a
group of nursery school and a group of control children at approximate
three-month intervals from November, 1936, to June, 1937. The findings
have been given in detail, and they are briefly as follows:

Fewer under-weight children were found in the nursery school
than in the control groups throughout this study and the two studies of
the series which preceeded it.

In some respects there were no significant differences between the
skeletal status of nursery school and control children. In others,
notably in ossific center age and in the number of centers missing for the
ossific center age, the nursery school children were superior to the
control group.

Haemoglobin status in the nursery school children became poorer
when no particular attention was paid to the iron in the children's
diet, and improved again when special care was given to this point.

The nursery school children were significantly higher than the
controls in average haemoglobin at each measurement time except one,
which followed a three-month period during which meat had been considerably
reduced in the diet with no particular attention to other iron-containing
foods (February, 1937). They became significantly higher than the controls

again after a three-month period during which meat and other iron-con-
taining foods were increased in the diet.

The average of the controls seemed at the time to reflect the advice
given to the mothers by a visiting nurse.

Capillary wall strength in the nursery school children improved
from the opening of the school in February, 1936, until November,
1936, at which time the limit of the instrument to obtain positive breaks
was exceeded. The nursery school children maintained this high average
throughout the remainder of the study.

The control children were inferior to the nursery school children
from the beginning of the study until August, 1936, at which time they
had an average not significantly different from the nursery school
group. They fell slightly during the winter months, but were not as
low as during the previous winter. They rose to the average of the nursery
school group again in June, 1937. It is believed that education of the
parents in the neighborhood by a visiting nurse from the federal emergency
nursery school, together with home gardens in summer are responsible for
the improvement in the controls with respect to the capillary wall strength.

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