MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

XVI. ESSENTIAL NUTRIENTS IN DIETS OF HIGH SCHOOL STUDENTS ACCORDING TO SEX AND AGE AND FOR DIFFERENT CULTURAL GROUPS IN NEW YORK CITY

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REQUIREMENTS for various food essentials are at a high level during the period of adolescent growth, and the need for some nutrients changes markedly. Data available, however, are very limited both as to requirements and consumption. In the present report, changes in consumption by age within this growth period are examined for a group of about 270 students in a private high school and for nearly 2,000 students in a public high school in New York City. Data on consumption by sex-age specific groups are presented for five nutrients, namely, protein, iron, calcium, vitamin A, and ascorbic acid.

Dietary data for pupils from the private and public schools afford a comparison of consumption levels for two groups representing widely different income levels. The students in the private school are from families of relatively high incomes, while those in the public high school in the lower East Side district of New York are from families whose economic status ranged from dependence on relief to moderately high wage levels.

Within the public school group, two distinct cultural groups are represented. The majority of these pupils were members of orthodox Jewish families and were American-born children with one or both parents born in a foreign country. A smaller homogeneous group is composed of American-born children of Italian parentage,

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one or both parents having been born in Italy. In a second section in this report, dietary differences between these two groups are considered and a comparison is made with the private school boys and girls, the majority of whom were from nonorthodox Jewish families.

Description of Data

The diet records which are used for this report were collected as a part of the investigation on Medical Evaluation of Nutritional Status. The investigation has been described (1) and the methods of collecting and processing the diet histories have been discussed in detail in earlier reports (1,2,3).

The survey was conducted in the public school during the months from March through June 1939 and from October 1939 through February 1940. About one-half of the records were collected in each period. In the private school, the survey was conducted between February 27 and April 4, 1940.

All diet records were obtained by the interview method. In the public school a two-day record was furnished by pupils interviewed in the winter months and a one-day record by those surveyed in the spring. For all the public school pupils an additional two-day record was obtained in the home from the mother or some other member of the family who estimated the amount of food eaten by the pupil. The pupil and family records were combined to furnish a three or four-day record of the child's food consumption. For the private school pupils, only the two-day record given by the child was obtained.

Reported amounts of foods consumed are approximations. For some food items and even for entire records, the error is probably of considerable magnitude. There is no evidence of, and no reason to expect, any bias through more frequent over-estimate than under-estimate of quantities and size of servings, or vice versa. In the present analysis, comparisons are made between the average intakes of different nutrients for groups of students, and it is believed that

these group averages furnish reasonably accurate measures of consumption levels which are characteristic of the groups.

Information also was obtained from each pupil concerning any vitamin or mineral preparation taken. In the private school, about one-fifth of the pupils were taking some preparation which furnished iron, calcium, or one or more of the vitamins. In the public school about 5 per cent were taking a supplement and nearly all of these were taking cod liver oil. In the following tables on nutrient intake, that obtained from supplements has not been included. This report is concerned only with the nutrient content of the diet.

Each pupil was asked whether the reported diet was typical of the usual diet and whether he, or she, was on a special diet for any medical reason or in order to lose weight. A number of diet records for private school pupils were discarded because the two-day record was described as not typical and an explanation was given or because the pupil was on a special or reducing diet. Since the private school group was relatively small, these unusual diets could significantly affect the averages. The public school pupils reported very few special diets and reported the diets as unusual much less frequently than the private school pupils. In the age tabulations for the public school students unusual dietary histories were not excluded since these were largely Saturday or Sunday records which, it was thought, could properly be included in obtaining average intake values for a large group. For the comparison of cultural groups, only samples of the public school records are used and the selection of these samples is described later.

I. Nutrient Values by School, Sex, and Age

In Tables 1 and 2, statistical values derived from the frequency distributions for the estimated amounts of the five specific nutrients in individual diets are presented for boys and girls at specific ages in each school. Values shown for each distribution are: mean or average daily intake of the nutrient; standard deviation, a measure

of variation among individual diets, approximately two-thirds of the individual values being within the range of the mean plus and minus the standard deviation; and the coefficient of variation (CV), which is the standard deviation divided by the mean expressed as per cent and indicates the variation *relative* to the mean. In addition to these values, for vitamin A and ascorbic acid the median of

Table 1. Average daily amounts of protein, iron, and calcium in diets of high school students classified according to sex and age and at two income levels, New York City, 1939-1940.

School and Age	Number	Protein-Grams			Iron-Milligrams			Calcium-Grams		
		Mean	St. Dev.	C.V. Per Cent	Mean	St. Dev.	C.V. Per Cent	Mean	St. Dev.	C.V. Per Cent
	BOYS									
Private School										
Total	153	119	31.6	26	20.5	5.98	29	1.46	0.44	30
11-12 Yrs.	26	103	26.8	26	19.2	5.63	29	1.33	0.31	23
13	35	117	30.5	26	19.4	5.23	27	1.29	0.37	29
14-15	49	114	32.3	28	19.7	6.33	32	1.45	0.41	28
16-18	43	138	26.3	19	23.2	5.68	25	1.68	0.50	30
Public School										
Total	1,092	103	25.2	24	15.5	4.20	27	1.19	0.42	35
13 Yrs.	25	96	23.9	25	14.6	4.33	30	1.22	0.34	28
14	135	101	20.9	21	15.0	3.51	23	1.19	0.38	32
15	253	100	24.0	24	15.2	4.46	29	1.17	0.40	34
16	320	103	25.8	25	15.6	4.30	27	1.18	0.41	34
17	256	106	26.7	25	15.9	4.05	26	1.21	0.45	37
18-19	103	107	26.3	25	15.7	4.41	28	1.22	0.47	39
	GIRLS									
Private School										
Total	119	88	21.0	24	15.0	4.41	29	1.13	0.37	33
11-12 Yrs.	20	86	13.9	16	14.7	4.04	27	1.19	0.24	20
13	20	83	18.8	23	12.7	2.93	23	1.17	0.27	23
14-15	43	88	24.2	27	15.3	4.98	32	1.10	0.47	43
16-18	36	91	21.5	24	15.9	4.28	27	1.13	0.37	33
Public School										
Total	901	79	19.2	24	12.0	3.52	29	0.98	0.34	35
13 Yrs.	24	86	20.4	24	13.9	5.48	40	1.13	0.40	35
14	115	82	19.1	23	12.4	3.55	29	1.05	0.32	30
15	282	79	19.3	25	11.8	3.37	29	1.00	0.36	36
16	284	78	18.4	24	11.9	3.30	28	0.93	0.31	34
17	152	79	19.9	25	12.2	3.77	31	0.97	0.35	36
18-19	44	76	19.0	25	11.2	3.18	28	0.94	0.32	34

each distribution is shown. The median is a central value which divides the distribution into two equal parts, the lower and higher 50 per cent of the total number.

Requirements for these five nutrients are related to the body size

Table 2. Average daily amounts of vitamin A and ascorbic acid in diets of high school students classified according to sex and age and at two income levels, New York City, 1939-1940.

School and Age	Number	Vitamin A—International Units (Thousands)				Ascorbic Acid—Milligrams			
		Median	Mean	St. Dev.	C.V. Per Cent	Median	Mean	St. Dev.	C.V. Per Cent
		BOYS							
Private School									
Total	153	8.9	11.4	7.92	69	126	134	46.6	35
11-12 Yrs.	26	10.0	11.8	7.57	64	135	133	46.0	35
13	35	8.5	9.7	5.52	57	121	125	37.2	30
14-15	49	8.5	11.9	9.57	80	126	137	53.0	39
16-18	43	10.2	12.1	7.76	64	131	138	46.4	34
Public School									
Total	1,092	4.3	6.0	5.01	84	84	88	40.6	46
13 Yrs.	25	4.9	7.9	7.02	89	92	92	43.1	47
14	135	4.1	5.9	4.97	84	86	91	36.8	41
15	253	4.1	5.5	4.34	79	81	88	41.7	47
16	320	4.4	5.9	4.54	77	88	91	40.6	45
17	256	4.5	6.5	5.80	90	82	86	41.7	48
18-19	103	4.2	6.0	5.24	88	78	83	39.2	47
		GIRLS							
Private School									
Total	119	5.8	7.9	5.74	73	113	116	39.2	34
11-12 Yrs.	20	7.5	8.1	5.40	67	108	103	32.7	32
13	20	5.5	7.1	5.15	72	110	110	40.3	37
14-15	43	5.5	8.2	6.14	75	112	115	37.2	32
16-18	36	6.0	7.9	5.94	75	132	127	43.0	34
Public School									
Total	901	3.8	5.3	4.29	81	75	81	40.2	50
13 Yrs.	24	4.3	5.7	3.82	67	90	92	31.2	34
14	115	3.8	5.2	3.99	76	77	82	36.2	44
15	282	3.9	5.2	3.94	75	76	81	38.3	48
16	284	3.7	5.3	4.81	90	73	78	40.1	51
17	152	3.9	5.5	4.53	83	77	86	45.0	53
18-19	44	3.2	4.3	2.75	63	73	79	49.4	63

of the individual and consumption tends to vary with size. Therefore, in Table 3, the daily intake per kilogram of body weight is shown for each of the five nutrients.

In Figure 1, age variation in consumption levels and in the average intakes per kg. for each of the five nutrients is shown graphically for boys in each school. The same data for girls are given in Figure 2. The vertical scale in these charts is logarithmic and, therefore, the

Table 3. Average daily intake per kg. of five nutrients for high school students classified according to sex and age and at two income levels, New York City, 1939-1940.

School and Age	Number	Protein Grams		Iron Micrograms		Calcium Milligrams		Vitamin A Int. Units		Ascorbic Acid Milligrams	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
	BOYS										
Private School											
Total	153	2.11	.655	358	124	25.1	8.38	202	140	2.38	.928
11-12 Yrs.	26	2.17	.698	399	138	27.5	8.20	245	155	2.84	1.082
13	35	2.34	.769	383	130	25.6	8.88	195	114	2.49	.885
14-15	49	1.93	.636	332	122	24.0	8.01	202	164	2.30	.963
16-18	43	2.09	.483	343	103	24.5	8.43	183	117	2.09	.699
Public School											
Total	1,034	1.70	.462	254	79	19.7	8.25	99	85	1.45	.724
13 Yrs.	25	1.86	.553	288	89	23.6	7.18	152	126	1.76	.875
14	132	1.82	.472	270	79	22.0	9.75	104	90	1.63	.733
15	242	1.67	.471	253	84	19.3	8.10	92	78	1.46	.787
16	291	1.69	.467	255	78	19.3	7.27	98	75	1.49	.704
17	246	1.67	.423	247	74	19.1	8.48	102	94	1.36	.660
18-19	98	1.66	.455	241	73	18.7	8.19	92	84	1.27	.641
	GIRLS										
Private School											
Total	119	1.66	.440	278	87	21.1	7.83	149	104	2.22	.758
11-12 Yrs.	20	1.82	.327	307	95	25.1	5.78	170	101	2.25	.770
13	20	1.61	.461	248	77	22.6	6.78	139	97	2.15	.860
14-15	43	1.66	.490	282	90	20.3	8.88	153	105	2.17	.663
16-18	36	1.61	.415	275	81	19.1	7.36	139	111	2.29	.823
Public School											
Total	868	1.50	.470	228	87	18.5	7.69	97	79	1.53	.812
13 Yrs.	23	1.83	.744	300	165	24.0	12.41	125	97	1.89	.749
14	114	1.60	.488	242	86	20.6	7.43	101	75	1.58	.797
15	271	1.48	.455	222	77	18.7	7.90	96	68	1.50	.748
16	272	1.46	.444	222	76	17.3	6.94	97	85	1.47	.788
17	146	1.47	.456	231	106	18.0	7.37	98	88	1.58	.883
18-19	42	1.49	.458	214	72	18.0	7.35	87	61	1.51	1.097

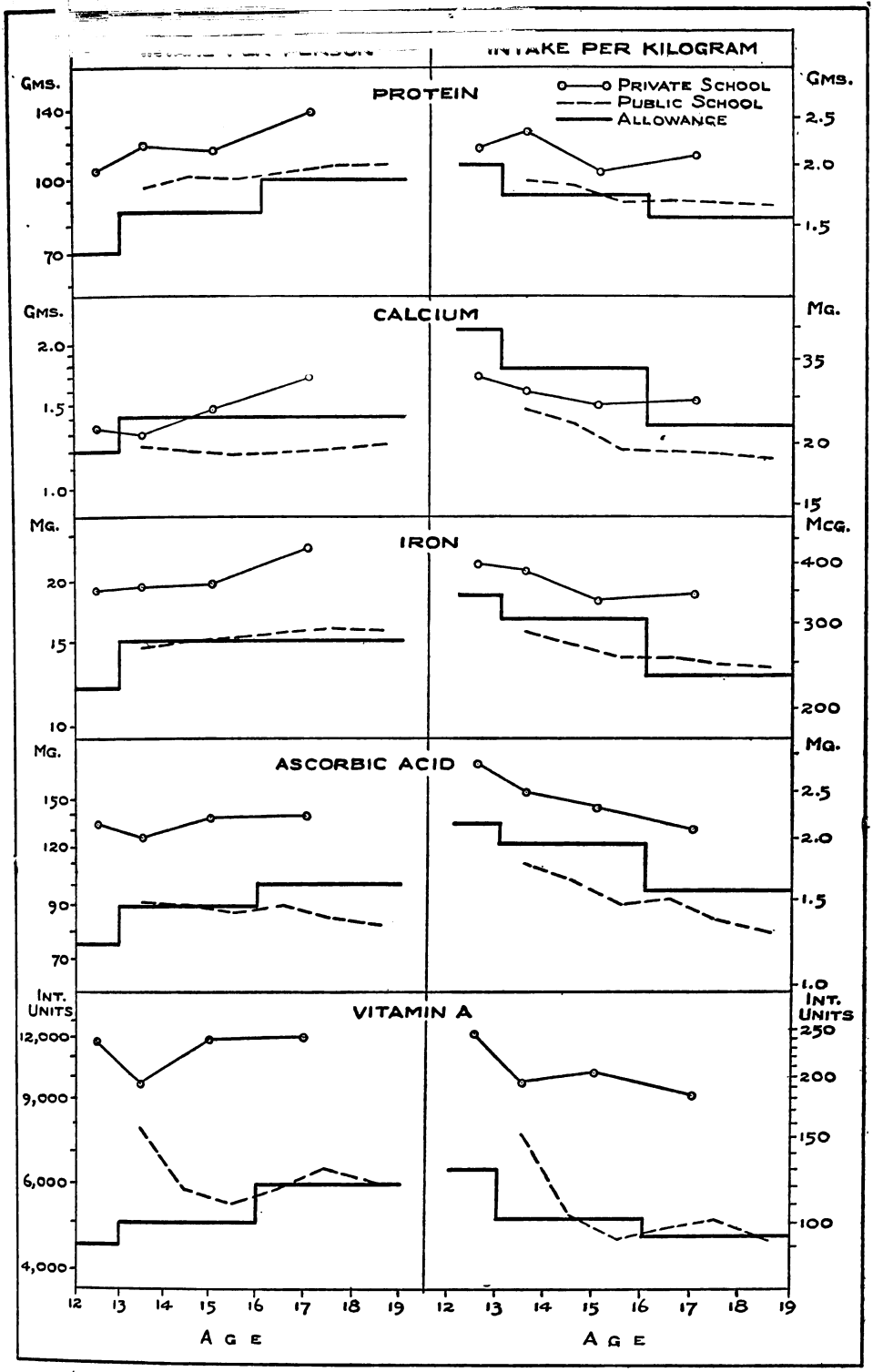

Fig. 1. Boys. Average daily intake of five nutrients at different ages by boys in a public and in a private high school in New York City compared with age-specific recommended allowances. Vertical scale is logarithmic.

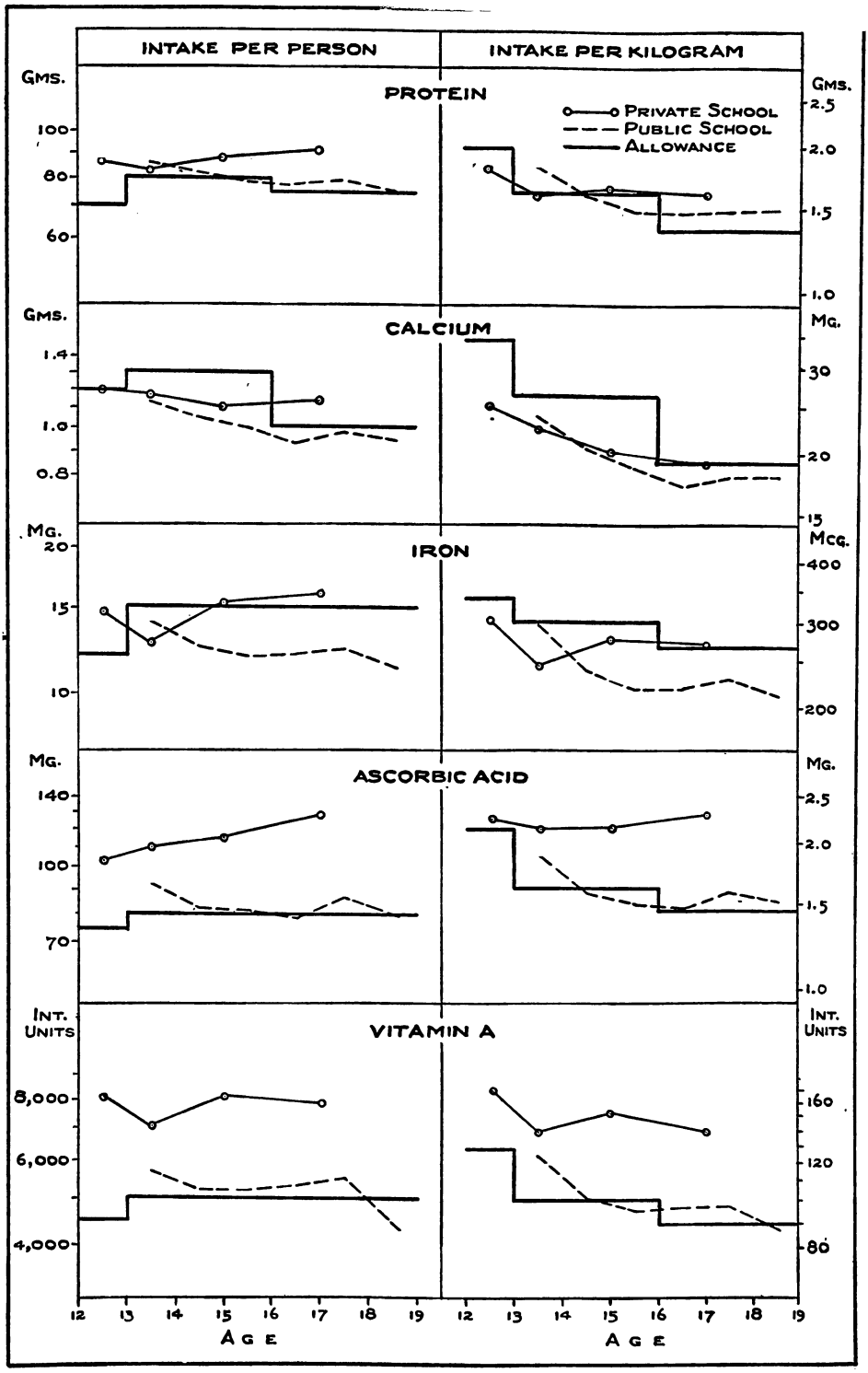

Fig. 2. Girls. Average daily intake of five nutrients at different ages by girls in a public and in a private high school in New York City compared with age-specific recommended allowances. Vertical scale is logarithmic.

difference in level between any two points plotted represents a proportional or percentage difference. In all age curves, regardless of differences in levels and in scales for different nutrients, an equal slope of lines indicates an equal percentage change between two points in the age curves. Similarly, the spread between the age curves for private and public school pupils represents a percentage difference and equal distances between the curves always indicate equal proportional differences in level of intake. Thus, differences in intake between boys and between girls in the two schools and for all nutrients can be compared, on a relative basis, from the charts; and relative changes from age to age for boys and girls and for the various nutrients are directly shown.

It will be of interest to compare the mean consumption levels of these groups for the different nutrients with the allowances recommended by the Food and Nutrition Board of the National Research Council (4). Therefore, the allowances also are shown in Figures 1 and 2. The allowances per kg. shown on the charts were derived by dividing the recommended allowances by the average weight of boys and girls at the central year of age within a specific age group. Average weights at ages 11, 14, and 17 years were used, and are those given by Roberts (5).

INTAKE OF NUTRIENTS

Protein. The amounts of protein per day consumed on the average by boys in both schools increased as age increased and the variation among means at different ages was statistically significant (*see* Table 4).[2] The increase in intake with age was much greater for

[2] The statistical significance of the variation among means for intake at different ages for each of the school and sex classes was tested by Fisher's method (6) of analysis of variance. Since there was no 12-year-old group in the public school, age variation in the private school was tested for ages 13 years and older. The results are summarized in Table 4, which gives the probability that the observed differences in means at different ages for any class would occur by chance. Thus, the probability (P) given indicates the chances in 100 that a given set of means by age would occur if each age group were a random sample drawn from the total population of any school-sex class. If P is .05 or less, i.e., the chances are 5 or less in 100 that the age-means would arise from chance, the age differences are considered significant.

the private school boys. The average protein intake varied from 103 gms. per day at age 12[3] to 138 gms. at ages 16 to 18 years in the private school group and the amount varied from 96 gms. at age 13 years to 107 gms. at ages 18-19 years in the public school group. At every age, boys in the public school had a lower average intake of protein than the private school boys.

If intake of protein per kilogram of weight is considered, the trend in the mean intake according to age is reversed for boys in both schools, and the variation among mean values at different ages is statistically significant. The per kg. intake of protein was highest

Table 4. Summary of changes in intake of specific nutritents as age increases and statistical significance of variation among means for daily intake at specific ages for pupils 13 to 19 years old.

Sex and School	Protein		Iron		Calcium		Vitamin A		Ascorbic Acid	
	Change[1]	P[2]	Change	P	Change	P	Change	P	Change	P
	AVERAGE DAILY AMOUNTS IN DIETS									
Boys										
Private School	Inc.	<.001	Inc.	<.01	Inc.	<.001	Inc.	>.05		*
Public School	Inc.	.01-.05	Inc.	>.05		*	No C.	>.05		*
Girls										
Private School		*	Inc.	.01-.05		*		*	Inc.	>.05
Public School	Dec.	>.05	Dec.	.01-.05	Dec.	<.01		*	Dec.	>.05
	DAILY AMOUNT PER KILOGRAM OF WEIGHT									
Boys										
Private School	Dec.	.01-.05	Dec.	>.05		*		*	Dec.	>.05
Public School	Dec.	.01	Dec.	.01-.05	Dec.	<.01	Dec.	.01-.05	Dec.	<.01
Girls										
Private School		*	Inc.	>.05	Dec.	>.05		*		*
Public School	Dec.	<.01	Dec.	<.01	Dec.	<.01		*	Dec.	>.05

[1] Increase with age is indicated by "Inc." and a decrease by "Dec.", no trend by "No C."

[2] P is the probability that the observed differences among age means would occur if age classes were random samples from a homogeneous population.

* Variance among age means was less than that for within age classes.

[3] Of the four boys and five girls in the private school group aged 11 years, all were 11 years and 9 to 11 months old except one girl who was 11 years and 5 months.

at age 13 years in both schools. In the private school, intake for the two age groups 14-15 and 16-18 years differed very little, and in the public school, intake was at a constant level from age 15 to 18 years.

For girls, variation in consumption of protein by age was not consistent for the two schools, and not significant statistically for either school group. In the private school, the mean intake of protein increased from 83 gms. per day for girls aged 13 years to 91 gms. for those aged 16 to 18 years, but in the public school protein intake tended to decrease with age from 86 gms. at age 13 years to 76 gms. at ages 18-19 years. Thus, the youngest girls in the two schools had about the same consumption of protein, but as age advanced the intake of protein by public school girls became definitely less than that of the private school girls.

The age trend in protein intake per kg. for girls in the public school was similar to that for boys and age variation is significant. The highest intake was at age 13 years, intake declined at ages 14 and 15 years and then remained at a constant level. For girls in the private school there was no significant difference by age for protein intake per kg. for ages 13 and older.

Iron. Age trends in the amount of iron in the diet are very similar to those for protein. In the private school group, boys aged 16-18 years obtained, on the average, a significantly larger amount of iron, 23 mgs. per day compared with 19 to 20 mgs. in diets of the younger boys. In the public school group, boys increased their consumption of iron slightly at older ages, but the means varied only from 14.6 to 15.9 mgs. at different ages, and the variation is not significant. For girls in the private school the increase in iron from 12.7 mgs. at age 13 years to 15.9 mgs. at 16-18 years was significant statistically. An opposite and fairly consistent trend is shown for girls in the public school. Their mean intake of iron decreased from 13.9 mgs. at age 13 years to 11.2 mgs. at 18-19 years, and the variation among means by age is significant.

For both boys and girls it is clearly shown in Figures 1 and 2 that

the differences between private and public school pupils with respect to dietary iron are greater than those found for protein. Throughout the age range, private school pupils had a significantly higher average intake of iron than the public school pupils with the single exception of girls aged 13 years.

Age differences in iron intake on a per kg. basis are not significant for either boys or girls in the private school. However, for boys in the public school the slight increase in per person intake was not sufficient to balance growth and there is a significant decrease with age in the iron intake per kg. In the case of the public school girls, the downward trend at ages 13 to 16 years is greater for the per kg. intake than for the per person intake and both measures of intake show significant age variation.

Calcium. Private school boys increased their consumption of calcium with age very significantly, the mean values rising from 1.29 gms. at age 13 years to 1.68 gms. at 16-18 years. Boys in the public school, on the other hand, show no change in calcium intake with age and their highest mean value is slightly lower than the lowest mean value for the private school boys. Among girls in the private school, there was no significant variation in calcium intake with age; but girls in the public school significantly reduced their consumption of calcium as age increased. At age 13 years there was little difference in the calcium supplied by diets of private and public school girls, 1.17 gms. and 1.13 gms., respectively, but at older ages the public school girls had significantly less calcium than those in the private school.

Calcium intake per kg. did not vary significantly with age for either boys or girls in the private school. Both boys and girls in the public school have a significant downward trend in calcium consumption per kg. as they become older.

Vitamin A. There are no significant changes with age in the vitamin A content of the diets of boys or girls in either school. The same lack of significant variation is found for mean vitamin A

values per kg. except among boys in the public school, and for this group the high value for 13-year-old boys accounts entirely for the significant age variation.

Extremely wide variation in vitamin A content of individual diets is indicated by the standard deviations and coefficients of variation shown in Table 2. Because of this great variation in individual records, averages are reliable only within wide limits and, therefore, only very big differences in the average values will be statistically significant. The median values for vitamin A in the diets at different ages, given in Table 2, are less influenced by extreme values for dietary vitamin A than the means. These median values, as well as the mean values, do not show any consistent age trends for vitamin A intake.

Average vitamin A values for diets of the private school pupils are much higher than those for public school pupils, and the percentage differences are greater than for any of the four other nutrients.

Ascorbic Acid. No significant variation with age is shown for ascorbic acid in the diets of boys or girls in either school. On a per kg. basis, boys in the public school had a significant decrease in the amount of ascorbic acid, but for boys in the private school and for girls in both schools, the differences in intake by age are not significant.

At every age both boys and girls in the private school had a much higher intake of ascorbic acid than pupils in the public school. The percentage differences in ascorbic acid values for diets of pupils in the two schools are greater than differences in intake shown for protein, iron, or calcium, but not as large as for vitamin A.

AVERAGE INTAKE COMPARED WITH ALLOWANCES

It is of interest to note not only whether average consumption of these food essentials was as high as the recommended allowances but also whether intake tended to vary according to age in accord-

ance with differences in allowances at these ages.[4] It may reasonably be assumed that unlimited amounts of foods were available to the private school group in contrast to the public school group which included many children from families forced to budget food expenses carefully. Food consumption by those in the former group would be sufficient to satisfy the appetite and desire for food, and levels of nutrient content reflect the dietary habits or food preferences of such a privileged group. But consumption levels for the latter group are the result of the composite effect of appetite, availability of food, and dietary habits. Intake levels for each of the five nutrients in relation to the allowances are shown in Figures 1 and 2 for intake per person and intake per kg.

For four of the five nutrients, namely, protein, iron, vitamin A, and ascorbic acid, the average daily intake per person for boys in the private school greatly exceeds at each age the recommended age-specific allowances. In the case of calcium, the mean intake approximates the allowance except at ages 16 years and older when it exceeds the allowance. When intake at specific ages relative to the corresponding age allowance is considered, it is of particular interest that the private school boys aged 11-12 years had an average intake for each of the five nutrients approximately equal to the average intake of boys 13 years old and of the 14-15-year-old group, although the allowance at ages 11-12 years is lower for each of the nutrients. The average values for protein, iron, and calcium at ages 16 years and older were higher than those for younger boys, but only the allowance for protein increases for the age group 16 years and over.

The intake per kg. relative to the allowance per kg. affords more significant information concerning the consumption levels. On a per kg. basis, the boys in the private school had average intakes of protein, iron, vitamin A, and ascorbic acid in excess of the allowance per kg. but their average intake of calcium was less than the allow-

[4] Data on the proportions of the public school group with dietary values for essential nutrients below allowances have been published (2) and also are included, together with similar data for the private school group, in a bulletin of the National Research Council (7).

ance except at ages 16 years and older. It is clearly shown in Figure 1 that the excess in the average intake per person over the allowance is greater than the excess in the intake per kg. This is very striking at age 12 years. For example, the total protein intake per person is 47 per cent higher than the allowance for boys 10-12 years of age, but on a per kg. basis the intake of the 12-year-olds is only 8.5 per cent above the allowance. Thus, much of the excess intake per person was associated with greater than average size for these 11-12-year-old boys,[5] and was necessary if they were to receive the per kg. allowance.

For boys in the public school, levels of intake for these five nutrients tend to be either approximately equal to or below the allowances. The principal exception to this is an intake of protein at ages 13-15 years in excess of the allowance, average daily amounts being only slightly less at these ages than at ages 16 years and over and about equal to the allowance for these older ages. Iron intake was equal to or very slightly above the 15 mg. allowance at all ages. Calcium values were definitely less than the allowance at every age. Ascorbic acid intake was equal to the allowance at ages 13 to 15 years, but less than the allowance at older ages. The average vitamin A values at each age are close to the allowance except at age 13 years, but the median values shown in Table 2 are much lower than the allowance and the medians are more typical of the usual vitamin A content of these diets.

When nutrient values for public school boys are expressed as amounts per kg., the ratio of intake to allowance for boys 16 years and older is about the same as the ratio of total intake per person to daily allowance. Thus, at these ages the boys weighed on the average

[5] The 11 and 12-year-old boys and girls in the private school were much taller and heavier, on the average, than the average heights and weights found in standard tables. They also weighed more than the average weights from standard tables for children of their age and height. They were in high school and may have been advanced for their age in physical growth as well as in school as compared with other children in their own economic class. On the other hand, the pupils over 12 years of age also were taller and heavier than average heights and weights, although the difference became smaller as age increased.

about the same as the standard weight. At ages 13 to 15 years the ratio of intake per kg. to allowance is lower than the ratio for intake per person, indicating that at these ages the public school boys were heavier than the standard weights.

On the basis of average intake per kg., public school boys had less than the allowance for calcium and ascorbic acid throughout the age period 13-19 years; they had less than the allowance for iron at ages 13-15 years, and very slightly more than the allowance at ages 16 years and older; their intake of protein did not differ markedly from the allowance at any age; and their intake of vitamin A also did not differ significantly from the allowance at any age.

Allowances per kg. for each of the five nutrients are reduced as age increases. In general, the reduction in allowance is greater than the reduction in average consumption levels for boys in both the private and public high schools.

For girls, allowances per day per person for iron, ascorbic acid, and vitamin A are constant from age 13 years to 20 years. In both schools there was no significant variation among age-specific mean values for either vitamin. There was a tendency for iron values to increase with age for diets of the private school girls and to decrease with age for public school girls. For protein the allowance is somewhat lower at ages 16 years and over than at 13 to 15 years, but levels of consumption did not vary significantly for girls in either school. The allowance for calcium at ages 16-20 years is 23 per cent less than at ages 13-15 years, and among public school girls a decrease in intake with age occurred. For the private school girls, however, there was no variation in calcium intake at these ages.

The private school girls had diets which did not furnish these nutrients in excess of the allowances to the same extent as the boys' diets. For girls the intake of ascorbic acid and vitamin A was greatly in excess of the allowances. The intake of protein also was greater than the allowance but the excess was much less than for boys. Iron values were about equal to the allowance at ages 14 years and over

and were less than the allowance at age 13 years. Calcium values were less than the allowance except at ages 16 years and over. If intake is expressed as amount per kg., the ratio of intake to allowance is reduced as compared with the ratio for total intake per person, as it was for boys. For the 11-12-year-old girls the effect is especially marked, and an intake per person much higher than the allowance was required to obtain an intake per kg. equal to the allowance per kg. The diets of these 11-12-year-old girls were below the allowance per kg. in protein, iron, and calcium.

The average values for diets of the public school girls at different ages deviated only slightly from the allowances for protein, ascorbic acid, and vitamin A. For vitamin A, however, the median values are much below the allowance. Average values for iron and calcium are below allowances at every age from 13 to 19 years, the deficiency for iron being least at ages 13 and 14 years and that for calcium being least at ages 16 and over because of the reduced allowance at these ages. Expressed as amounts per kg., average intakes of protein, ascorbic acid, and vitamin A are fairly close to the allowances per kg.; average intakes of iron are much less than the allowances except at age 13 years; and average intakes of calcium are definitely below the allowances at every age.

VARIATION AMONG INDIVIDUAL DIETS

The variability among individual diets in the amounts of these five food essentials, which is indicated by the standard deviations and coefficients of variation shown in Tables 1 and 2, is the result of errors in estimating individual intake and of real differences in consumption levels for the days of record. Since the error variation is unknown, no good measure of the variation in consumption is available. However, if it is assumed that the variation due to errors in reported amounts of food and in the estimates of nutrient values is of about equal magnitude for the different groups of pupils, the larger the standard deviation the greater the prevalence of diets which differed markedly from the average level. Although in-

dividual diets vary widely from day to day and from week to week and the average diet of the majority over a considerable period of time may approximate the group average, a relatively wide variation in dietary levels for the two to four-day period of record strongly suggests that a comparatively large number of the group will have an average consumption level over a longer period of time which differs from the group average. Marked variability among individual diet values is of increased importance if the average level for the group is barely equal to or less than the requirement level, since diets deviating below the mean will tend to be deficient. On the other hand, if the average consumption level is well above the requirement level, as is generally true of the private school group, wide deviation from the mean may occur without the diet being sub-standard.

For all school, sex, and age groups there was a fairly consistent tendency for the standard deviations for protein and iron intake to increase as the average increased and to change in proportion to a change in the mean intake level. Thus, regardless of the higher protein consumption of boys than of girls and higher values for the private school pupils than for public school pupils, nearly all the standard deviations are close to 25 per cent of the mean. For iron there is the same uniformity in the coefficients of variation which are slightly higher than for protein, the median coefficient for all sex-age groups being 28 per cent.

In the case of calcium, the pattern of a constant ratio between the standard deviation and the average intake is modified by a tendency for the ratio to increase somewhat at older ages in some of the school-sex groups. For boys in the public school there was a consistent increase in the coefficients of variation from 28 per cent at age 13 to 39 per cent at ages 18-19 years. A similar increase with age in the relative variation in calcium content of diets is not shown for public school girls, the coefficients being 30 to 36 per cent and comparatively high. For private school boys the coefficient was lower

at age 12 years (23 per cent) than at other ages, for which the coefficients were from 28 to 30 per cent; and for girls the coefficients were 20 and 23 per cent at 12 and 13 years of age as compared with 43 and 33 per cent for ages 14-15 years and 16-18 years. The public school boys and the private school girls did not have any significant change with age in their average intakes of calcium, but in both groups variation among individual diets increased with age.

The extremely large variation for vitamin A in the diets has already been mentioned. Relative variation ranges from 57 to 90 per cent and follows no pattern in relation to age or average intake. The markedly lower medians than means for vitamin A, shown in Table 2, indicate that these distributions included a number of diets with extremely high vitamin A values which raised the means and also account for the large standard deviations. These extreme vitamin A values occur when the diet includes such foods as liver, or vegetables of very high vitamin A content. From day to day the vitamin A content of the diet of an individual may shift from very high to low because of the very great range in the vitamin A content of different vegetables. Since regular or frequent use of vegetables that are good sources of vitamin A is so important in obtaining adequate amounts of this nutrient, diet records for only a few days furnish insufficient data for obtaining a valid index of an individual's consumption level.

Variation in the amount of ascorbic acid in diets was fairly similar for both schools, and the standard deviations show no consistent change in association with different average levels for the various school-sex-age groups. Since pupils in the private school had a much higher average intake of ascorbic acid, variation in the ascorbic acid content of diets relative to the mean level of intake was less for private school pupils than for the public school pupils. The coefficients of variation for private school pupils varied around 35 per cent; but in the public school the coefficients for boys were from 41 to 48 per cent and for girls ranged from 34 to 63 per cent.

II. Comparison of Cultural Groups

Dietary values for the Jewish and Italian children in the public school are compared in this section. Each of these cultural groups is also compared with the private school group. In order to make the three groups as comparable as possible, certain selections were made from the records available. Only the two-day diets reported by the pupil were available for the private school pupils, so the records used for the public school groups also are restricted to the two-day diets reported by the pupil. Diets reported as unusual are excluded from all groups. To reduce the seasonal variation, public school records taken between October 25, 1939 and January 30, 1940 are compared with the private school records taken between February 27 and April 4, 1940.

Age distributions could not be matched for the three cultural groups, but only ages 14 years and over have been included to eliminate weighting the private school group with younger children. For this age range, all available records for the private school pupils and for Italian girls are included, and nearly all for Italian boys. The one hundred records for Jewish boys and for girls were

Table 5. Age distributions of children in the private school and in the two cultural groups in the public school for whom diet values are compared.

Age	Percentage Distribution—Boys			Percentage Distribution—Girls		
	Private School	Public School		Private School	Public School	
		Jewish	Italian		Jewish	Italian
Total	100.0	100.0	100.0	100.0	100.0	100.0
14 Yrs.	28.3	22.0	19.0	26.6	22.0	21.7
15	25.0	28.0	21.0	27.8	41.0	50.0
16	23.9	33.0	38.0	25.3	29.0	20.0
17–18	22.8	17.0	22.0	20.3	8.0	8.3
Number of Persons	92	100	100	79	100	60

selected to approximate the distributions of Italian pupils by date of record and to furnish age distributions fairly similar to those for Italians. The age distributions of the three cultural groups are shown in Table 5. The dissimilarities in the age distributions are not sufficient to affect the average consumption values for the various nutrients, especially in view of the limited variation in intake among ages 14 years and over shown in the previous section.

Small differences in income at low-income levels may affect the amount and choice of foods purchased. Therefore, Table 6 shows the estimated weekly income of families of the Jewish and Italian children whose diets are compared. Information given in the home, usually by the child's mother, on wages of each working member of the family and on income from all other sources was the basis for estimating total family income. The percentage distributions according to income for these Italian and Jewish families differ very little.

Average values for intake of the five nutrients with standard errors of the means are shown in Table 7 for the three cultural groups; and the ratios of means for public school children to those for private school children, and for Italians to Jewish children in the

Table 6. Percentage distribution of the estimated total weekly income reported by families of selected Jewish and Italian children in the public school.

Total Weekly Income Reported By Families	Per Cent With Specified Weekly Income			
	Boys		Girls	
	Jewish	Italian	Jewish	Italian
Total	100	100	100	100
Less Than $20	24	28	30	24
$20–$34	44	39	40	47
$35–$49	21	21	20	21
$50 or More	11	12	10	8
Number of Families Reporting Income	100	100	100	59[1]

1 Income unknown for family of one girl.

public school are given in Table 7. The statistical probabilities for differences between cultural groups are shown in Table 8. Consumption levels are compared graphically in Figure 3.

Table 7. The estimated daily intake of five nutrients by the private school boys and girls and by Jewish and Italian boys and girls in the public school; and the ratios of the mean intake of each nutrient by the public school groups to that by the private school, and of the mean intake by Italian to Jewish boys and girls in the public school.

Nutrient and Cultural Group	Mean Intake and Standard Error		Ratio to Intake by Private School Group x 100		Ratio to Intake by Jewish Group x 100	
	Boys	Girls	Boys	Girls	Boys	Girls
Protein (Grams)						
Private School	125±3.31	90±2.58	100	100		
Public School—Jewish	108±2.50	76±2.06	86	84	100	100
Public School—Italian	100±2.99	74±3.32	80	82	93	97
Iron (Milligrams)						
Private School	21.3±.652	15.6±.523	100	100		
Public School—Jewish	16.5±.476	11.6±.387	77	74	100	100
Public School—Italian	14.6±.529	11.7±.615	69	75	88	101
Calcium (Grams)						
Private School	1.56±.049	1.11±.048	100	100		
Public School—Jewish	1.19±.036	.93±.031	76	84	100	100
Public School—Italian	1.00±.046	.79±.046	64	71	84	85
Vitamin A, Total (I.U.)						
Private School	12,033±910	8,070±676	100	100		
Public School—Jewish	5,544±491	3,915±325	46	49	100	100
Public School—Italian	7,858±954	5,607±787	65	69	142	143
Preformed Vitamin A (I.U.)						
Private School	3,167±222	1,955±163	100	100		
Public School—Jewish	2,367±219	1,615±121	75	83	100	100
Public School—Italian	1,608±130	1,219±127	51	62	68	75
Provitamin Carotene (I.U.)						
Private School	8,893±828	6,088±625	100	100		
Public School—Jewish	3,183±416	2,264±276	36	37	100	100
Public School—Italian	6,250±907	4,391±732	70	72	196	194
Ascorbic Acid (Mgs.)						
Private School	117±4.70	106±4.26	100	100		
Public School—Jewish	83±3.95	66±3.82	71	62	100	100
Public School—Italian	60±4.73	48±4.04	51	45	72	73

Protein. The average amount of protein supplied by the reported diets of private school children was 125 gms. for boys and 90 gms. for girls. In the public school the reported diets furnished, on the average, amounts of the nutrient which were from 14 to 20 per cent less than the amount in diets of private school pupils. Although the differences in mean intakes of protein were generally less marked than for the other nutrients, both Jewish and Italian children in the public school had significantly less protein than the private school pupils.

Jewish and Italian girls in the public school had approximately the same mean intake of protein, 76 and 74 gms., respectively. The average intake of 100 gms. of protein by Italian boys was only 7 per cent less than the average for Jewish boys, yet this difference is statistically significant.

Iron. Because of the high average intake of iron (21.3 mgs.) by private school boys, the ratios of the intake values for public school boys to the private school values are lower than for protein, and the differences in average intake between boys in the private school

Table 8. Summary of results of tests of significance of difference between mean intakes of five nutrients shown in Table 7. For each sex, diet values for the private school group are compared with those for Jewish and Italian pupils in the public school, and diet values for the two public school groups are compared.

Cultural Groups Compared	Probability (P) of Difference in Means Occurring by Chance						
	Protein	Iron	Calcium	Vitamin A			Ascorbic Acid
				Total	Preformed	Carotene	
Boys							
Private School—Jewish	<.001	<.001	<.001	<.001	.01-.02	<.001	<.001
Private School—Italian	<.001	<.001	<.001	<.01	<.001	.01-.05	<.001
Jewish—Italian	.01-.05	<.01	<.01	.01-.05	<.01	<.01	<.001
Girls							
Private School—Jewish	<.001	<.001	<.01	<.001	>.05	<.001	<.001
Private School—Italian	<.001	<.001	<.001	.01-.02	<.001	>.05	<.001
Jewish—Italian	>.70	>.90	<.01	.01-.05	.01-.05	<.01	<.01

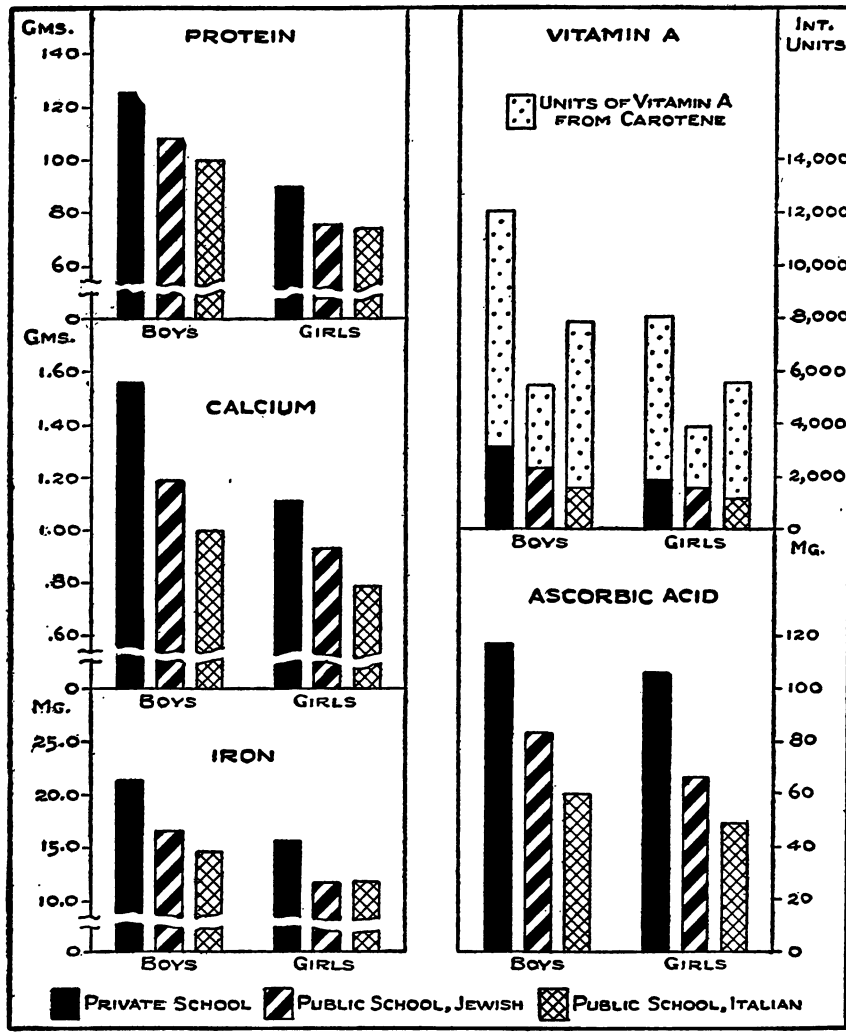

Fig. 3. Average daily amounts of five nutrients estimated for diets of 14-18 year-old boys and girls from three cultural groups.

and boys in the public school are highly significant. But, as a group, Jewish boys had 16.5 mgs. and Italian boys 14.6 mgs. of iron daily compared with 15 mgs. recommended. Diets of both Italian and Jewish girls in the public school furnished, on the average, approximately three-fourths of the 15.6 mgs. of iron supplied by diets of private school girls. Iron intake for Italian and Jewish girls, respec-

tively, was 11.7 and 11.6 mgs. compared with 15 mgs. recommended.

Hemoglobin determinations were available for all pupils, and mean hemoglobin levels for these three cultural groups have been compared (8). The mean hemoglobin levels for boys in the private school and for Jewish and Italian boys in the public school were not significantly different in spite of the difference in iron content of their diets. On the other hand, the mean hemoglobin levels for Italian and Jewish girls in the public school were slightly but significantly lower than the average hemoglobin values for girls in the private school. This suggests the possibility that the average consumption of iron by the public school girls is close to minimum need at these ages and that some who had less than this average intake had a very mild or borderline anemia. There were very few cases of definite anemia.

Calcium. With a mean of 1.56 gms. for boys and 1.11 gms. for girls, private school children had significantly higher intakes of calcium than either group in the public school. The average intake by Jewish boys of 1.19 gms. was 24 per cent less, and of 1.00 gm. by Italian boys 36 per cent less than that of the private school boys. Among girls, the differences were relatively smaller but, on the average, Jewish girls had 16 per cent less and Italian girls 29 per cent less calcium from their diets than private school girls. The relatively high intake of calcium by private school pupils is due undoubtedly in part to a greater consumption of milk, one of the rich sources of the nutrient, and is a reflection of the more favorable economic status of the group. Stiebeling and Phipard (9) have shown that the quantity of milk used varies directly with the amount of money being spent for food.

The daily intake of calcium by Italians was significantly lower than that by Jewish children, averages for both boys and girls being approximately 15 per cent less. Factors in addition to income apparently affected the diets of these public school groups. The more favorable consumption of calcium by the Jewish group may be a

reflection of the importance of "dairy" meals in the dietary of orthodox Jewish families, meals which may include such meat substitutes as milk, cheese, and eggs, all of which are good sources of calcium. The comparatively low intake of calcium by the Italian children is in agreement with data from a study of diets of low-income families in New York City in 1933 (10) which showed that the average amount of milk used by Italian families was somewhat less than amounts used by other families of similar income.

Vitamin A. The vitamin A values in the diets of these pupils were subdivided to show approximate values for intake of the preformed vitamin A and for intake of the provitamin carotene in addition to the total A content of the diet. The vitamin A values derived from milk products, eggs, and other animal foods or from prepared dishes in which these foods were the chief source of vitamin A were included as preformed vitamin A; and values derived from vegetables and fruits or dishes in which these foods supplied the principal estimated value were included as carotene. Such a procedure does not provide an exact subdivision of the vitamin A values. For example, eggs, butter, and other milk products contain carotene as well as preformed vitamin A, but the total vitamin A value has been allocated to preformed vitamin A. Nevertheless, the classification of vitamin A on the basis of types of foods affords an approximate index of the relative importance of vitamin A and carotene in the diets of these cultural groups.

Private school children had a mean daily intake of vitamin A from all foods significantly higher than the averages for Jewish and Italian children. Diets of the Italians furnished from 65 to 70 per cent of, and diets of Jewish children less than half the amount of vitamin A supplied by diets of the private school pupils. The relatively high intake of this nutrient by Italians (7,900 I.U. by boys and 5,600 I.U. by girls) as compared with Jewish boys and girls is in marked contrast to their intake of other nutrients. The average amounts of total vitamin A for Italian boys and girls were more

than 40 per cent above the averages for Jewish boys and girls, and the differences in mean intakes are significant.

The diets of private school pupils of each sex supplied more of both vitamin A and carotene than did the diets of children of the same sex in either public school group. For boys, all the differences were statistically significant. Although the differences in intakes between the private school girls and Italian and Jewish girls were large, they were not all significant. As compared with the Jewish girls in the public school, the private school girls had significantly more carotene but not a significantly larger intake of preformed vitamin A; and as compared with Italian girls, the private school girls had significantly more preformed vitamin A but not significantly larger amounts of carotene.

For the public school group it is evident that food sources of vitamin A in diets of Jewish and Italian children differed. The average intake of vitamin A from animal foods by Italians was 32 per cent less for boys and 25 per cent less for girls than the averages from this source by Jewish boys and girls, but the intake of carotene by Italians exceeded that of Jewish children by more than 90 per cent. About four-fifths of the total vitamin A in the diets of Italians was derived from foods of plant origin, and this reflects their frequent use of broccoli, escarole, and other green vegetables which are rich sources of carotene, as well as their relatively low intake of dairy products. The more favorable intake by Jewish children in the public school of preformed vitamin A is further indication of the relative importance of dairy foods in their diet, as noted previously for calcium. In view of the lower utilization of carotene, which must be converted in the body to vitamin A, the Italian children probably were no better nourished and maybe not as well nourished with respect to vitamin A as the Jewish children in spite of higher vitamin A values.

Ascorbic Acid. For this comparison of cultural groups the ascorbic acid values were recomputed to adjust for losses in cooking and

a few more recent values for raw foods have been used; therefore, amounts of ascorbic acid are somewhat less than those shown in Part I of this report. For many cooked foods the values used were the mid-values from those published by Bryan, *et. al.* (11), and all ascorbic acid values were within the range of values given by these authors.

Diets of the private school pupils, as a group, furnished generous amounts of ascorbic acid, and the averages for boys of 117 mgs. and for girls of 106 mgs. were significantly higher than averages for both cultural groups in the public school. The mean intake daily by Jewish boys of 83 mgs. and by Jewish girls of 66 mgs. were 71 and 62 per cent, respectively, of the intake by the private school boys and girls. Italian children were least well supplied with ascorbic acid; and boys on the average had only 51 per cent and girls 45 per cent of the amount of ascorbic acid furnished by diets of private school boys and girls. Ascorbic acid in the Italian diets was less than three-fourths of that in diets of Jewish children in the public school, and the differences in mean intake for both boys and girls are significant.

It is of interest to note the relative amounts of ascorbic acid from different types of foods in the diets of these three cultural groups. Table 9 shows the average daily intake from and the per cent of total ascorbic acid contributed by six food groups, namely: (1) citrus fruits, (2) tomatoes, (3) other fruits, (4) raw vegetables, (5) cooked vegetables, and (6) all other foods.

The differences in total intake of ascorbic acid by the three cultural groups are due chiefly to differences in their consumption of citrus fruits and cooked vegetables. Among private school pupils, citrus fruits supplied an average intake for boys of 56.6 mgs. and for girls of 60.1 mgs. of ascorbic acid daily, as compared with 37.4 and 28.6 mgs. for Jewish boys and girls, respectively, in the public school and 17.9 mgs. and 14.0 mgs. for Italian boys and girls. Thus, Italian diets furnished approximately half the amount of ascorbic acid

from citrus fruits furnished by Jewish diets. Citrus fruits ranked first as a source of ascorbic acid in the reported diets of both private school and Jewish pupils, supplying from 43 to 56 per cent of the total estimated values in the diets; but among Italians this source was second and furnished about 30 per cent of the estimated total ascorbic acid.

Some vegetables—cabbage, cauliflower, broccoli, and green peppers, for example—contain large amounts of ascorbic acid and estimated amounts of ascorbic acid derived from cooked vegetables were substantial for all groups of children. Cooked vegetables ranked first in importance as a source of ascorbic acid in Italian diets, but the average intake by Italian boys (19.9 mgs.) and by Italian girls (15.1 mgs.) was approximately two-thirds the intake

Table 9. Average amounts of ascorbic acid and percentages of total ascorbic acid furnished by different types of food in the diets of the three cultural groups.

Food Group	Boys			Girls		
	Private School	Public School		Private School	Public School	
		Jewish	Italian		Jewish	Italian
	MILLIGRAMS OF ASCORBIC ACID					
All Foods	117.2	83.3	59.6	106.1	66.4	48.4
Citrus Fruits	56.6	37.4	17.9	60.1	28.6	14.0
Tomatoes	5.6	6.3	4.6	4.9	5.2	3.9
Other Fruits	10.3	11.4	8.2	8.3	10.1	7.8
Raw Vegetables	2.2	3.4	2.7	3.0	3.5	2.4
Cooked Vegetables	31.5	16.3	19.9	22.3	12.4	15.1
All Other Foods	11.0	8.5	6.3	7.5	6.6	5.2
	PER CENT OF TOTAL ASCORBIC ACID					
All Foods	100	100	100	100	100	100
Citrus Fruits	48	45	30	56	43	29
Tomatoes	5	8	8	5	8	8
Other Fruits	9	14	14	8	15	16
Raw Vegetables	2	4	4	3	5	5
Cooked Vegetables	27	19	33	21	19	31
All Other Foods	9	10	11	7	10	11

from this source by private schoo[illegible] and girls had slightly less ascorbic acid from cooked vegetables than the Italians. Cooked vegetables ranked second to citrus fruits as a source of ascorbic acid for private school and Jewish pupils but, with the exception of private school boys, they supplied less than half the amount obtained from citrus fruits.

Tomatoes contain good amounts of ascorbic acid, but the average amounts[6] from this source were small and relatively unimportant in each group, varying from 3.9 to 6.3 mgs. Fruits other than citrus were the third most important source of ascorbic acid. Differences among the cultural groups were small, the average amounts of ascorbic acid ranging from 7.8 to 11.4 mgs.

Differences in consumption levels for ascorbic acid among these three cultural groups are confirmed by marked differences in their plasma ascorbic acid values. In Figure 4, percentage distributions of plasma ascorbic acid values are shown for all pupils in the survey in each cultural group who were examined for plasma ascorbic acid.[7] Among the private school pupils, 3.9 per cent of the boys and 1.8 per cent of the girls had plasma values below 0.40 mg. per cent; and 87.1 per cent of the boys and 90.2 per cent of the girls had plasma values of 0.80 mg. per cent or higher. In contrast to the private school group, 30.4 per cent of the Jewish boys in the public school and 60.5 per cent of the Italian boys had plasma values below 0.40 mg. per cent, and only 39.3 per cent of the Jewish boys and 17.1 per cent of the Italian boys had plasma values of 0.80 mg. per cent or higher. Among the girls, 22.5 per cent of the Jewish group and 36.6 per cent of the Italians had plasma values below 0.40 mg. per cent, and 49.9 per cent of the Jewish group and 30.4 per cent of the Italians had values of 0.80 mg. or higher. Thus, there are very

[6] Many Italians reported tomatoes but most of the tomatoes reported were eaten in sauces and ascorbic acid values were small because of the estimated loss of the nutrient in the long cooking necessary.

[7] Percentage distributions according to plasma ascorbic acid levels shown in Figure 4 are based on the following number of pupils: private school, 178 boys and 164 girls: public school, Jewish, 772 boys and 746 girls; public school, Italian, 205 boys and 112 girls.

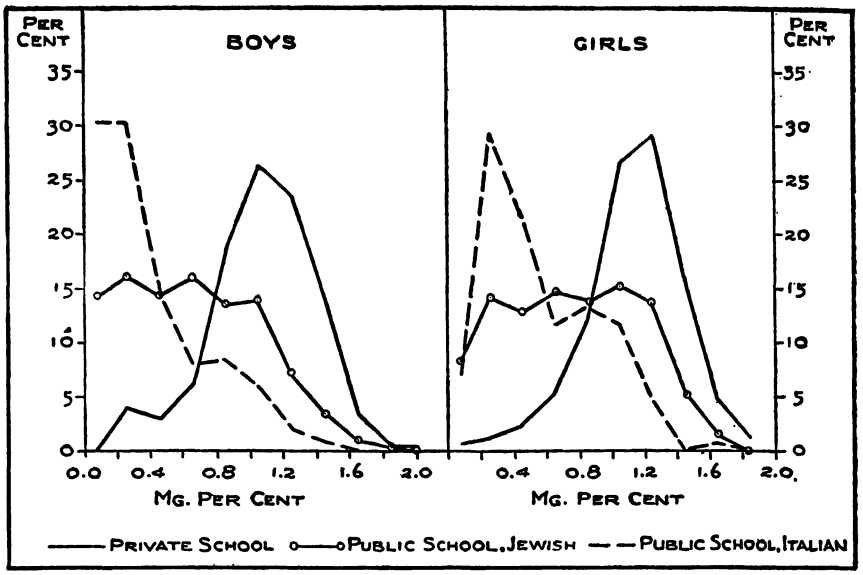

Fig. 4. Percentage distributions of plasma ascorbic acid values for boys and girls in a private high school and for those of two cultural groups, orthodox Jewish and Italian, in a public high school.

striking differences among these three cultural groups in the prevalence of very low plasma levels, and for each sex higher prevalence of low plasma values is associated with lower average intake of ascorbic acid.

Distribution of plasma values by sex for the same cultural group was somewhat more favorable for the girls than for the boys, especially in the Italian group, although the boys had on the average higher intakes of ascorbic acid.

Summary

Diets of high school students in a private and a public school in New York City are analyzed for amounts of protein, iron, calcium, vitamin A, and ascorbic acid.

Averages for intake according to age showed that boys in the private school increased their consumption of protein, iron, and calcium as they became older, but did not increase consumption of vitamin A or ascorbic acid. The increase was fairly proportional

with growth, and intake per kg. did not vary significantly at different ages except for protein for which amounts per kg. decreased significantly with age. Boys in the public school had significantly larger amounts of protein at older ages but not of any other nutrient; and for each of the five nutrients the average daily intake per kg. shows a significant decrease with age.

For girls, variation in consumption levels according to age was not significant for most of these nutrients. Girls in the private school, however, had more iron in their diets at older ages, and those in the public school had less iron and less calcium. Expressed as intake per kg., amounts of protein, iron, and calcium in diets of the public school girls decreased as age increased, but differences in intake per kg. by age among private school girls were not significant for any of these nutrients.

Average dietary values are compared with recommended age-specific allowances per person and per kg. In general, the average intake of pupils in the private school exceeded the allowances. For both boys and girls the intake per kg. of calcium was less than the allowance at ages under 16 years, and girls under 16 years had less iron per kg. than their allowance. Pupils in the public school had lower average amounts of these nutrients than those in the private school and their intake tended to be approximately equal to or to fall below the allowances. Calcium and ascorbic acid were the principal deficiencies for public school boys in relation to allowances, and calcium and iron were the principal deficiencies for public school girls.

Two homogeneous and distinct cultural groups in the public school are compared, namely, a Jewish group and an Italian group and each of these groups is compared with the private school group which was predominantly nonorthodox Jewish. Both for boys and girls, average values for each of the nutrients were significantly higher for the private school group than for the two public school groups. Jewish boys and girls had significantly larger amounts than

the Italians of calcium and ascorbic acid, and boys, but not girls, had significantly larger amounts of protein and iron. The Italian diets furnished about 40 per cent more vitamin A than the Jewish diets. Vitamin A from animal foods was furnished in larger amounts in the Jewish diets than in Italian diets, but the latter supplied nearly twice as much vitamin A from vegetables and fruits as the Jewish diets.

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