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NUTRITIONAL STATUS OF RURAL YOUTH
II. JOSEPHINE COUNTY

by

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This report on the nutritional status of rural youth in Josephine County is the second in a series of reports on a project being conducted by the Oregon Agricultural Experiment Station with the cooperation of the School of Home Economics of Oregon State College and the General Research Council of the Oregon State Board of Higher Education. The preliminary report on the nutritional status of rural youth in Marion County, published in September 1943 was the first in a series of five. Others will appear soon.

Procedure and Results

Forty-seven presumably healthy high school and twenty-eight presumably healthy grade school children in Josephine County participated in the study conducted during the periods of April 21 to May 19, 1943 and November 3 to 19, 1943, and during the 4-H Club Summer School sessions at Corvallis in June 1942 and 1943. They were students in approximately 20% of the rural schools in Josephine County in operation at the time. About 5% of the students in the Grants Pass High School and 10% of the children in each grade school were chosen for the tests. Only children from whom two samples of blood were taken on separate mornings are included in the results. Each child kept a record of all foods eaten during the period of one week.

Hemoglobin

Hemoglobin values were determined for 25 grade school children ranging in age from 10 to 14 years of age and 46 high school students ranging in age from 12 to 18 years of age.

As seen in Table 1, the average hemoglobin value for boys 13 years of age and under was 14.04 grams per 100 ml. blood and for girls of the same age group, the average was 14.08 grams. There is therefore no difference between the mean values for boys and girls at these ages although the girls showed a rather wider range of values. However, even the lowest value found, 12.69 grams per 100 ml. blood, is higher than the average of 12.0 gm. reported by Osgood and Baker in healthy Portland children 4 to 13 years of age.

Boys over 13 showed an increase in hemoglobin values, the mean for the 14 to 15 year old group was 14.54 gms. hemoglobin per 100 ml. and for those 16 and over, 16.05 gms. per 100 ml. Girls showed no such rise in hemoglobin during adolescence, the averages being 13.66 gms. for those 14

to 15 years old, and 14.02 gms. for those 16 and over. All these values are not far from Osgood's averages of 15.8 gms. for males over 14, and 13.8 gms. for females of the same age group.

Table 1. Hemoglobin Values for Age and Sex — Josephine County

<u>Age and Sex</u>	<u>No. Subjects</u>	<u>Grams of hemoglobin per 100 ml. of blood</u>	
		<u>Average</u>	<u>Range</u>
9-13 years			
Boys	12	14.04	13.38 to 15.07
Girls	17	14.08	12.69 to 15.80
14-15 years			
Boys	7	14.54	13.49 to 15.32
Girls	14	13.66	12.94 to 14.80
16-18 years			
Boys	6	16.05	15.01 to 16.90
Girls	15	14.02	12.59 to 15.07

Plasma Vitamin C

The blood plasma level of vitamin C depends on the daily intake. The Committee on Vitamins of the American Academy of Pediatrics (1940) has judged a level of 0.60 mg. of ascorbic acid (vitamin C) per 100 ml. of plasma as adequate. However, a level of at least 0.80 mg. per 100 ml. of plasma or more is needed for optimal nutrition.

Plasma ascorbic acid values for 22 grade school children and 47 high school children are included in this report. Fifty-nine per cent of the grade school children and 55 per cent of the high school young people had plasma ascorbic acid values below 0.60 mg. per 100 ml. of plasma. (Table 2)

Table 2. Comparison of Blood Plasma Ascorbic Acid (Vitamin C) Values of Grade and High School Children

	<u>No. Subjects</u>	<u>Average mg. of ascorbic acid per 100 ml. of blood</u>	<u>Range of Values</u>
Grade school	22	0.56	.24 - 1.00
High School	47	0.59	.17 - 1.34

Table 3 shows some differences between plasma ascorbic acid values of the sexes within the same age group, but the differences are not great enough to be statistically significant. The greatest difference comes between age groups, the 16 to 18 year old group having the highest level—an average value of 0.72 mg. of ascorbic acid per 100 ml. of plasma.

Table 3. Plasma Ascorbic Acid (Vitamin C) Levels of Boys and Girls at Different Age Levels--Expressed as Mg. of Ascorbic Acid per 100 Ml. of Plasma 3

	<u>Boys</u>		<u>Girls</u>		<u>Total</u>	
	<u>No. subjects</u>	<u>Average</u>	<u>No. subjects</u>	<u>Average</u>	<u>No. subjects</u>	<u>Average</u>
9-11 years	5	0.66	7	0.52	12	0.58
12-13 years	7	0.56	11	0.62	18	0.59
14-15 years	7	0.33	14	0.54	21	0.47
16-18 years	5	0.62	13	0.75	18	0.72

The relationship between vitamin C level and locality is shown in Table 4 in which it is evident that young people from the farming areas were definitely higher in plasma vitamin C than those from logging and mining regions.

Table 4. Comparison of Plasma Ascorbic Acid Values for Different Types of Locality

<u>Type of Locality</u>	<u>No. of Subjects</u>	<u>No. subjects with plasma levels 0.60 mg. per 100 ml. or above</u>	<u>Percent 0.60 mg. or above</u>
Predominately logging and mining	24	4	16.6
Predominately farming, or towns located in farming areas	45	24	53.3

There was little difference between the ascorbic acid values for the fall and spring months. A seasonal comparison shows an average of 0.55 mg. of ascorbic acid per 100 ml. of plasma for the spring and 0.62 mg. for the fall.

Food Consumption Records

Statistically there was a fair correlation in individuals between the consumption of citrus fruits and tomatoes and of other raw fruits and vegetables and the plasma ascorbic acid level, but not between the plasma ascorbic acid value and the amount of cooked fruits and vegetables eaten. (Table 5).

Table 5. Number of Servings of Fruits and Vegetables and Plasma Vitamin C Levels in Different Age Groups

<u>Age group</u>	<u>Mg. of Ascorbic acid per 100 ml. of plasma</u>	<u>Average Servings per Week</u>			
		<u>Citrus fruits and tomatoes</u>	<u>Other raw fruits and vegetables</u>	<u>Total Citrus, tomatoes, and other raw</u>	<u>Other fruits and vegetables</u>
10-11 yr.	0.58	3.44	9.48	12.92	15.20
12-13 yr.	0.59	3.90	7.39	11.30	15.32
14-15 yr.	0.47	5.24	6.22	11.46	18.20
16-17 yr.	0.72	4.88	7.28	12.16	19.59

The food record analysis shows some differences between fall and spring. Consumption of citrus fruits and tomatoes and of raw vegetables was higher in the spring while consumption of raw fruits other than citrus was higher in the fall. (Table 6)

Table 6. Consumption of Milk, Eggs, Meat, Fruits and Vegetables.

<u>Food</u>	<u>Average number of servings per week</u>	
	<u>Spring 1943</u>	<u>Fall 1943</u>
Milk and cream	17.0	19.1
Cheese	1.1	1.7
Eggs	5.6	3.4
Meat, fish and poultry	9.2	9.4
Citrus fruits and tomatoes	5.4	3.3
Raw Vegetables	3.7	2.5
lettuce	1.5	-
cabbage	-	0.5
carrots	1.0	0.8
celery	-	0.9
other raw	1.2	0.3
Raw fruits other than Citrus	1.8	5.7
apples	1.4	5.0
other	0.4	0.7
Potatoes	6.4	6.7
Cooked and canned vegetables	7.7	8.1
Dry peas and beans	1.3	1.3
Cooked, canned and dried fruits	5.2	6.5

It is interesting to note that during the spring green leafy vegetables such as spinach, turnip and mustard greens etc. were used quite extensively, 12.5% of all cooked vegetables being green leafy ones. In the fall hardly any appear on the food records (Table 7).

An average of 17 glasses of milk per week was consumed in the spring and 19.1 glasses in the fall. The range was from 2 to 35 glasses of milk per week, with one extreme of 50 glasses in a week.

The larger number of eggs used in the spring is probably indicative of the greater abundance during that period of the year. There was little seasonal difference in meat, fish and poultry consumption.

Table 7a. Numbers of Servings of Fruits and Vegetables
used in the spring 1943

Records of 330 days by 49 children

<u>Food</u>	<u>No. Servings</u>	<u>Food</u>	<u>No. Servings</u>
Citrus fruits - total	185	Dry beans and peas-total	62
oranges	119	navy beans	35
grapefruit ($\frac{1}{2}$)	56	red beans	17
lemons	10	lima beans	9
Tomatoes - total	72	black eyed beans	1
tomatoes, raw, stewed, etc.	61	Raw fruits - total	85
tomato soup	11	apples	67
Potato	302	avocado	8
Raw vegetables - total	173	bananas	5
lettuce	70	youngberries	2
carrots	48	gooseberries	1
cabbage	10	strawberries	1
celery	4	grapes	1
others	41	Cooked, canned and dried	
Other vegetables - total	365	fruit - total	244
vegetable soup	52	peaches	58
green peas	45	fruit pies, puddings	40
corn	45	mixed fruits	36
green beans	38	prunes and plums	16
vegetable salad	36	cherries	16
spinach	33	berries	14
carrots	30	pears	11
asparagus	18	rhubarb	10
peas and carrots	15	raisins	9
beets	9	applesauce	9
cabbage	8	fruit punch	9
sauerkraut	6	apricots	6
wilted lettuce	6	dates and figs	5
Swiss chard	5	pineapple	5
turnip greens	4	pineapple juice	2
rutabagas	3	grape juice	1
onions	2		
turnips	2		
greens	2		
cauliflower	2		
succotash	1		
artichokes	1		
radish greens	1		
mustard greens	1		

Table 7b. Numbers of Servings of Fruits and Vegetables
Used in the Fall 1943

Record of 103 days by 16 children

<u>Food</u>	<u>No. Servings</u>	<u>Food</u>	<u>No. Servings</u>
Citrus fruits - total	23	Dry beans and peas-total	19
oranges	19	navy beans	11
grapefruit	3	red beans	7
lemons	1	split peas	1
Tomatoes - total	28	Raw fruits - total	86
tomatoes, raw, stewed, etc.	25	apples	73
tomato soup	3	grapes	8
Potato	99	peaches	2
Raw vegetables - total	37	pears	1
celery	14	mixed salad	2
carrots	12	Cooked, canned and dried	
cabbage	7	fruit - total	93
others	4	pears	17
Other vegetables - total	116	applesauce	16
corn	22	fruit pies and similar	
vegetable soup	21	desserts	13
vegetable salad	14	peaches	12
cabbage	12	berries	12
carrots	12	baked apples	9
beets	7	prunes and plums	5
green beans	6	mixed fruits	5
peas	6	figs	3
onions	3	apricots	2
parsnips	3	raisins	1
asparagus	2		
squash	2		
cauliflower	2		
spinach	1		
beans and carrots	1		
peas and carrots	1		
broccoli, sprouting	1		

Summary

1. In general the young people in Josephine County showed high hemoglobin values. They would not be considered anemic under present standards.

2. Fifty-nine per cent of the grade school children and 55 per cent of the high school young people had plasma vitamin C values below 0.60 mg. of ascorbic acid per 100 ml. of plasma.

3. There was no outstanding difference between plasma ascorbic acid values of the two sexes within age groups. The greatest differences came between age groups, with the 16 to 18 year old group having the highest average value of 0.72 mg. of ascorbic acid per 100 ml. of plasma.

4. From the predominantly farming areas, 53.3% of the subjects showed values above 0.60 mg. ascorbic acid per 100 ml. of plasma while only 16.6% from the predominantly logging and mining regions had values above this standard.

5. There was little difference between the average plasma vitamin C values between the spring and fall seasons—0.56 mg. of ascorbic acid per 100 ml. of plasma in the spring and 0.60 mg. in the fall.

6. A fair correlation between the consumption by individuals of citrus fruits and tomatoes, and of other raw fruits and vegetables, and plasma ascorbic acid level was noted.

7. Green leafy vegetables other than lettuce and cabbage were used more often in the spring than in the fall.

8. Milk consumption averaged 17 glasses per week in the spring and 19.1 glasses in the fall and ranged in general from 2 to 35 glasses per week with an extreme of 50 glasses.

9. Egg consumption was higher in the spring, being 5.6 eggs per week as against 3.4 eggs per week in the fall.

10. Little seasonal variation was observed in the consumption of meat, fish, and poultry which averaged 9.2 servings per week in the spring and 9.4 servings per week in the fall.