



Blood measurements as related to food selection patterns of young adult women
by Lora Simard Hedegaard

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
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Abstract:

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Evaluation of the dietary patterns showed that a number of the students were making food choices that resulted in inadequate consumption of calcium, iron, Vitamin A and ascorbic acid. There was some improvement in the food selection patterns between the first week and the last week of the quarter while the students were enrolled in the class in elementary nutrition.

The blood measurements of these 40 young adult women showed that, in January and March, with one exception, the blood hemoglobin levels were within the normal range, a general indication of good health. All blood hemoglobin levels were within the normal range in May. The mean hematocrit and plasma protein determinations were within the normal range in all three periods. It is to be expected that a group of young women attending college would exhibit generally good health as this group did.

BLOOD MEASUREMENTS AS RELATED TO FOOD SELECTION

PATTERNS OF YOUNG ADULT WOMEN

by

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A thesis submitted to the Graduate Faculty in partial
fulfillment of the requirements for the degree

of

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in

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ABSTRACT

This study was set up to provide information on the relationship of certain blood measurements to the food selection patterns of young adult women and to test the hypothesis that their food selection patterns can be improved by the effective teaching of nutrition.

Forty young women enrolled in a college class in elementary nutrition kept seven-day dietary records in January and March, 1965. Blood samples were taken from these same students during the second weeks of January, March and May, 1965 and hemoglobin, hematocrit and plasma protein determinations were made.

Evaluation of the dietary patterns showed that a number of the students were making food choices that resulted in inadequate consumption of calcium, iron, Vitamin A and ascorbic acid. There was some improvement in the food selection patterns between the first week and the last week of the quarter while the students were enrolled in the class in elementary nutrition.

The blood measurements of these 40 young adult women showed that, in January and March, with one exception, the blood hemoglobin levels were within the normal range, a general indication of good health. All blood hemoglobin levels were within the normal range in May. The mean hematocrit and plasma protein determinations were within the normal range in all three periods. It is to be expected that a group of young women attending college would exhibit generally good health as this group did.

INTRODUCTION AND REVIEW OF LITERATURE

Food is plentiful in the United States, but nutrition problems exist, and many teen-agers and young adults are known to have poor patterns of food selection (1). Nutritional surveys indicate that poor food selection patterns result in low intakes of certain nutrients known to be required by the body for normal growth and function. There is little doubt that poor nutrition and poor dietary habits during the younger years of the life cycle contribute to inferiority in the mature physique, to reduced stamina, and to lowered resistance to disease (2).

Elvehjem (3) states that in areas of the world where the food supply is both abundant and varied the nutritionist has a responsibility to educate the public concerning food selection, so as to provide an adequate and balanced diet without overnutrition. Stiebeling (4) reminds us of the advantageous setting we have in this country for such work, including a tradition of education in matters related to problems of daily living, plenty of food, opportunities to bring scientific knowledge to bear on public issues, and living in an age of social concern. She also states that the task is far from finished; nutritionists have a continuing duty to advance the use of nutritional truths in practical programs. Todhunter (5) has written that there should be a "marriage of food habits and the science of nutrition", and goes on to say that one of the keys to human progress lies in nutrition for the whole man. This is the nutritionist's responsibility. And this makes the nutritionist the scientist with a sense of social responsibility.

The nutritional state of persons living in the United States is in general very good (6). We are fortunate in having an abundant and varied food supply. Recent precise data relative to nutritional status of the population of this country are not available. No survey has been made comparable to the surveys by the Interdepartmental Committee for Nutrition in National Defense (ICNND) conducted in other nations. The most recent information on a country-wide basis was collected by the cooperative efforts of the State Agricultural Experiment Stations and the U. S. Department of Agriculture about ten years ago. Findings are summarized in a bulletin edited by Morgan in 1959 (1). From 1947 through 1958, over 200 professional nutritionists investigated the nutritional status of children, adolescents, and adults in the United States. The population groups studied were children 5 to 12, adolescents 16 to 20 and adults 20 to over 80 years of age. About 4000 individuals were included in each group. The effort was cooperative within and among the four regions of the U.S.A., the Northeast, North Central, South and West. The results were surprisingly alike in all regions and among all ages and economic groups.

The nutritional status of the U.S.A. on the whole was found to be good, probably the best that has ever been reported for any similar population groups. However, good average intakes of any population group may conceal poor choices by some individuals. Since 1940, the Food and Nutrition Board has developed formulations of daily nutrient intakes which were judged to be adequate for the maintenance of good nutrition in the population of the United States (7). Intake of

nutrients in two-thirds or less than the recommended amounts was chosen as representing the borderline of inadequate choice of foods. The most important finding in this study, edited by Morgan (1), was a high incidence of caloric overnutrition. Among older women in the North Central States, 50 per cent were overweight and 30 per cent could be classified as obese, i.e., more than 20 per cent overweight as compared to desirable weight in the third decade. In Colorado and California, about 30 per cent of the women and 20 per cent of the men over 50 years of age were overweight. In New Jersey, 40 per cent of the men aged 20 to 50 were overweight.

The intakes of adolescents 13 to 20 years old, especially those of the girls, were more variable and less favorable than were those of either the younger children or the adults. Twenty-six groups of boys and girls were studied in as many states, and those 13 to 16 years old were examined in 8 Western and 3 Northeastern states. Of these, over 90 per cent of the boys had intakes exceeding two-thirds of the recommended allowances for protein, except for the Spanish-American group in New Mexico. More than a fifth of the boys had diets providing less than two-thirds the recommended amounts of calcium, a third were equally low in thiamine, nearly a fifth were low in niacin, and about half were this low in ascorbic acid. A much greater proportion of girls lacked these food nutrients to this extent. About 20 to 40 per cent of the girls had diets relatively low in protein, vitamin A, riboflavin and niacin. Among the girls studied in New Mexico, Colorado and Montana, more than

50 per cent had diets relatively low in calcium and ascorbic acid. The young people 16 to 20 years of age in 4 Northeastern, 3 Western states and in Iowa had somewhat better intake records than the younger adolescents. More than 90 per cent of the males, with the exception of those in Maine and Colorado, had diets providing more than two-thirds the recommended allowances of protein and niacin. Forty per cent of the diets of the young men in Maine, West Virginia and Colorado fell below this level in calcium and about 25 per cent in Idaho and Colorado were low in vitamin A and thiamine. In all 8 states 19 to 80 per cent of the young men received less than two-thirds the recommended amount of ascorbic acid. The records of the young women were similar, with large numbers showing relatively low intakes of calcium, iron, vitamin A and ascorbic acid, especially in Colorado, Idaho and Washington. Riboflavin intake was low in many of the Maine and Colorado women's diets and calcium was low in the Iowa diets.

Obviously, the same nutrient deficits occur again and again in all parts of the country in ascorbic acid, calcium, iron and vitamin A. The diets of teen-age girls presented the least favorable picture of all those examined. The nutrients most often found to be lower than the recommended amounts in the diets of children and adults in all four regions were vitamin A, ascorbic acid, calcium and iron.

In a study of the nutrient intakes and food habits of Montana students (8), conducted as part of the Western Regional Research Project, it was found that 78 per cent of the females were consuming diets providing less than two-thirds of the allowance in one or more nutrients.

One-third had diets below this level in only one nutrient--iron, calcium or ascorbic acid. If two or more nutrients were below two-thirds of the recommendation, most frequently there was a combination of calcium with iron, thiamine, riboflavin, and/or ascorbic acid.

Individual dietary records of 805 males and females in a rural township in New York were evaluated for nutrient content by researchers in Cornell University in 1948-1949 (9). This group consisted of males and females aged 1 year to more than 70 years old and included 65 males and 75 females of the 16 to 29 year-old range. The caloric intakes of adolescent girls and young women most frequently were low, reflected partly in relatively low intakes of many nutrients, particularly calcium and iron.

The Department of Health of Pennsylvania has sponsored a number of studies concerning the effects of nutrition on health. A report in 1955 (10) on the nutritional status of 2,536 young people 12 to 20 years old indicated that the diets of the girls were much less satisfactory than those of the boys in providing recommended amounts of nutrients.

The concern about eating behavior of teen-agers and adolescents is evident in a number of dietary studies. Everson (11) feels that the eating habits of teen-agers is a matter of concern, especially for the group of young girls who marry early. There is a high incidence of tuberculosis in this age group, caused primarily by overwork and malnutrition. Everson reports these shortcomings in teen-age diets: too little calcium due to low consumption of milk; insufficient intake of green and yellow vegetables and fruits, resulting in a sub-optimal supply

of vitamin A, too little ascorbic acid, and a questionable provision for an amino acid mixture which will support optimal health.

Litman (12) in a study of Austin, Minnesota school children 10 to 22 years of age analyzed the diets and found 44.6 per cent good, 31.77 per cent fair and 23.62 per cent poor. There was an extensive endorsement by the children of milk, potatoes, bread, meat, butter and eggs with an apparent low acceptance of green and yellow vegetables and liver. This study found the sanctioning of food likes and dislikes to be a family-centered activity with the mother the most frequently named authority figure for forming dietary habits. Cooksey (13) found that senior high school students who omit breakfast (52 of a class of 323) do so because they have to eat alone, have to prepare their own breakfast, or their peers also omit breakfast. Hinton (14) in a study of 12, 13 and 14 year old girls found that 44 per cent of the girls indicated they were not hungry for breakfast, and only 64 per cent of the girls stated that they enjoyed breakfast. This author also found that the educational level of the parents was related to the adequacy of the diet. This suggestion would agree with the findings of LeBovit and Clark (15) that the quality of the diet provided for the family was significantly related to the education of the wife. Spindler (16) also states that girls are consuming poorer diets than boys and further states that in the United States today, 53 per cent of all girls age 15-19 are, or have been, married. One of every 4 mothers bearing a first child is less than 20 years old. Parenthood, while a teen-age mother's body is still in

the formative stage, creates added physiological stress. Malnourished teen-agers are frequently poor obstetrical risks.

Iron is one of the nutrients found to be low in these dietary studies. An inadequate dietary intake of iron by growing children, by adolescent girls, or by women, especially during pregnancy and lactation, will produce iron-deficiency anemia (17). Krehl (18) states that iron deficiency anemia is one of the most common deficiencies seen in this country. During periods of stress such as infancy, childhood and adolescence, the state of iron balance may have a narrow margin of safety, and there is a large number of persons who may be in a precarious state of iron metabolism (19). The Food and Nutrition Board of the National Research Council revised the recommended daily allowance for iron upward in 1964 in accordance with the newer knowledge of nutritional needs (7, 20).

One of the most widely used methods of appraisal of nutritional status is the determination of hemoglobin in the blood (21). The mean level of hemoglobin and the percentage of persons with values below the accepted range of normal have been considered good indices of the general health of the population. Blood is still the most easily sampled tissue in vivo to indicate some phases of iron metabolism (22).

Macy states: "Adolescence is characterized by increased food needs. An unbalanced diet which does not furnish all the essential nutrients may be more harmful to the adolescent than an insufficient diet" (2). Williams (23) has written, "Since every cell and tissue in our bodies needs nourishment, and every part may be subjected to nutrition which

is faulty in varying degrees, the number of human ills that may arise because of imperfect nutrition is very large."

What can be done to help correct these faulty dietary patterns? Leverton (24), speaking at the Nutrition Education Conference in January, 1962, said, "Patterns of behavior can be more potent than knowledge in directing actions because knowledge of itself does not have the power to make its possessors use it. In every aspect of behavior, whether we are learning or teaching, we seek patterns to use as guide-lines to effective living." Todhunter (25), in drawing implications from this same conference, stressed that we must believe in the importance of good nutrition and let people know by our enthusiasm that we believe in it. "We can help other individuals learn about nutrition - not all that we know, but what each individual needs to know at the time."

A method of changing food habits as reported in the Manual for the Study of Food Habits (26) is that of group decision. It consists of a discussion led by a skillful leader in which the members of the group come to regard the matter being discussed as important to themselves and begin to take over responsibility for it, until finally, after some of their objections and statements of difficulties have been aired and discussed, they are ready to reach a decision. Again to quote Leverton (27), "An effective nutrition education program is based on meeting the needs of the people who are to participate. It must start within the existing food practices and knowledge of the group, progress to the recognition of needs, and culminate in action directed toward

improvement." Spindler (28), nutritionist with the Federal Extension Service, also points to the importance of involving the teen-agers in solving their own nutritional problems and the importance of basing the approach to nutrition education on the needs and wants of the teen-agers.

Knudson (29) suggests that whatever approach is used in dietary education, it must provide a means for the learner to integrate the new material or knowledge into his mental context and into his unique way of life. It is not enough to provide information alone. Few of us have the capacity or inclination to apply directly what we hear in lectures or read in books. It takes time and effort to fit new knowledge into present behavior patterns. The most effective educational techniques are likely to be those which help the educator and student come to common understandings about problems and ways of adapting new knowledge to solve these problems. Until new knowledge is applied, the educational process is not fully effective.

PURPOSE

Nutritional status studies of population groups in Montana (8), carried on as part of the Western Regional Research Project, included seven-day dietary records obtained from 418 students. Seventy-eight per cent of the females were consuming diets providing less than two-thirds of the recommended allowance in one or more nutrients. Surveys in the United States have repeatedly shown that the diets of teen-age girls are frequently low in ascorbic acid, calcium, iron and vitamin A (1). At the same time, the Food and Nutrition Board of the National Research Council has revised the recommended daily allowance of iron upward in accordance with increased knowledge of nutritional needs (7).

The purpose of this study was twofold: first, to provide information on the relationship of certain blood measurements to food selection patterns of young adult women; second, to test the hypothesis that food selection patterns can be improved by teaching nutrition.

It is the opinion of this author that educational programs need to be designed to help young people understand that health is important to their well-being, that nutrition affects health, and therefore, that health should be considered in selecting food. These young people need to be made aware of the obesity problems in existence among older men and women, of the nutrient deficits common among teen-age girls, and of the increased food needs of the adolescent and of pregnant and lactating women. They must regard the matter as important to themselves and begin to take responsibility for it.

PROCEDURE

Forty young women enrolled in a college class in elementary nutrition, taught by the author, were volunteers for this study during the winter quarter, January 6 to March 20, 1965. Each student kept a seven-day dietary record, including any multiple vitamin or vitamin and mineral preparations, during the first and last weeks of the quarter (Appendix A, B, pages 24, 25). The students calculated the average daily intake for calories and seven nutrients consumed during the first week of the quarter, using USDA Home and Garden Bulletin No. 72 (20). The results were compiled on a form titled Nutritive Values of Food (Appendix C, page 26) and were checked for accuracy by the instructor. The nutritive value of the dietary records kept during the last week of the quarter was calculated by the instructor. Average daily intakes for calories and five nutrients (protein, calcium, iron, vitamin A and ascorbic acid) were used in this study.

Blood samples were taken by finger puncture from these same students during the second weeks of January, March and May, 1965. Hemoglobin was measured by the cyanmethemoglobin method using a hemoglobin standard (30). Readings were made using a Beckman B spectrophotometer. Standardized heparinized capillary tubes were used for the microhematocrits (31). After centrifuging they were read in a microcapillary reader. Plasma protein determinations were made using a temperature compensated Goldberg refractometer (32). All blood withdrawals were made in the morning hours.

The means for hemoglobin, hematocrit readings, plasma protein determinations, and intakes of calories and the five food nutrients were determined for each period. Standard errors of the means were calculated using the procedures given by Snedecor (33). Correlation coefficients were determined for hemoglobin and iron intake in order to study the relationship of the iron intake of each student with her corresponding hemoglobin level (33). Deviations of the observed body weight of the students from the desirable weight indicated by the tables of Hathaway (34) are reported as per cent of standard weight.

During the class period, the lecture method of teaching was used, supplemented with demonstrations, charts, bulletin boards, and limited discussion. The main demonstrations included: instruction on size and weight of food servings, method of taking a blood sample for hemoglobin determination, and use of a basal metabolism machine. Teaching aids had been planned by the author as part of an adult education methods course.

RESULTS AND DISCUSSION

Nutrient Intake

The mean, range and standard error of the mean for the average daily intake of calories and five nutrients consumed by the 40 students in January and March are given in Table I. Foods consumed by these students on the average provided adequate or more than adequate amounts of calories and all nutrients except iron. The standards for adequacy used are two-thirds of the Recommended Daily Dietary Allowance as set up by the National Research Council, which are designed to afford a margin of sufficiency above average physiological requirements (7). These average intakes of nutrients that are adequate according to the standard used conceal poor food choices by a number of individuals. The number of diets and per cent of total diets below two-thirds of the recommended allowance for calories and five nutrients consumed in

Table I

Mean, range and standard error of the mean for average daily intake of calories and five nutrients for 40 young adult women.

	ENERGY	PROTEIN	CALCIUM	IRON	VITAMIN A	ASCORBIC ACID
	calories	gm.	gm.	mg.	I.U.	mg.
January	1686±81* (704-2909) [†]	65±2.3 (22-94)	0.9±0.22 (0.3-2.9)	8±0.4 (4-17)	5463±761 (1059- 32,087)	63±8 (11-317)
March	1709±58 (781-2315)	68±2.6 (23-118)	0.8±0.15 (0.4-1.9)	9±0.4 (3-17)	3944±525 (1312- 14,406)	72±6 (23-181)

*Standard error of the mean.

[†]Range.

Table II

Students with average daily intakes of calories and five nutrients below two-thirds of the recommended allowances.

	Calories		Protein		Calcium		Iron		Vitamin A		Ascorbic Acid	
	Jan.	Mar.	Jan.	Mar.	Jan.	Mar.	Jan.	Mar.	Jan.	Mar.	Jan.	Mar.
Number of students	10	11	2	2	5	3	30	24	9	15	20	9
Per cent of students	25	27.5	5	5	12.5	7.5	75	60	22.5	37.5	50	22.5

January and March are presented in Table II. The low intake of iron is apparent, since 75 per cent of the January diets and 60 per cent of the March diets were low in iron. Fifty per cent of the January diets and 22.5 per cent of the March diets were low in ascorbic acid, 22.5 per cent of the January diets and 37.5 per cent of the March diets were low in Vitamin A, and 12.5 per cent of the January diets and 7.5 per cent of the March diets were low in calcium. Low intakes of iron, ascorbic acid, Vitamin A and calcium have been reported in other studies (1, 8, 9, 11). Ninety-five per cent or 38 of the diets showed adequate consumption of protein. This may have been because the students like protein foods, particularly meat. This liking was frequently expressed during the class discussion period.

Another rating of the diets is presented in Figure 1. Only one student in the January period, and no student in the March period, consumed 100 per cent of the recommended allowance in calories and five nutrients. Five students in the January and 11 students in the March

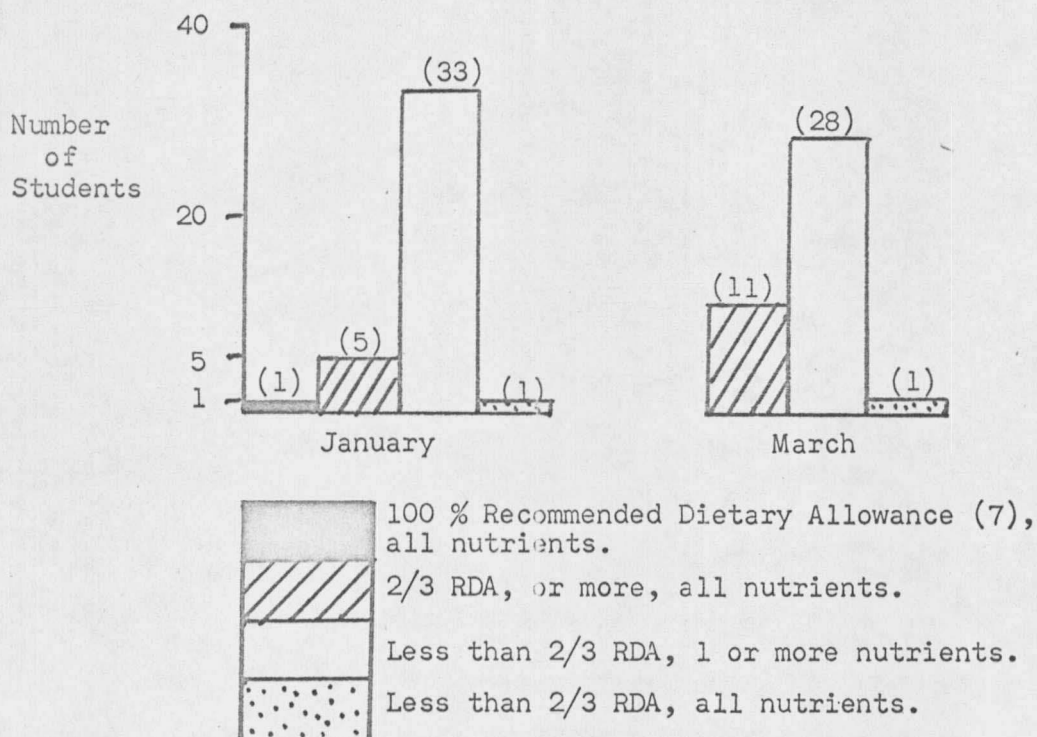


Figure 1. Ratings of January and March diets for 40 young adult women.

period consumed two-thirds or more of the recommended allowance for calories and five nutrients, while 33 students in the January period and 28 students in the March period consumed less than two-thirds of the recommended allowance in one or more nutrients. One student consumed less than two-thirds of the recommended allowance for calories and all nutrients in both January and March. This student was mentioned previously as being low in protein for both the January and March periods. The instructor noted that this student was pale and listless in appearance, frequently absent from class, and often fell asleep in class when present.

There was some improvement of the dietary pattern of the students between January and March. Table II shows that 20 diets or 50 per cent were low in ascorbic acid in January, while 9 diets or 22.5 per cent were low in March. The March diets showed increased consumption of citrus fruit or juice and/or fruit drinks enriched with ascorbic acid. After the importance of ascorbic acid in the diet had been studied and discussed, it was relatively easy for the students to increase consumption of this nutrient. The pattern of iron consumption also shows some improvement. Thirty diets or 75 per cent were low in iron during the January period; during the March period, 24 diets or 60 per cent were low in iron. No single factor seems apparent in this improvement as in the case of ascorbic acid. Five diets, or 12.5 per cent were low in calcium during the January period and 3 diets or 7.5 per cent were low in calcium during the March period, reflecting a slight change in consumption of milk. Improvement was not apparent in the case of Vitamin A consumption, as there were 9 diets or 22.5 per cent low in January and 15 diets or 37.5 per cent low in March. No single factor shows up to have reduced the intake of this nutrient.

It appears that a decided change in food selection patterns cannot be accomplished in a short time after these patterns have become established by years of eating in a particular way. The long term possibilities of improvement cannot be measured here. It would seem best to integrate nutrition education into the whole education system so that students would be made aware of the importance of good food selection patterns at the formative stage, i.e., when very young.

Table III

Mean values for hemoglobin, hematocrit and plasma protein for 40 young adult women.

Blood Constituent	January, 1965	March, 1965	May, 1965
Hemoglobin (gm./100 ml.)	14.69±0.14* (11.2-16.4) [†]	14.80±0.14 (12.6-17.2)	14.75±0.11 (13.3-16.2)
Hematocrit (ml./100 ml.)	43.82±0.33 (38.37-47.50)	43.97±0.35 (39.25-43.0)	44.80±0.26 (39.20-49.0)
Plasma Protein (gm./100 ml.)	7.4±0.63 (6.6-8.4)	7.3±0.70 (6.5-8.4)	7.7±0.57 (7.2-8.7)

*Standard error of the mean.

[†]Range.

Blood Measurements

Hemoglobin, hematocrit readings (per cent volume of packed red cells), and plasma protein content of the blood are widely used indices of health and nutritional condition (21). The values found in this study are shown in Table III.

The mean hemoglobin value of these subjects was 14.69 gm. per 100 ml. in January, 14.80 gm. in March, and 14.75 gm. in May. These values are in general agreement with those found in a previous Montana study (35), although higher than the average given by Albritton (36). Since the students were living at altitudes of 4000 to 5000 ft., some increase in hemoglobin level over that observed at sea level might be expected. Hemoglobin concentration is regularly increased in acclimated persons living at mountainous altitudes (1). With one exception, the students had normal blood hemoglobin values in January and March, as evaluated

Table IV

Hemoglobin values in gm./100 ml. for 40 young adult women in January, March and April, 1965.

Hemoglobin	January		March		May	
	Number	%	Number	%	Number	%
Below 13 gm./100 ml.	1	2.5	1	2.5	0	0.0
13.0-13.9 gm./100 ml.	4	10.0	6	15.0	5	13.0
14.0 gm./100 ml. and above	35	87.5	33	82.5	34*	87.0

*One student did not return for spring quarter.

by the range of normal hemoglobin values (14.0 ± 2 gm./100 ml.) given by Wintrobe (30). All students had normal blood hemoglobin values in May. Table IV shows the distribution of blood hemoglobin values. These values show that, on the average, 85 per cent of the students had blood hemoglobin values of 14.0 mg./100 ml. or above, a general indication of good health. The students (12.5 per cent) with hemoglobin values ranging from 13.0 gm./100 ml. to 13.9 gm./100 ml. were within the normal range. Healthy individuals differ widely with respect to their blood formulas (30). The one student with a blood hemoglobin level (11.23 gm./100 ml. in January) below the normal value consumed less than two-thirds of the recommended dietary allowances for iron and ascorbic acid, according to her 7-day dietary record for January. Her blood hemoglobin level in March was 12.65 gm./100 ml., with her dietary record for March showing less than two-thirds the recommended amounts consumed of calories, iron Vitamin A, and ascorbic acid. In May her blood hemoglobin level was

13.30 gm./100 ml. When the relationship of iron intake to hemoglobin values for the group was studied, positive, but statistically insignificant correlation was found for both January ($r = .142$) and March ($r = .091$).

The mean hematocrit readings as shown in Table III, were 43.82 ml./100 ml. for January, 43.97 ml. for March, and 44.30 ml. for May. These values are in general agreement with the previous Montana study (35) and are all within the normal range (42.0 ± 5 ml./100 ml.) given by Wintrobe (30).

Plasma protein content of the blood is a widely used method in appraising nutritional status although Albanese (37) has reported relatively poor correlation between total plasma protein levels and deviations from desirable body weight. Figure 2 shows the relationship of the plasma protein and blood hemoglobin determinations to observed body weight, reported as per cent of the standard body weight (34). Five students were determined to be 90 per cent of the standard, 18 students as 100 per cent of the standard, 12 students as 110 per cent of the standard, and 4 students as 120 per cent of the standard body weight. The plasma protein levels plotted against body weight reported as per cent of the standard show very little variation. It is interesting to note that the 4 students in the 120 per cent standard of body weight show a reduction in the mean blood hemoglobin value as compared to the other weight groups. The dietary pattern for 3 of these students shows that they consumed less than two-thirds of the recommended allowance for iron in March.

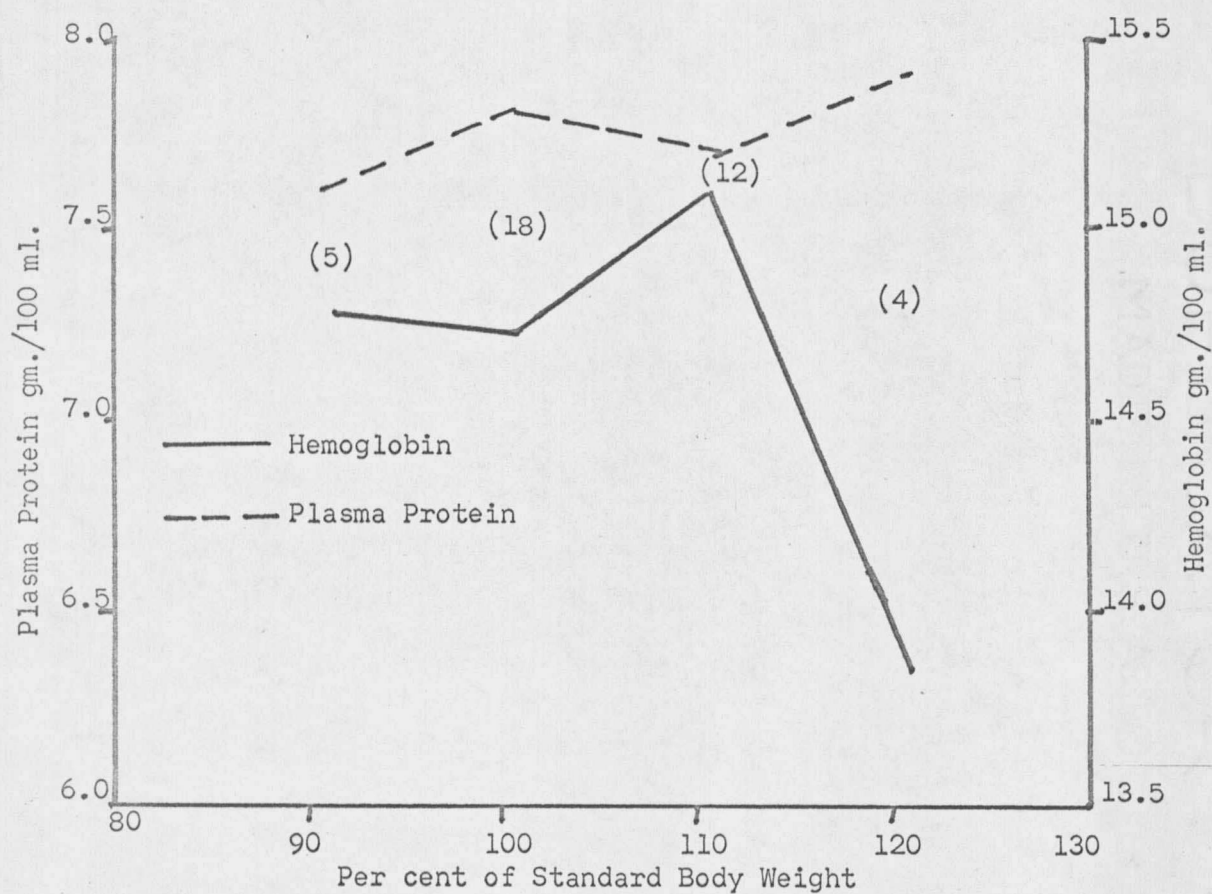


Figure 2. Plasma protein and hemoglobin levels in May for 39 young adult women as related to per cent of standard body weight.

SUMMARY AND CONCLUSIONS

The blood measurements of these 40 young adult women showed that, with one exception, the blood hemoglobin levels were within the normal range, a general indication of good health. There was positive, but statistically insignificant correlation of iron intake and blood hemoglobin levels. The mean hematocrit and plasma protein determinations were within the normal range.

It is to be expected that a group of young women attending college would exhibit generally good health as this group did. Sixteen of the students were classified as above the standard or desirable body weight. This also might be expected since there is a high incidence of caloric overnutrition in the United States.

Evaluation of the dietary patterns of the 40 young adult women participating in this study revealed that a number of them were making food choices that resulted in inadequate consumption of calcium, iron, vitamin A and ascorbic acid. There was some improvement in the food selection patterns between the first week and the last week of the quarter while these students were enrolled in a class in elementary nutrition. It seems that the lack of sufficient ascorbic acid in the diet was the easiest to correct, while much more careful food selection would be necessary to correct the lack of vitamin A and iron. Lack of sufficient calcium could be corrected by drinking more milk and only 3 diets in the March period showed that less than adequate amounts of calcium were consumed. This period of ten weeks was probably too short to expect to accomplish major changes in patterns of food selection, as

these are acquired over a period of years. However, nutrition education may make these young women aware of the problems that exist and of the importance of good food selection patterns for themselves and the families they may be rearing. Their nutrition education may result in better health for and increased well-being of their own children. Ideal nutrition education should begin early when food selection patterns are in the formative stage, and should be continuous.

APPENDIXES

Appendix A

Nutrition 217

Student No. _____

Instructions for Keeping Seven Day Dietary Record

1. BE COMPLETE -- BE ACCURATE -- BE SPECIFIC -- EAT AS YOU USUALLY EAT
2. Records are to be kept for seven (7) days.
 - a. Write record AT THE TIME the food is eaten, or immediately afterwards so that you won't forget anything.
 - b. Under the TIME OF DAY, record the time each food or drink was consumed, whether at meal time, between meals, or before bedtime.
 - c. Under PLACE record the place where the food was eaten.
 - d. Under KIND OF FOOD list only foods you ate, not foods served which you did not eat.
3. Name of foods and description.
 - a. Describe the foods carefully, especially mixtures. Tell the approximate food ingredients. If you eat a food raw, write "raw" after it.
 - b. Be sure to include everything that you eat between meals, such as candy, gum, pop, vitamins, laxatives, cookies, etc.
 - c. Be sure to include such items as butter, margarine, gravy, jam, salad dressings, sugar, cream, etc., each time you use them.
 - d. Give the KIND OF FOOD. Such as bread--wholewheat, cereal--corn-flakes, meat--pork, liver, hamburger, steak, etc., beans--dried or green canned, peas, dried or fresh green or canned, potatoes--white or sweet.
 - e. Under AMOUNT describe as carefully as you can just how much of each food you have eaten. Suggest that you give approximate size of slice of meat (2x3x $\frac{1}{2}$) or of piece of cake, or compare to size of a slice of bread.
4. Use one sheet for each day's food record.
5. Be sure the student number, day and date are on each sheet.

Appendix B

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Student No. _____

Individual Food Record

Record No. _____

Day of the week _____

Date _____

Time of Day	Kind of Food & Description (Describe carefully, be specific)	Amount (Be accurate)
Breakfast Time:		
Between breakfast and noon		
Noon meal Time:		
Between noon & evening meal		
Evening meal Time:		
After evening meal. Time:		
Vitamin or min- eral supplement		
Check your meal record with instructions		

Appendix C

Nutritive Values of Food

Appendix C

Nutritive Values of Food

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Hedegaard, Lora (Simard)

Blood measurements as related
to food selection patterns ...

NAME AND ADDRESS	
MAR 9 1967	<i>J. Hedegaard Hedegaard</i>
4-27-67	<i>J. Hedegaard Hedegaard</i>
4-27-67	<i>J. Hedegaard Hedegaard</i>
4-27-67	<i>J. Hedegaard Hedegaard</i>
4-26-67	<i>J. Hedegaard Hedegaard</i>
4-26-67	<i>J. Hedegaard Hedegaard</i>
5-10-67	<i>J. Hedegaard Hedegaard</i>
OCT 14 1967	<i>J. Hedegaard Hedegaard</i>
JAN 23 1968	<i>J. Hedegaard Hedegaard</i>

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