

# AN EXPERIMENT IN DIET EDUCATION DURING PREGNANCY

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**T**HAT there is an intimate relationship between the nutritional status of a mother and her well-being during pregnancy as well as that of her baby would scarcely be questioned today. Nevertheless, health supervision in prenatal clinics rarely includes any individual teaching of mothers concerning dietary requirements during pregnancy. No personnel is provided in hospitals for this service, and physicians give attention to the diet of a patient chiefly after toxic symptoms or excess weight gain are noted. The potential value of diet education for mothers in preventing complications of pregnancy and infant loss has been recognized by many public health workers, but programs for integrating such a service into hospital prenatal clinics have not been developed.

In 1947 the Nutrition Committee of the Bronx Council of Social Welfare became interested in the problem of teaching nutrition to patients in prenatal clinics in City Hospitals in New York and enlisted the cooperation of Morrisania City Hospital<sup>2</sup> for a maternal nutrition demonstration. It seemed desirable to evaluate the results of the demonstration, and a pilot experiment was planned with advice from the technical staff of the Milbank Memorial Fund. The Community Service Society of New York made it possible to conduct the project by furnishing a nutritionist and a nurse who took the diet histories and gave nutrition instruction to patients.<sup>3</sup>

This experiment in diet education was undertaken with two

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<sup>2</sup> Grateful acknowledgment is made to Dr. Nathan Smith, Medical Superintendent, and to Dr. Milton Goodfriend, Director of Obstetrics at Morrisania Hospital, for their cooperation in this Study; also to the medical, nursing, and administrative staff of the prenatal clinics, and to the staff of the record room at Morrisania Hospital for assistance throughout the Study.

<sup>3</sup> A major share of the credit for this Study should go to Mrs. Gertrude Odmark, nutritionist of the Nutrition Service, and to Miss Rose E. Line, nurse of the Department of Educational Nursing, of the Community Service Society.

objectives: first, to determine whether, with individual instruction on specific ways to improve the diet, prenatal patients with very low incomes would change their dietary patterns; and second, to evaluate whether the quality of their diets would have a demonstrable relationship to complications or outcome of pregnancy.

*Study Procedure.* Prenatal clinics are held at Morrisania City Hospital on Mondays for new patients and on Fridays for revisits. New patients register on their first visit and return one week later for the first physical examination. Thereafter, visits are at monthly intervals except when special visits are needed. All nulliparas were referred to the Study by a nurse at registration if pregnancy was estimated to be not later than the 20th week of gestation or if the patient had not felt life. However, some patients accepted for the Study were more advanced in pregnancy and have been included if not more than twenty-four weeks of gestation. Late in the Study a few multiparas were included.

Patients accepted for the Study were interviewed and a diet history taken at their first clinic visit. Alternate patients were given diet instruction. The patients who received no diet instruction (Controls) were interviewed once more on a revisit, usually at twenty-eight to thirty-four weeks of gestation. The Instructed patients were seen again, whenever possible, at the next monthly visit and a third time at twenty-eight to thirty-four weeks of gestation.

Histories taken at each interview included a record of food eaten at each meal and between meals for the previous day, a normal day's diet when that for the previous day was unusual, and the consumption in the previous week of important types of food. In addition, information was obtained on certain habits, as for example, the amount and kind of fluids consumed in one day, and on any symptom or discomfort the patient may have noted. Also, women were questioned as to the family income and living arrangements, were asked their immediate pregravid weight, and were weighed and measured.

Only advice on diet was given to any patient and that only to those in the group selected for instruction. If the patient asked advice for a specific condition, she was urged to call the matter to the attention of the doctor in the clinic who usually was seen after the diet interview.

Suggestions on specific ways to improve the reported diet were given to each woman in the Instructed group at each of the interviews. The importance of different types of foods was explained and, through the use of charts and the distribution of pamphlets, the most economical foods were pointed out. If the patient reported insufficient money to carry out the suggestions given, she was urged to contact the Social Service Department of the hospital for assistance.

After the delivery of the patient, data on her prenatal clinic record were copied and also some information on delivery and on the condition of the infant was abstracted from the hospital records. If the delivery record was not found at Morrisania Hospital after the expected date of delivery, a questionnaire was mailed to the home address of the patient asking for information about the delivery and the baby. If the questionnaire was not returned, a home visit was made by the nurse in a further effort to locate the case. The records for deliveries in other hospitals in New York City were made available<sup>4</sup> and were copied. Nine cases in each of the two Study groups who were delivered in other hospitals are included in the following analyses.

#### POPULATION OF INSTRUCTED AND CONTROL GROUPS

The first interview with any patient included in the Study was on April 19, 1948 and the last on July 21, 1950. The last delivery of any patient occurred on October 11, 1950. The total number of women entered in the Study and the numbers of incompletes and lost cases are shown in Table 1.

In spite of every effort to locate all cases, the outcome of

<sup>4</sup> Acknowledgment is made to the following hospitals where records were made available for use in this Study: Bellevue, City, Columbia-Presbyterian Medical Center, Fordham, Harlem, King's County, Lincoln, Metropolitan, Mother Cabrini, Queen's General, St. Mary's, and Sydenham.

	TOTAL PATIENTS	INSTRUCTED PATIENTS	CONTROL PATIENTS
Patients With One or More Diet Interviews	260	137	123
Outcome of Pregnancy Known	226	116	110
Abortion <sup>a</sup>	13	6	7
Multiple Births	3	2	1
Late Registration (After 24th Week of Gestation)	3	2	1
Only One Prenatal Visit	3	2	1
Only One Diet Interview	9	4	5
Delivered Out of City, Incomplete Record <sup>b</sup>	5	5	0
Cases With Acute or Chronic Conditions Diagnosed	28	14	14
All Other Cases	162	81	81
Outcome of Pregnancy Unknown	34	21	13

<sup>a</sup> Includes one live birth, weight 1 lbs. 11 oz., baby died.

<sup>b</sup> One case delivered in New York City.

Table 1. Number of patients interviewed in the Morrisania Prenatal Clinic for purposes of the study.

pregnancy was unknown for thirty-four patients, twenty-one of whom were in the Instructed group. Only six of these women, three in each of the two Study groups, had been seen for the interview scheduled between twenty-eight and thirty-four weeks of gestation. The majority of the remainder were interviewed only once, and they were found to be delinquent at the clinic after from one to three visits, including the first visit to register.

Of 226 women with the outcome of pregnancy known, thirteen were delivered of nonviable products of pregnancy and three were delivered of twins. In addition, the available records for twenty cases were considered incomplete or inadequate. These cases have been excluded from all tabulations. Examination of the clinic and hospital records revealed that twenty-eight women had been diagnosed with acute or chronic conditions,<sup>5</sup> that not only warranted special supervision from the

<sup>5</sup> There were fourteen cases with a positive serology test for syphilis; four with chronic kidney or hypertensive disease; three with acute kidney or bladder infections; five with a history of rheumatic heart disease; two with pneumonia; one with

(Continued on page 123)

clinic or hospital in most instances, but also subjected the patient to a greater risk of complications with the pregnancy. They were excluded also from further analyses of the data,

Table 2. Distributions of the Instructed and Control patients according to age groups.

AGE GROUPS	PER CENT OF TOTAL	
	INSTRUCTED	CONTROL
TOTAL	100.0	100.0
15-19	39.5	30.5
20-24	42.0	45.1
25-29	13.6	18.3
30-34	3.7	3.7
35-39	1.2	2.4
Total Number	81	81

leaving eighty-one women for study in each of the groups, Instructed and Control.

The general characteristics of the populations in the two groups were remarkably similar. There were fifty-nine Negro women in each Study group, and of the twenty-two

white patients in each group, eight of the Instructed and eleven of the Control were Puerto Ricans. Among the Instructed women, nine were multiparas and sixteen were not married compared with ten multiparas and eleven unmarried among the Controls. Only eight women, two in the Instructed and six in the Control group, reported any public assistance at time of first interview.

The distributions by five-year age groups are shown in Table 2. Sixty-six of the Instructed and sixty-two of the Control women were under 25 years of age. Although there was a somewhat greater proportion of Instructed than of Control patients who were in the 15-19 age group, there were six in each group aged 15 or 16, and twelve and eleven who were 17 or 18 years of age among the Instructed and Control groups, respectively. Only four Instructed and five Control cases were over 30 years of age.

The final diets reported after two periods<sup>6</sup> of instruction tuberculosis; one with a myomectomy during the pregnancy; and one with elephantiasis. Three of the positive serology cases were diagnosed also with one of the other chronic conditions.

<sup>6</sup> Eleven women in the Instructed group were seen only twice, and the second record for these cases after one period of instruction has been tabulated with the final diets.

were used to measure the change in diets for the Instructed women and for comparison with the records for the Control group taken during the third trimester of pregnancy. The weeks of gestation at which the patients were interviewed for the first and final records are shown in Table 3. Although expressed as weeks of gestation, they are estimated from the weeks antepartum. For some cases the reported date of the last menstrual period was obviously erroneous and the weeks antepartum indicate accurately the time before delivery that the patient was in the Study. Eight Instructed and six Control patients with gestation estimated in this manner were first seen after twenty weeks.

Three-fourths of the Instructed patients and more than four-fifths of the Control patients were seen for the final interview between twenty-seven and thirty-five weeks of gestation. Some of the patients were irregular in attendance at the clinic and considerable difficulty was encountered at times in locating patients for a scheduled interview.

Table 3. Distributions of the first and final diet records according to the weeks of gestation at interview.

WEEKS OF GESTATION <sup>a</sup>	PER CENT OF TOTAL CASES			
	First Interview		Final Interview	
	Instructed	Control	Instructed	Control
TOTAL	100.0	100.0	100.0	100.0
12	22.2	23.5		
12-14	24.7	24.7		
15-17	28.4	25.9	1.2	
18-20	14.8	18.5	2.5	
21-23	9.9	6.2	3.7	1.2
24-26		1.2	3.7	7.4
27-29			13.6	18.5
30-32			34.6	29.6
33-35			27.2	35.8
36-37			8.6	3.7
38-39			4.9	3.7
Total Number	81	81	81	81

<sup>a</sup> The weeks of gestation have been estimated from the date of delivery because of obvious inaccuracies for some cases in reported dates of last menstrual period.

## METHOD OF ANALYSIS OF DIET RECORDS

The amounts of protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid furnished by the one-day diets reported at the first and final interviews were estimated from food value tables of the Federal Security Agency (1) and of Bowes and Church (2). The estimated amount of each of these eight nutrients was then expressed as a percentage of the amount of the specific nutrient recommended for pregnancy<sup>7</sup> by the National Research Council in the 1948 revision (3). See Appendix 1. For each nutrient, the diets were rated in three broad classifications: good, 90 per cent or more of the recommended allowance; fair, 60 to 89 per cent; and poor, less than 60 per cent.

An over-all measure or index of the quality of the one-day diets was based on the ratings for the eight nutrients. A diet was classified as "good" if it had furnished 90 per cent or more of the recommended allowance for at least five nutrients and not less than 60 per cent of the allowance for any; as "fair" if it supplied 90 per cent or more of the allowance for less than five nutrients and less than 60 per cent for not more than two; and "poor" if the diet was estimated as furnishing less than 60 per cent of the allowance for three or more nutrients.

The record of foods consumed in one week was not obtained in sufficient detail to permit a quantitative tabulation of servings or amounts of most of the important food groups. The number of quarts or cans of milk, amounts of cheese or ice cream, the number of eggs, and the number or cans of specific fruits, juices, or tomatoes usually were reported. Since these foods represented an important part of the teaching program, the estimated weekly consumption of quarts of milk, numbers of eggs, and servings of foods which were good sources of ascorbic acid have been tabulated. The basis for the conversion of canned milk, cheese, and ice cream to quarts of milk,

<sup>7</sup> Although the pregnancy allowances are for the latter half of pregnancy, these amounts were used as a base for all diets. Most of the first diet histories were obtained earlier than an increased intake because of pregnancy is recommended.

PER CENT OF RECOMMENDED ALLOWANCE FOR SPECIFIED NUTRIENT	PER CENT OF WOMEN			
	First Diet		Final Diet	
	Instructed	Control	Instructed	Control
<b>TOTAL CASES</b>	100.00	100.00	100.00	100.00
<i>Protein</i>				
90 Per Cent or More	37.04	39.51	49.38	50.62
60—89 Per Cent	44.44	39.51	30.86	33.33
Less Than 60 Per Cent	18.52	20.99	19.75	16.05
<i>Calcium</i>				
90 Per Cent or More	20.99	19.75	35.80	34.57
60—89 Per Cent	24.69	32.10	34.57	25.93
Less Than 60 Per Cent	54.32	48.15	29.63	39.51
<i>Iron</i>				
90 Per Cent or More	22.22	25.93	40.74	32.10
60—89 Per Cent	40.74	40.74	33.33	48.15
Less Than 60 Per Cent	37.04	33.33	25.93	19.75
<i>Vitamin A</i>				
90 Per Cent or More	44.44	51.85	69.14	51.85
60—89 Per Cent	23.46	23.46	12.35	20.99
Less Than 60 Per Cent	32.10	24.69	18.52	27.16
<i>Thiamine</i>				
90 Per Cent or More	29.63	23.46	50.62	41.98
60—89 Per Cent	33.33	43.20	24.69	45.68
Less Than 60 Per Cent	37.04	33.33	24.69	12.35
<i>Riboflavin</i>				
90 Per Cent or More	27.16	32.10	41.98	45.68
60—89 Per Cent	33.33	27.16	34.57	28.40
Less Than 60 Per Cent	39.51	40.74	23.46	25.93
<i>Niacin</i>				
90 Per Cent or More	44.44	38.27	41.98	39.51
60—89 Per Cent	34.57	38.27	33.33	38.27
Less Than 60 Per Cent	20.99	23.46	24.69	22.22
<i>Ascorbic Acid</i>				
90 Per Cent or More	37.04	50.62	54.32	44.44
60—89 Per Cent	17.28	9.88	18.52	16.05
Less Than 60 Per Cent	45.68	39.51	27.16	39.51

Table 4. Percentages of women in the Instructed and in the Control groups for whom the estimated amounts of each of eight nutrients in reported daily diets furnished specified percentages of the recommended allowances for pregnancy.

and of amounts of fruit, tomatoes, and certain vegetables to servings of foods rich in ascorbic acid are shown in Appendix 2.

#### FIRST DIET RECORDS FOR INSTRUCTED AND CONTROL GROUPS

The one-day diets reported at the initial interview by women



NUMBER OF WOMEN			
First Diet		Final Diet	
Instructed	Control	Instructed	Control
81	81	81	81
30	32	40	41
36	32	25	27
15	17	16	13
17	16	29	28
20	26	28	21
44	39	24	32
18	21	33	26
33	33	27	39
30	27	21	16
36	42	56	42
19	19	10	17
26	20	15	22
24	19	41	34
27	35	20	37
30	27	20	10
22	26	34	37
27	22	28	23
32	33	19	21
36	31	34	32
28	31	27	31
17	19	20	18
30	41	44	36
14	8	15	13
37	32	22	32

assigned to the Instructed and to the Control group are compared in Table 4 and Figure 1. It is apparent that there was little difference between the two groups in the nutritive content of their diets when they registered at the clinic.

Less than half of the patients in each group reported diets which furnished 90 per cent or more of the allowances recommended for any nutrient with the exception of vitamin A and ascorbic acid. Among Control patients, 52 per cent had good supplies of vitamin A and 51 per cent of ascorbic acid, but slightly smaller percentages of the Instructed patients had diets rated good for these nutrients. Only one-fifth of the women in both groups reported diets with a good calcium content; and 54 per cent of the In-

structed and 48 per cent of the Control patients had diets rated poor for calcium. More diets were poor in calcium than in any other nutrient, but almost as many women in both groups had poor supplies of riboflavin and ascorbic acid.

The percentages of first diets of the Instructed and Control patients for which the general or total rating was good, fair, or poor are shown in Table 5. That there was little difference in

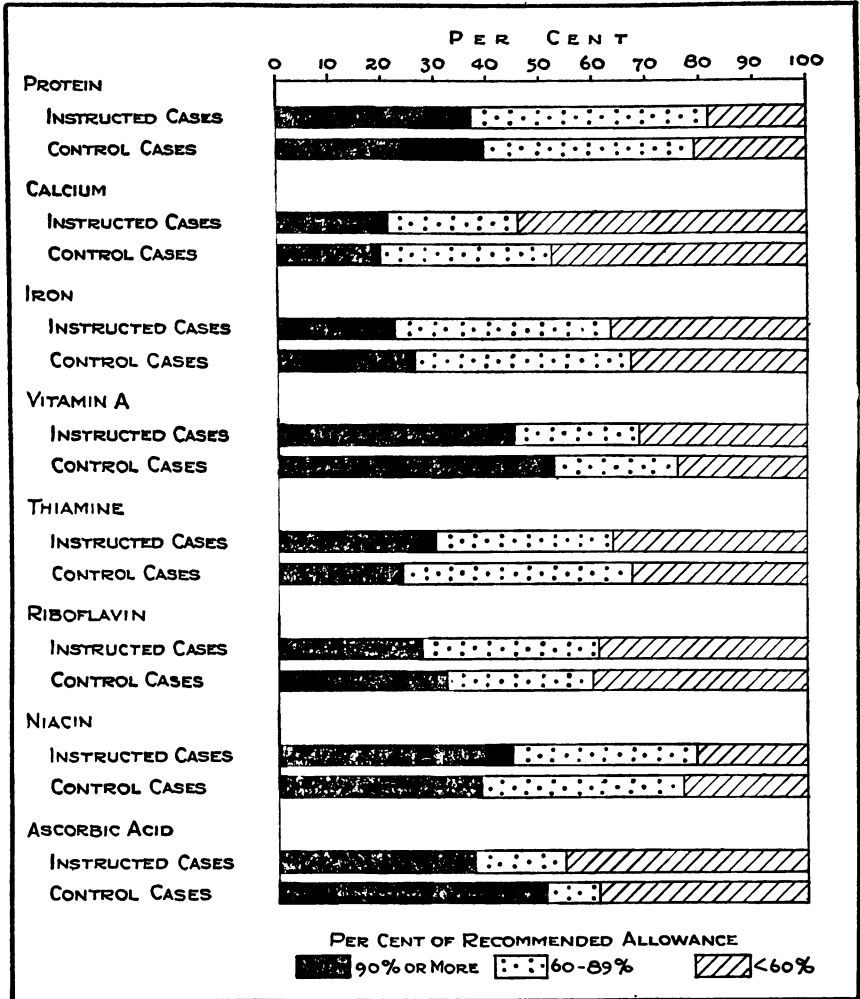


Fig. 1. Percentages of women in each study group for whom estimated amounts of each of eight nutrients in diets reported at first interview furnished specified percentages of the recommended allowances for pregnancy.

the quality of the one-day diets between the two groups of patients is again evident. Less than one-fifth of either group reported diets at the first interview which were generally good in quality, while 49 per cent of the Instructed and 43 per cent of the Control patients reported diets classified as poor.

The weekly amounts of milk, of eggs, and of foods rich in ascorbic acid estimated for the first diet histories are shown in

RATING FOR GENERAL QUALITY OF DIET <sup>1</sup>	PER CENT OF TOTAL FOR FIRST DIET RECORD		PER CENT OF TOTAL FOR FINAL DIET RECORD	
	Instructed	Control	Instructed	Control
TOTAL	100.0	100.0	100.0	100.0
Good	16.0	18.5	37.0	28.4
Fair	34.6	38.3	32.1	35.8
Poor	49.4	43.2	30.9	35.8
Total Number	81	81	81	81

<sup>1</sup> Quality rating based on composite classification of 8 nutrients. See page 125.

Table 5. Percentage distributions of women in each study group with diets rated good, fair, or poor.

Table 6. There was no difference between the two groups in the weekly consumption of foods rich in ascorbic acid and the difference in the amounts of milk was small. But there was a significant difference between Instructed and Control patients

Table 6. Percentage distributions according to weekly use of milk, of eggs, and of ascorbic acid foods for women in each study group at first and final interviews.

AMOUNTS OF SPECIFIED FOOD	PER CENT OF TOTAL FOR FIRST RECORD		PER CENT OF TOTAL FOR FINAL RECORD	
	Instructed	Control	Instructed	Control
<i>Milk—Quarts</i>				
Total	100.0	100.0	100.0	100.0
7 or more (Good)	24.7	30.9	39.5	33.3
3—6 (Fair)	43.2	34.6	44.4	39.5
Less Than 3 (Poor)	32.1	34.6	16.1	27.2
<i>Eggs—Number</i>				
Total	100.0	100.0	100.0	100.0
7 or More (Good)	33.3	33.3	34.6	23.5
3—6 (Fair)	45.7	22.2	39.5	45.7
Less Than 3 (Poor)	21.0	44.4	25.9	30.9
<i>Foods Rich in Ascorbic Acid—Servings</i>				
Total	100.0	100.0	100.0	100.0
14 or More (Good)	22.2	22.2	27.2	18.5
7—13 (Fair)	33.3	33.3	44.4	33.3
Less Than 7 (Poor)	44.4	44.4	28.4	48.2
Total Number	81	81	81	81

in the number of eggs reported consumed in one week.<sup>8</sup> One-third of the women in each group reported a weekly intake of seven or more eggs; but 44 per cent of the Control compared with 21 per cent of the Instructed patients reported that they ate less than three eggs in the week before they registered at the clinic.

The three food groups used for the weekly diet do not afford a precise comparison with the estimated amounts of nutrients in the one-day diets, but it is of some interest to point out that the protein content of the one-day diets reported at the first interview was very similar for the two groups. This suggests that many Control patients may have compensated for the lack of eggs in their diets with a choice of other protein foods.

The weekly consumption of milk gives a somewhat more favorable picture for both groups than does the estimated content of calcium in the one-day diets, but it is not unlike the estimated content of riboflavin.

Fourteen servings a week of foods with a good ascorbic acid content should furnish approximately the recommended allowance for pregnancy of this nutrient. Only 22 per cent of the women in each group reported fourteen or more servings of these foods compared with 37 and 51 per cent of the Instructed and Control patients, respectively, whose one-day diets supplied 90 per cent or more of the allowance. But the proportion of women with less than seven servings (44 per cent) was similar to the proportion with less than 60 per cent of the recommended allowance of ascorbic acid in the one-day diets.

One-day diet histories for 723 patients registered in prenatal clinics in New York City were studied by the New York State Nutrition Survey (4). The estimated amount of protein in these one-day diets is comparable with protein esti-

<sup>8</sup> The chi-square test for significance between the two Study groups in the percentage distribution of weekly diets according to numbers of eggs gave a  $X^2$  value of 13.37 with the probability of less than 1 in 100 that the observed or a greater difference would occur by chance alone.

mated for this Study, though classifications used differ slightly. The amounts of milk and servings of foods high in ascorbic acid reported in one-day diets are not necessarily comparable with the average daily intake for the Morrisania patients based on weekly consumption, but it is of interest to compare the results of these two studies.

In the State Nutrition Survey, 26 per cent of the prenatal patients reported one-day diets which furnished 75 gms. or more of protein and 39 per cent had diets with less than 55 gms. Among patients at Morrisania in this Study, 38 per cent obtained 76.5 gms. or more of protein and 20 per cent 50 gms. or less from the one-day diet. Thus, a higher proportion of the Morrisania group had adequate amounts of protein.

A milk consumption of one quart or more in one day was reported by 16 per cent of women in the State Survey compared with 28 per cent in this Study who reported seven quarts or more in one week. The proportions in the two studies that had less than a pint a day were fairly similar; 39 per cent in the State Survey used less than two cups daily and 33 per cent in the Morrisania group used less than three quarts in a week.

The classifications for daily servings of foods rich in ascorbic acid used in the State Study were two servings or more, one serving, and none. The percentages of the one-day diets in these three classifications were the same as percentages of weekly diets in the Morrisania Study, which included fourteen or more servings, seven to thirteen servings, and less than seven servings of foods rich in ascorbic acid.

#### FINAL DIET RECORDS

*Comparison of Two Study Groups.* The percentages of Instructed and Control patients whose one-day diets reported at the final interview were estimated as furnishing good, fair, or poor amounts of eight nutrients relative to the recommended allowance for pregnancy of each nutrient are shown in Table 4 and Figure 2.

There was evidence of some improvement in the later diets

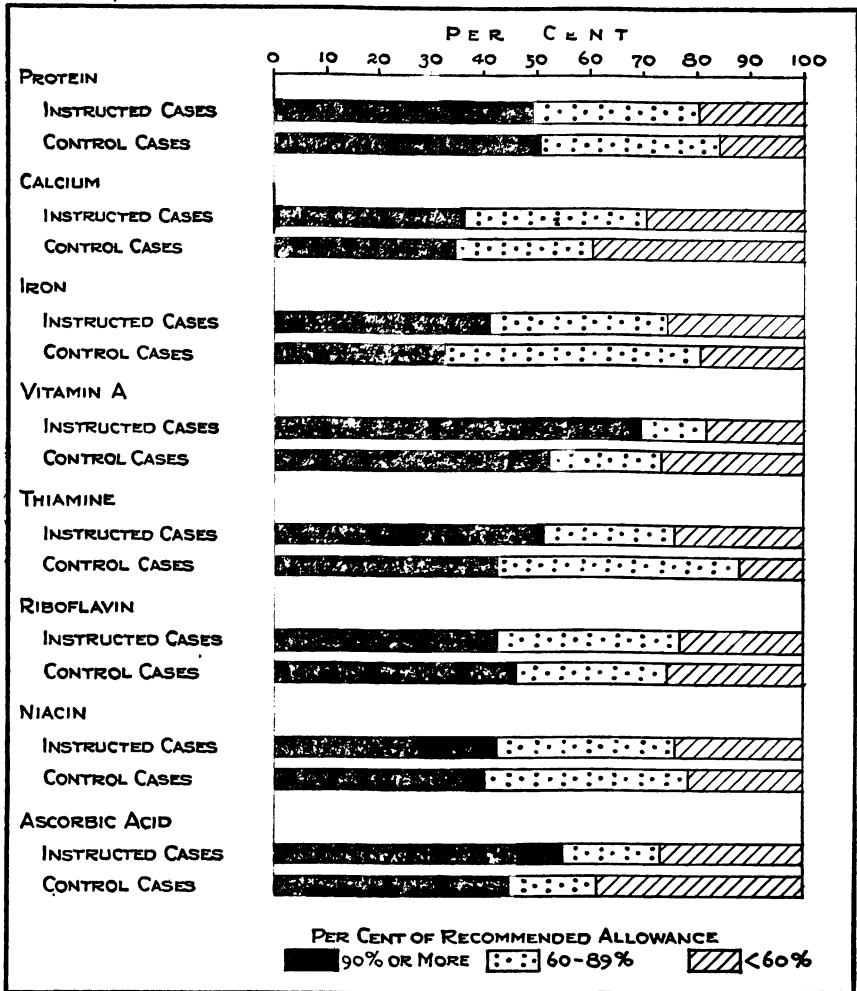


Fig. 2. Percentages of women in each study group for whom estimated amounts of each of eight nutrients in diets reported at final interview furnished specified percentages of the recommended allowances for pregnancy.

of women in both study groups although for many patients the estimated amounts of the various nutrients were still at the fair or poor level. The differences between the groups were small and the women who had been instructed, most of them twice, did not report diets that were consistently better than diets of the Control patients.

The diets of relatively more Instructed than Control patients furnished good supplies of iron, vitamin A, thiamine, and

ascorbic acid, but the difference between the two groups was significant statistically for vitamin A alone ( $P = .02-.03$ ).<sup>9</sup> For these four nutrients the percentages of diets furnishing 90 per cent or more of the allowances were 8 to 17 per cent higher among Instructed than among Control patients; and for the other four nutrients the groups were nearly equal in the percentages with good amounts of the nutrients.

Smaller percentages of the Instructed than of the Control group had diets with less than 60 per cent of the allowances for vitamin A, for ascorbic acid, and for calcium; and higher percentages of the Instructed patients had diets poor in thiamine and iron. A relatively high proportion of the Control group had diets with fair amounts of thiamine and iron, and the proportions with good and with poor supplies of these nutrients were smaller than among Instructed patients.

The general rating on quality of diets based on all eight nutrients indicated only a slight superiority for the Instructed group at the final interview as shown in Table 5 and Figure 3. In the Instructed group, 37 per cent of the diets were classified as good and 31 per cent as poor; and in the Control group, 28 per cent of the diets were good and 36 per cent were poor. The differences between the two groups were not significant.

The weekly amounts of milk, eggs, and foods rich in ascorbic acid reported at the final interview by women in the two study groups are shown in Table 6 and Figure 4. For these foods the weekly diets of Instructed patients were consistently better than those of the Control group in that relatively more diets were rated good and fewer rated poor. The difference between the two groups of patients was statistically significant, how-

<sup>9</sup> With 81 women in each group, the difference between any two percentages that is twice its standard error ( $P < .05$ ) varies from about 12 per cent difference between the lowest percentage values in Table 4 to about 15 per cent difference between the highest percentages. For the final diets, a significant difference between the Instructed and Control groups is found only for vitamin A, for which a higher percentage of Instructed patients had 90 per cent or more of the allowance, and for thiamine for which a higher percentage of Instructed patients had less than 60 per cent of the allowance.

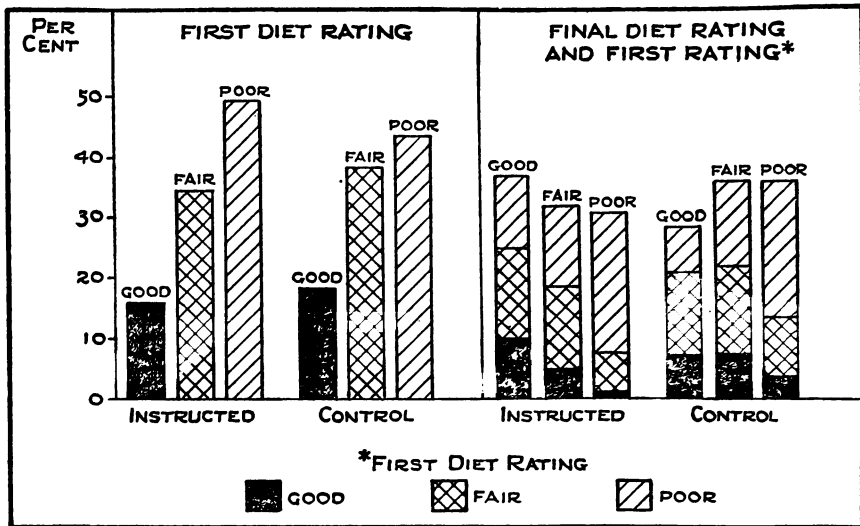


Fig. 3. The percentages of women in each study group with diets rated good, fair, or poor at the first and final interviews; and the first diet ratings for those with each specified final rating.

ever, only for foods rich in ascorbic acid, and the significance lay in the difference between the percentages of Instructed and Control patients who reported less than seven servings of these foods.<sup>10</sup> Twenty-eight per cent of the Instructed and 48 per cent of the Control group reported weekly diets with less than seven servings of foods rich in ascorbic acid.

In summary, diet histories taken at the final interview did not indicate that the Instructed group had significantly better diets than the Control group. However, a slightly greater proportion of the Instructed than of the Control group had diets with a general rating of good, had diets furnishing 90 per cent or more of the allowance for iron, vitamin A, thiamine, and ascorbic acid, and had adequate amounts of milk, eggs, and ascorbic acid-rich foods in the weekly diet.

*Change From First to Final Diet.* When the change in

<sup>10</sup> A  $X^2$  value of 6.74 was obtained when the hypothesis was tested that the weekly servings of foods rich in ascorbic acid was independent of the groupings used for the patients (Instructed and Control), with a probability of 4 per cent that the differences observed would occur by chance. The difference between percentages of Instructed and Control patients who reported less than seven servings was highly significant with a probability of less than 1 per cent that it was a chance occurrence.



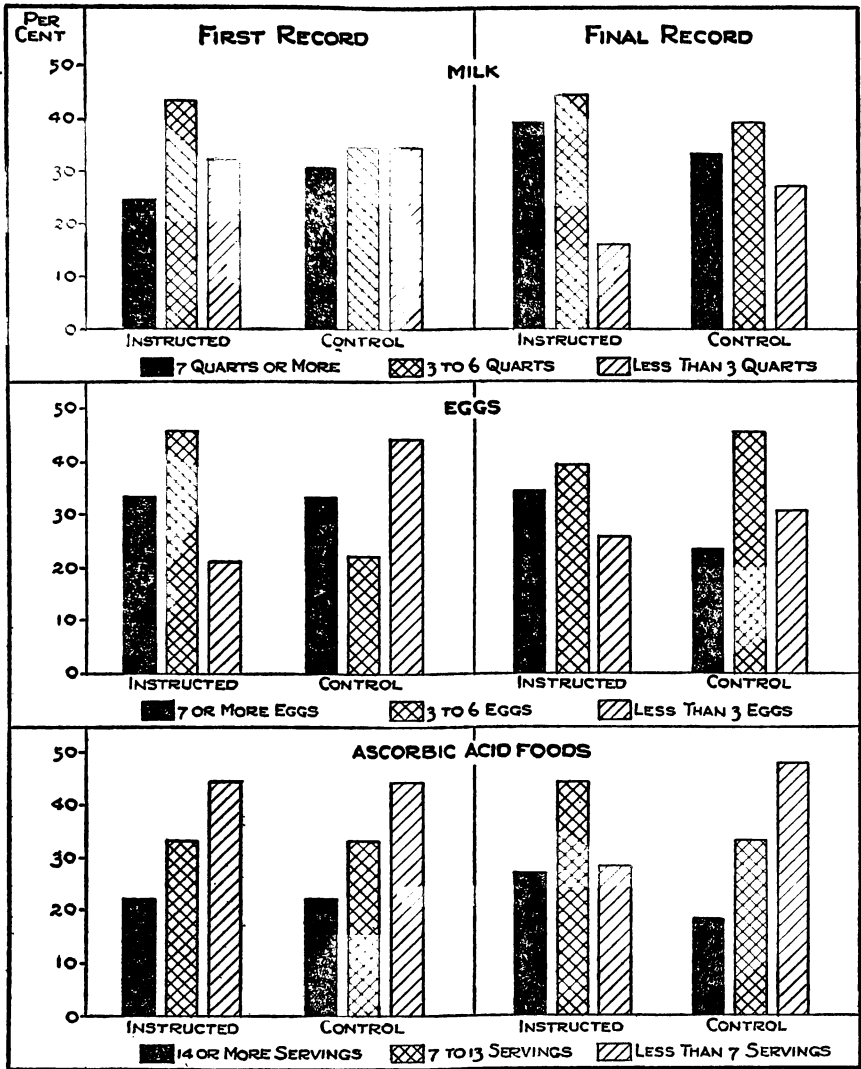


Fig. 4. The percentages of women in each study group whose weekly use of milk, of eggs, and of ascorbic acid foods was at specified levels.

consumption levels between the first and final diet records is compared for the two study groups, improvement in diets of Instructed patients is definitely more frequent than in diets of Control patients. Initially, the Instructed group had somewhat poorer diets though it did not differ significantly from the Control group.

For the Instructed group, a significant change<sup>11</sup> to a larger percentage of diets at the good level and a smaller percentage at the poor level is found for calcium, iron, vitamin A, thiamine, and ascorbic acid. For riboflavin the change is of borderline significance ( $P .05-.06$ ). For the Control group there was a significant improvement only in the thiamine content of the final diets ( $P < .01$ ).

The increase in the percentage of final diets given a general rating of good over the percentage rated good for the first diet was very significant for the Instructed group ( $P < .01$ ) but was not significant statistically for the Control group ( $P > .20$ ).

In the Instructed group there was a significant increase in the amounts of milk reported for one week, but there was no significant change in the use of milk by the Control group. The weekly consumption of eggs reported by Control patients changed significantly at the final interview but, although fewer women reported less than three eggs per week, there were fewer also using seven or more eggs. The Instructed group had no significant change in consumption of eggs and neither group changed significantly in the use of ascorbic acid-rich foods, although among the Instructed patients the percentage of patients who reported less than seven servings decreased from 44 per cent at first interview to 28 per cent at the final interview.

*Final Diet Ratings Related to First Diets.* Although the specific foods eaten from day to day vary, a one-day diet may afford a fair index of an individual's dietary pattern or of the general consumption level within the broad classifications used in this analysis. It is of interest to examine the frequency with which individuals shifted from one classification to another and the nature of these shifts.

For women whose first diets were in a specific classification

<sup>11</sup> The chi-square test for significance between the threefold distributions at the first and final interview was applied to each nutrient. The probability that the observed difference in the distributions would arise from chance alone was: for calcium,  $< .01$ ; for vitamin A,  $< .01$ ; and for iron, thiamine, and ascorbic acid,  $.02-.05$ .

for general quality, the percentages that were rated at each level on the final diet are shown in Table 7.

Among patients reporting first diets with a general rating of good, 61 per cent of the Instructed group compared with 40 per cent of the Control group reported final diets which were rated good. For women with an initial diet rating of poor, approximately one-half in each study group reported final diets classified as poor. Slightly higher percentages of Instructed than of Control patients with initial diets rated fair or poor reported final diets rated good. The greater increase in the number with good final diets among Instructed patients is due in part to a larger proportion of those with initially good diets maintaining that level of consumption, but even more to the greater number who improved their diets from poor quality to good. In Figure 3 the percentages of patients with final diet ratings at each level are subdivided according to the percentages of the total Study group that had the specified initial diet rating.

Table 7. Percentage distributions of final diets by three classifications based on eight nutrients for women whose first diets were in a specific classification.

FIRST DIET RATING <sup>1</sup> AND STUDY GROUP	PER CENT OF WOMEN WITH SPECIFIED RATING FOR FINAL DIET				NUMBER WITH SPECIFIED RATING <sup>1</sup> FOR FINAL DIET			
	Total	Good	Fair	Poor	Total	Good	Fair	Poor
<i>Total</i>								
Instructed	100.0	37.0	32.1	30.9	81	30	26	25
Control	100.0	28.4	35.8	35.8	81	23	29	29
<i>Good Diet</i>								
Instructed	100.0	61.5	30.8	7.7	13	8	4	1
Control	100.0	40.0	40.0	20.0	15	6	6	3
<i>Fair Diet</i>								
Instructed	100.0	42.8	39.3	17.9	28	12	11	5
Control	100.0	35.5	38.7	25.8	31	11	12	8
<i>Poor Diet</i>								
Instructed	100.0	25.0	27.5	47.4	40	10	11	19
Control	100.0	17.1	31.4	51.4	35	6	11	18

<sup>1</sup> A good rating was given to diets with 90 per cent or more of allowance for five or more nutrients and less than 60 per cent of allowance for no nutrients; a poor rating was given to any diet with less than 60 per cent of allowance for three or more nutrients; all other diets were rated fair.

AMOUNTS OF SPECIFIED FOODS AT FIRST REPORT AND STUDY GROUP	PER CENT OF WOMEN WITH SPECIFIED WEEKLY CONSUMPTION REPORTED ON FINAL RECORD			
	Total	Good	Fair	Poor
<i>Milk, Quarts—Total</i>				
Instructed	100.0	39.5	44.4	16.1
Control	100.0	33.3	39.5	27.2
7 or More (Good)				
Instructed	100.0	70.0	30.0	0
Control	100.0	60.0	24.0	16.0
3 to 6 (Fair)				
Instructed	100.0	34.3	48.6	17.1
Control	100.0	32.1	50.0	17.9
Less Than 3 (Poor)				
Instructed	100.0	23.1	50.0	26.9
Control	100.0	10.7	42.9	46.4
<i>Eggs, Number—Total</i>				
Instructed	100.0	34.6	39.5	25.9
Control	100.0	23.5	45.7	30.9
7 or More (Good)				
Instructed	100.0	48.1	37.0	14.8
Control	100.0	33.3	48.2	18.5
3 to 6 (Fair)				
Instructed	100.0	35.1	43.2	21.6
Control	100.0	16.7	38.9	44.4
Less Than 3 (Poor)				
Instructed	100.0	11.8	35.3	52.9
Control	100.0	19.4	47.2	33.3
<i>Foods Rich in Ascorbic Acid, Servings—Total</i>				
Instructed	100.0	27.2	44.4	28.4
Control	100.0	18.5	33.3	48.2
14 or More (Good)				
Instructed	100.0	27.8	50.0	22.2
Control	100.0	33.3	38.9	27.8
7 to 13 (Fair)				
Instructed	100.0	29.6	40.7	29.6
Control	100.0	29.6	33.3	37.0
Less Than 7 (Poor)				
Instructed	100.0	25.0	44.4	30.6
Control	100.0	2.8	30.6	66.7

Table 8. Weekly consumption of milk, of eggs, and of foods rich in ascorbic acid reported at final interview by women reporting various amounts per week at first interview.

The weekly consumption of milk, eggs, and foods rich in ascorbic acid reported at the final interview is shown in Table

NUMBER OF WOMEN WITH SPECIFIED WEEKLY CONSUMPTION REPORTED ON FINAL DIET			
Total	Good	Fair	Poor
81	32	36	13
81	27	32	22
20	14	6	0
25	15	6	4
35	12	17	6
28	9	14	5
26	6	13	7
28	3	12	13
81	28	32	21
81	19	37	25
27	13	10	4
27	9	13	5
37	13	16	8
18	3	7	8
17	2	6	9
36	7	17	12
81	22	36	23
81	15	27	39
18	5	9	4
18	6	7	5
27	8	11	8
27	8	9	10
36	9	16	11
36	1	11	24

8 for women classified according to use of these foods at the first interview.

Almost three-fourths of the Instructed group with less than three quarts of milk per week initially showed some improvement at the final interview and 23 per cent of them compared with 11 per cent of the Control group reported an increase to seven or more quarts of milk. Among those who said they had the equivalent of seven or more quarts of milk at the first interview, 70 per cent of the Instructed cases reported as much and none reported less than three quarts at the final interview; 60 per cent of the Control group with the same initial classification also maintained a good weekly consumption of milk, but 16 per cent reported that they had had less than three quarts of milk weekly at the final interview. For all patients

who used less than seven quarts of milk initially, 30 per cent of those in the Instructed group and 21 per cent in the Control group reported seven quarts or more at the final interview.

The consumption of eggs seemed to be variable and changes between the two diet histories for the two study groups did not have a consistent pattern. About one-half of the Instructed and only one-third of the Control group reporting a weekly intake of seven or more eggs at the first interview had as many at the final interview; and 35 per cent of the Instructed compared with 17 per cent of the Control group increased the number to seven or more from an initial use of three-six eggs. But among women reporting less than three eggs weekly for the first record, 53 per cent of the Instructed and 33 per cent of the Control patients continued in this class. As indicated previously, significantly more Control than Instructed patients reported less than three eggs at the first interview, and the majority of these Control patients increased their use of eggs.

The number of weekly servings of foods rich in ascorbic acid reported at the final interview showed very little relationship to that reported earlier. One exception was the high percentage (67 per cent) of women in the Control group with an initial use of less than seven servings who continued to have so few servings. Among Instructed patients who reported less than seven weekly servings initially, 25 per cent had fourteen or more servings on the final record compared with 3 per cent of the Control patients. This difference between the two study groups is highly significant ( $P = < .01$ ).

It is evident that between the two periods the diets had changed for many of these women; some were better and some were poorer in spite of a general tendency toward higher levels of consumption. But it is also true that the classifications on the final diets remained the same as those on the initial diet for many.

A crude statistical score for a one-day diet based on the ratings for eight separate nutrients was utilized to obtain a quantitative measure of change in the individual diets. A value of 3 was assigned to a nutrient if the estimated amount was 90 per cent or more of the recommended allowance for that nu-

trient; a value of 2 for 60 to 89 per cent; and a value of 1 for less than 60 per cent of the allowance. The values for eight nutrients were summed to obtain one figure ranging from 8 to 24 for a total diet score. For each individual the score on the first diet was subtracted from that on the final diet, and a plus difference represented improvement.

The average difference in the diet scores for Instructed patients was +2.11, standard error  $\pm 0.55$ ; for Control patients it was +1.21, standard error  $\pm 0.55$ . The increase for both groups is statistically significant; that for the Instructed group is greater but not significantly greater.

That the dietary advice given to the patients in the Instructed group was effective in changing the diets of some women seems likely. For those who initially reported diets of poor quality and of poor weekly supplies of milk and of foods rich in ascorbic acid, the generally larger proportions of Instructed than of Control patients with a rating of good on their final diets strongly suggest a response to the dietary instructions given. In addition, relatively more of the Instructed patients maintained good diets when their first diets had been good, and fewer reported final diets which were rated poor.

However, it is apparent that many women given instruction did not greatly modify their diets. The choice of foods included in the dietary of an individual is influenced by many things. Habits of eating become fixed. The availability of specific foods and sufficient money to purchase the food are immediate and urgent factors governing the selection of food for many people. Of possible importance, also, was the fact that many women in this Study did not have separate households but lived with relatives or friends. At the first interview, 47 per cent in the Instructed group and 35 per cent in the Control group were members of other households.

*Diets After Advice by Clinic Physician.* There was a record of diet advice from the clinic doctor before the final diet interview for thirty-six Instructed and thirty-eight Control patients. The advice given usually followed a rapid gain in weight and,

RATING FOR FINAL ONE-DAY DIETS BASED ON 8 NUTRIENTS <sup>1</sup>	PER CENT WITH SPECIFIED DIET RATING FOR EACH GROUP			
	Instructed Group		Control Group	
	With Diet Advice In Clinic	No Diet Advice In Clinic	With Diet Advice In Clinic	No Diet Advice In Clinic
TOTAL	100.0	100.0	100.0	100.0
Good	25.0	46.7	26.3	30.2
Fair	27.8	35.6	34.2	37.2
Poor	47.2	17.8	39.5	32.6
Total Number	36	45	38	43

<sup>1</sup> See page 125.

Table 9. General rating on diet quality for records taken for the Study after patient had received some diet advice from a clinic physician compared with diet records for women with no advice in clinic.

in so far as it was reported, was generally restrictive. The patient was told to use less of such items as starches, sweets, fried foods, fluids, and salt. For some cases the doctor had recorded "diet given" or "diet instructions given" on the clinic record, and a few women reported that they had been told to eat plenty of vegetables, fruit, lean meat, and occasionally specific quantities of milk. As a rule, however, neither the clinic record nor the report from the patient indicated any positive advice concerning foods to be eaten. If the patient had been told what she should eat, the doctor did not record the information and the patient rarely reported it.

The final diets of the patients who previously were advised by the clinic physician and of those without any record of such advice were compared for both study groups. The data are shown in Table 9 for the general ratings.<sup>12</sup>

For Control patients the groups with and without clinic advice on diet differed only slightly in the proportions of women

<sup>12</sup> For both study groups there was little difference in the weekly consumption of the three food groups between those who received advice in the clinic and those who reported none. An exception was the use of milk by Control patients. In this group only 16 per cent of the women who received dietary advice from the clinic reported less than three quarts of milk weekly compared with 36 per cent of those with no dietary advice from the clinic. The difference between the two percentages is significant ( $P = .04-.05$ ) and suggests that women with low intake of milk had been encouraged to increase their consumption of milk.



with good, fair, or poor general ratings on the one-day diets. But for the Instructed patients there were marked differences between the two groups. Forty-seven per cent of the patients who had received diet advice from the clinic doctor before the final interview reported diets which were rated poor in quality; and only 18 per cent of those without such advice reported diets which were rated poor. Furthermore, the diets were rated good for 47 per cent of the women with no clinic advice compared with 25 per cent of those who had received advice. These group differences are significant; the chi-square value is 8.53 and P is .01-.02.

Moreover, for Instructed patients with no dietary advice from the clinic physician, the over-all ratings on the final diets were better than those of Control patients. The difference between the distribution by quality of diet for this part of the Instructed group and that of the total Control group has borderline significance statistically; the chi-square value is 5.98, P is .05.

These data for the Instructed patients are not easily interpreted. Admittedly, the numbers of women with advice from the clinic physician and without advice are small. Also, those given advice were advised because of a condition noted by the doctor, and this may have selected women with poor dietary habits.<sup>13</sup> On the other hand, a similar difference is not found for members of the Control group. Regardless of what advice the doctor may have given, the patients' reports indicated that they were impressed with the advice to exclude foods much more than with any advice as to what foods should be eaten. The result apparently was a restriction in food intake without proper substitutions of foods to obtain the needed nutrients without high caloric intake, in spite of dietary instruction given by the nurse or nutritionist. One may conclude that closer cooperation between the physician and diet instructor

<sup>13</sup> A comparison of first diets reported by women who received diet advice in the clinic with first diets for women who were not advised in clinic showed no significant difference either for those in the Instructed group or those in the Control group.

is desirable and that the instruction is more likely to be effective if it has definite support by the physician.

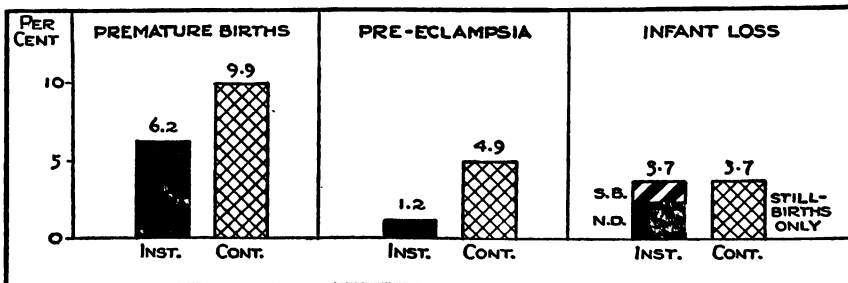
#### OUTCOME OF PREGNANCY BY STUDY GROUPS

Prematurity has been judged in this analysis on the basis of weight alone, and all babies weighing 5 pounds 8 ounces or less at birth were considered premature. Among 162 women included in the Study, thirteen or 8 per cent were delivered of premature babies. Five were born to the Instructed patients and eight to the Control, an incidence of prematurity of 6.2 per cent for the former and 9.9 for the latter, as shown in Fig. 5.

The neonatal history of the babies born to patients in the Study was obtained for the period of hospital residence only, and during this time there was no difference in infant loss between the two study groups. Two infant deaths one of which was a premature baby, and one stillbirth occurred among the Instructed group; and three stillbirths, two of which were premature, occurred among Control patients, an infant loss of 3.7 per cent for the women included in the Study.

A major complication which may occur during pregnancy is toxemia. While none of the women included in the Study became eclamptic, five were diagnosed as pre-eclamptic. Four of them were admitted to the hospital for stabilization before the onset of labor but none of these women were delivered prematurely. Only one case of pre-eclampsia occurred among the Instructed patients (1.2 per cent) compared with four among the Control (4.9 per cent).

Fig. 5. The incidence of premature birth, pre-eclampsia, and infant loss in each study group.



If patients with premature labor and pre-eclampsia are added together, the incidence of one or the other is 7.4 per cent for Instructed patients and 14.8 for Control patients.<sup>14</sup> The more favorable incidence of prematurity and of pre-eclampsia among Instructed patients suggests a probable benefit derived from the dietary education given to these women, but on the basis of eighty-one patients in each group, the differences are not statistically significant.

#### RELATIONSHIP OF DIET TO OUTCOME OF PREGNANCY

The relationship of the quality of the diet and the outcome of pregnancy has been evaluated for the Instructed and Control patients combined since there was little difference in the numbers in each group with diets classified as good, fair, and poor, and since presumably any effect of diet on the outcome of pregnancy would be independent of the instruction which may have influenced the diet.

The incidence of prematurity and pre-eclampsia and of the two combined is shown for all patients according to the composite nutrient rating for quality of the first and final one-day diets in Table 10.

There was no significant relationship between the incidence of prematurity and the quality of the diets reported at the first interviews. But there was a rather marked, although not statistically significant, association between pre-eclampsia and the quality of the first diet. No cases of pre-eclampsia were diagnosed among women with generally good diets and four of the five diagnosed cases occurred among women whose one-day diets were classified as poor at the first interviews.

The quality of the final diets shows a very definite association with the incidence of both prematurity and pre-eclampsia. Thirteen per cent of the patients with poor diets were delivered of premature babies compared with approximately 5.5 per cent of the patients with good or fair diets. Pre-eclampsia

<sup>14</sup> Among the fourteen Instructed and fourteen Control women in the Study excluded from the analyses of results because of acute or chronic complications (*see* Table 1), there was one premature birth and one case of pre-eclampsia in each group.

RATING FOR ONE-DAY DIET <sup>1</sup>	RATE PER 100 WOMEN			NUMBER OF CASES		NUMBER OF WOMEN
	Prema- turity or Pre- eclampsia	Prema- turity	Pre- eclampsia	Prema- turity	Pre- eclampsia	
<i>First Diet—Total</i>	11.1	8.0	3.1	13	5	162
Good	10.7	10.7	0	3	0	28
Fair	11.9	10.2	1.7	6	1	59
Poor	10.7	5.3	5.3	4	4	75
<i>Final Diet—Total</i>	11.1	8.0	3.1	13	5	162
Good	5.7	5.7	0	3	0	53
Fair	9.1	5.5	3.6	3	2	55
Poor	18.5	13.0	5.6	7	3	54

<sup>1</sup> Based on estimated amounts of eight nutrients. See page 125.

Table 10. Incidence of premature birth and of pre-eclampsia among women classified according to the rating of quality of the reported diet.

was diagnosed for 5.6 per cent of the women with poor diets, and again, no cases occurred among the women whose diets were classified as good.

These differences are not significant statistically for either prematurity or pre-eclampsia alone. But when the two are combined the incidence of 18.5 per cent among women with diets rated poor is significantly higher than among women whose diets were rated good ( $P = .04-.05$ ); and also it is significantly higher than the incidence among women whose diets were classified as either good or fair.<sup>15</sup>

The association between the quality of the one-day diets of the Morrisania patients and the incidence of premature birth and pre-eclampsia is in agreement with the results of other studies on the relationship of diet to the outcome of pregnancy. In a study of nutrition and pregnancy at the Boston Lying-In Hospital, Burke, Beal, Kirkwood, and Stuart reported no cases of premature birth nor of pre-eclampsia among thirty-one women whose prenatal diets had been classified as "good or excellent" (5), while among thirty-six women with "poor to very poor" diets, they reported eight cases of premature birth

<sup>15</sup> For good and fair groups combined, the incidence is 7.4 per cent and the probability is 3 to 4 per cent that the observed or a greater difference from the incidence for the group with poor diets would occur by chance.

and sixteen cases of pre-eclampsia. In a special study of clinic patients in the Toronto General Hospital, Ebbs, Tisdall, and Scott (6) found an incidence of premature birth of 8 per cent for 120 women with poor prenatal diets and an incidence of only 3 per cent for 170 patients with good diets. Pre-eclampsia or toxemia was diagnosed for approximately 13 per cent of the former group compared with 8 per cent of the latter.

#### PREGRAVID WEIGHT AND OUTCOME OF PREGNANCY

It is well known that the obese woman has an increased risk of toxemia in pregnancy and it has recently been shown that the underweight woman has an increased risk of both toxemia and premature labor (7). The relation of the immediate pre-gravid weight status to premature births and to pre-eclampsia among women in this Study, therefore, is of interest.

Although the reported pregravid weight undoubtedly is subject to error, it permits a reasonably accurate classification of the women as to their weight status relative to height. The average weight by age and height used by the Medico-Actuarial Mortality Investigation (8) was taken as the standard and the percentage deviation of weight from this standard was computed for each patient. For women over 25 years of age, the average weight at age 25 years was taken as standard.

In Table 11, the incidence of premature birth and of pre-eclampsia for women of different pregravid weight status is shown. Rates are computed only for the combined population of the Instructed and Control groups because of the small numbers; and only three weight classes are used.<sup>16</sup>

The five cases of pre-eclampsia were not concentrated in any pregravid weight class and there is no definite association between the incidence of pre-eclampsia and weight status.

The premature birth rate was 15 per cent among women 5 per cent or more underweight compared with an incidence of 7 per cent for women of approximately standard weight and

<sup>16</sup> There were fifteen women classified as 15 per cent or more underweight, five in the Study and ten in the Control group; one of the ten in the Control group had a premature baby and there were no cases of pre-eclampsia in either group.

PREGRAVID WEIGHT PER CENT OVERWEIGHT OR UNDERWEIGHT	RATE PER 100 FOR ALL WOMEN	NUMBER OF WOMEN <sup>1</sup>			NUMBER OF CASES		
		Total	Inst.	Cont.	Total	Inst.	Cont.
		Premature Births					
TOTAL	8.2	159	80	79	13	5	8
+5% or More	1.9	54	29	25	1	0	1
+ or - 0 to 4%	6.7	45	24	21	3	0	3
- 5% or More	15.0	60	27	33	9	5	4
		Pre-Eclampsia					
TOTAL	3.1	159	80	79	5	1	4
+ 5% or More	3.7	54	29	25	2	1	1
+ or - 0 to 4%	2.1	54	24	21	1	0	1
- 5% or More	3.3	60	27	33	2	0	2

<sup>1</sup> Height was unknown for one woman in the Instructed group and for two in the Control group.

Table 11. Incidence of premature births and pre-eclampsia among women classified according to percentage deviation of pregravid weight from the age-height weight standards.

2 per cent for women 5 per cent or more overweight. Thus, there was a marked association between weight status and the frequency of premature births. The rate for underweight women is significantly higher than that for the normal and overweight classes combined ( $P = .01-.02$ ).

The underweight woman has little or no nutritional reserves to meet the added demands of pregnancy. It seems reasonable to conclude that her greater risk of premature labor is associated with this lack of reserves and that fully adequate intake of nutrients to support foetal growth and her own tissue status is important to a successful pregnancy.

#### SUMMARY

The results of an experiment with individual diet instruction to nulliparous women attending prenatal clinic at Morrisania Hospital are reported.

For 162 women, one-day diet histories taken at first visit to clinic and again in the third trimester of pregnancy were analyzed. Eighty-one women received diet instruction from a nurse or nutritionist at first interview and most of them at one other visit before the final diet history was taken; and

eighty-one (Control group) had no diet instruction. Amounts of eight nutrients in the diet were estimated: namely, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid; and on the basis of these nutrients the diets were rated as good, fair, or poor. In addition, for the week preceding each interview, consumption of milk, of eggs, and of foods rich in ascorbic acid was tabulated.

Diets of the Instructed group and of the Control group were very similar at first interview. Deficiencies were greatest for calcium, riboflavin, and ascorbic acid. The general rating was good for slightly less than one-fifth of the diets reported by women in each study group; the rating was poor for 49 and 43 per cent of the Instructed and Control groups, respectively.

Diets at the final interview showed an increase in the food consumed by women in both groups. At this time, 37 per cent in the Instructed group and 28 per cent in the Control group had diets rated good; and 31 per cent and 36 per cent, respectively, had diets rated poor. Statistically, these differences are not significant. However, the increase in the percentage of good diets over the percentage at the first interview is significant for Instructed patients and not for the Controls. Greater improvement by Instructed patients is found for intake of calcium, iron, vitamin A, thiamine, and ascorbic acid.

Five premature babies were born to women in the Instructed group compared with eight to those in the Control group.

One case of pre-eclampsia occurred in the Instructed group and four in the Control group.

The incidence of both prematurity and pre-eclampsia for the 162 women (Instructed and Control groups) varied inversely with the quality of the diet at the final interview; and pre-eclampsia but not prematurity was associated with quality of the diet at the first interview. For prematurity and pre-eclampsia combined, the incidence was 18.5 per cent for women with poor final diets as against 7.4 per cent for those with fair or good diets, and the difference is statistically significant.

Among women who were 5 per cent or more underweight be-

fore pregnancy, the premature birth rate was 15 per cent and significantly higher than for normal and overweight women.

This Study adds to previous evidence that diets of prenatal patients affect the course and outcome of pregnancy and indicates that diets of women of low income can be improved by individual instruction. Nutrition teaching, therefore, seems a desirable preventive procedure for prenatal clinics.

#### ACKNOWLEDGMENT

This experiment in teaching diet to prenatal patients was proposed and sponsored by the Bronx Nutrition Committee of which Miss Mary Ross and Mrs. Emily K. Stamm were chairmen during the planning period. In 1947 the Committee was a part of the Bronx Council of Social Welfare but since 1948 has been affiliated with the Food and Nutrition Division of the Health Council of Greater New York. A survey of the teaching in prenatal clinics in the City Hospitals in the Bronx was made by nutritionists of the New York City Department of Health and the Community Service Society who were members of the Nutrition Committee. It was found that not more than 4 per cent of the prenatal registrants of Fordham, Lincoln, and Morrisania Hospitals were given any instruction on nutrition, and that these few patients received but one over-all lecture on food values lasting one hour, rather than getting any help with their individual problems. Following this survey, two members of the Nutrition Committee discussed the problem with the Commissioners of Health and of Hospitals and were granted permission to conduct a nutrition teaching demonstration in a Bronx city hospital. Dr. Isabella Haskell, then Health Officer in the Health Department's Westchester Pelham Health Center in the Bronx, an interested member of the Nutrition Committee, cleared with Dr. Nathan Smith and other staff members of Morrisania Hospital for needed cooperation for a nutrition teaching experiment in the prenatal clinic there. While the Commissioners of Health and of Hospitals were interested and willing to have the demonstration in one of the city hospitals neither Department could spare the time of their personnel for the experiment. The Community Service Society of New York, therefore, made the services of a nurse and a nutritionist available for the demonstration.

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Appendix Table 1. Daily allowances of eight nutrients recommended by the Food and Nutrition Board, National Research Council, in 1948 for the latter half of pregnancy, and the 90 per cent and 60 per cent levels used for classifying diets.

NUTRIENT	AMOUNT PER DAY	90 PER CENT OF ALLOWANCE	60 PER CENT OF ALLOWANCE
Protein, gr.	85.00	76.50	51.00
Calcium, gr.	1.50	1.35	.90
Iron, mg.	15.00	13.50	9.00
Vitamin A, I.U.	6,000.00	5,400.00	3,600.00
Thiamine, mg.	1.50	1.35	.90
Riboflavin, mg.	2.50	2.25	1.50
Niacin, mg.	15.00	13.50	9.00
Ascorbic Acid, mg.	100.00	90.00	60.00

Appendix Table 2. The equivalent quarts of milk for various milk products, and equivalent servings of foods rich in ascorbic acid for fruits and vegetables used in estimating total amounts reported for weekly diets.

AMOUNTS OF SPECIFIED FOODS	EQUIVALENT QUARTS OR SERVINGS
<i>Milk</i>	<i>Quarts</i>
1 Small Can	0.3
1 Tall Can	0.9
Ice Cream, 1 Pint	0.3
Cheese, 2 Oz. or 2 Sl.	0.3
<i>Foods Rich in Ascorbic Acid</i>	<i>Servings</i>
Orange, 1; Juice, ½ Cup	1
Grapefruit, ½; Juice, ½ Cup	1
Lemon, 1	1
Strawberries, 1 Serving	1
Collards, Kale, etc. (Except Spinach), ½ Cup	1
Broccoli, ½ Cup	1
Tomato, 1	½
Cantaloupe, ¼	½
Watermelon, 1 Sl.	½
Pineapple, 1 Serving; Juice ½ Cup	½
Cabbage, Cauliflower, Brussels Sprouts, ½ Cup	½
Green Pepper, ½ Cooked	½
Spinach, 1 Serving	½