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# Food Habits of South Dakota Women

L. M. Burrill

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# **FOOD HABITS OF SOUTH DAKOTA WOMEN**



HOME ECONOMICS DEPARTMENT  
**Agricultural Experiment Station**  
South Dakota State College ♦ Brookings

## Contents

|   |    |
|---|----|
| Introduction .....  | 3  |
| Survey Plan .....   | 3  |
| Description of Women .....                                  | 5  |
| Place of Residence .....                                    | 5  |
| Age .....   | 5  |
| Weight .....  | 6  |
| Height .....  | 7  |
| Marital Status .....  | 7  |
| National Extraction .....                                   | 7  |
| Education .....   | 7  |
| Composition of Family .....                                 | 7  |
| Occupation .....  | 7  |
| Average Nutrient Value of Diets .....                       | 8  |
| Calculation of Diets .....                                  | 8  |
| Total Group .....   | 8  |
| Place of Residence .....                                    | 9  |
| Age Decade .....  | 9  |
| Percentage Distribution of Women According to               |    |
| Nutrient Intake Level .....                                 | 10 |
| Calories .....  | 10 |
| Protein .....   | 13 |
| Minerals .....  | 14 |
| Vitamins .....  | 14 |
| Contribution of Breakfasts to Daily Diets .....             | 15 |
| Frequency of Food Groups in the Diets .....                 | 16 |
| Cereal Products .....                                       | 16 |
| Meat and Meat Substitutes .....                             | 16 |
| White Potatoes .....  | 17 |
| Vitamin-Rich Fruits and Vegetables .....                    | 17 |
| Other Fruits and Vegetables .....                           | 18 |
| Milk .....  | 18 |
| Soups .....   | 19 |
| Made Desserts and Sweets .....                              | 19 |
| Snacks .....  | 19 |
| Calories and Nutrients Furnished by Major Food Groups ..... | 20 |
| Calorie Sources .....                                       | 21 |
| Nutrient Sources .....                                      | 21 |
| Evaluation of Individual Dietaries .....                    | 22 |
| Summary and Conclusions .....                               | 23 |
| Women Interviewed .....                                     | 23 |
| Many Diets Inadequate .....                                 | 23 |

# Food Habits of South Dakota Women

LIDA M. BURRILL and BETH ALSUP<sup>1</sup>

## Introduction

Between 1940 and 1950 there was a 16 percent increase in the number of persons 55 to 64 years of age in South Dakota.<sup>2</sup> There was an even greater increase (24 percent) in the number of persons 65 years of age or over. Similar changes have been reported in neighboring states as well as for the nation as a whole.

The 1950 census showed there were 60,431 in the 55- to 64-year-old group and 55,287 in the over 65-year-old group in South Dakota. The health and welfare of a group of this size, comprising approximately one-fifth of the total population of the State, should be the concern of individuals and the communities in which they live.

Most nutritionists and physicians agree that the kind and quantity of food eaten by an individual is an important factor in maintenance of vitality and vigor throughout life. Dietary needs of growing children and young adults of college age have been rather extensively studied. Since relatively few investigations have been concerned with the food requirements of individuals as

they grow older, there is an urgent need for such information.

## Survey Plan

In 1947, nutrition workers at eight experiment stations in the north-central states began an extended study of the nutritional status and dietary needs of women over 30 years of age. South Dakota has taken an active part in these investigations.

One phase was a state-wide interview-survey to learn more about what South Dakota women eat. The

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The research is based on part of the North Central Cooperative Project NC-5, Nutritional Status and Dietary Needs of Population Groups, with the cooperation of the Human Nutrition Research Branch, Agricultural Research Service, USDA.

<sup>2</sup>Johansen, John P., "Recent Population Changes in South Dakota," *S. D. Farm and Home Research*, 3:49-54, 1952.

women to be interviewed were selected by a procedure known as area sampling as designed by the Iowa Statistical Laboratory in which the total land area of the State was divided into three zones:

(1) Open County—all the area outside urban centers and small towns.

(2) Small Towns—towns having populations less than 2500.

(3) Urban Centers—cities or towns having populations of 2500 or more (1940 Census).

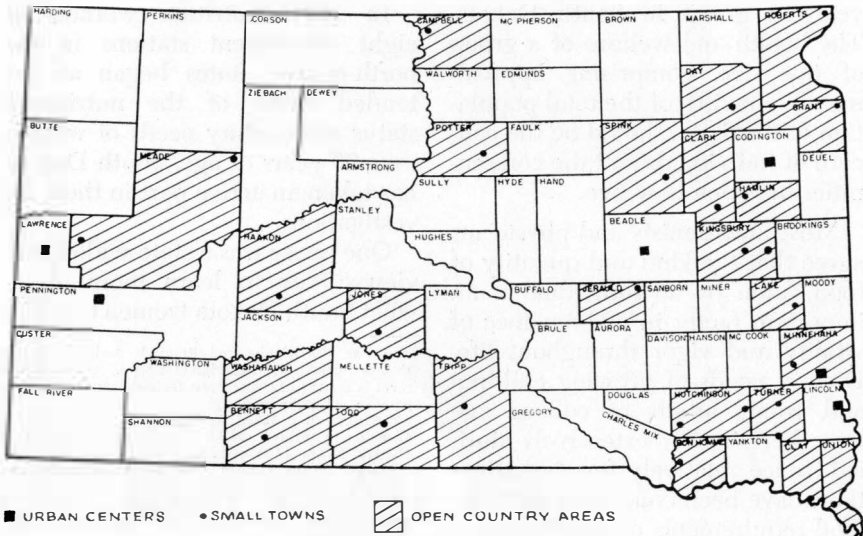
From these three zones about 100 small areas, each containing about 10 households, were randomly selected. In turn, three women were selected from the total number of women over 30 years living in each small area.

In all, 339 women from 24 counties and 6 cities (figure 1) were in-

terviewed between mid-June and mid-November of 1949. The dietary data collected were for meals eaten on weekdays. Members of the Experiment Station staff, Extension Service workers, and one high school home economics teacher did the interviewing. All interviewers attended an intensive 3-day training school at South Dakota State College before going into the field.

Each interview required from 30 to 60 minutes. A careful record was made of the kind and amount of food eaten during the preceding 24 hours. In addition, information about the woman's family, her activities, and general health was secured. The data were coded and punched on IBM cards from which numerous tabulations have been made. The principal findings are presented in this report.

Figure 1. Open country areas, small towns, and urban centers from which women were selected for state-wide food habit survey in South Dakota.



### Description of Women

According to the 1950 South Dakota census, there were approximately 149,200 women (not including those on Indian Reservations) 30 years or older living in the State. It would have been impossible to contact every one of these women, but the 339 women who were interviewed in this study were so selected that they would represent the entire group. Thus, from the data obtained from their interviews, it was possible to describe the general characteristics of all the women 30

years and older in the State. These characteristics were helpful in interpreting the dietary data that were collected. The data on individual and household characteristics are summarized in tables 1-4.

**Place of Residence.** Approximately one-fourth of the women interviewed lived in urban centers. Another one-fourth lived in small towns. The remaining one-half lived in the open country (table 1).

**Age.** The greatest number (31 percent) of the women interviewed

Table 1. Frequency Distribution of 339 South Dakota Women By Age and Place of Residence

| Decade<br>Years | All        |            | Open Country |           | Small Town |           | Urban     |           |
|-----------------|------------|------------|--------------|-----------|------------|-----------|-----------|-----------|
|                 | No.        | %          | No.          | %         | No.        | %         | No.       | %         |
| 30-39           | 91         | 27         | 46           | 50        | 14         | 15        | 31        | 34        |
| 40-49           | 105        | 31         | 61           | 58        | 24         | 23        | 20        | 19        |
| 50-59           | 73         | 21         | 37           | 51        | 17         | 23        | 19        | 26        |
| 60-69           | 45         | 13         | 20           | 44        | 17         | 38        | 8         | 18        |
| 70-over         | 25         | 7          | 4            | 16        | 12         | 48        | 9         | 36        |
| <b>Total</b>    | <b>339</b> | <b>100</b> | <b>168</b>   | <b>49</b> | <b>84</b>  | <b>25</b> | <b>87</b> | <b>26</b> |

Table 2. Description of South Dakota Women (339) in Successive Age Decades

|                                | All<br>Decades | Age Decade |       |       |       | 70 and<br>over |
|--------------------------------|----------------|------------|-------|-------|-------|----------------|
|                                |                | 30-39      | 40-49 | 50-59 | 60-69 |                |
| Number                         | 339            | 91         | 105   | 73    | 45    | 25             |
| Weight, average (lbs.)         | 147            | 136        | 145   | 152   | 160   | 144            |
| Height, average (in.)          | 64             | 63         | 64    | 64    | 64    | 64             |
| Marital Status:                |                |            |       |       |       |                |
| Married (%)                    | 85             | 94         | 88    | 85    | 82    | 44             |
| Widowed or Divorced (%)        | 11             | 3          | 3     | 15    | 16    | 52             |
| Single (%)                     | 4              | 3          | 9     | 0     | 2     | 4              |
| National Extraction:           |                |            |       |       |       |                |
| Central & Western European (%) | 42             | 34         | 47    | 41    | 44    | 44             |
| Scandinavian (%)               | 24             | 22         | 24    | 25    | 29    | 28             |
| British & Irish (%)            | 18             | 19         | 20    | 18    | 13    | 16             |
| Other (%)                      | 16             | 25         | 9     | 16    | 14    | 12             |
| Maximum years of schooling:    |                |            |       |       |       |                |
| 8 years or less (%)            | 45             | 23         | 41    | 55    | 69    | 72             |
| 8-12 years (%)                 | 29             | 42         | 24    | 26    | 24    | 24             |
| Some college (%)               | 26             | 35         | 35    | 19    | 7     | 4              |
| Average number in family:      |                |            |       |       |       |                |
| One (%)                        | 5              | 0          | 1     | 5     | 9     | 28             |
| Two to four (%)                | 70             | 58         | 67    | 81    | 89    | 68             |
| Five or more (%)               | 25             | 42         | 32    | 14    | 2     | 4              |
| Employed away from home (%)    | 10             | 7          | 16    | 11    | 4     | 4              |

were from 40-49 years of age. The next largest group (27 percent) was from 30-39 years of age. With each succeeding decade after 50 years, the percentage decreased so that there were 21 percent from 50-59 years, 13 percent from 60-69 years, and only 8 percent 70 years of age or older (table 1). These percentages correspond closely with the proportion of women of different age decades in the general population of South Dakota according to the 1950 census.

**Weight.** The average reported weight of all the women interviewed was 147 pounds. The average weight for each decade tended to increase with each succeeding one up to age 70, when a decrease was observed (table 2).

Because of the current interest in problems of overweight, the 339

women were classified into four weight groups as follows:

(1) Desirable weight—those who were within 10 percent of the average weight for height at age 30<sup>3</sup>.

(2) Underweight — those who were more than 10 percent below their desirable weight.

(3) Moderately overweight — those who were from 11-20 percent above their desirable weight.

(4) Excessively overweight — those who were more than 20 percent above their desirable weight.

The results are shown in tables 3 and 4 according to place of residence and age. Nearly one-half of the women were classified as being overweight, and approximately one-half of the overweight women were more than 20 percent above their

<sup>3</sup>Sherman, H. C., *Chemistry of Food and Nutrition*, MacMillan Co., New York, 7th Edition, page 512, 1946.

Table 3. Distribution of 339 South Dakota Women by Body Weight and Place of Residence

| Number of Women                             | Place of Residence |              |            |       |
|---|--------------------|--------------|------------|-------|
|   | All Zones          | Open Country | Small Town | Urban |
|   | 339                | 168          | 84         | 87    |
|   | %                  | %            | %          | %     |
| Within 10% of desirable weight* .....       | 42                 | 38           | 51         | 45    |
| More than 10% below desirable weight* ..... | 11                 | 9            | 8          | 16    |
| 11-20% above desirable weight* .....        | 19                 | 20           | 13         | 21    |
| More than 20% above desirable weight* ..... | 28                 | 33           | 28         | 18    |

\*Desirable weight is defined as average weight for height at age thirty.

Table 4. Distribution of 339 South Dakota Women by Body Weight and Age Decade

| Number of Women                             | All Decades | Age Decades |       |       |       |             |
|---|-------------|-------------|-------|-------|-------|-------------|
|   |             | 30-39       | 40-49 | 50-59 | 60-69 | 70 and over |
|   | 339         | 91          | 105   | 73    | 45    | 25          |
|   | %           | %           | %     | %     | %     | %           |
| Within 10% of desirable weight* .....       | 42          | 53          | 45    | 33    | 27    | 52          |
| More than 10% below desirable weight* ..... | 11          | 18          | 9     | 7     | 6     | 16          |
| 11-20% above desirable weight* .....        | 19          | 15          | 20    | 22    | 20    | 8           |
| More than 20% above desirable weight* ..... | 28          | 14          | 26    | 38    | 47    | 24          |

\*Desirable weight is defined as average weight for height at age thirty.

desirable weight. On the other hand, only one-tenth were classified as underweight.

There were more overweight women living in the country and more underweight women in the cities. The greatest percentages (60 and 67) of overweight women were in the sixth and seventh decades (50-69 years). About the same proportion of underweight individuals was found in the youngest (30-39 years) and the oldest (70 years and over) age groups.

**Height.** The average height for the different age groups of the women interviewed was essentially the same with an over-all average height of 64 inches (table 2).

**Marital Status.** Approximately 85 percent of the women interviewed were married. Of the remaining 15

**Women interviewed were asked to recall foods eaten in the 24 hours preceding the interview.**



percent, 11 percent were widowed and 4 percent were single (table 2).

**National Extraction.** Nearly one-half (42 percent) of the women interviewed indicated they were of central and western European extraction (table 2). This included France, Germany, Netherlands, Austria, Belgium, Czechoslovakia, and Bohemia. About one-fourth (24 percent) indicated Scandinavian descent which included Denmark, Norway, Sweden, Iceland, and Finland. The third largest group interviewed (18 percent) indicated a British Isles background including Eire and the United Kingdom.

**Education.** Nearly one-half (45 percent) of the women interviewed reported that they had attended school 8 years or less (table 2). Approximately one-fourth (29 percent) had attended school 8-12 years and the remaining one-fourth (25 percent) had had some college training.

**Composition of Family.** Seventy percent of the women interviewed lived in households of 2 to 4 persons, 25 percent in households of 5 or more persons, and only 5 percent lived alone (table 2). In one-third of the homes, there were one or more children under 11 years while in one-fourth of the homes, the family members were all 50 years or older.

**Occupation.** Homemaking was given as the only occupation of 88 percent of those interviewed (table 2). Another 10 percent reported



both homemaking and work outside the home.

#### Average Nutrient Value of Diets

When each woman was interviewed, she was asked to recall and enumerate all the foods she had eaten in the past 24 hours. She was questioned as to what she had eaten for breakfast, the noon meal, supper, and between-meal snacks. She estimated the amount of each food by common household measures such as 2 tablespoons,  $\frac{1}{2}$  cup, 1 egg. She also was asked to describe the way each food was prepared.

This method of recalling quantities and kinds of food eaten in a previous period is always subject to error. It is difficult to remember all the different foods one has eaten the day before. It is even more difficult to recall and estimate the amount of each food. However, errors tend to counter-balance each other in any group of dietaries. Some persons might omit foods eaten while others might list foods eaten by the family but not by themselves. Moreover, some women tend to underestimate while others overestimate amounts.

The short period covered by the diets should be considered when interpreting the distributions, for it probably accounts for some of the wide variability among the women. However, other studies<sup>4</sup> have shown that averages for groups usually are not changed by extending the period for more than 1 day.

**Calculation of Diets.** After all the interviews were completed, the 24-hour recall diets were summarized.

Their calorie value and nutrient content were also estimated.<sup>5</sup>

In evaluating the dietaries of the 339 South Dakota women, the first step was to find the average calorie value and nutritive content of the dietaries and discuss them in relation to the 1953 recommended allowances of the National Research Council (NRC) as shown in table 5. These recommended allowances are designed to indicate levels of intake of dietary essentials which can be expected to maintain in good nutrition, healthy persons living in the United States at the present time.

Allowances for women are based on a standard individual weighing 121 pounds who is normally vigorous. Because nutritional needs vary widely from person to person, all the allowances represent a level high enough to cover substantially all the individual variations in normal persons. For this reason, caution must be used in evaluating the adequacy of a 1-day diet of an individual by these allowances. However, they do serve as a ready reference when groups of diets are involved.

**Total Group.** The average values (table 6) for calories and nutritive content of the 339 South Dakota dietaries as a group indicated a slightly low or borderline intake of calories and riboflavin, and a definitely low intake of calcium and as-

<sup>4</sup>Northeast Regional Publication No. 10, *Cooperative Nutritional Status Studies in the Northeast Region III. Dietary Methodology Studies*, 1952.

<sup>5</sup>Lowenberg, Miriam E., et al., *Score Your Diet*, Rochester Child Health Institute, 1947.

corbic acid when they were evaluated against the NRC recommendations. The other nutrients compared favorably.

**Place of Residence.** After studying the average values of the total group of dietaries, the next step was to arrange the dietaries according to where the women lived and determine the average nutrient content for each zone (table 6). For calories and most nutrients, the diets of the open-country women averaged higher than those of either the urban-center or small-town women. The urban women had

diets lowest in vitamin A and ascorbic acid, whereas the diets of the women living in small towns were lowest in calories, fat, and calcium.

**Age Decade.** Another comparison was made of the average calorie and nutritive content of the diets by age decades (table 7). The general trend showed a slight decrease in calories and nutrient intake with succeeding age decades through the seventh decade (60-69 years). However, the seventh decade (60-69 years) had some averages that were slightly higher than those of the sixth decade (50-59

Table 5. Recommended Daily Dietary Allowances for Women\*

|                             | Age of Women |           |           |
|-----------------------------|--------------|-----------|-----------|
|                             | 25 years     | 45 years  | 65 years  |
| Weight .....kg (lbs.) ..... | 55 (121)     | 55 (121)  | 55 (121)  |
| Height .....cm (in.) .....  | 157 ( 62)    | 157 ( 62) | 157 ( 62) |
| Calories .....no. ....      | 2300         | 2100      | 1800      |
| Protein .....gm .....       | 55           | 55        | 55        |
| Calcium .....gm .....       | 0.8          | 0.8       | 0.8       |
| Iron .....mg .....          | 12           | 12        | 12        |
| Vitamin A .....IU .....     | 5000         | 5000      | 5000      |
| Thiamine .....mg .....      | 1.2          | 1.1       | 1.0       |
| Riboflavin .....mg .....    | 1.4          | 1.4       | 1.4       |
| Niacin .....mg .....        | 12           | 11        | 10        |
| Ascorbic Acid .....mg ..... | 70           | 70        | 70        |

\*National Academy of Sciences—National Research Council, *Recommended Dietary Allowances Revised 1953*, publication 302, P. 22, Washington, D.C., 1953.

Table 6. Average Nutritive Content of Dietaries of 339 South Dakota Women by Place of Residence

| Nutrient                    | Place of Residence |              |            |       |
|-----------------------------|--------------------|--------------|------------|-------|
|                             | All Zones          | Open Country | Small Town | Urban |
| Food Energy .....Cal .....  | 1705               | 1810         | 1582       | 1621  |
| Protein .....gm .....       | 57                 | 62           | 52         | 55    |
| Fat .....gm .....           | 76                 | 81           | 69         | 74    |
| Carbohydrate .....gm .....  | 198                | 210          | 189        | 185   |
| Calcium .....gm .....       | 0.50               | 0.53         | 0.45       | 0.50  |
| Iron .....mg .....          | 11                 | 12           | 10         | 10    |
| Vitamin A .....IU .....     | 4565               | 4721         | 5049       | 3794  |
| Thiamine .....mg .....      | 1.0                | 1.0          | 0.9        | 0.9   |
| Riboflavin .....mg .....    | 1.2                | 1.3          | 1.1        | 1.1   |
| Niacin .....mg .....        | 10                 | 12           | 10         | 10    |
| Ascorbic Acid .....mg ..... | 55                 | 58           | 56         | 47    |

Table 7. Average Nutritive Content of Diets of 339 South Dakota Women by Successive Age Decades

| Nutrient                  | Age Decades |       |       |       |       |             |
|---------------------------|-------------|-------|-------|-------|-------|-------------|
|                           | All Decades | 30-39 | 40-49 | 50-59 | 60-69 | 70 and over |
| Food Energy .....Cal....  | 1705        | 1840  | 1770  | 1608  | 1630  | 1353        |
| Protein .....gm....       | 57          | 64    | 59    | 55    | 52    | 42          |
| Fat .....gm....           | 76          | 83    | 79    | 73    | 70    | 58          |
| Carbohydrate .....gm....  | 198         | 210   | 208   | 183   | 197   | 165         |
| Calcium .....gm....       | 0.50        | 0.62  | 0.52  | 0.41  | 0.46  | 0.40        |
| Iron .....mg....          | 11          | 12    | 11    | 11    | 10    | 8           |
| Vitamin A .....IU....     | 4565        | 4779  | 5229  | 4062  | 4689  | 2236        |
| Thiamine .....mg....      | 1.0         | 1.1   | 1.0   | 0.9   | 0.9   | 0.7         |
| Riboflavin .....mg....    | 1.2         | 1.4   | 1.2   | 1.1   | 1.1   | 0.9         |
| Niacin .....mg....        | 10          | 11    | 11    | 10    | 10    | 8           |
| Ascorbic Acid .....mg.... | 55          | 52    | 59    | 56    | 62    | 34          |

years), while the women 70 years and over had averages showing a rather sharp decrease in calories and all nutrients.

#### Percentage Distribution of Women According to Nutrient Intake Level

Since average values (table 7) tend to cover up the wide variation that was present among the diets, the next step was a study of the percentage distribution of the women by several intake-levels of each nutrient.

In this section, estimates of the calorie value and nutritive content of the 1-day diets are discussed in relation to data on 1037 urban women<sup>6</sup> and the recommended dietary allowances of the National Research Council (figure 2). Data on the urban women were obtained in the winter of 1948 in Birmingham, Ala., Buffalo, N. Y., Minneapolis-St. Paul, Minn., and San Francisco, Calif. by the Family Economics Division of the Bureau of Human Nutrition and Home Economics, Agricultural Research Service, U. S. Department of Agriculture (USDA).

**Calories.** The average for all 339 South Dakota women was 1705 calories. Thirty-four percent of the diets provided fewer than 1500 calories, 41 percent provided between 1500 and 2000 calories, while the remaining 25 percent provided 2000 or more. These percentages follow very closely those of the USDA study of urban women except that South Dakota had a few more diets falling in the middle group and a few less in the higher one. More than one-half of the diets in both groups fell below the 1953 recommended allowances which suggest 2100 calories for a 45-year-old woman 1800 calories for a 65-year-old woman.

It appears that South Dakota women were eating diets that were low in food energy. However, as noted earlier, nearly one-half of the 339 women interviewed were classified as being overweight. Furthermore, the average calorie intakes were lower for the women who

<sup>6</sup>Home Economics Research Branch, Agricultural Research Service, USDA, *Nutritive Content of Homemakers' Meals*, Agricultural Information Bulletin No. 112, table 2, p. 5, Washington, D. C., March, 1954.

were overweight than for those who were average in weight (table 8).

Even though the recommended allowances for calories has been reduced in the 1953 revision, there is a possibility that they are still too high. They are based on calculation of the amount of energy it takes to keep the body functioning plus the energy cost of the activities of a normally vigorous, fairly active woman. These activities have changed considerably over the years as our household tasks have become lighter. New studies need to be made of the energy requirements of women who are normally active in our present-day environment. Nevertheless, in most cases, 1200-1600 calories can be questioned as being sufficient to meet the energy needs of active adult women.

In addition, the diets found low in calories were generally also low in protein, minerals, and vitamins. This was shown when the dietaries for the 339 South Dakota women were divided into five groups according to the number of calories furnished by the diet and the average intake of eight nutrients calculated for each group (table 9).

For diets that supplied less than 1200 calories, the average nutrient content was below the NRC allowances for all eight nutrients. Diets supplying 1200-1799 calories averaged slightly below the allowances for many of the nutrients, calcium and ascorbic acid being the lowest. With the exception of calcium and ascorbic acid, the average nutrient content of the diets met or exceeded the NRC allowances when the calorie value exceeded 1800 calories.

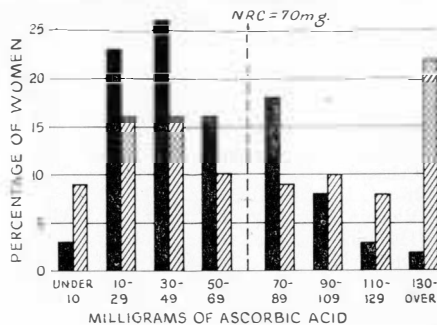
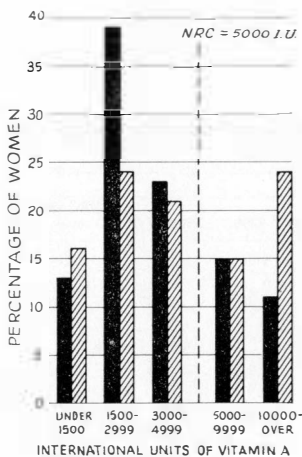
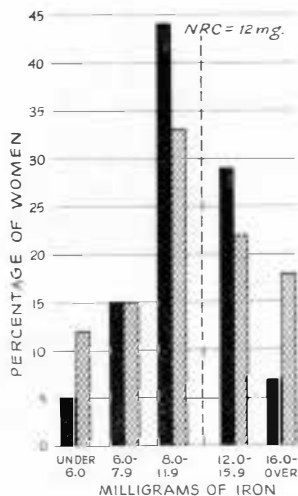
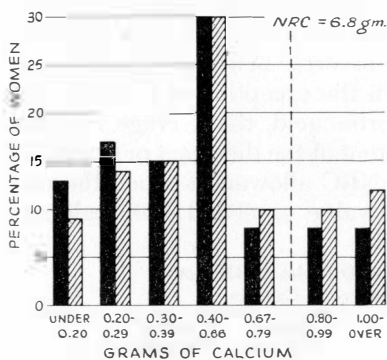
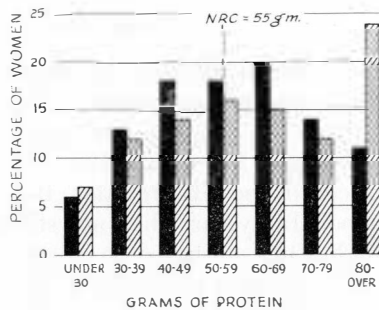
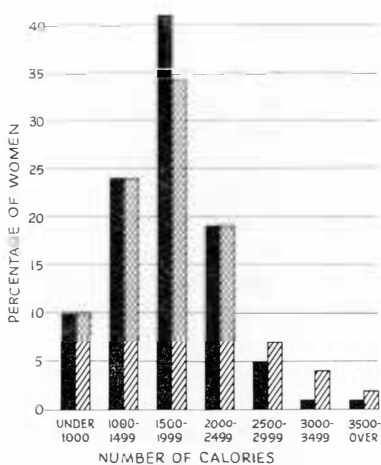
Table 8. Average Number of Calories in Dietaries of 339 South Dakota Women Which Provided Specified Numbers of Calories

| Classification of Women                     | Number of Women | Average Daily Calories |
|---|-----------------|------------------------|
| Within 10% of desirable weight* .....       | 38              | 1897                   |
| More than 10% below desirable weight* ..... | 144             | 1763                   |
| 11-20% above desirable weight* .....        | 63              | 1646                   |
| More than 20% above desirable weight* ..... | 94              | 1577                   |

\*Desirable weight is defined as average weight for height at age thirty.

Table 9. Average Intake of Eight Nutrients by 339 South Dakota Women Eating Food for One Day  
Dakota Women Classified by Weight Groups

|                             | Calories |            |           |           |           |               |
|-----------------------------|----------|------------|-----------|-----------|-----------|---------------|
|                             | Total    | Under 1200 | 1200-1799 | 1800-2399 | 2400-2999 | 3000 and over |
| Women Reporting .....no.... | 339      | 63         | 130       | 114       | 26        | 6             |
| Protein .....gm....         | 58       | 35         | 53        | 66        | 85        | 114           |
| Calcium .....gm....         | 0.50     | 0.26       | 0.46      | 0.59      | 0.87      | 0.87          |
| Iron .....mg....            | 11       | 7          | 10        | 13        | 15        | 20            |
| Vitamin A .....IU....       | 4565     | 3359       | 4294      | 4684      | 7435      | 8370          |
| Thiamine .....mg....        | 1.0      | 0.6        | 0.8       | 1.1       | 1.5       | 2.1           |
| Riboflavin .....mg....      | 1.2      | 0.7        | 1.1       | 1.4       | 2.0       | 2.1           |
| Niacin .....mg....          | 11       | 7          | 10        | 12        | 15        | 21            |
| Ascorbic Acid .....mg....   | 55       | 50         | 49        | 60        | 70        | 73            |



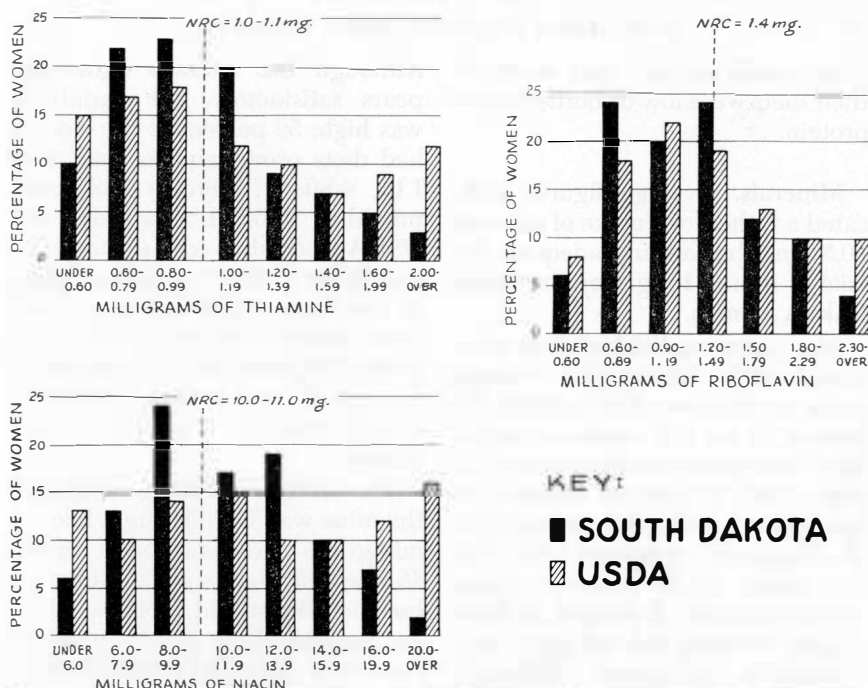


Figure 2. Percentage of women eating foods for one day providing specified numbers of calories and amounts of eight nutrients. (a) 339 South Dakota women (b) 1037 women from four cities surveyed by the USDA.

With 2400 or more calories, all nutrients exceeded the NRC allowances.

**Protein.** The average intake for the entire group was 57 grams of protein. Individual diets showed wide variation with 19 percent providing less than 40 grams of protein and 25 percent providing more than 70 grams. As was the case with calories, South Dakota had more diets providing medium amounts of protein and fewer providing large amounts than was the case with the USDA urban women although the same general trends were apparent.

The NRC recommends an average daily protein allowance of 1 gram for every 2.2 pounds of body weight for adult women. Average height of the South Dakota women was 5 feet, 4 inches and the desirable weight for women of this height who are of average build is between 124 and 132 pounds. If 1 gram of protein were figured for each 2.2 pounds of body weight, the protein requirement would fall between 56 and 60 grams. On this basis, approximately one-half of both the South Dakota women and the USDA urban women reported quantities of protein which fell below the recommended amount.

This would suggest that many of their diets were low or borderline in protein.

**Minerals.** Average figures indicated a rather low intake of calcium (0.5 gm.) but a fairly adequate intake of iron (11 mg.) by the South Dakota women.

Many of the individual diets were considerably below the average value for calcium. For instance, 35 percent of the 339 women reported diets with calcium values under 0.4 gram. Only 14 percent obtained as much as 0.8 gram, the recommended allowance for women. The USDA urban study showed similar trends with only 6 percent of their women meeting the 0.8 gram recommended allowance. Although day-to-day variation in intake may account for some variation in the calcium intake, these figures indicate a general low level of calcium in the diets of both groups of women.

With iron, individual dietaries showed more than half of the women received less than the 12 milligrams recommendation. The urban study showed more women in the two extreme groups under 6 milligrams and over 16 milligrams of iron and fewer in the middle groups than the South Dakota study. Here again, the likelihood of day-to-day variation is quite important.

**Vitamins.** The average vitamin A value of the South Dakota women's daily meals was 4565 International Units (I.U.) which is close to the 5000 I.U. recommended allowance.

Although this average figure appears satisfactory, the variability was high; 52 percent of the women had diets providing less than 3000 I.U., while 11 percent had foods providing 10,000 I.U. or more. The USDA study showed the same wide variability with even more falling in the "over 10,000" group. However, vitamin A is stored in the body so the low levels for 1 day reported by some of these women do not necessarily indicate a nutritional deficiency.

The estimated average intake of thiamine was 1 milligram while 1.1 milligrams is recommended for the 45-year-old woman and 1 milligram for the 65-year-old woman. Fifty-five percent of the women reported diets that provided below 1 milligram. The variability in the diets of the South Dakota women, however, was not as great as that in the diets of the USDA urban women.

Average intake of riboflavin was 1.2 milligrams. Approximately three-fourths of the South Dakota women's diets fell below the recommended allowance of 1.4 milligrams as did about two-thirds of the urban women.

Average intake of niacin was 10 milligrams. The estimated intakes of this vitamin in the diets of the women was relatively more generous than the intakes of the other B-vitamins (thiamine and riboflavin) with only 19 percent falling below 8 milligrams.

The average amount of ascorbic acid in the women's diets was 55 milligrams, which is considerably below the recommended amount of

70 milligrams. As with other nutrients, the variation among individual intakes of ascorbic acid was great. For example, 26 percent provided less than 30 milligrams of ascorbic acid and 14 percent had more than 90 milligrams. The urban study showed even more variability with 25 percent below 30 milligrams and 22 percent above 130 milligrams.

Ascorbic acid is not stored in the body for any length of time so it is desirable that the recommended amount be eaten daily. With 68 percent of the South Dakota women reporting diets providing less than 70 milligrams of ascorbic acid, it would appear that many of them are not meeting their requirements for this important vitamin.

#### Contributions of Breakfasts to Daily Diets

Starting the day with a nourishing meal is essential for maximum efficiency, both physical and mental. Nevertheless, various surveys have disclosed that from one-half to

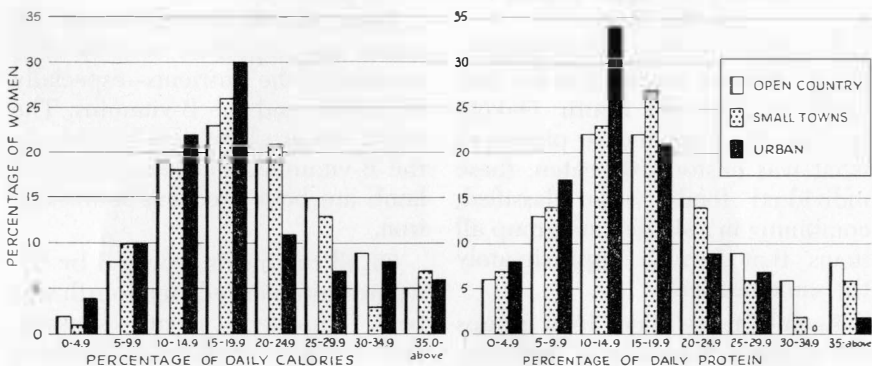
two-thirds of the American adult population do not eat an adequate breakfast.

Due to the wide-spread emphasis placed on nutritionally - sound breakfasts during the past few years, the breakfasting habits of the 339 South Dakota women were studied in some detail. Surprisingly enough only two of those interviewed went without breakfast and just 5 percent ate as little as coffee or fruit, or coffee and fruit.

It is generally recommended that breakfasts supply 25 to 33 percent of the daily calories. However, the South Dakota study showed that the average of the breakfasts of all the women contributed only 19 percent of the daily calories. There was little difference in the averages for the women according to place of residence.

Statewide, 26 percent of the women interviewed received the recommended calories from their breakfasts (figure 3). Twenty-nine percent of the open-country women,

Figure 3. Percentages of women eating breakfasts which supply specified percentages of the daily calories and protein.





23 percent of the small-town women, and 21 percent of the urban subjects reached or exceeded the suggested allowance.

It is also recommended that breakfast furnish 25 to 33 percent of the daily protein. On the average, women in the open country received 18 percent, small-town women 17 percent, and urban women 15 percent of their daily protein from their breakfast. The over-all average for the women was 17 percent.

Only 16 percent of the women received the recommended one-fourth or more of their daily protein from their breakfasts (figure 3). Zone-wise, 23 percent of the open country women received the recommended proportion of this nutrient from breakfast, as did 15 percent of the small-town women and 11 percent of the urban women.

From these figures, one can see that 74 percent of the South Dakota women had breakfasts low in calories on the day interviewed. Moreover, 84 percent of the women reported an inadequate protein allowance for breakfast.

#### **Frequency of Food Groups in the Diets**

An almost endless list of individual foods were reported in the diaries of the 339 South Dakota women. To obtain a clear picture of what was customarily eaten, these individual foods were classified, combining in a single food group all items that furnish approximately the same nutrients.

Each of these major food groups has a distinctive role in the diet.

Therefore, if they are all represented daily in meals and snacks, the diet most likely will be satisfactory. However, if one or more groups are left out, sufficient quantities of certain nutrients are apt to be lacking.

**Cereal Products.** Enriched breads and breakfast cereals contribute thiamine, niacin, iron, and protein to the diet in addition to energy-giving calories. Of all breakfast cereals eaten, one-fourth were ready-to-eat whole wheat products—shredded, puffed, or flaked. In fact, almost as much ready-to-eat whole wheat cereal was eaten as all other cereals of this type combined, including corn, bran, rice, and oat. Twice as much rolled oats was consumed as all other hot cereals. In all age groups, cooked oats and ready-to-eat whole wheat cereals were the most popular cereals.

Of the 339 women sampled, 174 of them, or more than one-half, ate no breakfast cereal whatsoever for the period covered by the interview. One hundred fifty-nine ate some kind of breakfast cereal once a day, and six individuals ate it two or more times a day.

**Meat and Meat Substitutes.** All meats are important sources of a number of the nutrients—especially of protein and the B-vitamins. The organ meats abound in vitamin A, the B-vitamins, and iron. Beef and lamb are both excellent sources of iron.

Of all the meats reported by the women interviewed, one-fourth was beef. Luncheon meats, sausage, and wieners came next, totaling

one-fifth of all meat consumed. Third in popularity was pork and ham. Bacon constituted approximately one-tenth of all meats eaten. Fowl and fish were next in line. Organ meats, veal, and lamb were least frequently used.

In all age groups, with the exception of the oldest group, beef proved most popular. The women 70 years and over tended to use more luncheon meat.

Altogether, meat appeared 589 times in the dietaries of the 339 women. One-third of the women ate meat once a day. Almost one-half had meat twice daily. Meat appeared in the diets of 44 women three times a day, while seven women reported having it four times and one woman, five times. Nineteen women did not eat meat at all, and of these 19, 6 ate no meat substitutes either.

In this study eggs, cheese, cottage cheese, peanut butter, and legumes (dried beans and peas) were all combined under the heading of meat substitutes. Eggs were used more than twice as often as all other meat substitutes combined. However, in the sixth and seventh decades, eggs appeared three times as often as all other substitutes. Cheese made up approximately one-fourth of all substitutes, and about one-tenth were legumes.

In all, meat substitutes were reported 227 times. Three-fourths of the women reporting this class of foods used them only once a day.

**White Potatoes.** Food energy is usually thought of as the main nu-

trient contribution of white potatoes, overlooking the ascorbic acid which they also provide. In fact, a medium-size baked potato can supply approximately one-fourth of the recommended daily adult allowance of this vitamin. Potatoes were found to be the vegetable used most frequently and in the largest quantities by South Dakota women. Almost one-half of the 339 interviewees ate potatoes once a day. Close to one-third had potatoes twice a day, and two women even had them three times a day. However, 70 women ate none.

**Vitamin-Rich Fruits and Vegetables.** A fruit or vegetable is classified as vitamin-rich when a usual serving as defined by Lowenberg<sup>7</sup> provides at least one-tenth of the recommended daily allowance of vitamin A or one-fourth of the recommended daily allowance of ascorbic acid (vitamin C).

Fruits named by the women that are reliable sources of vitamin A include: apricots, peaches, prunes, cantaloupe (deeply colored varieties), tomatoes, and watermelon. Excellent sources of ascorbic acid were: cantaloupe, strawberries, gooseberries, loganberries, citrus fruits, and tomatoes.

More than twice as many tomatoes were used as any other single vitamin-rich fruit. Next in line in popularity were peaches. Following those in order of their popularity were: oranges, grapefruit, and berries. Melons, apricots, and prunes

<sup>7</sup>Lowenberg, Miriam E., op. cit.

totaled only one-eighth of all the vitamin-rich fruits.

One-third of the 339 women ate vitamin-rich fruits once a day. Slightly more than one-third used fruit from this class two to five times a day. During the 24-hour period recorded, 102 women ate no vitamin-rich fruit whatsoever.

Of the vegetables reported, the ones outstanding for their vitamin A content were: asparagus, green beans, carrots, peas, squash, sweet potatoes, broccoli, chard, and rutabaga. Important for ascorbic acid were cabbage, cauliflower, spinach, chard, and sauerkraut.

Peas accounted for one-fourth of the 219 times vitamin-rich vegetables were listed. Close runner-up was green beans; third choice was carrots. Cabbage was fourth in popularity. Asparagus, spinach, sweet potatoes, and squash totaled about one-eighth of the vitamin-rich vegetables used.

One hundred thirty-seven women used a vitamin-rich vegetable once a day and 41 women twice a day. However, such vegetables were not listed in the diets of about one-half of the women. When both vitamin-rich fruits and vitamin-rich vegetables were considered as a single group, one-seventh of the women still failed to use one or the other.

**Other Fruits and Vegetables.** Some fruits and vegetables do not contain sufficient vitamin A or ascorbic acid to place them in the vitamin-rich bracket so they make up a separate category known as

"other" fruits and vegetables. They are desirable, however, for their color, flavor, texture, and bulk-forming qualities as well as for the small amount of nutrients they contribute. Fruits included under this classification are: apples, bananas, rhubarb, pears, cherries, pineapple, plums, grapes, and dried fruits such as dates, figs, and raisins. Vegetables included are: lettuce, corn, hominy, celery, beets, cucumbers, wax beans, lima beans, radishes, and onions.

Of all "other" fruit eaten, one-fifth was apples. Running a close second in popularity were bananas. Plums came third. Cherries, grapes, rhubarb, and pineapple were eaten in equivalent quantities, and their sum made up about one-sixth of this group. About one-half of the 339 women used "other" fruit at least once a day.

Of all "other" vegetables eaten, lettuce was chosen 30 percent of the time. Corn and hominy placed second in popularity. Celery, beets, and cucumbers shared third place. Lima beans, wax beans, radishes, and onions were incorporated into diets less frequently.

"Other" vegetables were recorded once in each of the diets of 123 women, whereas 42 diets contained two such vegetables. Diets of one-half of the women did not include any vegetables in this group. This study showed a marked decrease in the use of "other" vegetables by women 70 years and over.

**Milk.** To provide sufficient calcium for the body, it is almost im-

perative to include milk in the diet. Milk also furnishes good quality protein as well as one of the B-vitamins—riboflavin. These three nutrients also are provided by milk derivatives such as cheese and other products containing large proportions of milk such as ice cream, puddings, cream soups, and white sauces. The fluid milk equivalents of such products can be calculated and added to the beverage milk to give a more complete picture of the milk intake.

In this study, "milk as a beverage" included all milk used for drinking purposes and on breakfast cereal and fruits. Only one-half of the women from the open country and small towns and two-thirds of the urbanites used milk in this form, but practically all of them indicated usage of at least some milk in their cooking.

**Soups.** Soups vary in their nutritive values according to their principal ingredients. Altogether, soups were reported only 44 times probably due to the hot weather that was prevalent during the summer and fall when the interviewing was done. Soups eaten most frequently were vegetable, tomato, and chicken. Consumed less often were beef, bean, split pea, and potato soups. Trailers in popularity were oyster, spinach, and mushroom soups.

**Made Desserts and Sweets.** Although fruits served as dessert much of the time in the South Dakota diets, cakes, pies, cookies, doughnuts, puddings, ice cream, and gelatin desserts were widely

used also and are referred to as "made desserts." Syrups, honey, preserves, jellies, and candies are classified as sweets.

Except for abundant calories, sweets and "made desserts" offer little nutritionally unless milk is a basic ingredient, as in ice cream or pudding. Generally speaking, it is better to avoid this food group until all nutritive needs have been met through the use of foods from the other groups. Then these foods can be added for extra food energy.

As revealed by this study, 60 percent of the desserts eaten were of the "made" variety. Cakes, cookies, and pies headed the list, in that order. Other desserts reported were: ice cream, puddings, gelatin dishes, and doughnuts.

**Snacks.** A number of foods named were eaten between regular meal periods. Such foods are classified in a separate unit designated as snacks. Special note was taken of these between-meal satisfiers to determine how prevalent a practice snacking is and to check the foods most commonly chosen as snacks.

More than one-third of the women questioned refrained from snacking. For those who did eat during mid-morning, mid-afternoon, or before going to bed, the number of food items eaten as snacks ranged from one to 14 for the entire day.

Coffee, the favorite snack, appeared in more than one-fourth of the snacks reported. Cookies, cake, sandwiches, and ice cream followed in that order. Milk drinks ranked

second in the beverage line. Trailing in popularity were fruits, rolls, doughnuts, and carbonated beverages. Crackers, pie, candy, popcorn, and tea were the least common snacks.

### Calories and Nutrients Furnished by Major Food Groups

Although calories are an important factor in the study of foods, they should not be regarded as a nutrient such as calcium or iron. Actually, calories are small units of heat by which the energy values of foods are measured. Foods of high fat or carbohydrate (sugar and starch) content are the greatest storehouses of calories, but most foods supply calories in varying

amounts depending upon their composition.

In this study, the sources of both calories and nutrients were determined. For the calories, the problem was approached from two angles. First, the percentage of calories contributed by each of the major food groups was calculated on the basis of the women's ages (table 10). Second, the percentage of calories from the broad food groups was figured according to the different calorie intake levels at 600-calorie intervals (table 11). Since the calories furnished by foods of similar nutrient content are derived from their mutual calorie-giving substance (for example, protein in meat and meat substitutes), some

Table 10. Percentage of Calories Provided by Major Food Groups in Diets Reported by 339 South Dakota Women in Successive Age Decades

| Food Group                      | Age Decade  |       |       |       |       |             |
|---------------------------------|-------------|-------|-------|-------|-------|-------------|
|                                 | All Decades | 30-39 | 40-49 | 50-59 | 60-69 | 70 and over |
|                                 | %           | %     | %     | %     | %     | %           |
| Meat and Meat Substitutes ..... | 16          | 17    | 16    | 17    | 13    | 13          |
| Milk as Beverage .....          | 7           | 9     | 6     | 5     | 6     | 8           |
| Cereal Products .....           | 20          | 18    | 19    | 17    | 22    | 23          |
| Table Fats .....                | 19          | 18    | 19    | 20    | 19    | 20          |
| White Potatoes .....            | 8           | 8     | 8     | 9     | 7     | 8           |
| Fruits and Vegetables .....     | 7           | 7     | 8     | 9     | 9     | 6           |
| Sweets and Desserts .....       | 22          | 22    | 23    | 23    | 22    | 20          |
| Other .....                     | 1           | 1     | 1     | 0     | 2     | 1           |

Table 11. Percentage of Calories Provided by Major Food Groups in Diets of Specified Calorie Levels (339 South Dakota Women)

| Food Group                      | Calorie Level |            |           |           |           |               |
|---------------------------------|---------------|------------|-----------|-----------|-----------|---------------|
|                                 | All Levels    | Under 1200 | 1200-1799 | 1800-2399 | 2400-2999 | 3000 and over |
|                                 | %             | %          | %         | %         | %         | %             |
| Meat and Meat Substitutes ..... | 16            | 18         | 17        | 15        | 16        | 18            |
| Milk as Beverage .....          | 7             | 6          | 7         | 7         | 10        | 6             |
| Cereal Products .....           | 20            | 24         | 19        | 18        | 16        | 18            |
| Table Fats .....                | 19            | 14         | 18        | 20        | 20        | 18            |
| White Potatoes .....            | 8             | 8          | 8         | 8         | 8         | 6             |
| Fruits and Vegetables .....     | 7             | 12         | 8         | 7         | 5         | 6             |
| Sweets and Desserts .....       | 23            | 17         | 21        | 24        | 25        | 27            |
| Other .....                     | 2             | 1          | 2         | 1         | 0         | 1             |

food groups were combined for this part of the study.

Percentages of nutrients from the major food groups were also calculated for those diets considered calorically adequate (table 12). In that case, similar food groups were separated, since the representatives of food classes (for instance, different vegetables) can vary greatly in nutrient content even though as calorie-producers they rate about the same.

**Calorie Sources.** In all age brackets desserts provided almost one-fourth of the calories (table 10). On the average, cereal products were the second best providers of calories—contributing one-fifth of the daily total. Ranking next to cereal products as a source of calories were table fats (butter, cream, etc.). Slightly less than one-sixth of the calories were supplied by meats and meat substitutes. White potatoes provided less than one-tenth. Beverage milk and fruits and vegetables—vitamin-rich and otherwise

—furnished the least calories for women in all decades. In the two oldest age groups, meat consumption fell, and cereal intake increased.

In diets providing 1200 or fewer calories (table 11), cereal products were the highest source of calories, while diets of higher than 1200 calorie value derived the most calories from desserts. Up to the 1200-calorie level, meat and meat substitutes were the second best contributors of calories, with sweets and desserts taking third position. As sources of calories, fats ranked second and cereals third in the higher calorie diets, with meat and meat substitutes placing fourth.

In most cases, regardless of calorie level of the diet, sources of calories descended in this order: desserts, cereal products, fats, meats and meat substitutes, white potatoes, beverage milk, fruits, and vegetables.

**Nutrient Sources.** An evaluation of the 61 diets judged to be calor-

Table 12. Percentage of Nutrients Furnished by Major Food Groups in 61 Diets (South Dakota Women) Which Provided 1800-1999 Calories

| Food Group                              | Nutrient    |         |         |      |           |          |            |        |               |
|---|-------------|---------|---------|------|-----------|----------|------------|--------|---------------|
|   | Food Energy | Protein | Calcium | Iron | Vitamin A | Thiamine | Riboflavin | Niacin | Ascorbic Acid |
|   | %           | %       | %       | %    | %         | %        | %          | %      | %             |
| Meat .....                              | 12          | 38      | 2       | 31   | 1         | 28       | 16         | 40     | 0             |
| Meat Substitutes .....                  | 3           | 8       | 8       | 7    | 7         | 4        | 8          | *      | 0             |
| Milk as Beverage .....                  | 6           | 10      | 44      | 3    | 8         | 7        | 26         | 2      | 2             |
| Cereal Products .....                   | 19          | 18      | 8       | 21   | *         | 24       | 14         | 22     | 0             |
| Table Fats .....                        | 20          | 6       | 10      | 4    | 24        | 4        | 9          | 3      | 0             |
| White Potatoes .....                    | 9           | 6       | 6       | 12   | 2         | 15       | 5          | 18     | 30            |
| Vitamin-Rich Fruits and Vegetables .... | 4           | 4       | 6       | 10   | 47        | 8        | 6          | 7      | 56            |
| Other Fruits and Vegetables .....       | 3           | 1       | 4       | 3    | 3         | 2        | 2          | 2      | 11            |
| Sweets .....                            | 6           | 0       | 0       | 0    | 0         | 0        | 0          | 0      | 0             |
| Desserts .....                          | 17          | 8       | 10      | 8    | 8         | 8        | 11         | 4      | *             |
| Other .....                             | 1           | 1       | 2       | 1    | *         | *        | 3          | 2      | 1             |

\*Less than 1%.

ically satisfactory—those providing 1800 to 2000 calories daily—indicates what foods supply the greatest or the smallest amounts of specified nutrients (table 12).

Meat provided 38 percent of the protein. Cereal products furnished 18 percent, milk 10 percent, and meat substitutes 8 percent.

As might be expected, milk provided the greatest amount of calcium—44 percent. Ten percent of the calcium was derived from table fats and another 10 percent from “made desserts”—the chief calcium-giving ingredient was undoubtedly milk. Meat substitutes furnished 8 percent of the calcium.

Chief sources of iron were meat—31 percent, cereal products—21 percent, white potatoes—12 percent, and vitamin-rich fruits and vegetables—10 percent.

The greatest amounts of vitamin A came from vitamin-rich fruits and vegetables—47 percent, and fats—24 percent.

Principal suppliers of ascorbic acid were vitamin-rich fruits and vegetables—56 percent, white potatoes—30 percent, and “other” fruits and vegetables—11 percent.

Foods supplying thiamine were: meat, yielding 28 percent of the nutrient; cereal products, yielding 24 percent; and white potatoes, yielding 15 percent.

Riboflavin was furnished chiefly by milk—26 percent, meat—16 percent, and cereal products—14 percent.

Heavy suppliers of niacin were: meat—40 percent, cereal products—22 percent, and white potatoes—18

percent. Further comparisons can be made from values shown in table 12.

### **Evaluation of Individual Diets**

To complete the nutritional evaluation of the diets of the South Dakota women, the individual records were checked for over-all adequacy. It was found that the diets of only five women supplied 100 percent or more of the NRC recommended allowances of all eight nutrients. These could be considered as truly superior diets. Another group of 14 women had slightly less-complete diets in which the amounts of one or two of the nutrients exceeded two-thirds of the recommended allowance but did not supply 100 percent of it. A third group of 10 women ate foods which furnished the full allowance of at least one nutrient and two-thirds of the allowance for each of the remaining nutrients. Thus, the diets of only 29 or 8 percent of the women could be rated as superior.

Of the 195 diets which furnished 1600 or more calories, 42 percent of them had more than half of the NRC allowances of all eight nutrients. The rest (58 percent) failed in supplying even one-half of the allowances of from one to four nutrients.

Nearly three-fourths of the low calorie diets, those furnishing less than 1600 calories, supply less than one-half the recommended allowances of one to four nutrients. Another 20 percent of the low-calorie diets had less than half the recom-

mended allowances of five or more of the nutrients. Six dietaries were low in all eight nutrients.

### **Summary and Conclusions**

The increase in the number of older people in South Dakota as well as in the population of the nation as a whole has emphasized the need for study of the food habits of individuals as they grow older.

This interview-survey of the food habits of 339 South Dakota women 30 years or older selected by area sampling was conducted in the summer and fall of 1949. The interview schedule included information about the woman's family, activities, and general health as well as a 24-hour dietary recall. A general description of South Dakota women and their food habits can be derived from the data collected.

**Women Interviewed.** Approximately one-half of the women interviewed live in the open country, one-fourth in small towns, and one-fourth in urban centers. There were decreasing numbers of women in succeeding decades from age 30 with the exception that a few more women were found between 40 and 49 years than between 30 and 39 years. Nearly one-half of the women were considered to be somewhat above desirable weight with about one-fourth being excessively overweight. Most of the women were homemakers, living in households of 2 to 4 persons. Nearly one-half of them were of central and western European extraction and one-fourth of Scandanavian descent.

Approximately one-half of them had not gone past the eighth grade in school, but one-fourth had varying amounts of college training.

It was found that both place of residence and age were factors influencing the choice of foods eaten. Women in the open country tended to have the most adequate diets. A decrease in calories and nutrients was found with each succeeding age decade.

A wide variation in calorie and nutritive value was observed among the 24-hour recall dietaries of the women. This variation was quite similar to that observed in a study of urban women by the USDA except that South Dakota tended to have more individuals with median intakes and the urban study more individuals with high intakes.

**Many Diets Inadequate.** When evaluated with the NRC recommended allowances, a large portion of the South Dakota women were found to have diets inadequate in the various nutrients. Approximately one-third had calorie intakes of less than 1500. An 1800 calorie diet was found necessary to furnish an adequate supply of most of the nutrients. Less than one-fourth of the women were eating breakfasts that supplied 25 to 33 percent of their daily calories and proteins.

Eight percent of the 339 dietaries were rated as superior while a similar proportion were rated as poor, failing to supply even half the recommended amounts of five to eight of the essential nutrients.

A study of the frequency with which various food groups were in-



cluded in the diets revealed that meat, potatoes, bread, butter, and "made desserts" were prominent in the diets of South Dakota women. Groups which are necessary for well-balanced meals but were often found in small amounts or omitted were: milk, eggs, vitamin-rich fruits and vegetables, and "other" fruits and vegetables.

It appears from this study that South Dakota women need to recognize their chief dietary problem—eating foods low enough in calories to prevent weight gains but providing an adequate supply of all essential nutrients. It becomes necessary to see that every calorie of food energy in meals or snacks be accompanied by other nutrients.