

A COMPARATIVE STUDY OF THE MEAN NUTRIENT INTAKES OF
VARIOUS POPULATION GROUPS OF THE ELDERLY IN SASKATOON

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by

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ABSTRACT

This survey was conducted in order to examine the dietary adequacy of three different support systems for single elderly people living alone in Saskatoon, Saskatchewan. One hundred and twenty people over the age of 65 were selected from the Alliance of Youth and the Elderly, Meals on Wheels, and the Sherbrooke Community Center. The Alliance of Youth and the Elderly helps to repair and maintain the homes of the elderly, but does not provide meal service. Meals on Wheels provides one hot meal each weekday while the Sherbrooke Community Center provides all meals and snacks.

Food consumption of subjects was recorded using the 24-hour dietary recall method. Exact quantities of food consumed were determined with the aid of food models. Socio-economic and demographic data for each individual were entered on a questionnaire, and all data were coded for computer analysis. Computer analysis utilized food composition data from the Handbook of The Nutritional Contents of Foods, U.S.D.A. No. 8, and printed out the daily intake of calories, protein, fat, calcium, iron, vitamin A, vitamin C, thiamine, riboflavin, and niacin for each individual. The effects of socio-economic and demographic variables on the caloric and nutrient intakes of the elderly subjects were determined with the analysis of variance. Adequacy of diet for the three support systems of the elderly was assessed by comparison with the recommendations made in the 1976 edition of Dietary Standard for Canada.

Results of this survey indicated that elderly males and females in the Alliance of Youth and the Elderly and Meals on Wheels met Canadian

recommended levels for calories and all nutrients. Males in the Sherbrooke Community Center did not meet recommended levels of intake for thiamine while females in the Sherbrooke Community Center exceeded recommended levels of intake for calories. Protein intakes for all subjects were affected by differences in age and sex. Protein, calcium and vitamin A intakes of all subjects were affected by differences in the type of support program. Results of this survey suggest that elderly males and females living alone at home and receiving help from the community can adequately meet their nutritional needs.

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1. INTRODUCTION

Research on the nutritional status and dietary habits of the elderly is just beginning. Although most modern surveys of the elderly use statistically accurate methods to determine calorie and nutrient intakes, no consistent relationships between nutrient intake and socio-economic conditions of the aged have been established.

The few longitudinal studies^{60,63} that have been conducted on the elderly indicate that good health is important in the maintenance of a good diet. As the number of disabilities appear to increase with increasing age,^{2,23} elderly people require more care from their families or communities to meet everyday needs. If the family is unable to cope with this increased demand, the elderly are often placed in nursing homes⁵⁷. A more practical and less expensive method of assisting the elderly is to increase the quality of services presently existing in the community. One component of these services is home delivery of meals to the elderly. Results of several studies^{27,48,61} suggest that meals-delivery programs can adequately meet nutritional needs of the elderly.

In the present survey, caloric and nutrient intakes were determined for three groups of elderly people, subjects living at home who were receiving Meals on Wheels; subjects living at home who were not receiving meal service of any kind; and subjects residing in an institution. The survey was undertaken in order to determine a) whether socio-economic conditions of the elderly affect caloric and nutrient intakes, and b) whether Meals on Wheels subjects could adequately meet their nutritional needs living at home.

2. REVIEW OF THE LITERATURE

2.1 Population statistics of the aged in Canada

In 1977, Statistics Canada⁵⁴ stated that greater than eight percent of the Canadian population was over 65 years of age, and that by the year 2001 this figure will reach ten percent. The aged are a rapidly growing segment of the population. Between 1961 and 1971, the number of Canadians over 65 years of age increased by 26 percent. During this same period the overall population increased by only 18 percent¹⁶. Improved health care and a decline in fertility rates since the late nineteenth century may account for this increase in the proportion of the elderly.

Census data reveals that 57 percent of the elderly are female. Fifty-four percent of the elderly are married, and 11 percent are not married. Thirty-five percent are widowed, and one percent are divorced.

As a group, the elderly are not as well educated as those under 65⁵⁴. Sixty-four percent of the elderly population have less than a grade nine education. Twenty-six percent have attended high school, ten percent have post-secondary educations, and of these, two percent have obtained university degrees. These latter figures for education are significantly lower than the percentages for those aged 25 to 64.

2.2 Dietary intake surveys of the elderly in Canada

In 1970, Nutrition Canada¹⁶ conducted a national survey in order to determine the nutritional status of Canadians. A representative sample of Canadians was assessed according to clinical evidence, anthropometric measurements, biochemical analyses and dietary intakes. Mean caloric and

nutrient intakes for elderly males and females are presented in Table 2.1.

Table 2.1: Mean¹ caloric and nutrient intakes for elderly males and females

Kilocalories and Nutrients	Male	Female
Kilocalories	2,056	1,530
Protein (g)	72	54
Fat (g)	89	63
Calcium (mg)	709	619
Iron (mg)	13	10
Vitamin A (I.U.)	3,706	3,557
Vitamin C (mg)	85	87
Thiamine (mg)	1.08	.85
Riboflavin (mg)	1.77	1.47
Niacin (N.E)	28	21

1. Mean values do not include supplements.

Nutrition Canada, 1973

Intakes of thiamin and calcium for males and females did not meet recommended intakes¹⁵. Dairy products were the main source of calcium in the diets of the elderly.

Nutrition Canada¹⁶ evaluated the quality of diet by classifying nutrient intakes into three levels: inadequate, less-than-adequate, and adequate.

"Inadequate intakes" are considered to be those intakes that are below the minimum requirements of a nutrient. "Less-than-adequate" intakes are above the minimum requirement but below the desirable amount of intake for a given nutrient. "Adequate" intakes provide a desirable margin of safety in meeting the body's need of a nutrient. The percentages of elderly men and women with "inadequate" intakes of nutrients are presented in Table 2.2.

Table 2.2: Percentages of Canadian males and females with "inadequate" intakes of nutrients

Nutrient	Male (%)	Female (%)
Protein	7.1	14.5
Iron	4.9	8.4
Calcium	9.9	20.0
Vitamin A	23.1	32.1
Vitamin C	4.0	1.9
Thiamine	10.7	14.5
Riboflavin	4.3	14.8
Niacin	1.6	4.7

Nutrition Canada, 1973.

Murray⁵¹ assessed the results of Nutrition Canada¹⁶, and concluded that non-institutionalized mobile elderly showed no gross nutritional deficiencies. He further concluded that many elderly were obese, especially females. Also iron, calcium and vitamin A were the nutrients most often low in the diet.

The Saskatchewan results of the Nutrition Canada¹⁶ survey indicated

that the elderly, particularly males, were the group most vulnerable to nutritional deficiencies. The elderly had the lowest calorie intake of all age groups in Saskatchewan, and the highest percentage of overweight people. Calcium and thiamine intakes were below recommended levels. Vitamin A and riboflavin intakes were the lowest of all age groups studied. Calorie and nutrient intakes were similar for the national and provincial samples of elderly people except that Saskatchewan females consumed less calories, calcium and vitamin C. Saskatchewan males consumed more vitamin A and less vitamin C than the national sample of males.

Monagle^a examined dietary intakes of 780 Canadians, 60 years of age and over. Results indicated that the patterns of food intake remained constant with increasing age, but that smaller amounts of each food were consumed. Mean caloric and nutrient intakes for males and females are presented in Table 2.3.

Monagle reported that several factors affected dietary intakes. In all age groups, males had better nutrient intakes except for the 60 to 70 year old group in which females consumed better diets. High income groups had better nutrient intakes than low income groups. Although single women tended to have better nutrient intakes than single men, those single men living with relatives consumed better diets. Subjects without formal education had the poorest dietary intakes while subjects with high school education tended to consume the best diets.

Reid,⁴⁷ in a survey of 50 non-institutionalized elderly living in Guelph, Ontario, found that only ten percent of the subjects consumed diets that met the 1964 Canadian recommended nutrient intakes¹⁰. Mean caloric and nutrient intakes for elderly males and females are presented in Table 2.4.

^aMonagle, J. E., personal communication.

Table 2.3: Mean caloric and nutrient intakes for males and females over 60 years of age

Kilocalories and Nutrients	Male	Female
Kilocalories	1,872	1,461
Protein (g)	65.7	53.3
Fat (g)	81.8	60.0
Calcium (mg)	746	554
Iron (mg)	11.5	9
Vitamin A (I.U.)	8,496	6,860
Vitamin C (mg)	62	63
Thiamine (mg)	.99	.77
Riboflavin (mg)	1.44	1.12
Niacin (mg)	12	9.8

Monagle, J. E., personal communication.

Intakes of calories, vitamin A, and vitamin C were most often deficient in the diet. As calorie consumption increased, subjects were more likely to have nutrient intakes exceeding 67 percent of recommended allowances.

Supplementation of the diet did not appear to be effective. Reid found that only four of the 12 subjects consuming supplements raised deficient nutrient intakes to recommended levels.

Table 2.4: Mean caloric and nutrient intakes for elderly males and females, and percentages of diets below recommended intakes

Kilocalories and Nutrients	Mean Intakes				Percent of Diets	
	Males		Female		<100% RDA	<67% RDA
Kilocalories	1,776	± 479 ¹	1,542	± 430	38	20
Protein (g)	69	± 26	55	± 14	18	2
Fat (g)	68	± 23	61	± 21	--	
Calcium (mg)	673	± 314	636	± 253	32	2
Iron (mg)	11.7	± 6.3	8.8	± 2.2	8	2
Vitamin A (I.U.)	5,943	±4,447	4,737	±3,578	26	14
Vitamin C (mg)	81	± 46	70	± 39	8	8
Thiamine (mg)	1.05±	.41	.87±	.21	34	-
Riboflavin (mg)	1.72±	.6	1.37±	.5	44	-
Niacin (mg)	14.2 ±	4.0	12.6 ±	3.7	8	-

1. Standard deviations

Reid, D. L., 1975.

A relationship was found between income and diet. Subjects with greater financial resources consumed a wider variety of foods and consumed nutritionally superior diets.

Johnson³⁶ surveyed 74 homebound individuals who were unable to prepare their own food. Results from dietary histories showed that only 15 percent

of the subjects met the recommended allowances¹⁰ for calories and eight nutrients. Greater than two-thirds of the group were below the recommended calorie intake for people of their age and weight. Forty-five percent did not meet vitamin A recommendations, 39 percent did not meet recommendations for iron, and 31 percent were below recommendations for vitamin C. A relationship between age and nutrient intake was found. Subjects over 80 years of age were more likely to consume diets deficient in total nutrient intake than subjects under 80. Daily mean caloric and nutrient intakes for elderly males and females are presented in Table 2.5.

Miles⁴⁶ examined three-day food records of 106 elderly subjects in a normal care home for the aged in Guelph, Ontario. Dietary intakes of all subjects exceeded recommendations except for the 65 to 74 year old males who were low in calcium. Twenty-three subjects consumed supplements but only one individual raised the inadequate intake of a nutrient to recommended levels of intake. Mean caloric and nutrient intakes for elderly males and females are presented in Table 2.6.

Leichter⁴¹ surveyed 104 single elderly and 23 couples, using the 24-hour dietary recall method. Mean caloric and nutrient intakes for single elderly men and women are presented in Table 2.7.

Mean intakes of individual nutrients were comparable to or greater than recommended allowances¹⁵ for both single men and women⁴¹. Mean caloric intakes were below the levels recommended by the Canadian Dietary Standard¹⁵. Single men consumed greater amounts of calcium as compared to married men. Single women consumed more calories, calcium, thiamine, and riboflavin than married women. The percentages of individuals with "inadequate" intakes, according to Nutrition Canada¹⁶ standards are presented in Table 2.8.

Table 2.5: Average daily caloric and nutrient intakes for a group of elderly males and females and percentages of diets below recommended intakes

Kilocalories and Nutrients	Average Daily Intake	Percent of Diet	
		<100% R.D.A.	<67% R.D.A.
Kilocalories	1,584	67	20
Protein (g)	60.7	18	2
Calcium (mg)	685	28	12
Iron (mg)	7.5	39	12
Vitamin A (I.U.)	6,245	45	23
Vitamin C (mg)	42.8	31	19
Thiamine (mg)	.7	25	7
Riboflavin (mg)	1.3	19	4
Niacin (mg)	9.1	7	4

Johnson, B., and Feniak, E., 1965.

Table 2.6: Mean caloric and nutrient intakes for elderly males and females

Kilocalories and Nutrients	Males		Females	
Kilocalories	2,091	± 365	1,989	± 389
Protein (g)	74	± 14.5	68	± 14.9
Fat (g)	89	± 18	83	± 20.5
Calcium (mg)	816	± 323	817	± 348
Iron (mg)	11.7	± 2.49	10.6	± 2.33
Vitamin A (I.U.)	5,607	± 1,503	5,437	± 1,864
Vitamin C (mg)	78	± 30.8	94	± 38.9
Thiamine (mg)	1.14±	.29	1.06±	.23
Riboflavin (mg)	1.99±	.53	2.02±	.61
Niacin (mg)	12.96±	4.06	12.31±	3.07

1. Standard deviations

Miles, E., and Chapple, D. J., 1975.

Table 2.7: Mean caloric and nutrient intakes for single elderly men and women

Kilocalories and Nutrients	Male	Female
Kilocalories	1,867 ± 648 ¹	1,449 ± 495
Protein (g)	73 ± 33	62 ± 38
Fat (g)	81 ± 44	60 ± 25
Calcium (mg)	859 ± 538	671 ± 381
Iron (mg)	11.1 ± 6.9	9.4 ± 5.6
Vitamin A (I.U.)	5,150 ± 4,476	5,320 ± 5,295
Vitamin C (mg)	65 ± 61	87 ± 68
Niacin (mg)	15 ± 9.1	12.1 ± 5.6
Riboflavin (mg)	1.7 ± .9	1.8 ± 1.6
Thiamine (mg)	1.0 ± 5	.9 ± .5

1. Standard deviations

Leichter, J., et al., 1978

Table 2.8: Percentages of single elderly males and females with "inadequate" intakes according to standards developed by Nutrition Canada¹⁶

Nutrient	Male (%)	Female (%)
Protein	4	7
Calcium	10	16
Iron	18	24
Thiamine	14	16
Riboflavin	4	7
Niacin	28	33
Vitamin C	16	7

Leichter, J., et al., 1978

Thirty-five percent of all subjects were on special diets of which about one-third were diabetic diets. Fifteen percent of all subjects consumed vitamin supplements. The effect of either factor on nutrient intake was not reported.

Several Canadian surveys^{a,16,36,56} have indicated that elderly males and females are not meeting recommended intakes¹⁵ for calcium and thiamine. Males and females in other surveys^{41,46} did not meet recommended intakes¹⁵ for thiamine. Intakes of calcium and thiamine are consistently inadequate in the diet of elderly Canadians.

2.3 Dietary intake surveys of the elderly in other countries

Major nutritional surveys of the elderly have been conducted in foreign countries, especially in the United States and Britain. These surveys are of interest as they indicate the different cultural and social

^aMonagle, J. E., personal communication.

factors that may influence the quality of the diet of the elderly.

The Department of Health and Social Security¹³ in the United Kingdom conducted a major nutrition survey of the elderly in 1973. Dietary records were kept by 879 men and women over the age of 65. A broad range of social and economic variables was examined in relation to dietary intakes. Results indicated that quality of diet was affected by age. In both sexes, 65 to 75 year olds consumed better diets than those over 75. Mode of living affected the nutrient intakes of single men over the age of 75. This group had poorer dietary intakes than those men living with spouses or relatives. The average intake of nearly all nutrients was close to recommended intakes¹⁴ but a wide range of intakes was reported. The panel suggested some malnutrition does exist in the elderly population. Mean calorie and nutrient intakes for elderly males and females are presented in Table 2.9.

The Ten State Nutrition Survey⁶⁶ in the United States found that persons over 60 years of age were at nutritional risk. A wide range of intakes was observed for most nutrients and many subjects consumed less than survey standards. The Ten-State standards for calorie and dietary intakes approximated those values set in the 1968 American Recommended Dietary Allowances²⁴. Calorie intakes did not meet survey standards for males and females. Iron and protein intakes were low for women. The survey was unable to find any relationships between adequacy of diet and income. Mean calorie and nutrient intakes for males and females are presented in Table 2.10.

Table 2.9: Mean caloric and nutrient intakes for elderly males and females according to age

Kilocalories and Nutrients	Males		Females	
	65 - 74	75 and over	65 - 74	75 and over
Kilocalories	2,344	2,103	1,787	1,628
Protein (g)	74.6	67.6	59.2	53.6
Calcium (mg)	910	880	800	730
Iron (mg)	12.2	10.9	9.4	8.5
Vitamin A (I.U.)	3,790	3,650	3,420	2,960
Vitamin C (mg)	43	38	40	34
Thiamine (mg)	1.1	.9	.8	.7
Riboflavin (mg)	1.6	1.4	1.3	1.1

Department of Health and Social Security, 1972.

Table 2.10: Mean caloric and nutrient intakes for males and females

Kilocalories and Nutrients	Male	Female
Kilocalories	1949	1412
Protein (g)	80.1	59.5
Calcium (mg)	736	568
Iron (mg)	13.1	9.6
Vitamin A (I.U.)	4979	5172
Vitamin C (mg)	59	67
Thiamine (mg)	1.14	.86
Riboflavin (mg)	1.76	1.40
Niacin (N.E.)	19.06	14.72

Ten State Nutrition Survey, 1972.

The San Mateo⁶³ nutrition survey was a 14 year longitudinal study initiated in 1948. Nutrient intakes of 577 subjects over the age of 50 were recorded using a seven-day food record and a dietary history interview. During the study, four separate dietary surveys were administered. Information on nutrient intakes, disabilities and illnesses were obtained for 141 of the 577 original subjects at the completion of the study.

Men and women significantly reduced their food intake after 75 years of age. Calorie consumption decreased with increasing age, but intakes of

animal protein remained constant with age. Mean intakes were found to be adequate for most nutrients although some subjects had intakes below two-thirds of the recommended levels²⁴. Individual intakes did not reveal a consistent trend over the four separate surveys. Percentages of 141 subjects with nutrient intakes below two-thirds of recommendations²⁴ are presented in Table 2.11.

Table 2.11: Average percentage of diets below two-thirds of recommended levels over four surveys for 141 elderly subjects according to sex.

Calories and Nutrients	Male (%)	Female (%)
Calories	9	9
Protein	7	8
Calcium	16	41
Iron	2	6
Vitamin A	16	23
Vitamin C	18	19
Thiamin	7	5
Riboflavin	5	10
Niacin	52	60

Steinkamp, R. C., et al., 1965.

Eighty of the 141 subjects examined in the final survey consumed vitamin and mineral supplements. Twenty-seven of these individuals had adequate diets and did not need supplementation.

The American^{63,66} surveys revealed that calcium intakes of the elderly

did not meet recommended intakes. Thiamine intakes were inadequate in American⁶⁶ and British¹³ surveys. These results are similar to Canadian surveys and suggest that dietary inadequacies may originate from common nutritional problems of the elderly in all countries.

2.4 Nutrition problems of the elderly

Natural changes occurring with age may interfere with food intake³³. The loss of teeth and diminishing senses of taste and smell may inhibit the consumption of an adequate diet. Sensory losses may make food unattractive and monotonous. Loss of teeth or poorly fitting dentures may lead to a diet high in carbohydrate and low in protein.

Processes that are basic to the digestion and absorption of nutrients are impaired during aging³³. These processes include atrophy of the salivary glands, a reduction in the secretory ability of the digestive glands, and decreased production and release of bile from the liver. These changes may directly affect nutritional requirements for specific nutrients.

A gradual reduction of basal metabolism occurs with increasing age⁵⁹. As well, McGandy⁴⁵ has reported a tendency for people to reduce physical activity as they become older. These two factors indicate a decreased need for calories for the elderly. Results of several studies^{a,5,13,60,63} have indicated that overall calorie consumption tends to decrease with increasing age. Macleod⁴³ suggested that differences in energy intake attributed to age and sex may be caused by differing body sizes and composition. Macleod, using a seven-day dietary record, measured intakes of energy, protein, sucrose, carbohydrate, and fat for 77 elderly men and 187 elderly women living at home. All subjects were found to have decreased their energy intakes with increasing age. Men consumed more energy than women, but

^aMonagle, J. E., personal communication.

when intakes were expressed on the basis of lean body mass, these apparent differences in energy consumption disappeared.

A failure to adequately decrease calorie consumption with increasing age often leads to obesity³³. Nutrition Canada¹⁶ found that the elderly had the highest proportion of obese subjects in all age groups.

Nutrition of the elderly may be affected by increasing disabilities that occur with increasing age²³. Akhtar² surveyed a random sample of 808 people, 65 years of age and older. Results indicated that the occurrence of disability increased from 12 percent for those aged 65 to 69, to more than 80 percent for those over 85 years of age. Akhtar defined disability as "the inability to live at home without help". According to his definition disability includes abnormalities in one or more of five areas; mobility, domestic care, self-care, psychiatric care, and continence.

In 1962, Stanton⁶⁰ conducted a dietary study of 60 women aged 70 to 94 years who were living alone. Seven years later a follow-up study was carried out on 22 of the original 60 subjects. A comparison of dietary intakes from both studies indicated that nutrient intakes for those subjects who had retained good health did not change over the seven year period. Subjects whose health had declined showed a 17 percent decrease in calorie intake and a 20 percent decrease in protein intake. During their eighth decade a large proportion of the elderly are affected by increasing physical and mental disabilities. Stanton suggests that these disabilities have a major influence on nutrient intake.

Caird,⁸ using a seven-day dietary history and a 24 hour recall, interviewed 264 old people living at home. Indices of malnutrition were constructed from the number of nutrients taken in amounts less than