CLIENT ACCEPTANCE OF FROZEN HOME-DELIVERED MEALS

by

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INTRODUCTION

Home-delivered meals is a federally supported feeding program for the elderly, Title VII of the Older Americans Act authorized hy P.L. 92-258 in 1972 (1). The program was designed to meet the nutritional and social needs of persons 60 years of age or older who could not afford an adequate diet, were not able to prepare adequate meals, had limited mohility, or were isolated and therefore lacked incentive to prepare a meal. The 1978 Amendment to the Older Americans Act, P.L. 95-478 (2), consolidated Social Services (Title III), Multipurpose Senior Centers (Title V), and Nutrition Program (Title VII) under Title III. This consolidation eliminates the nutrition program and makes nutrition services a component of the Comprehensive and Coordinated Services Delivery System. According to Title III (2), nutrition services programs should provide home-delivered hot, cold, frozen, dried, canned, or supplemental foods once a day, five or more days a week.

According to a National Report hy the U.S. Department of Health and Human Services (3), the home meals program is expanding, and as it does, the informal, highly personalized approaches that worked well for a small scale effort, are becoming increasingly inadequate. Osteraas et al. (4) stated that the majority of meal plans are structured somewhat inflexibly on the daily delivery of five hot meals per week which could limit efforts to provide appropriate nutritional services and to avoid institutionalization. According to the American Dietetic Association (ADA) (5), in order for a community-hased healthcare program to

succeed, programs that operate only on weekdays need to find a way to ensure weekend meals for people who have no other source of food. Some individuals may require a combination of hot meals and frozen meals. Also, significant cost savings may be realized through assessment and provision of the proper level of service. Frozen food may allow alternate day or every third day delivery of meals.

In 1982, 11.6 percent of the population was elderly. The Census Bureau estimates that this percentage will increase to 13.1 percent by the year 2000 and to 21.7 percent by the year 2050 (6). According to the American Dietetic Association (5), the 75 or older age group will increase more than four times faster than the under-65 age group. During the next nine years, the number of elderly over 65 years of age will more than double; and during the next 14 years, the number of elderly will quadruple. The older population will continue to increase at a phenomenal rate into the middle of the next century.

In a national report by the U.S. Department of Health and Human Services (3), nearly all the home-delivered meal providers believed that the unmet need for home-delivered meals was substantial, and that if their funding were doubled, the caseload could justifiably be expanded. According to the report, 54 percent of the providers in the study rely on volunteers for the delivery of home meals. Volunteers are hard to recruit and retain due to a number of factors, two of which are the rising cost of gasoline and the limited amount of mileage reimbursement providers can afford to pay them.

Increased attention has been focused on the costs of public

feeding programs under a federal government intent on decreasing social program expenditures and controlling a runaway hudget deficit (6). The estimation was made that the elderly feeding programs are actually reaching as few as 20% of the elderly needy at the current time.

Ohjectives

The purpose of this research is to determine if frozen home-delivered meals are an acceptahle alternative to hot home-delivered meals. Specific ohjectives of the research are to:

- .compare the hot and frozen home-delivered meal acceptance ratings, and
- .evaluate frozen home-delivered meals for cost efficiency.

Definitions

The following definitions were used for this research:

- .elderly - for the purposes of Title III meals, anyone over age 60.
- .nutrition site - any puhlic or private facility that serves Title III congregate and home-delivered meals and provides social supportive services.
- .congregate meals - a government funded feeding program for the elderly which provides meals and social interaction at a nutrition site. Recipients are not charged for meals.
- .home-delivered meals - a government funded feeding program for the homebound elderly. Recipients are not charged for meals.
- .Meals-on-Wheels - a meal program which relies primarily on

volunteers. Anyone is eligible to receive meals and recipients are charged a sliding fee based on their ability to pay.

.preference - an expression of degree of liking, a choice of one object over others.

.acceptance - an experience characterized by a positive attitude or actual utilization (eating).

.consumption - amount of food eaten.

REVIEW OF LITERATURE

Older Americans Act

Title VII

The Nutrition Program for Older Americans, Title VII of the Older Americans Act, was authorized by P.L. 92-258 in 1972 (1). The program was designed to meet the nutritional and social needs of persons sixty years of age or older who can not afford an adequate diet, are not able to prepare adequate meals, have limited mobility, or are isolated and therefore lack incentive to prepare and eat a meal alone. Nutritionally sound, low cost meals are provided in strategically located senior centers and other public or private facilities with social supportive services including outreach, escort and transportation, health services, information and referral, health and welfare counseling, and nutrition and consumer education.

Title III

The 1978 Amendment to the Older Americans Act was P.L. 95-478 (2). The amendment consolidated Title III (Social Services), Title V (Multipurpose Senior Centers), and Title VII (Nutrition Program) under one program, Title III, eliminating the nutrition program. Nutrition services then became a component of the Comprehensive and Coordinated Services Delivery System. The amendment also established separate authorizations for congregate and home-delivered meals.

Elderly Participation

In 1982, 191 million meals were served to 3.4 million elder-

ly persons through federal programs according to a national report hy Kirschner Associates (7). Estimates are that programs are reaching as few as 20 percent of needy elderly. In the Kirschner Report, 96 percent of all home-delivered meal clients and 78 percent of all congregate meal clients were from priority target groups (low income and minority groups) and 75 percent of both groups lived on less than $10,000 a year.

According to the Census Bureau (6), in 1980 32.6 million adults were over the age of 60, and in 1982, 11.6 percent of the total U.S. population was elderly. Estimates hy the Census Bureau indicated this percentage will increase to 13.1 percent hy the year 2000, and to 21.7 percent hy the year 2050. The American Dietetic Association (ADA) testified that during the next nine years, the numher of elderly over 65 years of age will more than douhle, and hy the year 2000, the number of elderly will quadruple (5).

Financial Costs of the Nutrition Program

Increased attention has been focused on the costs of puhlic feeding programs under a federal government intent on decreasing social program expenditures and controlling a runaway hudget deficit (6). In fiscal year 1981, $295 million in federal money was spent on congregate feeding programs for the elderly, and $55 million was spent on home-delivered meals programs. In fiscal year 1982, those figures were $286 million and $57 million respectively. The national average cost for congregate meals and home-delivered meals respectively were $2.45 per person and $2.35 per person in 1982, and for each, the federal government contri-

huted $1.79.

The cost of all federal programs for the elderly during the 1982 fiscal year was $210 billion, accounting for approximately 28% of total federal expenditures. For fiscal year 1983, the congregate and home-delivered meals program had a combined total increase in federal appropriation of $37 million (6).

Nutritional Benefits for the Elderly

Title III meals must provide one-third of the Recommended Daily Allowance (RDA) for persons aged sixty and over (2). Kohrs (8) found that the majority of meals provide more than this amount for many nutrients and concluded that the Title III Nutrition Services Program is associated with improvement in the nutritional status of the elderly.

In a second study, Kohrs (9) suggested that a meal program can improve nutritional health of the elderly, especially those at risk of vitamin A and C deficiencies. Kohrs cited a report on the sociological impact of the congregate meal program in Central Missouri which showed that one-fourth of the clients believed their health was improved by participation in the program; none reported that health declined as a result of involvement in the program.

Schlenker (10) stated nutrients provided by the meal programs are commonly over one-third the RDA requirements for protein, calcium, phosphorous, vitamins A and C, riboflavin, and iron. Zinc was the nutrient most frequently below 33% of the RDA. Title III clients consumed better diets on days that included a site meal and had better diets than non-participating neighbors

of similar age and socioeconomic status (11).

Federally Supported Nutrition Delivery Systems

Congregate Meals

According to a report prepared by Kirschner Associates (7), the central activity of the nutrition program is a congregate dining service. Nutritionally balanced meals and opportunities for social interaction are provided daily in meal sites located throughout the country. These sites are located in a variety of settings: community centers, town halls, store fronts, church buildings, school cafeterias, high rise apartment complexes, and other facilities. At the end of fiscal year 1976, 6,672 sites were in operation with approximately 1,723,000 clients and an average of 257,092 meals served daily. Participants may contribute to the cost of their meal if they wish although no income guidelines have been established. The investigators of the Kirschner Report found that sanitation and food temperature control standards at the sites were not being met consistently, that certain projects were serving food which could be considered potentially unsafe to eat, and that a large number could and should improve their basic sanitation practicies.

The Kirschner Report found that nearly two-thirds (2000) of the sampled clients have annual family incomes of less than $4000, and one-fourth belong to an ethnic minority. Clients had a wide range of attendance patterns, varying from daily to less than once a month, and the majority attended once a week or more. Site records revealed an average attendance rate of two to three days per month for all sample clients. Burkhardt et

al. (12) found the most important variables affecting attendance at congregate nutrition sites included: type of food preparation, type of huilding where the site is located, amount of suggested contrihution, and competition from other nutrition sites and other programs such as Meals-On-Wheels.

Home-Delivered Meals

The idea of sending hot meals to homes of "invalids" hegan in 1905 with the "Invalid Kitchen of London" and spread to the United States in 1954 when a program duhhed "Meals-on-Wheels" was started in Philadelphia (13). Before the federal estahlishment of home-delivered meals, Meal-on-Wheels was a primary distributor of home-delivered meals to the elderly. The program functions primarily through volunteer efforts and donations.

The 1978 amendments to the Older Americans Act (2) estahlished federal funding for home-delivered meals. The nutrition services program must provide home-delivered hot, cold, frozen, dried, canned, or supplemental foods once a day, five or more days a week, and meals must provide one-third of the daily RDA. Each area agency must give consideration to using organizations, such as Meals-on-Wheels, that have proven ahility to provide home-delivered meals efficiently and reasonahly.

According to a national report (3), the home-delivered meals program is shaped hy local influence and is generally run hy individuals who do not have professional training in foodservice hut who know their communities well and have acquired much on-the-joh training. A numher of prohlem areas associated with the operation of home-delivered meals programs were identified, such

as:

- a significant proportion of home-meal clients receive no in-home services heyond the home-delivered meal;
- a significant proportion (25 percent) of clients are clearly not homebound;
- outreach efforts which emphasize other service programs for the elderly are sporadic and not usually ofmuch consequence;
- client eligihility assessment practices aretypically conductedona quick and informal basishyindividuals without healthcare training;
- voluntary contrihutions for meals generate little income and contain considerable inequities because thepoorest contrihute more proportionately than those who are financially hetter off;
- communication among directors of home meal programs is infrequent; and
- meal preparation and delivery systems are often notahle to assure the delivery of hot, nutritionally sound meals.

The investigators (3) reported that hy fiscal year 1980, home meals accounted for expenditures of $53.5 million, close to 20 percent of all federal nutrition program expenditures. Home meal clients tend to he very old (47 percent over age 80), live alone, and female; and ethnic minorities accounted for 24 percent of clients. Most home clients had incomes at or near supplemental security income elihility levels. Forty-six percent of clients in the report had heen receiving home meals for over a year, while 30 percent had heen receiving meals for six

months or less. The majority of clients receive one meal a day, at or around noon, five days a week, yet only 50-60 percent of clients were ready to eat the meal as soon as it arrived. One-half of the programs relied primarily on volunteers for delivery of home meals.

Serious nutritional problems and nutritional vulnerahility of the elderly emphasize the importance of trained staff at nutrition sites (5). Although foodservice and sanitation practices were listed as the most frequent training area for staff, nutrition service directors say that additional training is needed in this area. A major cause of food safety problems for home-delivered meals appears to he overlong food holding due to inadequate planning, packaging, and transportation constraints.

Home Delivered Meals Studies. In 1971, the British Department of Health and Social Security hecame concerned that Meals-on-Wheels was a "second hest" service because it involved an interval between cooking and service which would normally be unacceptable with the major prohlems identified as time hetween cooking and consumption, temperature control during delay period, and inevitahle loss of three ohvious requirements of the meal: palatahility, acceptahility, and nutritonal value (14). A study was conducted to determine the practical and nutritional aspects of the use of frozen meals in a Meals-on-Wheels service. The top tray system, composed of end-cooked individual pack frozen meals produced hy Smethursts Food, was implemented and researchers found that recipients were extremely pleased with frozen meals. The recipients helieved the presentation was superior to "home-

style" cooked meals hecause component parts of the meals were in separate parts of the container. When compared to hot meals, frozen meals had very similar plate waste. The use of pre-packed frozen meals offered advantages over conventionally prepared meals in terms of lahor costs, hygienic distribution, and certain aspects of management, and researchers concluded frozen foods were satisfactory from hoth nutritional and catering standpoints.

Cairns and Caggiula evaluted the attitudes of recipients of home-delivered meals and found recipients responded favorahly (13). Sixteen percent of responses in a selected program indicated the temperature of hot foods was a problem and of the five programs studied, all had a concern ahout meals heing delivered at correct temperatures.

The National Aeronautics and Space Administration (NASA) (15) attempted to develop a wider range of alternatives in home-delivered meals in the mid 1970s. The specific purpose was to develop and test a pleasant tasting, easily transportahle, shelf-stahle meal system which required few utensils and minimal preparation skills and which could complement existing congregate meal and Meals-on-Wheels programs. NASA tested a series of canned and freeze-dried meals on 150 elderly volunteers. Frozen foods were excluded hecause specifications noted that all food items must have a minimum shelf life of one year. Only 30 percent of participants had heen clients of home-delivered meals prior to the study and anyone on a restricted diet was excluded. At the conclusion of the project, 75 percent of the participants in the NASA program said they would continue huying the meals if costs were comparahle to that of other foods they purchased.

The Catering Research Unit at the University of Leeds collaborated with the Department of Social Services and the Nuffield Centre for Health Service Studies in Leeds in a project aimed at developing a number of alternative methods for providing supplementary nutrition to elderly people in their own homes (16). The investigators believed elderly people would welcome a meal delivery service that would have more flexibility in terms of meal times and allowed those who were interested and capable to use their own skills in preparation of a meal. Three food options selected for the study were individual frozen meals, sterilized pouch food, and raw ingredient packs, and all three were well accepted by the elderly who appreciated being able to cook meals at their leisure.

According to a national report compiled by the U.S. Department of Health and Human Services (3), nutrition providers' asserted that home meals improve diet and health of program clients, provide important social contact, are influential in helping older people stay out of nursing homes, and reduce dependency by enabling home bound elderly to make fewer requests of family or friends. The investigators emphasized that home delivered meals could be generating unnecessary dependency among individuals with limited mobility because once individuals are accepted into the program, they have almost no alternative except to receive five hot meals a week. Most clients are not given the option of receiving canned, frozen, dried, or supplemental foods which could free them to go out occasionally for meals, and a lesser level of intervention such as a combination of hot and frozen foods might be more conducive to the objectives of avoid-

ing institutionalization and maintaining as much self-sufficiency as possihle. The investigators reported increasing difficulty in keeping food sufficiently hot, therehy raising issues of nutritional value and safety to clients. A major factor in the temperature of the food was the length of time taken to prepare, package, and deliver meals.

Turner and Glew (17) conducted a study to determine nutrient content of frozen home-delivered meals which were supplied hy two manufacturers. The investigators found individual frozen meals provided the elderly with a wide variety of hot, more attractively served meals. The frozen meals had a lower weight than hot meals and provided less nutrients than freshly prepared meals.

Lyons found frozen meals were less well received in a group of older people. The participants resented the effort involved in reheating the food (18).

Osterraas et al. (4) tested frozen meals as an alternative meal system. The frozen meal system was implemented hy the research team and consisted of three phases: estahlishment of haseline information on clients' attitudes toward fresh food, frozen food (not home-delivered meals), and hot home-delivered meals; short term reactions to the frozen meals system; and long term reactions to the frozen meals system. The food was rated for five attributes: taste, texture, appearance, convenience, and healthfulness. The investigators found no predisposition to regard frozen foods as inferior to hot home-delivered meals. The long term assessment (20-35 days) indicated that 80 percent rated the frozen meals either "good" or "excellent" on all five attrihutes and when asked directly which they preferred, the

majority of respondents regarded the frozen meals as equal to or superior to hot meals. A cost comparison of frozen and hot home-delivered meals was performed and investigators identified a savings of 16% in the system based on weekly delivery of five frozen meals as compared to daily delivery of hot meals. The alternative meal system also maintained clients' usual social patterns.

Elderly Food Acceptance and Preference

Anderson (19) reported a common belief that as time goes on, the diet of the elderly person becomes soft, high in carbohydrates, and low in protective foods such as meat and fresh fruits and vegetables because foods that are hard to chew are omitted from the diet. However, her study found that elderly consume less bread and more crisp, raw vegetables in later years. The findings contradicted common belief and suggested eating patterns of the elderly may be easier to change than previously thought.

Clancy (20) studied the relationship between media and food habits of the elderly. She concluded that food habits of the elderly are related to television viewing and social participation and there are undoubtedly other environmental influences such as education and income.

Harrill et al. (21) observed calcium intake of sixty elderly women and found level of calcium intake was not significantly related to age, state of dentition, number of years of education, appetite, foodservice satisfaction, or changes in dietary patterns. They concluded appropriate nutritional care of the aged can be maintained if nutritionally adequate diets are offered

that include foods to which the elderly are accustomed.

Bilderbeck et al. (22) reported many health educators believe changes in eating habits of the elderly, as well as changes in foods, are not always welcome because food habits are firmly established by this age. He found, however, that every elderly individual participating in the research had made some alteration in food habits with over half the sample changing the type of bread they used. Health was the main reason given by 26 percent who changed to a higher fiber breakfast cereal and by 38 percent who changed from whole milk to non-fat dried milk. There was enhanced desire for foods which were convenient to use.

Schafer and Keith (23) reported the elderly follow a traditional food pattern and are less likely to seek information about food. They found retirement results in a slight increase in importance of the causal information sources, those sources of information that are not directly sought after but may influence food decisions, such as newspaper, magazine, television, and radio advertisements. The investigators recognized the general influence of television and radio in regard to food decisions.

Krondl et al. (24) investigated food use of non-institutionalized elerly and observed differences in eating patterns of men and women, with women showing greater variety and significantly higher intakes of fruits and vegetables. Individuals who were active both socially and physically were found to use a greater variety of foods.

In a research review by Roe (25), it was stated elderly food preferences are determined by family traditions, ethnicity, and by religious or traditional beliefs. Roe stated that with aging,

rigidity of food hahits usually increases and the familiar food pattern is sought. Other factors that determine food preferences are education, financial resources, living conditions, and medical factors.

Schlenker (26) reported the diet of older people reflects both traditional patterns and general food supply. Older people do try new foods and adapt to changing food situations. She stated older persons prefer foods associated with pleasant experiences or that are related to home or place of origin and that physical changes occuring as a result of both normal aging and degenerative disease influence food hahits.

Interviewing

Interviewing Skills

The interview is actually an oral questionnaire where the subject verhally provides the information in a face-to-face situation (27). With a skillfull interviewer, the interview may be superior to other data gathering devices hecause certain types of confidential information may he ohtained that an individual may he reluctant to put into writing. Interviewers must have a clear conception of information needed. An open form question where the suhject is encouraged to answer in his/her own words at some length will likely provide a greater depth of response hut the closed form question which uses a multiple choice response is easier to record though it may yield more superficial information. Leading questions that unconsciously imply a specific answer must he avoided. An effective interview will reveal feelings and attitudes of the suhject and this is dependent upon

tbe extent to which the interviewer can estahlish rapport. The interview technique is time consuming and one of the most difficult to employ. Ohjectivity, sensitivity, and insight hy the interviewer are crucial.

Interviewing the Elderly

Many problems arise when interviewing the elderly hecause older people must be sought out individually, many of them are in sucb poor health they cannot he easily interviewed, and they may have suspicions and fears of research procedures (28). Havighurst (28) concluded from his Prairie City experience that 75 percent of those over 65 could he interviewed, 10% were too feeble or too ill, and another 10 to 15 percent were physically ahle hut unwilling to he interviewed. Two groups of people were easily interviewed, the upper-middle class and lower-lower class. The upper-middle class tended to he interested in social prohlems and civic welfare and to understood the purposes of the study. The lower-lower class were accustomed to visits from social agency representatives and accepted the interview as a matter of course, and they were prohahly flattered by the attention from the interviewer and glad to have a hreak in a rather monotonous existence. Two groups were likely to refuse heing interviewed, the upper-class widows and lower-middle class women and men. Havighurst concluded that interviewing was more effective than a mail questionnaire in ohtaining information from older people.

According to Schmidt (29), special approaches and instruments are needed for productive interviewing of the elderly. Too many times the elderly are suhjects hut not respondents. The

cardinal rule is "go slow" because the older person may be uncertain about his own ability to respond to unfamiliar demands. These fears are reduced if he has a chance to see the interviewer is not the type of person to embarass him. It is important the respondent observe the interviewer to reduce this fear. In an institutional setting, the interviewer should first function as a participating observer and in a community setting, a preliminary visit and informal interview is helpful. After these preliminaries have been secured, special attention must be given to research instruments which should be short, varied, and clear, employing familiar terms whenever possible. Schmidt stated interviewers should leave the respondent with a sense of accomplishment rather than a reaffirmation of failure. Schmidt identifies six kinds of special challenges commonly encountered when interviewing elderly: intermittent confusion, chronic confusion, dysphasia, problems of sight and hearing, unwillingness, and overprotective nurses and relatives.

Joh (30), sought tape-recorded interviews from 340 elderly persons and found the response rate was best (74 percent) for those living alone, and worst (49 percent) among the institutionalized. He concluded an immediate interview was desirable whenever possible because some elderly changed their minds about being interviewed when appointments were made for the following day or the next week.

Schlenker (31) stated the perceived attitude of the interviewer toward the aged client will be a significant factor in encouraging participation because negative attitudes hinder rapport with the older person and may bias the interview. Schlenker

also stated considering the difficult circumstances under which many elderly are forced to live, it may become necessary to develop rapport in homes that are unbearably hot in summer, unheated in winter, cluttered, unclean, or unpleasant in odor.

Measurement of Food Acceptability

Food acceptability, as defined by Pilgrim (32) is consumption with pleasure, or nutrition of body and soul. This definition encompasses both affective and behavioral responses. Pilgrim stated preference is an important indicator of food consumption and expresses the degree of like or dislike of a specific food item. Preference predicts the average amount of food consumed and the proportion of persons accepting a food. Pilgrim grouped acceptance measurements into three classes: attitudes, sensory tests, and consumption. He stated (33) food consumption is predictable and determined largely by food preferences which may be determined by the hedonic scale method which measures degree of liking.

Pilgrim (33) found food preferences fall into distinct patterns and similar food preference results were obtained from persons with similar background or for foods prepared in a similar manner. He found soups and vegetable preference increased with age while beverage, cereal, dessert, and fruit preference decreased with increasing age.

Preference Testing

Ellis (34) reported the most common methods of measuring preference as ranking, paired comparison, and rating scales.

Ranking methods are easily applied and interpreted but do not measure degree of preference difference between samples. The paired comparison test is simple to use and easily applied. Rating scales are most widely used with the best known rating scale being the nine point hedonic scale developed at the U.S. Army's Quartermaster Corps for the purpose of determining preferences as predictors of army food acceptability.

Hedonic Scale. With hedonic scales, subjects are asked to rate a number of foods using food name only, on a nine-point scale ranging from "like extremely" through "neither like nor dislike" to "dislike extremely" (32). The number nine is assigned to the phrase "like extremely and successive integers are assinged to other phrases down to one which applies to "dislike extremely."

Ellis (34) stated variations of the hedonic scale include five, six, seven, and eight point scales. Researchers have determined longer scales up to nine intervals tend to be more sensitive to preference differences, that elimination of the neutral category was beneficial, and that an equal number of positive and negative intervals is not essential. A problem with hedonic scales is respondents tend not to use extreme categories because they fear if they use it to rate a food item, and another food item is presented they like even better, then they have no category available to assign it (35). Hedonic scales are used to study both food preference and food acceptability because of their simplicity and reliability. A good hedonic scale should be easy to administer, understand, and analyze. The verbal labels

used in hedonic scales often pose problems for children, the visually impaired, those with reading difficulties, and with geriatric clients and therefore, a variety of facial and/or pictorial scales have been developed.

Facial Hedonic Scales. Ellis (34) reported that descriptive phrases may be ambiguous and problems in semantics have occured with use of descriptive rating scales. A modified hedonic method, the facial hedonic, minimizes confusion due to termi nology and is also referred to as the "smiley" rating scale. The faces depict degree of pleasure or displeasure experienced by the subject and scales may consist of five, seven, or nine faces. Facial hedonics have widespread use and are considered to be reliable and sensitive according to Ellis. Facial hedonic scales were used by Comstock et al. (36) to study food preferences of kindergarten and elementary children.

Assessment of Food Consumption

Consumption is the ultimate criterion of liking and the nutritional quality of food becomes secondary if the food is not consumed (35). Consumption is a difficult, time-consuming, and costly way to measure food likes and dislikes.

Weighed Plate Waste. Individual weighed plate waste provides a reliable estimate of consumption of food (36). Major disadvantages of this method are: a great deal of space is required for holding trays, scraping food, and weighing waste; the method is time-consuming and costly; and it is impractical to measure individual plate waste for more than 100 individuals at a

meal. Because of these disadvantages, alternate strategies of plate waste are heing used such as aggregate measure, visual estimation, and self-reported consumption.

Aggregate Plate Waste. In this method, waste from all individuals is scraped into separate containers and mean or percent waste is calculated for all participants for each food item served (36). Individual data on participants are not ohtained. Aggregate measures simplify data collection hecause food waste is weighed only after all scraping is completed. This method is much faster than individual plate waste and still provides accurate percentages of total waste. In some situations, aggregate plate waste may not provide enough information, for example, if plate waste is aggregated across all food items, it is impossible to tell which items were responsible for changes in amount of plate waste. Aggregate waste measurements will not indicate differences in plate waste by sex nor will they correlate food preferences with food waste.

Ohservational Plate Waste. In observational plate waste, ohservers rate each food item on each tray of food as the tray is turned in at the end of a meal (36). The ohservers are trained to recognize average serving sizes of each food item and to make judgments as to proportion left on the plate.

In a study hy Comstock (36), researchers visually estimated plate waste for each child who ate lunch hy assigning one of the following codes to individual food items: 5, if the full portion of food remained; 4, if nearly a full portion remained hut at least one hite was eaten; 3, if three-fourths of the portion

remained; 2, if one-half the portion remained; 1, if one-fourth the portion remained; and 0 if none remained. Trained visual collectors were able to make visual estimations of plate waste that correlated highly (0.93) with percentage waste.

Self-reported Consumption. This method of measuring plate waste requires participants to rate their own trays from memory soon after leaving the cafeteria (36, 37). Head et al. (37) recommended using ratings by children as a measurement of plate waste when accuracy of individual weighed plate waste is not needed. Head found there was a positive relationship between self-reported consumption and actual consumption of school children.

Comstock (36) found self-reported consumption ratings correlated highly with percent waste but not as high as visual estimation. Comstock reported indirect measures of plate waste (self-reported consumption) provide data on individuals and offer savings in time and space but more information is needed regarding accuracy of these measurements.

Foodservice Systems

Conventional System

According to Rinke (38), a traditional conventional foodservice system is an on-premise production of meals from raw food, either centralized in a main kitchen or decentralized in ward kitchens. Conventional systems are now thought of as those foodservices that prepare meals on-premise prior to each meal and do not use primarily convenience foods. Food is assembled and

delivered to clients by three methods: decentralized, centralized bulk, and centralized.

Unklesbay (39) identified a conventional foodservice system as one which uses some prepared food items, such as bread, ice cream, and frozen or canned vegetables, but relies on preparation from raw food materials, especially for entree items. Since this system relies on preparation from scratch, it is labor intensive. Realistically, a purely conventional system does not exist since many items such as bread, ice cream, orange juice, and vegetables can be purchased at lower cost than they can be produced from recipes. Matthews (40) stated the conventional system continues to be one of the major types of foodservices in the United States and is traditionally used by most establishments.

Commissary System

Unklesbay (39) described a commissary foodservice system as centralized food procurement and production with distribution of prepared menu items to several remote areas for final preparation and service. Commissary operations acquire food products which have either received no processing or limited amounts of processing. Most food items are completely processed in central production and stored and/or delivered to satellite facilities. Savings by central production can justify expensive equipment needed at satellites (42). Spears and Vaden (41) state commissary systems are adaptable particularly for foodservice operations in unique places such as airline foodservice.

Assembly/Serve System

This system is referred to as either convenience (38) or

assembly/serve (39). Rinke (38) stated in assembly/serve systems, foods are available in various stages of readiness: completely prepared foods ready to serve, completely prepared foods ready to serve after a simple preparation method such as thawing or heating, and partially prepared food items ready to combine with one or more ingredients before heating or chilling. The advantages of assembly/serve systems are lower labor costs and elimination of capital investment for a conventional kitchen which results in overall lower operating cost of foodservice departments.

Unkleshay (39) reported assembly/serve foodservice systems evolved in response to three factors: chronic shortage of skilled personnel available for food production, extensive marketing and distribution systems for frozen food products, and technologic changes within the food processing industry. She identified three market forms of completely processed frozen entree products which predominate in assembly/serve systems as bulk, preportioned, and pre-plated.

Assembly/serve systems do not require highly skilled production personnel because the only labor required before service is for portioning and reheating, and with certain items, these steps can be eliminated (43). The primary purpose of assembly/-serve systems is to provide food ready for service while minimizing labor usage (41).

Ready Prepared System

Cook/chill. Rinke (38) stated cook/chill systems are based on two premises: refrigerated food is less perishable and re-

tains nutrients longer than hot food, and because holding time for refrigerated food is not critical, distribution of refrigerated food carts can begin earlier and be staggered to eliminate peak work loads. Many hospitals have found that cook/chill systems, compared to conventional systems, improve quality of patient meals, increase productivity of foodservice employees, and decrease food and labor costs. Oakleshay (39) identified the cook/chill system as one in which batches of food are prepared daily, chilled in bulk for 24 to 72 hours, individually plated, stored in refrigerated carts, and then reheated usually by microwave.

Cook/freeze. Because of rising costs, many foodservices are producing their own frozen foods by pre-plating, packaging, and freezing conventionally prepared food (38). The cook/freeze system involves on-premise production of food items which are frozen in a form that requires only reheating to be ready for service. Rinke cited the Leeds system, also known as the cook/-freeze system, which was developed by the United Leeds Hospitals in England in which foods are slightly undercooked to allow for further cooking during reconstitution and packed into polyethylene molds that hold six to eight portions. Foods are blast frozen, removed from molds, heat sealed into polyethylene bags, and packaged into boxes for storage. In reconstitution, foods are reheated in forced hot air convention ovens. Rinke cited a study by Bysen which found when food, labor, freezing, and reconstitution costs were combined, the ready food (cook/freeze) system was least costly and the convenience system was most expen-

sive. A major disadvantage of cook/freeze systems is cost associated with a properly equipped test kitchen that can experiment with recipe development, packaging, reconstitution, and freezing systems. Two major problems of the cook/freeze system, according to Rinke, are necessity for high volume to ensure preparation of nutritional and palatable diets at a reasonable cost and for highly qualified food production employees.

Unklesbay (39) stated cook/freeze systems developed in response to a critical shortage of skilled food production personnel and higher labor costs. Doyon (44) identified several advantages of cook/freeze systems over conventional systems such as shortened production time, minimized staffing problems, decreased peak periods of activity, extended product life, minimized waste, and labor savings as much as 46 percent per shift. Patient satisfaction was improved by serving higher quality food at the right temperature.

Hofabauer (45) surveyed cook/freeze systems and identified four basic systems: single portions in two or three compartment trays, single portion trays, multiportion trays, and boil-in-bag meals. Recommended storage times differed from three to fifteen months.

Herz (43) described cook/freeze systems as in-house production of convenience foods. Foods are typically reheated by microwave at point of service (42). According to Spears and Vaden (41), special recipe formulations are needed for many menu items because of changes that occur in freezing.

Microbial Quality. Unkelesbay (39) stated heat processed

menu items must be frozen as rapidly as possible, and hecause many microorganisms found in frozen foods are preserved, precautions must he taken to control microbial growth during freezing and thawing. Food should he reheated to an internal temperature of 73 degrees Celsius. Kerwin (46) concluded meals produced in a cook/freeze system were microbiologically acceptahle for at least 48 hours after removal from frozen storage when stored at 10 degrees Celsius. Storage at 22 degrees Celsius should not exceed six hours after removal from frozen storage.

Bryan et al. (47) tested spoiled frozen dinners prepared hy a caterer and concluded spoilage resulted from failure to freeze prepared meals rapidly, and to reheat frozen foods rapidly to an internal tremperature that would kill vegetative hacteria.

Nutritional Quality. Ang (48) reported a loss of vitamin C during storage of frozen ready prepared foods, which averaged up to 30 percent after six months. In comparison, loss of B vitamins was much lower with an average of five to 27 percent after a storage period of six to nine months. Textural changes in meat and vegetahle products occurred which resulted in toughness and loss of water binding capacity. Klaassen (49) determined that foods prepared in cook/freeze systems were nutritionally sound and comparahle to nutrient quality in foods prepared hy conventional method. Glew (50) reported thiamine and rihoflavin losses were the same using cook/freeze or conventional system and found during a storage period of three to six weeks, nutrient loss was negligihle.

METHODOLOGY

Research Site

Two types of home-delivered meals, hot and frozen, were evaluated hy Title III clients. The study was conducted in a medium sized midwestern city at a senior center funded for food and labor from the North Central Flint Hills Area Agency on Aging. The senior center, one of 36 nutrition centers in the Flint Hills area, produces and serves approximately 75 congregate and 50 home-delivered meals daily.

The director of the senior center is responsihle for overall administration and coordination of Title III meals in the local area and the head cook manages food production and service. Five week cyclical menus are centrally planned at the Flint Hills Area Agency on Aging. Prior to collection of data, approval was sought from the local area agency on aging and the director of the senior center.

The research team consisted of four Institutional Management graduate students; one was research coordinator and three were research assistants. The research coordinator was responsihle for organizing, conducting personal interviews, and recording times and temperatures. The research assistants were responsible for assisting with personal interviews.

Research Design

This study was developed after consultation with the director of the local area agency on aging. The sample consisted of

recipients of hot home-delivered meals from the senior center. The site manager determined through original program eligihility assessment and personal knowledge which clients had the appropriate equipment and desire to receive frozen meals.

Initial contact with eligihle clients was made hy letter which descrihed the research, the research team, and the method of data collection (Appendix A). Follow-up contact was made hy telephone to estahlish rapport with the clients and obtain verbal consent. Consent forms (Appendix B) were mailed to each participant and returned to the senior center hy volunteer deliverers of the home meals.

Clients were interviewed to evaluate hot meals currently received. Self-reporting consumption cards were used for 5 hot meals to indicate the amount of foods consumed. In order to reduce the cost of delivery of hot meals, the center hegan delivery of some frozen meals also in March 1985. Eight frozen meals, two per week, were served to participants over a one month period (Appendix C). Senior center ccoks produced more hot meals than needed and used the excess for frozen meals. The extra meals were placed in aluminum trays and stored in conventional freezers for a maximum of three weeks. Instructions for reheating frozen meals (Appendix D) were developed by the research coordinator. Two of each frozen meal were heated to verify that all foods reached a temperature ahove 160 degrees Fahrenheit in a 350 degrees Fahrenheit oven for 40 minutes. The research coordinator also heated two of each frozen meal in the microwave oven to determine heating time. Each meal lahel wss color coded to indicate the date of intended delivery, and included the date the

meal should be eaten and a list of food items on the plate. With each frozen meal, clients received a bag, containing bread, margarine, milk, tea and coffee bags, sugar, creamer, pepper, and occasionally fruit. The bags were labeled to indicate content and day of consumption (Appendix E). The volunteer drivers placed the bags in the refrigerator and the frozen meals in clients' freezers. Self-reported consumption cards were used for six frozen meals to indicate the amount of foods consumed. Self-reported consumption on the remaining two frozen meals was unavailable. The cards were delivered and picked up from clients by the volunteer drivers. Four weeks after implementation of frozen meals, clients were again interviewed to evaluate the frozen meals. Temperatures were recorded at end of production, beginning of delivery, and at fifteen minute intervals during a one hour delivery route. The final phase of the project involved cost evaluation of the alternative frozen delivery system. Total mileage and container costs were assessed for both hot and frozen meals.

Development of Instruments

Initial Interview

The initial interview guide consisted of twelve questions including multiple choice, forced choice, and open-ended questions. The interview guide was critiqued by Institutional Management students and faculty. Due to possible eyesight problems and nervousness of the elderly in interviews, posters for use as "prompt cards" were developed for the multiple choice and forced choice responses. Four posters were made to indicate the

following:

.poster 1: poor, okay, good;

.poster 2: too much, too little, just right;

.poster 3: overcooked, undercooked, just right;

.poster 4: none, 1/4, 1/2, 3/4, all.

The pilot study was conducted in Manhattan, Kansas. The research coordinator received a list from the senior center director of local elderly people who received home-delivered meals. Clients were contacted by telephone and asked to participate in a ten minute home interview, and ten people agreed. The research assistants were trained in the interview process and assisted the research coordinator in conducting the ten interviews. After all interviews were completed, the interview guide was simplified in terminology and expanded to include additional areas of interest (Appendix F).

Hot Food Interview Guide

The hot food interview guide (Appendix F) consisted of twenty-five questions and was developed by the research team. A rating scale ranging from 1, poor, to 3, good, was used to evaluate flavor, appearance, texture, temperature of food, variety, and convenience. The interview guide also consisted of open ended questions to determine how meals were reheated, stored, and consumed, as well as inquiries concerning advantages and disadvantages of hot home-delivered meals. Data were collected by forced choice questions on the amount of foods consumed, tenderness of the food, amount of food delivered, acceptability of packaging, temperature of foods, and social contact with others.

Demographic information was obtained on clients' age, gender, living arrangements, and length of time they had been receiving home-delivered meals.

Frozen Food Interview Guide

The frozen food interview guide consisted of thirty-five questions (Appendix G). A rating scale ranging from 1, poor, to 3, good, was used to measure flavor, appearance, texture, temperature, variety, and convenience. Data were collected using open-ended questions on how frozen meals were reheated, stored, and consumed, as well as inquiries concerning advantages and disadvantages of frozen meals. The interview guide also consisted of forced-choice questions on the amount consumed, tenderness, amount delivered, acceptability of packaging, temperature after reheating, and delivery patterns of frozen foods. Data were collected on client preference for having hot or frozen meals delivered daily, on weekends, and for emergency meals.

Self-Reported Consumption

An instrument developed by Comstock et al. (36) was adapted to measure self-reported consumption (Appendix H). Clients were asked to rate their food consumption on a six-point scale ranging from "none" to "all", illustrated by a circle completely filled in for "none" and an empty circle for "all." The clients' name and date of consumption were written at the top of the card. Each food item in the meal was listed on left side of the card and clients placed an "X" on the circle on the same line of the food item to indicate the amount consumed. The cards were color coded to correspond to individual days.

Temperature and Time Forms

A card (Appendix I) was prepared for collecting times and temperatures at specific points in the data collection procedure: end of production, beginning of delivery, and four fifteen minute intervals on the one hour delivery route.

Data Collection

Inital Interview

Using the questionnaire developed as the hot food interview guide, each client was interviewed at home by the research team prior to receiving frozen meals. Interviews lasted approximately ten minutes. The research coordinator asked the questions and the research assistant displayed the appropriate response poster and recorded answers.

Self-Reported Consumption Cards

The research team distributed self-reporting consumption cards for hot meals during the initial interview and each client was instructed on how to complete the cards. Volunteer drivers returned the cards to the senior center where they were picked up by the research coordinator. Volunteer drivers also delivered self-reporting consumption cards for frozen meals with the meals. The cards were then collected by the volunteer driver and delivered to the senior center.

Final Interview

Clients were interviewed in their homes after receiving eight frozen meals. Interviews lasted approximately fifteen minutes. The research coordinator asked the questions and the

research assistant showed tbe appropriate posters and recorded answers.

Time and Temperature Measurements

Time and temperature for bot meals were recorded at end of preparation, beginning of delivery, and during fifteen minute intervals on a one bour delivery route. Temperatures for frozen foods were not recorded because meals remained in a frozen state during delivery and were placed in tbe clients' freezer by tbe volunteer drivers.

Cost Analysis

Mileage records for delivery of meals were obtained from tbe area agency on aging for tbe montb prior to delivery of frozen meals and for tbe montb of frozen meal delivery. Costs for aluminum and styrofoam containers and paper bags were also obtained from tbe area agency on aging.

Data Analysis and Design

Programs and routines in the Statistical Analysis System (SAS) were used for all data analysis (51). Preliminary analysis included compilation of absolute and relative frequencies on tbe demograpbic variables.

Means and frequencies were computed for all responses relating to self-reported consumption of hot and frozen food items. Frequencies were also computed for responses related to variables sucb as flavor, appearance, texture, temperature, beating procedures, storage, eating patterns, tenderness, amount eaten, meal delivery patterns, containers, and advantages and disadvantages

of delivery systems.

Means, frequencies, Chi square, and univariate analysis were computed for variables relating to differences between consumption of specified hot and frozen food items. Values were assigned to each response on the self-reported consumption card ranging from 0, none eaten, to 5, all eaten.

Chi square was used to examine relationships between amount consumed and variables such as temperature, appearance, amount received, tenderness, containers, and flavor. Chi square was also used to examine the relationship between delivery system preference (hot vs. frozen) and variables such as appearance, flavor, temperature, amount consumed, tenderness, and containers.

RESULTS AND DISCUSSION

General Information

Demographic information, collected by personal interview, on the clients in the sample is presented in Table 1. Seventy-five percent of the sample was female and the mean age was 82 years with a range of 60 to 96. Forty-six percent of the clients lived alone and 32 percent lived with spouse. The majority (93 percent) lived in a house and the remainder (7 percent) lived in apartments for senior citizens. These results are similar to national findings by Kirschner Assoicates (7) who found that home meal clients tend to be over age 80, female, and live alone.

The majority (54 percent) indicated they did not have regular visitors (at least once a week), but 11 of the 15 did not count clergy or family as "visitors". Only 9 percent of the clients had been receiving home-delivered meals for a period exceeding 48 months. The majority (71 percent) had received home-delivered meals for 6 montha or less and 40 percent had been previous congregate meal clients. Kirschner (7) found 46 percent of clients in a national study had been receiving home meals for over a year, while 30 percent had been receiving meals for six months or less.

Data on Characteristics of Meals

Characteristics of hot and frozen meals are presented in Table 2. When asked to rate the flavor of the meals, approximately 85 percent rated hot meals aa "okay" or "good", and 90

Table 1. Characteristics of sample*

characteristics	N	percent
sex		
male	7	25.0
female	21	75.0
living arrangement		
alone	13	46.4
with spouse	9	32.1
with child	3	10.7
with other family	3	10.7
housing		
house	26	92.9
senior apartments	2	7.1
length of time in program		
1-6 months	15	71.4
13-24 months	3	14.3
25-48 months	1	4.8
over 48 months	2	9.5
previously ate congregate meals		
yes	11	39.3
no	17	60.7
has regular visitors		
yes	12	42.8
no	15	53.6
sometimes	1	3.6
mean age	82	

*Totals may vary due to nonresponses.

Table 2. Results of interviews on characteristics of meals*

characteristics	hot		frozen	
	N	percent	N	percent
flavor				
poor	4	14.4	21	9.5
okay	12	42.8	11	52.4
good	12	42.8	8	38.1
appearance				
poor	1	3.6	1	4.8
okay	10	35.7	13	61.9
good	17	60.7	7	33.3
texture				
poor	1	3.6	4	22.0
okay	11	39.3	4	22.0
good	16	57.1	10	56.0
seasonings added				
yes	21	75.0	19	90.5
no	6	21.4	2	9.5
sometimes	1	3.6	-	-
good variety				
yes	24	85.8	17	81.0
no	2	7.1	2	9.5
sometimes	2	7.1	2	9.5
appropriate containers				
yes	27	96.4	20	95.2
no	1	3.6	1	4.8
degree of doneness				
undercooked	7	25.0	2	9.5
overcooked	-	-	-	-
just right	21	75.0	19	91.5

*Totals may vary due to nonresponses.

percent gave the same ratings to the frozen meals. The relationship between clients' flavor ratings for hot and frozen meals is shown in Table 3. No significant difference ($p \leq .93$) was found. The majority of the clients (96 percent) rated hot meals as "okay" or "good" for appearance. Approximately the same percentage gave s similar rating to the frozen meal appearance. The relationship hetween clients' ratings for hot and frozen meal appearance is shown in Table 4. No significant difference ($p \leq .07$) was found. Approximately 96 percent of clients rated texture of hot meals as "okay" or "good", but only 78 percent gave the same ratings to frozen meals. Seasonings (primarily salt) were added to hot meals hy 75 percent of the clients and to frozen meals hy 91 percent. Clients helieved they receive a good variety in food in hoth types of meals and considered the containers appropriate. Clients were asked to identify the degree of doneness of foods; 75 percent rated hot meals as "just right" and 91 percent gave the same rating to frozen meals. The relationship between clients' assessment of degree of doneness for hot and frozen meals is shown in Tahle 5. No significant difference ($p \leq .04$) was found. Clients tended to give high ratings on characteristics of hot and frozen meals and this could be due to fear that meals would he discontinued if low ratings were given.

Data on Temperature Characteristics of Meals

Temperature of Hot Meals

Data on temperature of hot meals are presented in Tahle 6. When asked if the home-delivered meals were delivered hot, 36

Table 3. Relationship of clients' ratings of flavor for hot and frozen meals*

flavor of hot meals	N	flavor of frozen meals†		
		poor	okay	good
		← % →		
poor	3	-	66.7	33.3
okay	11	-	54.6	45.5
good	5	-	60.0	40.0

*Totals may vary due to nonresponses.

†Analysis of flavor: $\chi^2 = .154$, df = 2, $P \leq .9257$.

Table 4. Relationship between clients' ratings of appearance for hot and frozen meals*

appearance of hot meals	N	appearance of frozen meals†		
		poor	okay	good
		← % →		
poor	0	-	-	-
okay	9	-	88.9	11.1
good	10	-	50.0	50.0

*Totals may vary due to nonresponses.

†Analysis of appearance: $\chi^2 = 3.32$, df = 1, $P \leq .0686$.

Table 5. Relationship between clients' ratings of degree of doneness for hot and frozen meals*

degree of doneness for hot meals	N	degree of doneness for frozen meals†		
		overcooked	undercooked	just right
		← % →		
overcooked	0	-	-	-
undercooked	7	-	28.6	71.4
just right	14	-	-	100.0

*Totals may vary due to nonresponses.

†Analysis of degree of doneness: $\chi^2 = 4.421$, df = 1, $P \leq .0355$.

percent of clients responded "yes", 39 percent "no", and 25 percent "sometimes." The majority of clients (64 percent) reheated their meals before eating. The equipment most commonly used to reheat meals was a conventional oven (33 percent). The majority of clients (89 percent) did not find it necessary to rechill any cold foods.

Information on Heating Frozen Meals

Table 7 displays information on the use of frozen meals. All clients stored their meals in the freezer upon delivery as suggested by the research team. Of the 19 responding only one thought heating instructions were unclear. All respondents stated they were able to heat frozen meals sufficiently, and 81 percent thought heat distribution was even. The conventional oven was used most often (71 percent) used for heating meals and was generally done by the client.

Table 6. Temperature characteristics of hot meals*

characteristics	N	percent
meals delivered hot		
yes	10	35.7
no	11	39.3
sometimes	7	25.0
meals reheated		
yes	18	64.3
no	7	25.0
sometimes	3	10.7
equipment used to reheat		
conventional oven	7	33.3
microwave oven	5	23.8
stovetop	5	23.8
stove and/or oven	3	14.3
toaster oven	1	4.8
cold foods rechilled		
yes	3	10.7
no	25	89.3

*Totals may vary due to nonresponses.

Table 7: Information on heating frozen meals*

information	N	percent
instructions clear		
yes	19	95.0
no	1	5.0
hot foods hot		
yes	21	100.0
no	-	-
even heat distribution		
yes	17	81.0
no	2	9.5
sometimes	2	9.5
equipment used for heating		
conventional oven	15	71.4
microwave oven	3	14.3
stove and/or range	1	4.8
toaster oven	2	9.5
person responsible for heating		
self	14	66.6
wife	2	9.5
wife and husband	2	9.5
child	1	4.8
friend	1	4.8
home aide	1	4.8

*Totals may vary due to nonresponoses.

Data on Consumption of Meals

Consumption of Hot Meals

Results of the interview on consumption of hot meals are shown in Table 8. The majority (82 percent) of clients consumed their meal within fifteen minutes of delivery. Of the five who did not eat the meal immediately, three waited until 1:30 p.m. More than three-fourths (79 percent) of the clients considered the amount of food delivered "just right." The majority of clients (61 percent) reported having leftovers, and 94 percent of those stored leftovers in the refrigerator. Responses to the question, how much of the hot meals were eaten, resulted in 86 percent reporting "all". Several notable contradictions in the responses were noted.

Consumption of Frozen Meals

Data collected on consumption of frozen meals after the study was completed are reported in Table 9. Eighty-six percent of the clients ate their meal on the day specified by the research team. Eighty-six percent also reported consuming the supplemental food with the frozen meal. Reasons for not eating the supplemental food with the meal were saving the milk for breakfast or supper and the other food to eat later.

Seventy-two percent of the clients said the amount of food is just right. Approximately 38 percent of the clients reported having leftovers. Of the seven clients reporting storage of leftovers, 85 percent used the refrigerator. Clients were asked to indicate how much of a frozen meal they typically ate, and 62 percent responded "all". None of the clients reported not eating

Table 8. Results of interviews on consumption of hot meals*

results	N	percent
meals eaten immediately (within 15 minutes)		
yes	23	82.1
no	5	17.9
reason for delayed consumption		
late breakfast	2	40.0
not hungry	2	40.0
meal delivered too early	1	20.0
time of meal when not consumed immediately		
12:00 p.m.	1	20.0
1:30-2:30 p.m.	3	60.0
after 4:00 p.m.	1	20.0
food amount delivered		
too much	4	14.3
too little	2	7.1
just right	22	78.6
leftovers		
yes	17	60.7
no	11	39.3
storage of leftovers		
refrigerator	15	93.7
table/counter	1	6.3
proportion eaten		
none	1	3.6
1/4	-	-
1/2	2	7.1
3/4	1	3.6
all	24	85.7

*Totals may vary due to nonresponses.

Table 9. Results of interviews on consumption of frozen meals*

results	N	percent
meal consumed on specified day		
yes	18	85.7
no	3	14.3
sometimes	-	-
non-frozen supplemental food eaten with frozen meal		
yes	18	85.7
no	-	-
sometimes	3	14.3
reason for non-consumption of supplemental food with meal		
milk for breakfast	1	33.3
saved to eat later	1	33.3
milk for supper	1	33.3
food amount delivered		
too much	2	9.5
too little	4	19.0
just right	15	71.5
leftovers		
yes	4	19.0
no	13	62.0
sometimes	4	19.0
storage of leftovers		
refrigerator	6	85.7
table/counter	1	14.3
proportion eaten		
none	-	-
1/4	1	4.8
1/2	5	23.8
3/4	2	9.5
all	13	61.9

Table 9. Results of interviews on consumption of frozen meals* (cont.)

results	N	percent
all of meals consumed		
yes	13	62.0
no	8	38.0
reasons for non-consumption of meals		
was not home	4	66.8
ate at senior center	1	16.6
did not like the meal	1	16.6
number of total meals consumed		
6	1	12.5
7	7	87.5

*Totals may vary due to nonresponses.

any of the frozen meal. Reasons given for not eating a frozen meal on the day intended were: 67 percent, not at home; 17 percent, ate at senior center; and 17 percent, did not like the meal.

Advantages and Disadvantages of Home-Delivered Meals

Advantages of Home-delivered Meals

Table 10 shows the advantages of hot and frozen home-delivered meals as perceived by clients. Forty-seven percent considered "convenience" as the principal advantage of home-delivered hot meals. Forty-two percent of clients considered the principal advantage of frozen meals was the availability of favorite food items, especially chicken or potatoes. One-fourth of the clients cited temperature of frozen meals after heating as an advantage.

Disadvantages of Home-delivered Meals

Disadvantages of home-delivered meals reported by clients are presented in Table 10. The most common disadvantage for both hot and frozen meals was the appearance of specific disliked food items (78 percent and 57 percent respectively). Thirty-six percent considered the heating time of frozen meals and need to rethermalize as disadvantages.

Data on Self-Reported Consumption

Data on self-reported consumption are presented in Table 11. According to federal guidelines (2), five categories of food items have been identified for a meal. The clients reported

Table 10. Advantages and disadvantages of home-delivered meals as perceived by clients*

advantages and disadvantages	hot		frozen	
	N	percent	N	percent
advantages				
convenience	8	47.0	2	16.8
variety of food	1	5.9	-	-
nutritionally balanced	2	11.8	-	-
availability of modified diet foods	1	5.9	-	-
temperature of meal	-	-	3	25.0
advance notice of menu	-	-	2	16.6
availability of specific favorite foods	17	29.4	5	41.6
disadvantages				
not home cooked	1	7.1	-	-
delivery times inappropriate	1	7.1	-	-
temperature inappropriate	1	7.1	-	-
heating time too long	-	-	3	21.5
need to rethermalize	-	-	2	14.3
skimpy amounts	-	-	1	7.1
appearance of specific disliked foods	11	78.7	8	57.1

*Totals may vary due to nonresponses.

Table 11. Self-reported consumption* of food items by categories for hot and frozen meals†

categories‡	number of food items#		meals¶	
	hot	frozen	hot	frozen
			mean and standard deviation	
entree	5	6	4.63 ±.76	4.83 ±.35
complement	5	5	4.40 ±1.10	4.40 ±.84
vegetable	5	6	4.62 ±1.0	4.83 ±.39
bread	4	6	3.96 ±1.47	4.13 ±1.5
dessert	5	6	4.63 ±.69	4.73 ±.65

*Totals may vary due to nonresponses.

†5 hot meals and 6 frozen meals.

‡See Appendix J for specific food items in each category.

#N = number of food items in hot meals and frozen meals.

¶Scale = 0, none consumed, to 5, all consumed.

eating almost all of the food items in each category whether delivered as hot or frozen meals. Table 12 shows self-reported consumption of separate food items in hot and frozen meals. Only three hot meals and three frozen meals were used for analysis because these were the only food items that were the same for both hot and frozen meals. The mean ratings indicated that virtually all items were eaten. In most instances, the smaller mean rating had the largest standard deviation indicating that distribution of ratings was skewed. The frozen vegetables had higher reported consumptions which could be due to elderly preference for mushy vegetables. The higher rating for frozen bread contradicted statements by the elderly who stated the bread was hard and stale. Based on conversations with clients, the researcher noted bigh mean consumptions did not always indicate favorable acceptance of hot or frozen meals. Many clients stated they were not always pleased with the meal, but it was the only "decent" meal each day; therefore, they ate most of it.

Data on Meal Delivery Preference

Meal delivery preference is indicated in Table 13. The majority of clients (59 percent) did not want hot meals delivered on the weekend and 53 percent had the same opinion for frozen meals. When queried, clients stated the belief that receiving home-delivered meals on weekends would reduce some of their independence. Cost, however, might also bave been a factor because most clients contributed voluntarily to the cost of the meal.

When asked if they preferred frozen meals to be delivered

Table 12. Self-reported consumption of food items in hot meals and frozen meals*

food items	number of responses		consumption†	
	hot meals	frozen meals	hot meals	frozen meals
			mean and standard deviation	
pork cutlet	15	15	4.8 ±.56	4.9 ±.26
chicken	16	10	5.0 ±0.0	4.6 ±.84
fish	17	14	4.9 ±.24	4.9 ±.53
mashed potatoes	15	13	4.9 ±.26	4.4 ±.99
escalloped potatoes	17	9	4.5 ±1.18	4.8 ±.43
beets	16	14	4.8 ±.75	4.9 ±2.7
carrots	17	14	4.4 ±1.2	4.9 ±.53
green beans	17	4	4.4 ±1.5	5.0 ±0.0
bread	16	8	3.9 ±2.0	3.5 ±2.2
corn bread	16	15	4.4 ±1.4	4.5 ±1.4

*Totals may vary due to nonresponses.

†Scale = 0, none consumed, to 5, all consumed.

Table 13. Clients' meal delivery preferences*

preferences	N	percent
hot home-delivered meals on weekends		
yes	10	37.0
no	16	59.3
sometimes	1	3.7
frozen home-delivered meals on weekends		
yes	7	36.9
no	10	52.6
sometimes	2	10.5
frequency of home-delivered meal		
delivered every other day	8	38.1
delivered 2 days in a row	3	14.3
no preference	10	47.6
number of frozen meals each week		
0	9	49.2
2	5	23.8
5	3	14.3
no preference	4	19.0
type of home-delivered meal		
hot	3	14.3
frozen	3	14.3
no preference	15	71.4
type of emergency meals		
canned	13	61.9
frozen	3	14.3
no preference	5	23.8
type of weekend meals		
canned	6	30.0
frozen	10	50.0
no preference	4	20.0

*Totals may vary due to nonresponses.

every other day or two days in a row, 38 percent preferred delivery every other day and 48 percent had no preference. Clients were asked how many frozen home-delivered meals they would like to receive each week. Slightly less than half of the clients (49 percent) reported none, 24 percent 2 meals, 14 percent 5 meals, and 19 percent had no preference. Seventy-one percent had no preference between hot and frozen meals, and the remainder were divided evenly between hot and frozen. When asked directly which meal service they preferred for emergency meals, the majority (62 percent) chose canned meals, assuming they might he without electricity in emergencies. When asked directly which meal service they preferred for weekend meals, 50 percent preferred frozen meals, 30 percent canned, and 20 percent had no preference.

Data On Time-Temperature Studies

Variations in temperatures of hot food items on a one hour delivery route are shown in Tahle 14. The two entrees, pork cutlet and roast beef, from end of production to final delivery, had total decreases in temperature of 50 percent and 39 percent, respectively. Mashed potatoes decreased in temperature hy 35 percent and 21 percent respectively. Pickled beets were placed in the container cold and had an increase in temperature of 20 percent. Green heans had a temperature drop of 48 percent. The dessert, fruit crisp, had temperature drops of 52 percent and 55 percent respectively.

All temperatures of food at final delivery were in the microhiological danger zone of 4.5 to 60 degrees Celsius (52) and

Table 14: Temperature changes of food items in hot meals on a one hour delivery route

food item	delivery times						% change in temperature
	end of production	beginning of delivery	15 minutes	30 minutes	45 minutes	60 minutes	
	← temperature in Celsius →						
pork cutlet	89	80	63	53*	48*	45*	50%
mashed potatoes	65	61	53*	45*	45*	42*	35%
cold pickled beets	26*	30*	33*	34*	40*	33*	20%
corn bread	92	33*	30*	30*	30*	30*	67%
fruit crisp	80	52*	42*	40*	40*	38*	52%
roast beef	78	80	75	60*	50*	48*	39%
mashed potatoes	70	65	65	65	56*	55*	21%
green beans	96	98	70	60*	55*	50*	48%
fruit crisp	88	60*	50*	40*	40*	40*	55%

*Microbiological danger zone, 4.5° to 60° Celsius.

many were in the zone within 15 minutes of transport. The cold pickled beets gained in temperature from other foods in the serving container.

Data on Meal Delivery Costs

Total mileage reimbursement for the month, prior to implementation of frozen meals, was $295.00, and when frozen meals were delivered was $232.25. A savings of 21 percent was realized on transportation costs when frozen meals were delivered with hot food on eight days.

Container costs were calculated for 160 frozen meals, based on eight meals to 20 people. The cost of containers for frozen meals was $30.80. If only hot meals had been delivered, the container cost would have been $13.76. The frozen meals resulted in a 55 percent increase for container costs.

When mileage reimbursement and container costs were totaled, cost for delivery of frozen meals was $263.05 as compared to delivery costs for hot meals of $308.76. A 15 percent cost savings was realized with frozen meals. Greater savings might have been realized if routes were reorganized for the project by having two drivers responsible for delivery of frozen meals.

SUMMARY AND CONCLUSIONS

Tbe knowledge of serious nutritional problems and vulnerability of elderly Americans has led to tbe development of programs for better nutritional bealtb of the aged. Witb tbe enactment of tbe 1972 Amendments to tbe Older Americans Act of 1965, a major part of community-based activities bas been nutrition services designed to provide congregate and bome-delivered meals to the elderly. The objective of this research was to compare consumption and acceptability of bot and frozen home-delivered meals for eligible recipients under Title III of tbe Older Americans Act.

Tbe study was conducted at a senior center in a medium sized midwestern city, whicb bas been producing and serving approximately 75 congregate meals and 50 bome-delivered meals daily. Securing volunteers to deliver five bot meals a week was a continual problem and a project was desired for reduction in tbe number of deliveries by combining one hot meal for immediate use and frozen meals for subsequent days. A sample of recipients of bot bome-delivered meals from tbe senior center participated in this study to evaluate hot and frozen meals. In an interview witb tbe researcb coordinator and a researcb assistant before tbe project started, clients were asked to evaluate bot meals they currently received. The investigation of reducing delivery times and cost led to the delivery of a bot meal witb one or two frozen meals for succeeding days, thus reducing the total number of deliveries. Eigbt frozen meals were delivered to clients during

the one month period of the study. Clients were given forms on which to report amount consumed for hoth meals. Holding times and temperatures for the hot meal foods from end of production through the transportation phase were recorded hy the research coordinator. The project concluded with a second interview with clients to evaluate the frozen home-delivered meals. Total mileage and container costs were also assessed for hoth hot and frozen meals.

Distrihutions were compiled for characteristics relating to hot and frozen meals. Means and frequencies were computed for responses related to self-reported consumption of hot and frozen food items.

Seventy-five percent of the sample was female and 46 percent lived alone. The majority of clients had received home-delivered meals six months or less.

More than three-fourths the sample reported eating all the hot meals; whereas slightly more than half reported eating all the frozen meals. Clients were satisfied with amount of food received for hoth meals.

More than three-fourths of the clients reported ratings of "okay" or "good" for flavor, appearance, texture, variety, containers, and degree of doneness for hot and frozen meals. The majority of clients reheated the hot meals hefore consumption, and all reported the frozen meals were sufficiently hot after heating. The principal advantage of hot meals was convenience and of frozen meals, availahility of specific foods.

The majority of clients did not wish to receive hot or frozen meals on the weekend. If home-delivered meals were

offered on weekends, half the clients favored frozen meals.

Clients reported eating almost all of food items whether delivered as hot or frozen meals. All temperatures of hot foods, on a one-hour delivery route, were in the microhiological danger zone at final delivery. A 15 percent cost savings was realized with frozen meals.

Based on results from this research study similar to that reported by Osteraas (4) and Kirschner (7), additional research could be conducted on the following topics: validation of self-reported consumption by the elderly; development of data collection techniques in research involving the elderly; training of nutrition site personnel in sanitation, production, and cook/freeze systems; development of alternative delivery methods for hot home-delivered meals; determination of optimum length of time and number of stops on delivery routes to maintain food safety and quality; determination of economic feasibility of providing 7-day service to home-hound participants; and training of drivers in periodic monitoring of food temperatures and in food handling. The final reccomendation is that until further investigation of production and distribution of frozen home-delivered meals, nutrition sites should not attempt to produce frozen meals in their conventional settings.

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APPENDIXES

APPENDIX A

Correspondence

Department of Dietetics, Restaurant and Institutional Management

Justin Hall
Manhattan, Kansas 66506
913-532-5521

February 14, 1985

Dear

My name is Linda Yarrow and I am a student at Kansas State University in Manhattan. I am working with Roberta Sanders, at the Junction City Senior Center, on a school assignment involving Meals-On-Wheels.

The Junction City Senior Center will serve two to three (2-3) frozen Meals-On-Wheels each week to interested persons beginning in February and March. We have learned that you might be interested in receiving the frozen Meals-On-Wheels in addition to the hot meals.

For the school assignment, we would like to find out how well you like the hot Meal-On-Wheels and the frozen Meals-On-Wheels once you have received them. To do this, we would like to visit you one time in February or March and again in April to talk to you about the meals. Each visit would last about twenty (20) minutes. The information you give us will be used to improve the Meals-On-Wheels in Junction City.

I will be calling you within a few days to see if you would like to help us, and to answer any questions you might have.

Sincerely,

Linda K. Yarrow
Graduate Research Assistant

Deborah D. Canter, Ph.D., R.D.
Assoc. Professor & Project Director

Roberta Sanders
Junction City Site Manager

Department of Dietetics, Restaurant and Institutional Management

Justin Hall
Manhattan, Kansas 66506
913-532-5521

March 19, 1985

Dear

I would like to tell you how much I enjoyed visiting with you a few weeks ago. The information you gave us was very helpful and will be used to improve the home-delivered meals in Junction City.

We are getting ready to serve you the frozen meals that I told you about. As I mentioned, there will be eight (8) frozen meals served during a one (1) month period. These frozen meals will be served the following days:

March 27 - Wednesday	April 10 - Wednesday
March 29 - Friday	April 11 - Thursday
April 3 - Wednesday	April 15 - Monday
April 4 - Thursday	April 16 - Tuesday

The drivers will deliver the meals the day before and will place them in your freezer. Because you will have a frozen meal in the freezer, you will not have a hot meal delivered on the eight days that I listed above. When reheating the meals, simply follow the instructions taped on them. We will also give you a colored card to record how much you ate just as you did for the hot meals.

The purpose of this research is to find out whether or not people will like frozen home-delivered meals. In order for this research to be successful, we need you to try all eight meals so that we can record whether or not you liked them.

Again, thank you for helping us. I will keep in touch with you to see if you have any questions. I look forward to visiting with you again at the end of April.

Sincerely,

Linda K. Yarrow
Graduate Research Assistant

Debbrah D. Canter, Ph.D., R.D.
Assoc. Professor & Project Director

Department of Dietetics, Restaurant and Institutional Management

Justin Hall
Manhattan, Kansas 66506
913-532-5521

MEMO TO: Drivers for Junction City Home-delivered Meals

FROM: Linda K. Yarrow, Graduate Research Assistant

RE: Kansas State University Research Project

You are probably aware that Kansas State University is conducting a research study on the acceptability of frozen home-delivered meals. Twenty-six Junction City recipients have agreed to participate in this study. A list of their names is attached.

The Senior Center is currently overproducing certain meals and freezing them for use in the study. The frozen meals will be eaten by the selected recipients on the following days:

March 27th	April 4th	April 15th
Marcy 29th	April 10th	April 16th
April 3rd	April 11th	

On the day prior to each day listed above, we would like you to deliver the regular hot meal plus a frozen meal. We will also include a colored card for the recipients to record the amount of the frozen meal they ate. The recipients will not receive a hot meal on the eight days listed above.

The schedule will be as follows:

March 26th - deliver hot meal and frozen meal
27th - no delivery
28th - deliver hot meal and frozen meal
29th - no delivery
April 2nd - deliver hot meal and two (2) frozen meals
3rd - no delivery
4th - no delivery
9th - deliver hot meal and two (2) frozen meals
10th - no delivery
11th - no delivery
12th - deliver hot meal and two (2) frozen meals
15th - no delivery
16th - no delivery

When you deliver the frozen meals, place them in the freezer of the recipient. Be sure to inform each person that you are placing their frozen meals in their freezer.

I will be at the Senior Center the first couple of times to help organize the meals and to answer questions. This is an important research project for Kansas State University, and we appreciate your cooperation and contribution to the project.

Department of Dietetics, Restaurant and Institutional Management

Justin Hall
Manhattan, Kansas 66506
913-532-5521

MEMO TO: Orivers of Home-delivered Meals

FROM: Linda Yarrow

RE: Frozen meals for Wednesday, April 3, and Thursday, April 4

On Tuesday of this week, April 2nd, you will be delivering 2 sets of frozen meals in addition to the hot meal for Tuesday. The frozen meals are to be eaten Wednesday and Thursday, therefore, the participating clients will not receive a hot meal these two days.

I have color coded the frozen meals. Each client will receive a frozen meal with the yellow sticker and a frozen meal with the green sticker. The yellow meal is for Wednesday. The green meal is for Thursday.

I have placed the yellow meals in one freezer, and the green meals in another. The freezers will have signs on them indicating where the meals are.

You should also take one paper sack to each client. The sacks contain 2 milks, 2 breads with butter, coffee, tea, sugar, one fruit, and one pudding. Again, place the sack in the refrigerator. You will find the sacks on the left side of the big refrigerator.

I have also grouped the colored cards by drivers. Please be sure to check your cards and make sure they are the right ones. Leave two cards with each client.

In summary, for each client you will have:
1) the regular hot meal with milk
2) two frozen meals - one yellow and one green
3) one paper sack
4) two colored cards

IT IS VERY IMPORTANT THAT YOU PLACE THE FROZEN MEALS IN THE CLIENT'S FREEZER, ANO THE PAPER SACK IN THEIR REFRIGERATOR.

IT IS ALSO VERY IMPORTANT TO TELL EACH CLIENT THAT YOU ARE OELIVERING TWO FROZEN MEALS -- ONE FOR WEDNESOAY, ANO ONE FOR THURSDAY -- AND THAT THE PAPER SACK CONTAINS MILK, BREAO, AND OESSERT FOR TWO OAYS.

I realize that this type of schedule makes deliveries harder for you, and I very much appreciate your contribution to this research project.

Have a nice day, and I'll see you next Tuesday.

APPENDIX B

Consent Form

IF YDU WOULD LIKE TD PARTICIPATE IN THIS SCHDOL ASSIGNMENT, PLEASE READ AND SIGN THE CDNSENT FDRM BELOW. AFTER YDU HAVE SIGNED THE FORM, RETURN THIS PAPER TD THE VDLUNTEER WHD DELIVERS YOU MEALS. THANK YDU.

CONSENT FORM

I HAVE READ THE DESCRIPTIDN OF THIS STUDY DN HDT AND FRDZEN HDME-DELIVERED MEALS. I UNDERSTAND THAT I MAY WITHDRAW MY PARTICIPATIDN AT ANY TIME DURING THE INTERVIEW, AND THAT I WILL HAVE AN DPPDRTUNITY TO ASK THE INTERVIEWER QUESTIDNS ABDUT THIS STUDY. I ALSO UNDERSTAND THAT ALL INFDRMATIDN I PRDVIDE WILL BE CONFIDENTIAL.

(PLEASE CHECK ONE)

_____ I AGREE TD PARTICIPATE IN THE HOME-DELIVERED MEAL STUDY

_____ I DO NDT AGREE TD PARTICIPATE IN THE HDME-DELIVERED MEAL STUDY

_____ _____

SIGNATURE DATE

APPENDIX C

Frozen Meal Delivery Schedule

FROZEN HOME-DELIVERED MEAL SCHEDULE

Menu	Delivered	Eaten
Menu 1 Pork Cutlet Mashed Potatoes Pickled Beets Corn Bread Rhubarb Crisp	March 26- Tuesday	March 27- Wednesday
Menu 2 Baked Fish Potatoes Carrots Whole Wheat Bread Fresh Fruit	March 28- Thursday	March 29- Friday
Menu 3 Beef Vegetable Casserole Peas Whole Wheat Bread Fresh Fruit	April 2- Tuesday	April 3- Wednesday
Menu 4 Oven-fried Chicken Mashed Potatoes Mixed Vegetables Whole Wheat Bread Lemon Pudding	April 2- Tuesday	April 3- Wednesday
Menu 5 Corn-salmon Casserole Broccoli Tomato Juice Whole Wheat Bread Bread Pudding	April 9- Tuesday	April 10- Wednesday
Menu 6 Roast Pork Mixed Vegetables Cinnamon Applesauce Whole Wheat Bread Chocolate Pudding	April 9- Tuesday	April 11- Thursday
Menu 7 Smothered Steak Rice Wax Beans Whole Wheat Bread Fresh Fruit	April 12- Friday	April 15- Monday
Menu 8 Baked Ham Scalloped Potatoes Green Beans Roll Fruit Crisp	April 12- Friday	April 16- Tuesday

APPENDIX D

Frozen Meal Reheating Instructions

1

OVEN

1. KEEP FROZEN
2. PLACE FOIL OVER CONTAINER
3. BAKE AT 350^{O} FOR 20 MINUTES
4. FOLO BACK FOIL TO EXPOSE MEAT ONLY
5. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. PLACE BEETS AND RHUBARB IN SEPARATE OISHES
2. PLACE PORK AND POTATOES IN A OISH
3. COVER FOOOS ANO COOK ON LOW OR DEFROST 5 MINUTES
4. COOK ON HIGH 3½ MORE MINUTES

2

OVEN

1. KEEP FROZEN
2. REMOVE THIS LIO
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350^{O} FOR 20 MINUTES
5. FOLO BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE FISH AND POTATOES IN A OISH
3. COVER FOOOS AND COOK ON LOW OR OEFROST 5 MINUTES
4. COOK ON HIGH 3 MORE MINUTES

3

OVEN

1. KEEP FROZEN
2. REMOVE THIS LIO
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350° FOR 20 MINUTES
5. FOLO BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE FOOO IN MICROWAVE OISH
3. COVER FOODS ANO COOK ON LOW OR OEFROST FOR 5 MINUTES
4. COOK ON HIGH 3 MORE MINUTES

4

OVEN

1. KEEP FROZEN
2. REMOVE THIS LIO
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350° FOR 20 MINUTES
5. FOLO BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE VEGETABLES IN A SEPARATE DISH
3. PLACE POTATOES IN A SEPARATE OISH
4. PLACE CHICKEN ON A PLATE
5. COVER FOOOS ANO COOK ON LOW OR OEFROST FOR 5 MINUTES
6. COOK ON HIGH 5 MORE MINUTES

5

OVEN

1. KEEP FROZEN
2. REMOVE THIS LID
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350° FOR 20 MINUTES
5. FOLD BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE APPLESAUCE IN A SEPARATE DISH
3. PLACE PORK AND CORN ON A PLATE
4. COVER FOODS AND COOK ON LOW OR DEFROST FOR 5 MINUTES
5. COOK ON HIGH 3 MORE MINUTES

6

OVEN

1. KEEP FROZEN
2. REMOVE THIS LID
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350° FOR 40 MINUTES

MICROWAVE

1. KEEP FROZEN
2. PLACE SALMON CASSEROLE ON A PLATE
3. PLACE BROCCOLI AND BREAD PUDDING IN SEPARATE DISHES
4. COVER FOODS AND COOK ON LOW OR DEFROST FOR 5 MINUTES
5. COOK ON HIGH 2½ MORE MINUTES

7

OVEN

1. KEEP FROZEN
2. REMOVE THIS LID
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350^{O} FOR 20 MINUTES
5. FOLD BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE VEGETABLE AND RICE IN SEPARATE DISHES
3. PLACE STEAK ON A PLATE
4. COVER FOODS AND COOK ON LOW OR DEFROST 5 MINUTES
5. COOK ON HIGH 3 MINUTES
6. REMOVE VEGETABLE & RICE. COOK STEAK 3 MORE MINUTES.

8

OVEN

1. KEEP FROZEN
2. REMOVE THIS LID
3. PLACE FOIL OVER CONTAINER
4. BAKE AT 350^{O} FOR 20 MINUTES
5. FOLD BACK FOIL TO EXPOSE MEAT ONLY
6. CONTINUE BAKING 20 MINUTES MORE

MICROWAVE

1. KEEP FROZEN
2. PLACE POTATOES AND GREEN BEANS IN SEPARATE DISHES
3. PLACE HAM ON A PLATE
4. COVER FOOOS AND COOK ON LOW OR DEFROST 5 MINUTES
5. COOK ON HIGH 3½ MORE MINUTES

APPENDIX E

Bag Labels

EXAMPLES OF PAPERSACK LABELS

THIS BAG CONTAINS:

For Monday: milk, coffee, tea, bread, butter, and fruit.

For Tuesday: milk, coffee, tea, bread, and butter.

THIS BAG CONTAINS:

For Wednesday: milk, coffee, tea, bread, butter , and tomato juice

For Thursday: milk, coffee, tea, bread, butter, and pudding

APPENDIX F

Hot Foods Interview Guide

NAME_____

HOT FOODS INTERVIEW GUIDE

	Poor	Okay	Good
1. How do you feel about the flavor of the hot meals delivered by the volunteers?	1	2	3
2. How do you like the looks of the hot meals delivered by the volunteers?	1	2	3
3. How well can you chew the hot food delivered by the volunteers?	1	2	3

4. Do you add any seasonings to the food? (Examples: salt, pepper, bacon grease)	Yes	No	Sometimes
5. Is the hot food hot enough when you receive it?	Yes	No	Sometimes
6. Do you reheat any of the food before you eat it?	Yes	No	Sometimes
7. If yes -- how do you reheat the food?			
9. Do you re-chill any cold foods before you eat them?	Yes	No	Sometimes
9. Are you satisfied with the variety of foods offered for the hot meals?			
10. When you receive the hot meals, do you eat the meal right away? (If yes - go to q.13)	Yes	No	Sometimes
11. If no -- why not?			
12. If no -- when you you eat the meal?			

13. Are you given: food to eat?	too much	too little	just the right amount
14. Do you eat any leftover food at a later time?	Yes	No	Sometimes
15. How do you save leftover food from the hot meals?			

16. Do you feel the food is:	overcooked		undercooked		just right
17. How much of the food do you eat?	none	1/4	1/2	3/4	all

18. Do you like the containers the food is served in?	Yes	No	Sometimes
19. What do you like best about the hot meals?			
20. What do you like least about the hot meals?			
21. Who prepares your meals on weekends?			
22. Would you like to receive Meals-on-Wheels on the weekend?	Yes	No	Sometimes
23. Did you eat at a senior center before receiving home-delivered meals?	Yes	No	Sometimes
24. Do you have other visitors in addition to the volunteer who delivers your meals?	Yes	No	Sometimes

25. Who prepares your meals in the evening?

INFORMATION TO BE TAKEN FROM CLIENT RECORDS

Age

Sex

Living arrangement (alone, spouse, etc.)

Length of time they have been receiving home-delivered meals

APPENDIX G

Frozen Foods Interview Guide

Name _____

FROZEN FOODS INTERVIEW GUIDE

	Poor	Okay	Good
1. How did you feel about the flavor of the frozen meals after they were reheated?	1	2	3
2. How did the frozen meals look after they were reheated?	1	2	3
3. How well could you chew the frozen food after it was reheated?	1	2	3

4. Did you add any seasonings to the frozen meals? (salt, pepper, bacon grease, etc.) yes no sometimes

5. Was the food hot enough after you reheated it? yes no sometimes

6. Did the foods heat evenly? yes no sometimes

7. How was the food reheated?

8. Who reheated the meals?

9. Were the instructions on the meals clear? yes no sometimes

10. If no -- why not?

11. Where did you keep the meals until they were ready to be reheated?

12. Were you satisfied with the variety of foods offered for the frozen meals? yes no sometimes

13. Did you eat the frozen meal for lunch on the specified day? yes no sometimes

14. If no -- when did you eat the meal?

15. If no -- did you eat lunch those days? yes no sometimes

16. Did you save your milk and fruit to eat with the meals? yes no sometimes

17. If no -- why not?

18. Were you given: too much too little just the right amount of food to eat?

19. Did you eat any leftover food at a later time? yes no sometimes

20. How did you save the leftover food?

21. Do you feel the food was: overcooked undercooked just right after you reheated it?

22. How much of the food did you eat: none 1/4 1/2 3/4 all

23. Did you like the containers the frozen meals were served in? yes no sometimes

24. Was separate packaging and delivery of beverages and fruit acceptable? yes no sometimes

25. What did you like the best about the frozen meals?

26. What did you like least about the frozen meals?

27. Would you like to receive frozen meals for the weekends? yes no sometimes

28. Which did you like better - getting frozen meals every other day or getting frozen meals 2 days in a row?

29. If frozen meals were delivered on a regular basis, how many would you like to receive each week?

30. Do you think the frozen meals were: worse than equal to better than the hot meals?

31. Which would you prefer for "emergency" foods: canned foods or frozen foods?

32. Which would you prefer for weekend meals if they were offered: canned foods or frozen foods?

33. Did you eat all of the frozen meals that were delivered? yes no

34. If no - why not?

35. If no - how many did you eat?

APPENDIX H

Self-Reported Consumption Card

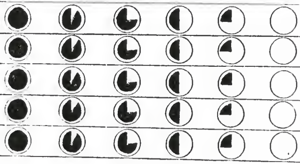
NAME________________________ DAY________________

HOW MUCH DID YOU EAT?

Example

For each food, place an X on top of the circle which shows how much you ate.

FOOD	I ate NONE of it.	I just TASTED it.	I ate SOME of it.	I ate HALF of it.	I ate A LOT of it.	I ate ALL of it.



APPENDIX I

Time and Temperature Recording Form

TIME AND TEMPERATURE RECORDING FORM

Food Item	end of production	beginning of delivery	15 minutes	30 minutes	45 minutes	60 minutes
Time						
	Temperature in Celsius					

APPENDIX J

Self-Reported Consumption by Food Category

SELF-REPORTED CONSUMPTION BY FOOD CATEGORY

	HOT	FROZEN
ENTREE	swiss steak	smothered steak
	fish	fish
	pork cutlet	pork cutlet
	baked chicken	baked chicken
	turkey tetrazzini	beef casserole
		baked ham
COMPLEMENT	macaroni/cheese	rice
	escalloped potatoes	escalloped potatoes
	mashed potatoes	mashed potatoes
	potatoes	mashed potatoes
	pea salad	escalloped potatoes
VEGETABLE	green beans	wax beans
	coleslaw	carrots
	beets	beets
	carrots	mixed vegetables
	broccoli	peas
		green beans
BREAD	whole wheat bread	whole wheat bread
	whole wheat bread	whole wheat bread
	corn bread	corn bread
	whole wheat bread	whole wheat bread
		whole wheat bread
		whole wheat bread
DESSERT	pudding	fruit
	fruit	fruit
	fruit crisp	fruit crisp
	fruit salad	pudding
	sherbet	fruit
		fruit crisp

CLIENT ACCEPTANCE OF FROZEN HOME-DELIVERED MEALS

by

LINDA KAYE YARROW

B.S., Kansas State University, 1983

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

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1985

ABSTRACT

The knowledge of serious nutritional prohlems and vulnerahility of elderly Americans has led to the development of programs for hetter nutritonal health of the aged. With the enactment of the 1972 Amendments to the Older Americans Act of 1965, a major part of community-hased activities has heen nutrition services designed to provide congregate and home-delivered meals to the elderly. The ohjective of this research was to compare consumption and acceptahility of hot and frozen home-delivered meals for eligible recipients under Title III of the Older Americans Act.

The study was conducted at a senior center in a medium sized midwestern city, which has heen producing and serving approximately 75 congregate meals and 50 home-delivered meals daily. Securing volunteers to deliver five hot meals a week was a continual problem and a project was desired for reduction in the numher of deliveries by comhining one hot meal for immediate use with frozen meals for suhsequent days. The sample consisted of recipients of hot home-delivered meals from the senior center. In an interview, clients were asked to evaluate hot meals currently received. The investigation of reducing delivery times and cost led to the delivery of the hot meal with one or two frozen meals for succeeding days, thus reducing the total numher of deliveries. Eight frozen meals, two per week, were delivered to clients. Clients were given forms on which to report amount consumed for both meals. In a second interview, clients were asked to evaluate the frozen home-delivered meals. Holding times

and temperatures for the hot meal foods from end of production through the transportation phase were recorded hy the research coordinator. Total mileage and container costs were also assessed for hoth hot and frozen meals.

Seventy-five percent of the sample was female and 46 percent lived alone. The majority of clients had received home-delivered meals six months or less. More than three-fourths of the clients reported eating all of hot meals, whereas slightly more than half reported eating all of frozen meals. Self-reported consumption revealed that clients ate almost all of food items regardless of whether hot or frozen.

More than three-fourths of the clients reported ratings of "okay" or "good" for flavor, appearance, texture, variety, containers, and degree of doneness for hot and frozen meals. The majority of clients reheated the hot meals before consumption, and all reported the frozen meals were sufficiently hot after heating. The principal advantage of hot meals was convenience and of frozen meals, availahility of specific foods.

The majority of clients did not wish to receive hot or frozen meals on the weekend. If home-delivered meals were offered on weekends, half the clients favored frozen meals.

All temperatures of hot foods, on a one-hour delivery route, were in the microhiological danger zone at final delivery. A 15 percent cost savings was realized with frozen meals.