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The purpose of this study was to investigate the usage of frozen precooked foods and to consider the nutritive values and costs of these foods.

In carrying out this study, three supermarkets were selected in different sections of Durham, North Carolina as representative of high-, middle-, and low-income shoppers. A questionnaire was applied to obtain information from the twenty persons interviewed in each store.

Duplicates of the precooked frozen products selected by the interviewees were purchased, and the individual foods weighed. Calculations pertaining to the nutritive values of the products and to the cost of preparation at home were made. The cost of the home-prepared dish, exclusive of labor and fuel, was compared with that of the ready-prepared product.

The majority of the participants in this investigation were married women between the ages of thirty-five and fifty-five years. Most of the participants were employed outside the home.

Frozen dinners were found to be more popular than any of the other precooked frozen foods available. A large percentage of the interviewees reported using these products from one to five years and serving such foods either once or twice each week. Even though convenience was a major factor

that influenced the shoppers to purchase frozen precooked foods, this factor could not be related to either the size of the family or to employment outside the home.

Most of the interviewees considered frozen foods less expensive than home-prepared dishes. Actual costs of the frozen products were found to be greater than those of similar dishes prepared at home, exclusive of labor and fuel.

According to calculations on the nutritive value, none of the precooked products would provide 30 per cent of the Recommended Dietary Allowances of the National Research Council for the groups considered. However, the addition of suitable foods could increase the nutritive value of the dish. Calculations for the nutritive values did not consider any losses which might result from either storage or reheating.

CONSUMER USAGE OF FROZEN DINNERS AND MAIN DISHES, SOME NUTRITIVE AND ECONOMIC IMPLICATIONS

by

Linda Tinkham Lane

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Faye W. Grant
Thesis Adviser

APPROVAL SHEET

This thesis has been approved by the following committee of the Faculty of the Graduate School at The University of North Carolina at Greensboro.

Thesis Adviser Faye W. Grant

Oral Examination Committee Members Mildred B. Johnson

Esther B. White

Allen C. Magee

December 9, 1970
Date of Examination

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CHAPTER I

INTRODUCTION

This study is concerned with precooked frozen foods, including various aspects of interest to the consumer and to the home economist.

Consumer use of frozen dinners and main dishes is steadily increasing. A number of factors have influenced this growth, including the large number of women who work outside the home. According to recent reports, one out of every three homemakers has outside employment. These women constitute a large group of potential consumers for commercially prepared frozen foods. By using these foods, work associated with the preparation of meals is reduced greatly.

The present shortage of household help is another factor that has contributed to the increased use of frozen precooked foods. There is a probability also that a number of the younger homemakers have not learned to cook. The art and skill of cooking may not be passed on from mother to daughter as widely as it was in earlier times. The use of frozen precooked foods, however, does not seem to be limited to any one age group.

Present day living patterns, which include increased activities outside the home and the concomitant need for

flexible meal schedules, probably have resulted in a decrease in the preparation of food at home. Persons living in single or small household units often find it convenient to use frozen precooked foods to some extent. Then, too, it may be that many people are more leisure-oriented than formerly.

Other factors in the increased use of frozen prepared foods undoubtedly include the recent improvements in the quality of these foods and the augmented variety available now.

Regardless of the reasons, 471 million dollars were spent in 1968 for frozen dinners. This represents 607 million pounds of food. In addition to frozen dinners, many frozen main dishes are available to the homemaker. With expenditures for frozen dinners alone reaching the proportions given above, it is desirable to know more about the ways these meals are combined with other foods and about their total nutritive contributions. The microbiological problems associated with these foods are also of interest.

The present study was undertaken to learn more about the usage of frozen prepared foods by shoppers in Durham, North Carolina. The specific objectives of the study were: (1) to determine the frequency of consumer usage of frozen dinners and main dishes; (2) to determine portion weights of the commonly selected frozen products; (3) to consider the foods used in relation to nutritive contributions, palatabil-

ity, and wholesomeness; and (4) to determine the unit serving cost of the commonly selected frozen products in comparison with the direct food cost of home-prepared dishes.

CHAPTER II

REVIEW OF LITERATURE

Precooked frozen foods did not appear to any extent in the retail market until after World War II, according to the president of Campbell Soup Company (1). When these foods first appeared on the market, they were not generally accepted.

In a review of the history of the preservation of foods by freezing, Tressler (2) stated that considerable research was carried out before World War II on the methods of improving the quality of frozen foods, including precooked food. It was explained that initially the quality of frozen prepared foods was poor and few economic advantages were associated with the use of these food products.

Proctor and Phillips (3) have discussed the factors which created an interest in the use of frozen prepared foods during World War II. Shortages of containers for canned food, the scarcity and high prices of fresh foods available in retail markets, and increased consumer demands for food were among the ones listed. Joslyn (4) has reported on a program organized during these war years by the Quartermaster Corps. Comments were included in this report that the effects of the program were continuing as shown by improvements in packaging of foods, development of convenience foods, and storage

stability and acceptability of packaged perishable, semi-perishable, and preserved foods.

Studies Pertaining to Consumer Usage and Cost

Cook (5,6) conducted a door-to-door canvass to determine the extent to which frozen dinners and pot pies were used by one thousand families living in Long Island in 1963. This study was repeated in 1969. Of the one thousand families canvassed, 23.6 per cent reported in 1963 that they sometimes had bought a frozen dinner (5). Six years later, 26.3 per cent of the households reported the occasional use of frozen dinners. Analysis of the data collected in 1963 showed that children under thirteen years of age were the only users in 22.5 per cent of the families who chose frozen dinners. Children continued to account for a large percentage of the consumers in 1969. Nevertheless, the total number of adults and adolescents using the precooked frozen dinners had increased. This increase was attributed to the availability of three-course dinners.

The results of the surveys completed in Long Island showed that the percentage of people using frozen meat pies decreased in the period from 1963 to 1969 (6). A greater selection of family-size main dishes and frozen dinners was considered responsible for the decrease in meat pie users. The persons who continued to use the meat pies tended to use them more frequently in 1969 despite the higher cost of the

product. The data indicated that the smaller pies (8 ounces in weight) were purchased either for children or for emergency use such as quickly available snacks for various members of the family. Consumption of larger pies was found to be principally by men and teenagers.

According to Martin (7), the monetary value of frozen dinners sold in 1967 was 421 million dollars; in 1968, the value was 471 million dollars. This represents a 12 per cent increase in a period of one year. Martin pointed out that promotional and marketing techniques were used to popularize these foods in the early fifties. Their usage has soared ever since, with sales increasing yearly from 10 to 30 per cent.

Similar increases also occurred in the retail sale of pot pies and family-size main dishes. In 1968, the retail value of frozen pies was 136 million dollars. The retail value of the family-size main dishes sold during that same year totaled 226 million dollars.

The cost of individual servings of precooked frozen foods has been studied in relation to that of conventionally prepared dishes. A study of this type was carried out by Quam (8) in 1967. The combined costs of food and labor of preparing 100, 200, and 300 servings each of beef stew, macaroni and cheese, and fried chicken were determined. Using an average hourly wage of $2.25, Quam found that a

unit serving of the ready-prepared beef stew cost 47 per cent more than did the conventionally prepared dish; macaroni and cheese and fried chicken cost 32 and 17 per cent more, respectively.

The Food and Nutrition Department of the Drexel Institute of Technology (9) investigated the cost and preparation time for preparing thirty-one convenience foods and their homemade counterparts. Two of the convenience foods examined in this study were a precooked frozen beef dinner and a precooked frozen chicken pie. Based on an hourly wage of $1.40, the beef dinner was less expensive than the home-cooked dish; the commercial chicken pie was more expensive.

Meals composed of convenience foods in amounts to serve four persons required an average of 32 minutes to prepare. Similar meals of home-cooked foods required an average of 119 minutes.

Studies Pertaining to Nutritive Value

With increased usage of frozen precooked foods, the need to consider nutritive contributions becomes more important than when there were fewer users. Among the factors which have been found to affect the nutritive value of these foods are (1) the cooking process itself, (2) the length and conditions of storage, and (3) reheating before consumption.

Morgan and co-workers (10) studied the loss of

various water-soluble vitamins which occurred in chicken as a result of both cooking and freezing. It was reported that a loss of 20 to 40 per cent of the thiamin in the raw chicken resulted from the process of cooking. Losses of riboflavin and niacin varied from 10 to 20 per cent.

These authors found also that riboflavin and niacin were well-retained in most tissues of the cooked frozen chickens during the first eight months of storage. Thiamin was found to be more labile in smaller chickens than in those of larger weights.

Causey and Fenton (11) investigated the effect of reheating on the nutritive value of meat dishes including creamed chicken on rice, paprika chicken and gravy, spaghetti and meat balls, and ham patties. A high retention of thiamin was reported for the products tested.

The amount of ascorbic acid lost during the preparation of vegetables (12) has been found to vary greatly. Small amounts of water, short boiling times, and consumption of the cooking water has been recommended as a means of reducing the loss of this vitamin. As much as one-third of the thiamin content may be lost if large amounts of water are used during the process of cooking. Also, some leaching of riboflavin and niacin apparently takes place as a result of the process of cooking.

Causey and Fenton (13) reported that reheating frozen

cooked vegetables decreases the ascorbic acid content. For green beans, Swiss chard, and broccoli, from 18 to 30 per cent of the vitamin content of the cooked vegetables was lost as a result of reheating. Cooking, freezing, and reheating resulted in a total loss of the nutrient for carrots, beets, and potatoes.

Harjes and Smith (14) have reported on the development of a more precise method for the analysis of the nutritive value of frozen fully-cooked foods. According to these authors, more reliable results may be expected in the future.

Studies Pertaining to Retention of Flavor

Various means have been used to delay changes in flavor of precooked frozen foods during storage. Lineweaver and associates (15), in investigating the prevention of rancidity, found antioxidants to be useful for turkey. The greatest antioxidant effect was found when the compounds were added to the water used for cooking. Chang, Younathan, and Watts (16) reported that treatment with an antioxidant dip resulted in products of good flavor. The dip precluded the necessity for smoking, covering with strongly flavored sauces, or excluding oxygen from the package. Watts and Peng (17) compared the rate of development of rancidity in raw and precooked pork during frozen storage. It was found that the precooked product kept better. Cooking was believed to have inactivated the peroxidizing enzymes.

Storage in the absence of oxygen has also proved to be important in delaying a change in flavor. Hanson (18) reported that air may be excluded by the use of a tight-fitting, vapor-proof package, by packing with a sauce or gravy, or by replacement of the air with nitrogen. At the time of this report (1960), nitrogen packing was not used to any extent in frozen precooked food. However, it was thought that this method might later prove to be the most practical means of preventing the development of rancidity, especially where high-cost foods are concerned.

Length and temperature of storage are other factors to be considered in the production of off-flavors. Hanson and associates (19) reported that development of rancidity is delayed by use of low temperatures during storage. In air packed samples of frozen fried chicken, rancidity was detected in two months at 20°F and in six months at 10°F. Storage at 0°F delayed detection of a change in flavor for nine months. Products in a solid pack or an inert atmosphere (nitrogen packing) are affected less by higher temperatures.

Bramblett and co-workers (20), who studied the effects of storage on flavor changes and stability of gravy frozen with beef, found that the flavor of the gravy decreased as storage time increased.

Felstehausen and associates (21) reported a correla-

tion between the presence of selected bacteria and flavor changes in precooked chicken products. Results of the study indicated that the four-hour period between the preparation of the food and the freezing was a critical time in quality control. The authors suggested that any similar time lapse between processing, packaging, and freezing could be partly responsible for some of the off-flavors found in precooked frozen foods.

Studies Pertaining to Texture

The texture of reheated frozen food is a major factor in determining acceptability by consumers. Sauces and gravies are the components of frozen dishes which show considerable texture change upon freezing. The liquid tends to separate and leave the solids of the sauce in a curdled state. These changes often cause the product to be rejected by the consumer. Yet, sauces and gravies are important since they increase the stability of flavor in precooked frozen foods. Considerable study has been done on the problem. Hanson, Campbell, and Lineweaver (22) found that retrogradation of the starch was the main cause of the instability. Waxy rice flour and corn flour were found to be superior as thickening agents. This result was confirmed in separate studies by two graduate students (23, 24) at The University of North Carolina in Greensboro when a number of different thickening agents were tested for

stability during freezing and reheating.

Studies by Osman and Cummisford (25) showed that tapioca amylopectin produced white sauces of about the same stability as waxy rice flour. The stability of the sauces was greater than that produced by any other thickening agent tested. Although retrogradation of the starch was considered the major factor affecting liquid separation and curdling, Osman and Cummisford reported that the other ingredients present were important in determing freeze-thaw stability. The proteins and salts of milk and flours appeared to affect the stability.

Hanson, Campbell, and Lineweaver (22) considered the effect of fat on stability. It was concluded that thickening agents rather than fat were primarily responsible for differences in storage stability.

Hanson and Fletcher (26) investigated the use of waxy cereals as coatings for fried chicken. The use of either waxy or common cornstarch produced coatings that were more elastic and less tough. A better quality of adhesion was reported when these products were used. Shrinkage of chicken parts by cooking before application of the batter reduced the tendency of the coating to peel. Thinner coatings were also beneficial in decreasing peeling.

Hanson and associates (27) found that the desired texture, color, and flavor of the vegetables used in precooked

frozen foods can be retained through control of the raw materials and of processing and storage conditions. Overcooking before freezing or during reheating was found to produce a mushy texture although vegetables of high quality were selected.

According to Appleyard (28), food manufacturers can guarantee the quality of their products at the time of preparation. However, measurable losses in quality may occur between the time of preparation and consumption as a result of temperature variations. Hanson (18) has reported similar findings.

Studies Pertaining to Microbiological Problems

Various microbiological problems are encountered in the production, distribution, and consumer handling of precooked frozen foods. Borgstrom (29) summarized the factors that influence the bacterial content of precooked frozen foods as follows:

> (1) The treatment of the raw product including the number of bacteria originally present in the raw product, the manner and rapidity of handling between harvesting (or slaughter) and processing, the processing methods, and the hygienic conditions in factories with machines and equipment. (2) The freezing rate. (3) The amount of oxygen present in the package. (4) The microbiological conditions in packages for frozen foods. (5) The storage temperature. (6) The pH of the product. (7) The presence of osmotic substances in frozen foods. (8) Defrosting.

According to Borgstrom, there are three groups of

microbes which are of significance in consideration of the microbiology of frozen foods. These include the pathogenic, toxicogenic, and saprophytic types.

Straka and Stokes (30) have reported that the customary hand-picking of cooked meat from carcasses and the handling during other stages of preparation prior to storage are possible sources of contamination. It was emphasized also that the time and temperature of the storage and the interval between preparation and freezing are factors in the wholesomeness of these products.

Causey and Fenton (11) also emphasized the importance of sanitation during preparation. The average bacterial plate count per gram was found to be approximately forty times greater in commercially prepared chicken à la king than in a similar sample prepared in the laboratory.

Straka and Combes (31) studied the effect of delayed freezing times on the survival of Micrococcus pyogenes var. aureus in creamed chicken. It was determined that a delay of five hours at room temperature between preparation and freezing provided sufficient time for the build-up of bacteria. Two hours outside the refrigerator was considered the maximum length of time for holding the product before freezing.

According to Borgstrom (32), the temperature of the frozen goods during transportation should remain below -10°C.

This is necessary to prevent the possible development of organisms which may cause food poisoning. The author also stated that a temperature of -18°C at loading and a trailer thermostat set at or below -18°C does not insure a similar temperature at delivery. In 50 per cent of the loads, the temperature had climbed above -7°C and occasionally above -4°C before the destination was reached. Thawing has been reported for approximately one out of every ten loads.

Prior to 1967, some states (33) had passed codes which prohibited the handling of frozen foods at temperatures above 0°C. Other states are reported to be considering a frozen food code.

Other investigators have considered the problem of refrigeration. According to Saleh and Ordal (34), the hazard from Clostridium botulinum exists when precooked frozen foods are grossly mishandled. The toxins of these microorganisms developed in three out of twelve uninoculated samples of chicken à la king held at 86°F.

Kereluk, Peterson, and Gunderson (35) reported on the growth of bacteria at refrigerator temperatures. The psychrophilic bacteria (bacteria which grow at refrigerator temperatures) investigated by them outgrew other bacteria known to be health hazards. This bacterial contamination resulted in the extensive development of off-flavors, off-odors, and deteriorated physical appearance. Generally, such products

would be unacceptable so that they probably can be eliminated as major potential health hazards.

According to Canale-Parola and Ordal (36), the amount of bacterial contamination of chicken and turkey pies varies among brands. Their investigation of five brands showed that some of the pies contained microorganisms which could produce food poisoning. The baking times and temperatures specified on the packages were not sufficient in all cases to destroy the microorganisms.

The importance of thorough reheating of precooked foods before they are eaten has been emphasized by various investigators. Hussemann (37) examined packages of frozen chicken à la king, beef stew, and a variety of creamed seafood products available to the consumer in the retail market. Her findings indicated that the quantity and kind of bacteria varied widely and that cooking did not completely eliminate any type originally found in the sample. Multiplication of bacteria continued to occur at refrigerator temperatures. Non-disease producing organisms, possibly of intestinal origin, also were detected in certain frozen foods studied. In a majority of samples, micrococci were found. This group included Micrococcus pyogenes var. aureus, a common cause of food poisoning.

Ott and associates (38) studied the effects of heat on Streptococcus faecalis, an organism of intestinal origin.

Selected products were inoculated with the test organism and the thermal requirements were determined. In this case, it was found that the heating times recommended by the manufacturers were adequate to control infection or intoxication by these non-spore forming bacteria except for the lobster pie examined.

Studies by Houghtby and Liston (39) showed the effect of heat on Staphylococcus aureus which had been inoculated into frozen precooked seafoods. Fish steaks were the only type of seafood tested in which the directions for cooking were not adequate to eliminate Staphylococcus aureus. In most cases, a safety margin had been provided.

According to Burr and Elliott (40), only a few cases of food poisoning from precooked frozen products had been reported prior to 1960. Spoilage which usually occurs before food poisoning organisms become numerous was considered an important factor in preventing consumption of a food hazardous to health.

Nickerson and co-workers (41) have summarized the relationship of frozen foods and public health by stating that food infections and food intoxications are no more likely to result from the processes used in the freezing of foods than by those employed by other methods of preservation.

Predictions for Continued Increases in Frozen Precooked Foods

Food manufacturers have suggested that the appearance of a wider variety of precooked frozen foods will result in increased sales. Frozen ready-to-heat breakfasts are among the recent additions by the food industry (42). Combinations of sausage patties with scrambled eggs, French toast, pancakes, and country fried potatoes are available. Other breakfast menus are being considered. These breakfasts can be placed in an unheated oven and cooked in about eighteen minutes.

The number of potential users for frozen breakfasts may be limited. Producers are aware that breakfast is the forgotten meal by a large percentage of persons in this country.

Soul food dinners are another addition to the variety of frozen foods already available (43). They were developed principally to attract certain ghetto populations. These dinners were introduced in 1969 and the early part of 1970. They include such foods as chitterlings, ham hocks, okra, collards, kale, mustard greens, and black-eyed peas. The dinners are expected to sell because these are palatable combinations of foods well liked by certain ethnic groups and they are expected to be considered the "in" thing in food.

Williams (44) has predicted that centralized commissaries with facilities to produce up to fifty million dinners

per year will be available in the near future to serve an entire local area. Among other predictions that may be expected to increase the use of frozen foods are home heating devices available at a nominal cost.

CHAPTER III

METHODS OF THE STUDY

Initial Plans

In carrying out this study, three supermarkets were selected in different sections of Durham, North Carolina. The first store selected appeared to be principally oriented to high-income shoppers. This assumption was based upon the location of the market in a shopping center that has several stores specializing in merchandise of high quality and upon other criteria as well. For example, the food market itself was stocked with a variety of precooked frozen foods, including the more exotic and higher priced ones. Higher priced meats, fish, and shellfish were displayed prominently, along with an extensive variety of fresh fruits and vegetables.

The second store was located in a middle-income section of the city and it was reasonable to assume that the majority of the shoppers in this store were from this income bracket. A moderately wide selection of precooked frozen foods was found to be available in this store.

The third store selected was located near a low-income residential section. At the time of this study, the shops in this area were poorly kept and did not appear to have a wide range of high-price merchandise. This store

was found to have a smaller variety of prepared frozen foods than the other two supermarkets. According to information obtained in the store, transactions involving food stamps amounted to approximately thirty thousand dollars monthly. A welfare worker with whom the store was discussed reported that the meats sold in this store were of a lower quality than those in other stores operated by the same company in other sections of the city.

Hereafter, in this report, the high-, middle-, and low-income supermarkets will be referred to respectively as stores A, B, and C.

In each store, permission to conduct the study was obtained from the management. Additionally, permission was obtained to conduct a pilot survey in the middle-income store to determine the feasibility of the plan.

During the pilot study, two half-hour sessions were spent in the supermarket. At this time, those persons who selected a precooked frozen food were asked if they would be willing to answer questions concerning the usage of such products. Approximately 97 per cent of the shoppers answered in the affirmative.

The study proper was planned to include sixty persons, twenty persons in each store. The decision to interview sixty persons was made on the advice of a statistician and based upon the total persons purchasing precooked frozen

food during the pilot study. A total of eight hours in each store was allotted for the interviews. However, it was found that from two to six hours were sufficient for the interviews in each of the stores. Observations on the choice of frozen precooked food were planned for Thursday and Friday from ten to eleven o'clock and from five to six o'clock. These hours were selected so that samples could be obtained from shoppers of both periods of the day.

The investigator stood near the frozen food section. After the choices were made, the shoppers were approached individually concerning their willingness to be interviewed relative to the purchases. A questionnaire was developed to obtain the information desired. A copy of the questionnaire is given in Appendix A.

The questionnaire sought general information pertaining to age, sex, marital status, and occupation. The interviewees were subsequently placed in the age categories used by the Food and Nutrition Board of the National Research Council (45). Questions pertaining to the reasons for the selections, the number of persons who would consume the frozen prepared food, the meal at which the product was to be used, and the nature of any additional foods to be served at the same meal were also included. The questionnaire also requested information on the length of time the precooked foods had been used, the frequency of its use, the prefer-

ence for this type of food relative to similar dishes prepared in the home, and an estimation of any differences in the cost of the two foods.

The names of the brands sold in the various supermarkets were obtained prior to the interviews. Information relative to the nutritive value was requested from the producers. Of the six companies to whom the request was addressed, two responded by sending estimates of the nutritive values. This information came in table form and included in one case, the total calories for the dish as well as those provided by carbohydrate, fat, and protein. In the second case, information was provided giving the total calories and the weight of carbohydrate, fat, protein, sodium, and vitamin A. A third company replied stating that nutritive values were not available for their precooked frozen foods.

Evaluation

In order to evaluate the foods more completely, duplicates of the foods previously selected by the interviewees were purchased by the investigator. The solids and liquids such as gravies and sauces were separated and weighed individually where possible. Weights of the foods are given in Table 8 and Appendix B. Separation was not possible for some of the dishes such as macaroni and cheese, the pizzas, dumplings, meat loaf, apple betty, and other desserts. In

order to arrive at the weight of the food in these mixed dishes, basic recipes were used for the calculations. These dishes were prepared and compared subjectively with the precooked frozen products.

In the case of the dumplings in the chicken and dumplings main dish, a plain dough was prepared without eggs since eggs were not listed as an ingredient of the dish. Individual dumplings of similar size were weighed before and after being cooked in a stew mixture. This made it possible to estimate more precisely the ingredients of the commercial product and to better identify the source of protein in the dish.

It was possible in the case of the gravy to compare the derived recipe with a recommended formula reported by Tressler and Evers (46). This formula gave the thickening agent as 5.8 per cent by weight; the derived recipe provided for 5.1 per cent by weight.

A recommended recipe was also available for use in determining the ingredients of salisbury steak patties. According to specifications (47), the product should consist of a minimum of 80 per cent by weight of beef. Other ingredients in the patties would include bread, beef stock, salt, monosodium glutamate, and pepper. Bread was estimated by the investigator to account for 5 per cent of the weight of the product.

The nutritive values for the foods contained in each dinner or mixed dish were calculated from those given in Agriculture Handbook No. 8 (48). In case of the pizzas and apple betty, where the food appeared to conform to basic recipes, the values in the Handbook for these foods as prepared were used. Butter or margarine that was visible on vegetables other than potatoes was determined separately. For the mashed potatoes, it was calculated as a part of the dish. In determining the nutritive value of beef, meat graded as "good" was used as the basis for the calculations.

Monosodium glutamate is commonly used as the hydrolyzed vegetable protein which is listed as an additional ingredient in many of the dishes. According to Merory (49), the suggested range for various products is 0.13 to 0.34 per cent. The usual concentrations used are from one to three ounces for each 100 pounds of product. One gram per 800 grams of product was used for the calculations in this study.

A comparison of the values as calculated from a separation of the ingredients with the information provided by the manufacturers is given in Table 1.

The nutritive values of the foods selected were considered in relation to nine of the categories of the Recommended Dietary Allowances of the National Research Council (45). In order to do this, it was necessary to take into account the number of persons who would eat the family-size

Table 1.--Comparison of Nutritive Values Provided by Manufacturers With Those Calculated

Frozen Product	Food Energy (Kcal.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)
Dinners				
Beef				
Company Values	414	33	17	33
Calculated Values	389	36	14	30
Family-Size Main Dishes[1]				
Turkey				
Company Values	677	102	20	22
Calculated Values	650	92	18	25
Salisbury Steak				
Company Values	1524	103	103	47
Calculated Values	1508	110	91	35
Beef Stew				
Company Values	720	42	25	82
Calculated Values	687	55	25	58
Chicken with Dumplings[2]				
Company Values	1306	87	57	111
Calculated Values	992	85	25	101

[1]In case of family-size main dishes, the weight was determined by dividing the kilocalories from protein, fat, and carbohydrate by 4, 9, and 4, respectively.

[2]Additional fat was added by the manufacturer, according to the label.

main dishes. Thirty per cent of the allowances were arbitrarily selected as the minimum contribution of these foods to the suggested requirements.

Since the metric system was used in determining the nutritive values of the foods and because small quantities were involved, unit costs were calculated in terms of grams.

A comparison of the cost of the ready-prepared dishes was made in relation to the cost of preparing the same dishes at home. The price of each frozen dish selected was obtained in each of the three stores so that the average cost for the dish could be calculated.

In order to determine the food costs of preparing the frozen foods at home, prices for the ingredients also were obtained from the three supermarkets. Where there were differences, the medium price was used or, in some cases, the lower of two prices was used.

CHAPTER IV

FINDINGS OF THE STUDY

Purchasers of Frozen Prepared Foods

The sixty purchasers of frozen prepared foods who were interviewed ranged in age from eighteen to more than fifty-five years as shown in Table 2. The majority of these individuals were between the ages of thirty-five and fifty-five years. The percentage of persons in specified age categories was as follows: 10 per cent, eighteen to twenty-two years of age; 27 per cent, twenty-two to thirty-five years of age; 45 per cent, thirty-five to fifty-five years of age; and 18 per cent, over fifty-five years of age. Only one of the shoppers exceeded the age of seventy-five years.

As may be seen from Table 2, a slightly larger proportion of the interviewees who selected frozen foods in the high-income oriented store were eighteen to thirty-five years of age. In each of the lower income oriented stores, the largest number of purchasers were from thirty-five to fifty-five years of age.

Of the shoppers interviewed, 88 per cent were women. Ten per cent of the women lived alone. Another 12 per cent reported the presence of children in the home but the absence of a male head of the household. The number of shoppers in

Table 2.--General Description Of Shoppers Interviewed

Store	Age Group	Number Interviewed	Sex		Marital Status		Activity			
			Male	Female	Married	Single	Light[1]	Moderate[2]	Heavy[3]	Retired and Non-employed[4]
A	18-22	3	1	2	1	2	1	1	1	..
	22-35	8	..	8	6	2	6	1	..	1
	35-55	5	1	4	3	2	2	3	..	..
	Over 55	4	..	4	2	2	..	..	..	4
	Sub-total	20	2	18	12	8	9	5	1	5
B	18-22	1	..	1	1	..	..	..	..	1
	22-35	5	1	4	4	1	1	1	1	2
	35-55	12	1	11	8	4	3	3	1	5
	Over 55	2	1	1	1	1	..	1	..	1
	Sub-total	20	3	17	14	6	4	5	2	9
C	18-22	2	1	1	..	2	..	..	1	1
	22-35	3	..	3	2	1	..	..	..	3
	35-55	10	..	10	9	1	4	4	..	2
	Over 55	5	1	4	3	2	1	..	..	4
	Sub-total	20	2	18	14	6	5	4	1	10
Totals		60	7	53	40	20	18	14	4	24

[1]Includes sedentary factory and office workers.
[2]Includes teachers, nurses, cottage parent, nursing home manager, sales persons, waitresses, and domestic workers.
[3]Includes dock and sheet metal workers, installer of air conditions, and a pipe fitter.
[4]Extent of work not known.

each of the three supermarkets who reported either living alone or with children but with no male head was approximately equal. Sixty-seven per cent of the total sample were married with spouses living at home.

Exclusive of the women living alone, families of the persons interviewed ranged in size from two to eight members. The number of children in families with no male head varied from three to seven.

The activity of the persons interviewed varied from light to heavy. Thirty per cent of the interviewees whose activities were classified as light were employed in sedentary work including that carried out in factories and offices. The activities of 23 per cent of the group were classified as moderate. This group included teachers, nurses, and domestic workers. Only 7 per cent of the persons were engaged in work classified as heavy.

Approximately 40 per cent of the number interviewed were not employed outside the home. About one-fourth of this latter group was made up of retired persons for whom the extent of activity was not determined. A number of the persons staying at home cared for their children during the day. Presumably, they could be placed in the category of light to moderate activity.

Frozen Precooked Food Selected

The one-course and three-course dinners were purchased more often than any other category of frozen food. The dinners selected included turkey, sliced beef, salisbury steak, fried chicken, flounder, spaghetti, and meat loaf. Thirty-one persons selected these frozen dinners. More than one-half of the persons shopping in either a high-or middle-income oriented store (Store A or B) purchased a dinner whereas only one-fourth of the shoppers purchased them in the low-income oriented store (Store C). The turkey and fried chicken dinners were chosen more frequently than any of the others.

The frozen pies and individual main dishes including turkey, beef, chicken, and macaroni and cheese were purchased by twenty-one of the shoppers. Approximately one-half of the participants shopping in Store A and Store C purchased a pot pie, while only two persons in Store B chose from this group of prepared foods. The majority of the shoppers who selected these particular foods were between the ages of thirty-five and fifty-five years. They tended to choose either chicken or turkey pies.

Fourteen of the shoppers purchased a family-size main dish including turkey, salisbury steak, chicken with dumplings, beef stew, fried chicken, pizza, and fish sticks. Only one person in Store A selected a family-size main dish,

a pizza in this case. Salisbury steak and fish sticks were selected more often than other dishes in this group. The four shoppers who purchased fish sticks were interviewed in Store C.

Reasons for the Choices of the Shoppers

As may be seen in Table 3, various reasons were given for the use of precooked frozen foods. The convenience of the products was the factor that influenced the purchase in 55 per cent of the cases. Approximately two-thirds of this group of purchasers were employed outside the home. Of the interviewees, 33 per cent made the selection on the basis of desirable taste. A combination of desirable taste and convenience was the reason reported by 11 per cent of the participants. One person was trying precooked frozen foods for the first time.

When questioned concerning their preference for home-cooked foods, irrespective of convenience, 65 per cent of the shoppers said they preferred home-prepared food. Although the responses to a previous question indicated that 33 per cent based their usage on the desirable taste rather than convenience, only 20 per cent of the group stated a preference for frozen foods over home-cooked foods.

The reasons given for the purchase of specific foods selected were not completely consistent with the responses given for the use of frozen foods in general. Of the thirty-

Table 3.--Preferences Of The Shoppers As Related To Home-Prepared And Frozen Commercial Foods

Age Group	Reasons for Selection				Preferences Relative to Frozen Food		
	Convenience	Taste	Taste and Convenience	Trial	Home-Prepared Preferred	Ready-Prepared Preferred	No Preference
			Dinners (Including Three-Course)				
18-22	2	3	..	..	5	..	..
22-35	6	1	..	..	4	2	1
35-55	11	4	1	..	13	2	1
Over 55	3	..	..	..	2	..	1
Sub-total	22	8	1	0	24	4	3
			Pot Pies and Individual Main Dishes				
18-22	2	1	..	..	3	..	..
22-35	3	2	..	..	3	2	..
35-55	4	1	3	..	3	2	3
Over 55	..	4	1	..	1	2	2
Sub-total	9	8	4	0	10	6	5
			Family-Size Main Dishes				
18-22	1	..	..	..	1	..	..
22-35	2	1	1	..	2	1	1
35-55	1	1	1	1	3	..	1
Over 55	1	4	..	..	3	2	..
Sub-total	5	6	2	1	9	3	2
Total[1]	36	22	7	1	43	13	10

[1]Some shoppers purchased from two categories.

one persons who purchased dinners, the choice was said to be based on convenience in 65 per cent of the cases. Where the pot pies and individual main dishes were concerned, convenience was the determining factor for 50 per cent of the twenty persons who chose these foods. Convenience was also the reason given by a like percentage of the fourteen persons who chose a family-size main dish.

Specific comments relative to texture and stability as influencing factors were not made by the interviewees. No one reported differences in cost as a motivating factor in the purchase. As will be reported in the next section, opinions were expressed relative to differences in the cost of frozen foods selected and comparable dishes prepared at home.

Comparison of Costs of Frozen and Home-Cooked Foods

Opinions of the Shoppers

As may be seen from an examination of Table 4, most of the interviewees considered frozen foods less expensive than home-prepared dishes. When questioned concerning individual choices, 73 per cent of those who purchased one-course dinners stated that the commercial product would cost less than would similar foods prepared at home. On the other hand, 15 per cent thought that the frozen foods were more expensive. Approximately 12 per cent considered the frozen foods and

Table 4.--Opinions Of The Shoppers Relative To The Cost Of Ready-Prepared And Home-Prepared Dishes

Frozen Product	User's Cost Estimate Relative to Ready-Prepared		
	More	Less	Equal
Dinners (One-Course)	4	19	3
Dinners (Three-Course)	2	2	1
Pot Pies and Individual Main Dishes	1	15	5
Family-Size Main Dishes	4	10	0
Total[1]	11	46	9

[1]Answers would appear to exceed total number of informants. This disparity results from the purchases of two or more products by some of the shoppers.

similar home-prepared foods to be about equal in cost. The shoppers were not given the opportunity to consider either the cost of labor and fuel or any differences in the size of standardized portions of the frozen dishes and the portions that might be available from the home preparation of the recipes.

The three-course dinners were considered to be less expensive than similar home-prepared dishes by 40 per cent of the interviewees. A similar percentage believed the cost of the frozen dinners to be greater while 20 per cent indicated they thought there would be no difference in the price of these foods whether purchased frozen or prepared at home.

Of those selecting pot pies or an individual main dish, 71 per cent were of the opinion that they were less expensive than would be those made at home. Five per cent of the purchasers believed the contrary and 21 per cent considered the cost would be about equal.

Family-size main dishes were thought to be less expensive by 71 per cent of the participants who selected them.

Comparison Based upon Actual Cost of Home-Preparation

The cost of the home preparation of the foods that were contained in the frozen products purchased by the interviewees are shown in Table 5 in comparison with the average cost of the commercial products. These frozen products were less than two to more than five times as expensive as similar dishes prepared at home, exclusive of labor and fuel.

The average cost of the one-course dinners was approximately 50 per cent higher than that of home-prepared dishes. The range of differences varied from a low of 10 per cent for a Brand B beef dinner to a high of 80 per cent for a flounder dinner. Three-course dinners were 60 to 65 per cent more expensive than were the direct food costs of home-prepared dishes with the exception of the beef dinner which was 46 per cent higher in cost.

The costs of the commercially prepared pot pies and individual main dish were from 8 to 68 per cent higher than

Table 5.--Cost Of Precooked Frozen Products And Similar Dishes Prepared At Home

Frozen Product	Total Weight (gm.)	Total Cost		Percentage Difference
		Ready-Prepared[1] ($)	Home-Prepared[2] ($)	
Dinners (One-Course)				
Beef - Brand A	312	.63	.43	32
Beef - Brand B	312	.49	.44	10
Meat Loaf	312	.49	.21	57
Spaghetti	312	.39	.21	46
Salisbury Steak	312	.49	.25	49
Turkey	340	.49	.22	55
Flounder	255	.49	.10	80
Fried Chicken	312	.49	.21	57
Dinners (Three-Course)				
Fried Chicken	482	.78	.27	65
Salisbury Steak	482	.79	.32	60
Turkey	482	.79	.29	63
Beef	482	.79	.43	46
Individual Main Dishes				
Beef Pot Pie	227	.25	.21	8
Chicken Pot Pie	227	.25	.08	68
Turkey Pot Pie	227	.25	.09	64
Macaroni and Cheese	227	.25	.13	48
Family-Size Main Dishes				
Beef Stew	907	1.29	.67	48
Salisbury Steak	907	1.29	1.09	16
Turkey	907	1.29	.54	58
Chicken with Dumplings	907	1.29	.44	66
Fried Chicken	907	1.89	.74	61
Fish Sticks	454	.67	.55	18
Cheese Pizza	354	.69	.19	71
Cheese Pizza with Sausage	397	.79	.30	62

[1]Average cost of frozen foods as purchased in early March, 1970.

[2]Costs computed from the medium-priced products as found in the three supermarkets and based upon the portion weights of the frozen foods.

were those of the foods contained in these dishes when prepared at home. The least difference found for this group of food was for the beef pot pie. Cost of the foods contained in a macarroni and cheese dish was 48 per cent below the cost of the commercial product.

For the family-size main dishes, the difference in cost between commercially prepared and home-prepared products ranged from 16 to 71 per cent. Individual differences for the commercially prepared dishes were found to be lowest for salisbury steak and highest for cheese pizza. The price of the commercial products averaged 50 per cent greater than that of the home-prepared ones, exclusive of labor and fuel.

Extent of Usage

The length of time during which the precooked frozen foods had been used by the shoppers ranged from less than one month to more than sixteen years. Approximately 13 per cent of the group had used these products less than one year; 60 per cent from one to five years; 13 per cent from five to ten years; and 13 per cent, for more than ten years. The specific nature of the responses concerning usage and frequency is given in Table 6.

The monthly usage of frozen prepared foods was found to vary from less than one each month to as many as sixteen. Twenty-eight per cent of the shoppers reported that they served frozen foods less than three times a month; 57 per

Table 6.--Length Of Time And Frequency Of Use For Frozen Prepared Food Reported By Shoppers

Store	Age Group	Length of Time				Frequency of Use		
		Less than 1 year	1-5 years	5-10 years	More than 10 years	Less than 3/month	3-8/ month	More than 8/month
A	18-22	2	1	..	..	2	1	..
	22-35	1	6	..	1	5	2	1
	35-55	..	4	..	1	2	2	1
	Over 55	..	2	1	1	1	3	..
	Sub-total	3	13	1	3	10	8	2
B	18-22	..	1	..	..	..	1	..
	22-35	1	2	1	1	2	2	1
	35-55	3	5	2	2	3	6	3
	Over 55	..	1	1	..	..	1	1
	Sub-total	4	9	4	3	5	10	5
C	18-22	..	2	..	..	..	2	..
	22-35	1	1	1	..	1	1	1
	35-55	..	7	1	2	1	8	1
	Over 55	..	4	1	..	..	5	..
	Sub-total	1	14	3	2	2	16	2
	Total	8	36	8	8	17	34	9

cent, from three to eight times; and 15 per cent, more than eight times.

When considered in terms of individual stores, there were marked differences in the frequency of usage. In the low-income-oriented store (Store C), 80 per cent of the shoppers reported that they served frozen prepared foods from three to eight times a month. Usage of these products from three to eight times a month was reported by 50 per cent of the shoppers in the middle-income-oriented store (Store B) and by 40 per cent of those in the high-income-oriented store (Store A). Fifty per cent of the interviewees in Store A stated they used these commercial products less than three times a month. Frozen food usage of less than three times a month was reported by 25 per cent of the participants in Store B; a like percentage reported usage of more than eight times a month.

Food Usage Relative to Other Meals

Approximately 65 per cent of the interviewees reported that the precooked frozen food would be served as the main meal eaten at home. Another 17 per cent stated that sometimes they served the frozen food as the main meal. There appeared to be no marked differences among the shoppers in the three supermarkets with respect to the usage of the precooked frozen foods.

In terms of the specific foods chosen, 79 per cent of the purchasers of the family-size main dishes would use this food at the main meal of the day; 71 per cent of the purchasers of the dinners reported that these foods would be used as the main meal while 62 per cent of those purchasing individual main dishes would use these at the principal meal. Additionally, the possibility of the use of the frozen precooked food as a main meal was reported by 15 per cent of the purchasers.

When questioned concerning the other meals of the day, 75 per cent of the shoppers interviewed said that they considered the other meals of the day to be complete. However, the shoppers were not given any criteria for this evaluation. Twenty-three per cent of these people indicated that the meals varied from complete ones to smaller meals such as a salad or a sandwich.

In general, most of the meals were eaten at home. Exceptions to this included lunches eaten at school or work.

Use of Additional Food with Frozen Precooked Products

Thirty-two per cent of the sixty interviewees stated they would serve additional food with the frozen precooked product. Twenty-three per cent of the shoppers reported that they might serve other foods at the same meal. Infor-

mation concerning the use of supplementary food is given in Table 7.

Of the twenty-six persons who purchased the one-course dinners, 23 per cent stated they would use other food with the meal. The majority of this group reported they would serve either bread or fruit or, possibly, a salad. Only two of the shoppers would serve a combination of bread, milk, and a fruit or salad as additions. Sixty-five per cent of this group indicated that they would not serve any other food. The remaining 12 per cent of the purchasers in this group said they might serve an additional food but were not sure.

Only one of the five persons who purchased three-course dinners stated that either a fruit or a salad would be added. Another shopper indicated that bread might be used with the meal.

Of the twenty-one persons who chose either pot pies or a macaroni and cheese dish, 29 per cent indicated they would not use any other food at the meal. Nineteen per cent of this group planned to serve either fruit or salad; another 19 per cent might add either fruit or salad.

Approximately 43 per cent of the fourteen shoppers who chose family-size main dishes planned to use additional

Table 7.--Extent Of Supplementation Of The Precooked Frozen Foods Used By The Interviewees

Precooked Frozen Food	Store	Number of Purchasers	Number Not Using Supplement	Number Using Supplementary Food	Kind of Supplement Used				
					Bread	Milk	Fruit or Salad	Combination of Two Groups	Combination of Three Groups
Dinners (One-Course)	A	8	7	1	..	..	..	..	1
	B	12	8	1	1	..	..	..	..
	C	6	2	4	1	..	2	..	1
Dinners (Three-Course)	A	4	3	1	..	..	1	..	..
	B	1	..	..	..	..	..	..	..
	C	0	..	..	..	..	..	..	..
Individual Main Dishes	A	9	2	2	..	..	2	..	..
	B	2	1	..	..	..	..	..	..
	C	10	3	6	1	1	2	1	1
Family-Size Main Dishes	A	1	..	..	..	..	..	..	..
	B	7	2	3	..	..	..	3	..
	C	6	3	3	1	..	..	1	1
Total [1]		66	31	21	4	1	7	5	4

[1]Discrepancy in total number of persons to supplement and not to supplement results from indecision concerning the addition of other foods.

food with it. Of this group, 67 per cent planned to serve a combination of two foods which would include bread and a fruit or salad, milk and a fruit or a salad, or bread and milk. Thirty-six per cent of the participants who chose family-size main dishes had no plans for serving additional foods.

Nutritive Value

Nutrient Content

The weights of the individual foods in the various frozen dishes chosen by the shoppers were determined. These weights and the nutrient content[1] of the more popular foods are given in Table 8. Similar information for the less frequently selected dishes is given in Appendix B.

The one-course turkey dinner was found to weigh 340 grams (12 ounces); the one-course salisbury steak dinner, 312 grams (11 ounces). Both of the three-course dinners weighed 482 grams (17 ounces) each. As may be seen from Table 7, the total weight of the meat in these dinners ranged from 53 to 84 grams (1.9 to 3 ounces). The average caloric value of the starchy food for each dinner, exclusive of desserts in the three-course meals, was 119 grams (4.2 ounces). Where vegetables other than potato were included, the average weight was 48 grams (1.7 ounces). Gravy represented a

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[1]Nutrient content is based on the cooked values prior to reheating.

Table 8.--Weight And Nutrient Content Of Selected Frozen Prepared Foods[1]

Food	Nutritive Value[2]											
	Weight (gm.)	Food Energy (Kcal.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Iron (mg.)	Vitamin A (I. U.)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Turkey Dinner - Three-Course												
Soup	104	21	1.4	0.5	2.5	3.1	0.1	62	-	0.01	0.3	-
Turkey	53	101	16.7	3.2	-	4.2	1.0	-	0.02	0.09	4.1	-
Dressing	57	204	3.7	12.4	20.3	37.6	0.9	371	0.05	0.07	0.9	-
Gravy[3]	54	7	0.8	-	1.7	0.2	-	-	-	-	0.1	-
Peas	45	32	2.4	0.2	5.5	10.4	0.8	243	0.13	0.05	1.0	9.0
Margarine	1	7	-	0.8	-	-	-	-	-	-	-	-
Mashed Potatoes	95	88	1.8	3.0	13.8	29.5	0.3	124	0.04	0.04	0.9	4.8
Cherry Crisp	74	78	0.8	0.4	18.8	22.9	0.4	50	0.01	0.02	0.1	1.9
Total	483	538	27.6	20.5	62.6	107.9	3.5	850	0.25	0.28	7.4	15.7
Salisbury Steak Dinner - Three-Course												
Soup	112	40	0.9	1.1	7.2	6.7	0.3	459	0.02	0.02	0.6	5.6
Salisbury Steak	84	207	16.7	13.8	2.9	12.2	2.2	27	0.07	0.15	3.8	-
Gravey[3]	80	15	1.5	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Mushroom	1	-	-	-	-	0.1	-	-	-	-	-	-
Peas	45	32	2.4	0.2	5.5	10.4	0.8	243	0.13	0.05	1.0	9.0
Butter	1	7	-	0.8	-	0.2	-	33	-	-	-	-
Mashed Potatoes	84	78	1.6	2.7	12.2	26.0	0.3	109	0.03	0.03	0.8	4.2
Apple Dowdy	76	115	1.2	2.7	22.6	13.7	0.5	76	0.05	0.03	0.3	0.8
Total	483	494	24.3	21.3	53.7	69.6	4.1	947	0.31	0.29	6.6	19.6
Turkey Dinner - One-Course												
Turkey	67	127	21.1	4.1	-	5.4	1.2	-	0.03	0.12	5.2	-
Dressing	57	204	3.7	12.4	20.3	37.6	0.9	371	0.05	0.07	0.9	-
Gravy[3]	75	15	1.0	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Peas	31	22	1.7	0.1	3.8	7.1	0.6	167	0.09	0.03	0.7	6.2
Carrots	15	5	0.1	-	1.1	5.0	0.1	1575	0.01	0.01	0.1	0.9
Butter	1	7	-	0.8	-	0.2	-	33	-	-	-	-
Mashed Potatoes	95	88	1.8	3.0	13.8	29.5	0.3	124	0.04	0.04	0.9	4.8
Total	341	468	29.4	20.4	42.3	85.1	3.1	2270	0.23	0.28	7.9	11.9
Salisbury Steak Dinner - One-Course												
Salisbury Steak	84	207	16.7	13.8	2.9	12.2	2.2	27	0.07	0.15	3.8	-
Gravy[3]	80	15	1.0	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Mushroom	1	-	-	-	-	0.1	-	-	-	-	-	-
Peas	42	30	2.3	0.2	5.1	9.7	0.8	227	0.12	0.05	1.0	8.4
Carrots	15	5	0.1	-	1.1	5.0	0.1	1575	0.01	0.01	0.1	0.9
Butter	2	14	-	1.6	-	0.4	-	66	-	-	-	-
Mashed Potatoes	87	81	1.7	2.8	12.6	27.0	0.3	113	0.03	0.03	0.8	4.4
Total	311	352	21.8	18.4	25.0	54.7	3.4	2008	0.24	0.25	5.7	13.7
Turkey Pot Pie												
Crust	60	300	3.7	20.0	26.3	8.4	1.0	-	0.12	0.08	1.1	-
Turkey	31	59	9.8	1.9	-	2.5	0.6	-	0.02	0.06	2.4	-
Gravy[3]	120	21	1.0	-	5.0	0.4	-	-	0.01	0.01	0.1	-
Peas	10	7	0.5	-	1.2	2.3	0.2	54	0.03	0.01	0.2	2.0
Carrots	6	2	0.1	-	0.4	2.0	-	630	-	-	-	0.4
Total	227	389	15.1	21.9	32.9	15.6	1.8	684	0.18	0.16	3.8	2.4
Macaroni and Cheese Dish												
Macaroni and Cheese Total	227	488	19.1	25.2	45.6	410.9	2.0	976	0.23	0.45	2.0	-
Fish Sticks - Family-Size Main Dish												
Fish Sticks (Total)	454	799	75.4	40.4	29.5	49.9	1.8	-	0.18	0.32	7.3	-
Salisbury Steak - Family-Size Main Dish												
Salisbury Steak	554	1443	108.8	91.3	20.6	82.9	15.2	177	0.46	1.01	24.9	-
Gravy[3]	353	65	1.9	0.1	14.7	1.4	0.3	-	0.04	0.02	0.3	-
Total	907	1508	110.7	91.4	35.3	84.3	15.5	177	0.50	1.03	25.2	-

[1]Selection of frozen prepared foods based on popularity.
[2]Calculations based on cooked food prior to reheating.
[3]Calculations include values for the additive, hydrolyzed plant protein.

relatively small portion of the total weight and ranged from 54 to 80 grams (1.9 to 2.8 ounces). The average weight of the soup in a three-course dinner was 108 grams (3.8 ounces) or approximately two-fifths of a cup; the average weight of the dessert was 75 grams (2.6 ounces).

The average caloric value of the popular three-course dinners was 516 kilocalories; that of the one-course dinners was 410. The average calculated values for protein, fat, and carbohydrate for the three-course meals were: 26, 21, and 58 grams, respectively, and 26, 19, and 34 grams for the one-course dinners.

Calcium content of these meals ranged from 54.7 milligrams in the one-course salisbury steak dinner to 107.9 milligrams in the three-course turkey dinner. Nutritive values for iron ranged from 3 to 4 milligrams. The range of values for the vitamins were calculated as follows: vitamin A, 850 to 2270 International Units; thiamin 0.23 to 0.31 milligrams; riboflavin, 0.25 to 0.29 milligrams; niacin, 5.7 to 7.9 milligrams; and ascorbic acid, 12 to 20 milligrams.

The total weight of the individual main dishes was 227 grams (8 ounces). The turkey pot pie and the macaroni and cheese dish provided an average of 439 kilocalories, 17 grams of protein, 24 grams of fat, and 39 grams of carbohydrate. The calcium provided by the individual meals ranged from 15.6 milligrams for the turkey pot pie to 410.9

milligrams for the macaroni and cheese. The iron of these foods ranged from 1.8 to 2.0 milligrams. Ranges for the vitamins were calculated to be as follows: vitamin A, 684 to 976 International Units; thiamin, 0.18 to 0.23 milligrams; riboflavin, 0.16 to 0.45 milligrams; niacin, 2.0 to 3.8 milligrams; and ascorbic acid, a trace to 2.4 milligrams.

The complete family-size main dishes were found to range in weight from 454 to 907 grams (1 to 2 pounds). The foods in these dishes were calculated to provide an average of 1154 kilocalories, 93 grams of protein, 66 grams of fat, and 32 grams of carbohydrate. The nutritive value of the total family-size meal is shown in Table 8. On the basis of five servings per meal, these values were calculated to be: energy, 230 kilocalories; protein, 20 grams; fat, 13 grams; carbohydrate, 6 grams; calcium, 13.4 milligrams; iron, 1.7 milligrams; vitamin A, 18 International Units; thiamin, 0.07 milligrams; riboflavin, 0.14 milligrams; and niacin, 3.3 milligrams. The nutritive values are considered in relation to nine of the Recommended Dietary Allowances of the National Research Council.

Nutrient Content of the Dishes in Relation to Recommended Dietary Allowances (RDA)

The nutritive values of the selected frozen precooked foods are shown in Table 9 in relation to nine of the Recommended Dietary Allowances (45) for the following age groups: a woman, 35 to 55 years of age; a man, 35 to 55 years of age; a teenage girl; a teenage boy; and children of elementary and preschool ages. Allowances are given in terms of the requirements for persons engaged in light activities.

The three-course dinners were calculated to provide about 28 per cent of the caloric allowance for the adult woman of 35 to 55 years of age and 20 per cent of that for the adult man of this age group. These meals provided more than 30 per cent of the suggested protein and niacin allowances for the adults. Although the dinners provided more than 30 per cent of the daily iron recommendation for the man, they only provided an average of 21 per cent of that for the woman. The three-course salisbury steak dinner furnished 31 per cent of the thiamin recommended for the woman and similar percentages of the ascorbic acid for both persons. Calcium, vitamin A, and riboflavin content of the dinners was less than 30 per cent of the RDA for the adults. The nutritive value of the three-course meals was not considered for the younger age groups since, in this study,

Table 9.--Nutritive Value Of Selected Frozen Foods[1] In Relation To Percentage Of Recommended Dietary Allowances Supplied By The Food

Consumer Category	Percentage of Nutritive Value								
	Food Energy	Protein	Calcium	Iron	Vitamin A	Thiamin	Riboflavin	Niacin	Ascorbic Acid
Turkey Dinner - Three-Course[2]									
Woman, 35-55	29	50	13	19	17	25	19	57	29
Man, 35-55	21	43	13	35	17	19	16	44	26
Salisbury Steak Dinner - Three-Course[2]									
Woman, 35-55	27	44	9	23	19	31	19	50	36
Man, 35-55	19	37	9	41	19	24	17	38	30
Turkey Dinner - One-Course									
Woman, 35-55	25	53	11	17	45	23	19	61	22
Man, 35-55	18	45	11	31	45	18	16	46	20
Teen Girl, 16-18	20	53	7	17	45	19	19	53	24
Teen Boy, 14-18	16	49	6	17	45	15	19	40	22
Child, 8-10	21	74	9	31	65	21	23	53	30
Preschooler, 3-4	33	100	11	31	91	33	35	88	30
Salisbury Steak Dinner - One-Course									
Woman, 35-55	19	40	7	19	40	24	17	44	25
Man, 35-55	14	34	7	34	40	18	15	34	23
Teen Girl, 16-18	15	40	4	19	40	20	17	38	27
Teen Boy, 14-18	12	36	4	19	40	16	17	29	25
Child, 8-10	16	55	5	34	57	22	21	38	34
Preschooler, 3-4	25	73	7	34	80	34	31	63	34
Turkey Pot Pie									
Woman, 35-55	21	28	2	10	14	18	11	30	4
Man, 35-55	15	24	2	18	14	14	9	23	4
Teen Girl, 16-18	17	28	1	10	14	15	11	26	5
Teen Boy, 14-18	13	26	1	10	14	12	11	20	4
Child, 8-10	18	38	2	18	20	16	13	26	6
Preschooler, 3-4	28	50	2	18	27	26	20	43	6
Macaroni and Cheese Dish									
Woman, 35-55	26	35	51	11	20	23	30	15	-
Man, 35-55	19	29	51	20	20	18	26	12	-
Teen Girl, 16-18	21	35	32	11	20	19	30	13	-
Teen Boy, 14-18	16	32	29	11	20	15	30	10	-
Child, 8-10	22	48	41	20	28	21	38	13	-
Preschooler, 3-4	35	64	51	20	39	33	56	22	-
Fish Sticks - Family-Size Main Dish[3]									
Woman, 35-55	9	27	1	2	-	4	4	12	-
Man, 35-55	6	23	1	4	-	3	4	9	-
Teen Girl, 16-18	7	27	1	2	-	3	4	10	-
Teen Boy, 14-18	5	25	1	2	-	3	4	8	-
Child, 8-10	7	38	1	4	-	4	5	10	-
Preschooler, 3-4	11	50	1	4	-	6	8	17	-
Salisbury Steak - Family-Size Main Dish[3]									
Woman, 35-55	16	40	2	17	1	10	14	38	-
Man, 35-55	12	34	2	31	1	8	12	29	-
Teen Girl, 16-18	13	40	1	17	1	8	14	33	-
Teen Boy, 14-18	10	37	1	17	1	7	14	25	-
Child, 8-10	14	55	2	31	1	9	18	33	-
Preschooler, 3-4	22	74	2	31	1	14	26	56	-

[1]Selection of frozen foods based on popularity.
[2]Three-course dinners were not reported as being eaten by children and teenagers.
[3]Based on one-fifth of total since most of these dishes were purchased to serve five persons.

they were not reported to be consumers of these foods.

The one-course dinners provided less than 30 per cent of the kilocalories recommended for all age and sex groups considered here with exception of the preschool child for whom the turkey dinner would have provided 33 per cent of the caloric allowance. These dinners were calculated to provide 30 per cent of the protein, vitamin A, and niacin allowances for each of the consumer categories. Both the turkey and the salisbury steak dinners would have furnished at least 30 per cent of the recommended amount of iron for the man and the children of elementary and preschool age, and approximately 18 per cent of that for the woman and the two teenage groups. Each of these dinners were calculated to contain 30 per cent or more of the ascorbic acid, thiamin, and riboflavin recommended for a child of preschool age. Like percentages of ascorbic acid were calculated for a child of elementary school age. The calcium of the dinners was found to be less than 12 per cent of the RDA for all groups considered.

The turkey pot pie was calculated to provide from 13 to 28 per cent of the caloric allowances for each of the groups; the macaroni and cheese dish would provide from 16 to 35 per cent of this allowance. The turkey pot pie would provide 30 per cent or more of the protein allowances for the children; the macaroni and cheese dish, from 29 to 64

per cent of that for each of the groups. The pot pie would not provide as much as 30 per cent of the allowances for the other nutrients for each group considered with exception of that of niacin for the woman and child of preschool age.

The macaroni and cheese dish was calculated to provide 29 to 51 per cent of the calcium and 26 to 56 per cent of the riboflavin allowances for each of the groups. There would be no significant amount of ascorbic acid in this dish. With exception of vitamin A and thiamin for the child of preschool age, this dish would provide less than 30 per cent of the allowances of these two nutrients as well as iron and niacin for each of the groups.

One-fifth of the family-size salisbury steak dish was calculated to provide from 12 to 22 per cent of the caloric allowances for each group considered. Lower percentages of the RDA were found for the main dish containing fish sticks. The salisbury steak dish would also provide 31 per cent of the iron allowances for the adult man and the younger children and 17 per cent of that for the woman and the teenagers. Little or none of the RDA for calcium, vitamin A, and ascorbic acid would be obtained from either of these dishes.

The one-fifth portion of the family-size meal of fish sticks would provide less than 30 per cent of the allowances for thiamin, riboflavin, and niacin for each group. Similar

percentages were found for the salisbury steak portion with the exception of niacin for a child of preschool age.

Effect of Additional Foods on the Nutritive Value and Percentage of RDA

The nutritional effect of adding four different combinations of food to one-fifth of the salisbury steak family-size main dish was calculated. The selection of the foods was based upon those reported by the interviewees as the most frequently used additions. As may be seen in Table 10, these combinations included some or all of the following: baked potato, a salad, bread, milk, and ice cream.

Combination One consisted of a slice of bread, a medium portion of lettuce salad with oil dressing, and one cup of milk. This combination would increase the caloric value of the serving by 373 kilocalories. Other increases in nutritive value included the following: protein, 11.1 grams; fat, 25.8 grams; carbohydrate, 26.3 grams; calcium, 324 milligrams; iron, 1.7 milligrams; vitamin A, 855 International Units; thiamin, 0.16 milligrams; riboflavin, 0.49 milligrams; niacin, 1 milligram; and ascorbic acid, 2.4 milligrams.

The nutritive increases resulting from the addition of two medium slices of tomato and an extra slice of bread to the first combination of foods was then considered. This second combination would provide 452 additional kilocalories,

Table 10.--Effect Of Additional Foods On The Nutritive Value Of One-Fifth Of A Salisbury Steak Family-Size Main Dish

Salisbury Steak and Additions	Nutritive Value										
	Food Energy (Kcal.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Iron (mg.)	Vitamin A (I.U.)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Salisbury Steak (181 gm.)	302	22.1	18.3	7.1	16.9	3.1	35	0.10	0.21	5.1	-
Combination One Bread (25 gm.) Lettuce (50 gm.) Oil Dressing (15 gm.) Milk (240 gm.)	373	11.1	25.8	26.3	324.0	1.7	855	0.16	0.49	1.0	2.4
Salisbury Steak with Combination One	675	33.2	44.1	33.4	340.9	4.8	890	0.26	0.70	6.1	2.4
Combination Two Bread (50 gm.) Lettuce (50 gm.) Tomato (50 gm.) Oil Dressing (15 gm.) Milk (240 gm.)	452	13.7	26.7	41.7	351.5	2.6	1305	0.25	0.56	1.7	13.9
Salisbury Steak with Combination Two	754	35.8	45.0	48.8	368.4	5.7	1340	0.35	0.77	6.8	13.9
Combination Three Combination Two Baked Potato (100 gm.) Butter (20 gm.)	687	16.2	42.8	62.7	364.5	3.3	1965	0.35	0.60	3.4	33.9
Salisbury Steak with Combination Three	989	38.3	61.1	69.8	381.4	6.4	2000	0.45	0.81	8.5	33.9
Combination Four Combination Two Baked Potato (100 gm.) Butter (20 gm.) Ice Cream (100 gm.)	892	20.2	55.8	83.7	487.5	3.4	2485	0.39	0.79	3.4	34.9
Salisbury Steak with Combination Four	1194	42.3	74.1	90.8	504.4	6.5	2520	0.49	1.00	8.7	34.9

13.7 grams of protein, 26.7 grams of fat, 41.7 grams of carbohydrate, 351.5 milligrams of calcium, 2.6 milligrams of iron, 1305 International Units of vitamin A, 0.25 milligrams of thiamin, 0.56 milligrams of riboflavin, 1.7 milligrams of niacin, and 13.9 milligrams of ascorbic acid.

Combination Three included a medium serving of lettuce and tomato salad with oil dressing, a baked potato of medium size, two slices of bread, two pats of butter, and one cup of milk. These foods were calculated to provide 687 kilocalories, 16.2 grams of protein, 42.8 grams of fat, 62.7 grams of carbohydrate, 364.5 milligrams of calcium, 3.3 milligrams of iron, 1965 International Units of vitamin A, 0.35 milligrams of thiamin, 0.60 milligrams of riboflavin, 3.4 milligrams of niacin, and 33.9 milligrams of ascorbic acid.

A three-fourth cup serving of ice cream with Combination Three would increase the caloric value of the food supplement to 892 kilocalories. This fourth combination also was calculated to provide the following: protein, 20.2 grams; fat, 55.8 grams; carbohydrate, 83.7 grams; calcium, 487.5 milligrams; iron, 3.4 milligrams; vitamin A, 2485 International Units; thiamin, 0.39 milligrams; riboflavin, 0.79 milligrams; niacin, 3.6 milligrams; and ascorbic acid, 34.9 milligrams.

The effect that the addition of each of the combinations have on one-fifth of the salisbury steak meal is given in Table 11 in relation to the Recommended Dietary Allowances of the National Research Council for a woman of 35 to 55 years of age, a girl of 16 to 18 years of age, and a child of elementary school age.

Combination One increased the caloric value of the salisbury steak by approximately 17 per cent. With this addition, the dish would now provide from 29 to 36 per cent of the kilocalories recommended for each group. The one-fifth portion of the unsupplemented dish was calculated to provide from 40 to 55 per cent of the allowances for protein for the three groups considered here. With the additional foods, from 60 to 83 per cent would be provided. Niacin allowances for the groups would be increased from a range of 33 to 38 per cent to one of 41 to 47 per cent. The supplementary foods augmented the serving of salisbury steak sufficiently to provide 30 per cent of the riboflavin recommended for each of the three groups. The additions would also increase calcium content of the meal to provide 30 per cent of the RDA for the woman and child, and iron for the child. Thirty per cent of the iron needs of the adult woman and teenage girl would not be provided by the meal even with the additional foods.

Table 11.--Effect Of Additional Foods On The Percentage Of Recommended Dietary Allowances Provided By One-Fifth Of A Salisbury Steak Main Dish

Salisbury Steak and Additions	Percentage of Nutritive Value								
	Food Energy	Protein	Calcium	Iron	Vitamin A	Thiamin	Riboflavin	Niacin	Ascorbic Acid
Salisbury Steak Portion									
Woman, 35-55	16	40	2	17	1	10	14	38	-
Girl, 16-18	13	40	1	17	1	8	14	33	-
Child, 8-10	14	55	2	31	1	9	18	33	-
With Combination One									
Woman, 35-55	36	60	43	27	18	26	47	47	4
Girl, 16-18	29	60	26	27	18	22	47	41	5
Child, 8-10	31	83	34	48	25	24	58	41	6
With Combination Two									
Woman, 35-55	41	65	46	32	27	35	51	52	25
Girl, 16-18	33	65	28	32	27	29	51	45	28
Child, 8-10	34	90	37	57	38	32	64	45	35
With Combination Three									
Woman, 35-55	53	70	48	36	40	45	54	65	61
Girl, 16-18	43	70	29	36	40	38	54	57	68
Child, 8-10	45	96	38	64	57	41	68	57	85
With Combination Four									
Woman, 35-55	65	77	63	36	50	49	67	67	63
Girl, 16-18	52	77	39	36	50	41	67	58	70
Child, 8-10	54	106	50	65	72	45	83	58	87

The use of Combination Two with the salisbury steak was calculated to provide more than 30 per cent of the recommended kilocalories, protein, iron, riboflavin, and niacin for the woman and girl. Thirty per cent of the calcium and thiamin recommended would be provided by this same combination of foods. However, it would not provide 30 per cent of the allowances of vitamin A and ascorbic acid for the woman and the girl nor would it provide 30 per cent of the calcium and thiamin for the girl. This combination would provide at least 30 per cent of the RDA for the child.

Each of the last two combinations shown in Table 11 would provide approximately 30 per cent of the RDA for each group.

CHAPTER V

DISCUSSION

In this study, 63 per cent of the shoppers were over thirty-five years of age, with the majority between thirty-five and fifty-five years of age. This suggests the possibility that frozen prepared foods are more popular with the older age groups than with the younger aged shoppers. One may speculate that the quantity of food provided in the precooked combinations is not sufficient for the appetites of younger persons. Cost, also, may be a deterrent to younger shoppers and to those over fifty-five years of age.

Dinners were purchased more frequently than any of the other precooked frozen foods in this investigation. This is in agreement with information reported by Martin (7). Convenience was the reason given for this choice by the majority of those buying them.

Fewer dinners were purchased in the low-income oriented store than in the middle- or high-income oriented stores. This may be related in part to the limited selection available. Three-course dinners were not stocked in this store nor was there a large selection of nationally known one-course brand dinners. Choices under a national label were limited to meat loaf, fried chicken, and turkey.

Apropos of the private label versus a well-known national label, an industrial report (50) suggests that allegiance of the lower income groups, especially non-white, to nationally advertised brands of frozen foods is a barrier to the sale of foods bearing a private label. This allegiance was thought to be partly the result of the fear of being cheated by unfamiliar manufacturers. It is possible that the limited selection of nationally known brands was a factor that influenced the choices of the shoppers in this study.

Nationally advertised brands of individual and family-size main dishes, especially those containing fish sticks, were popular among the shoppers of the low-income-oriented store. This popularity may have been related in part to the ethnic group of the shoppers. The food manufacturers who produce precooked frozen soul foods (43) have recognized the role of ethnocentrism in influencing food choices.

Outside employment of the homemaker did not appear to be an outstanding factor in the use of precooked frozen foods. A larger number of the shoppers in the high-income-oriented store were employed outside the home than was the cases in the other two stores. These shoppers used the frozen foods less frequently than did those in the other stores. The interviewees were not questioned specifically concerning the number of meals eaten outside the home. However, incidental

comments of this group indicated that approximately one-third of them occasionally ate the evening meal outside the home. The meals eaten outside the home may have been a reason for the less frequent usage of frozen foods.

Size of the family did not appear to influence the use of frozen precooked foods. As reported earlier, these products were used by persons living alone and by families consisting of as many as eight members.

Purchasers of precooked frozen foods usually considered them less expensive than their home-prepared counterparts. A male shopper and his teenage daughter supported their response by stating that their family had recently made a comparison of cost, without reference to time, and found an equal quantity of ready-prepared macaroni and cheese to be lower in price than the home-cooked dish. Both dishes were considered equally acceptable in taste.

When the foods used by the shoppers were duplicated at home, the cost of the ingredients was found to be less than that of the total cost of the commercial product. An estimate of the cost of the fuel and labor was not made as a part of this study.

In 1967, Quam (8) found that quantity foods prepared in an institution kitchen were cheaper than similar foods purchased precooked and frozen. The labor cost in this investigation was based on an hourly rate of $2.25. In a

study carried out at Drexel Institute of Technology (9) in 1963, it was found that the home-cooked beef dinner was more expensive and the chicken pie less expensive than those purchased ready-prepared. Labor costs were established at $1.40 an hour, a figure no longer applicable. The Drexel study also reported that the average amount of time required to prepare a home-cooked meal for four persons was 119 minutes.

When the hourly pay rate of $2.25 as used by Quam is applied to the average time for the preparation of family-size meals as determined by the Drexel Institute of Technology, the cost of labor for the home preparation of the dish is approximately $4.46. On this basis, the precooked frozen dishes would be less expensive. However, where a larger number of servings are prepared together, the cost of labor for each serving would decrease within limits.

As reported in a recent trade journal (51), commercial food companies have emphasized that more economical ways of processing and handling foods have in general helped to hold down food prices. Despite a 46 per cent increase in the cost of labor from 1955 to 1965, the cost of labor for each unit increased only 14 per cent during the same period.

However, in view of the nutritive inadequacies found in some of the frozen combinations when used as main meals, it may be of value for home economists to carry out further

work on time and money saving procedures in the preparation of home-cooked recipes for freezing. In this way more variety and more generous servings could be provided. Convenience would not need to be entirely sacrificed since the preparation of larger quantities of food at one time would provide for meals requiring no preparation beyond reheating.

Certainly, the increased usage of frozen prepared foods points up the need to give consideration to the nutritive values of these foods. As calculated, none of the popular dishes met the imposed criterion of 30 per cent of the Recommended Dietary Allowances of the National Research Council for the nine factors considered for selected age groups[2]. Somewhat less than 30 per cent of the RDA might be acceptable where the other meals of the day were generous and contained a variety of nutritious food. However, for those persons who used the precooked foods as the main meal and for whom the other meals were particularly light, the nutritional hazard would be increased.

In terms of the RDA for the adult man and woman, the three-course dinner containing salisbury steak was more nutritious than the turkey. The one-course turkey dinner, the macaroni and cheese, and the one-fifth portion of the family-size salisbury steak dish more nearly met 30 per cent

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[2]Activity of the groups was classified as light.

of the RDA for each age group considered than did the other popular foods in this study.

Values for these calculations recognized only the average losses which occur during the cooking process. The complete effect of reheating on the nutritive value of frozen precooked foods is not known. As reported by Causey and Fenton (11,13), there is evidence of further loss of water-soluble vitamins during reheating. Also apropos of nutrient loss, Morgan and co-workers (10) state that long periods of storage decrease the nutritional value of foods. Thus, it may be that these foods provide smaller amounts of the nutrients than the calculations indicate.

As stated earlier in this report, the calculations were based on the requirements of persons engaged in light activities. The interviews suggest in a few cases that the activities might better have been classified as moderate or even heavy. For these persons, the discrepancy between 30 per cent of the RDA and the nutrients provided by these foods would be even greater.

The use of additional foods with the frozen precooked products would increase their nutritive values. As was shown in Table 10, the salisbury steak portion of the family-size dish was low in calories, calcium, iron, vitamin A, thiamin, riboflavin, and ascorbic acid. Supplementation of the dish with bread, lettuce and tomato salad with oil

dressing, and milk would augment the nutrients so that 30 per cent or more of the specified nutrients would be provided except for vitamin A and ascorbic acid. If a medium size baked potato and butter were consumed at the same meal, vitamin A and ascorbic acid would appear to be increased above the 30 per cent level.

Similar increases in nutritive value would result from the use of these supplementary foods with the dinners and individual main dishes.

While not possible to include an investigation of microbiological problems in this study, it was observed in one store that some frozen precooked foods were left outside the freezer cabinet during the entire one hour period allotted for the interviews. This observation adds emphasis to the need for frozen food laws and their enforcement (33).

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Summary

The objectives of this study were: (1) to determine the frequency of consumer usage of frozen dinners and main dishes; (2) to determine portion weights of the commonly selected frozen products; (3) to consider the foods used in relation to nutritive contributions, palatability, and wholesomeness; and (4) to determine the unit serving cost of the commonly selected frozen products in comparison with the direct food cost of home-prepared dishes.

To obtain the objectives of this study, three supermarkets were selected in different sections of Durham, North Carolina as representative of high-, middle-, and low-income shoppers. A questionnaire was developed to obtain information from the twenty persons interviewed in each store.

Information relative to the nutritive value of the precooked frozen foods was requested from the manufacturers of the brands available in the three supermarkets. Only two of the companies responded by sending estimates of the nutritive values. These values were compared with those calculated on the basis of the weight of the component foods of the dish. The values determined were considered in

relation to nine of the Recommended Dietary Allowances of the National Research Council.

A comparison of the cost of the ready-prepared dishes and the cost of preparing the same dishes at home, exclusive of labor and fuel, was made using medium-priced products.

The majority of the participants in this investigation were married women between thirty-five and fifty-five years of age. Most of the participants were employed outside the home. Usually this work involved activities that could be classified as light.

Frozen dinners were found to be more popular than either the individual or family-size main dishes. More than one-half of the interviewees had used precooked frozen foods from one to five years, and served these products at the main meal of the day either once or twice each week. In most instances, additional foods were not served with the frozen dish.

Convenience was cited by 55 per cent of the participants as the main reason for usage. Eleven per cent reported that the selection of these foods was influenced by the taste as well as by convenience. Even though convenience was a major factor that influenced the shoppers to purchase frozen precooked foods, this factor could not be related to either the size of the family or to employment outside the home.

Most of the interviewees considered frozen foods less expensive than home-prepared dishes. Actual cost of the frozen products purchased by the participants was less than two to more than five times as great as similar dishes prepared at home, exclusive of labor and fuel.

According to calculations on the nutritive values, none of the precooked products would provide 30 per cent of the food energy and the nutrients of the Recommended Dietary Allowances of the National Research Council for the groups considered. However, the addition of nutritious foods could increase the value of the dish to provide 30 per cent or more of the RDA. Calculations for the nutritive values did not consider any losses which might result from either storage or reheating.

Recommendations

This consideration of frozen precooked foods has resulted in identification of the following areas that seem to require further study: (1) effects of changes in temperature during distribution from the point of manufacture to the point of consumption; (2) effects of storage and reheating on the nutritive value of precooked foods; and (3) time and cost of the home-preparation of doubled or tripled family recipes for freezing.

Food manufacturers might consider the possibility of giving the weights of individual food components. Consideration could be given to packaging each meat with two or three choices of vegetable combinations as suggested by several interviewees.

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APPENDIX A

QUESTIONNAIRE

Directions: Write a brief statement to answer the following questions. Where indicated, use a check (✓) to mark your choice.

1. Age group (Check)
   _____ 18-22 _____ 35-55 _____ Over 75
   _____ 22-35 _____ 55-75

2. Marital status (Check) _____ Married _____ Single

3. Sex (Check) _____ Female _____ Male

4. Occupation _____

5. Kind of frozen precooked food selected _____
   _____

6. Why do you use these foods? _____
   _____

7. Do you prefer the frozen dinners and main dishes to home-prepared meals? _____

8. Do you consider this type of convenience food more or less expensive than a comparable home-cooked meal? _____

9. How often do you serve frozen precooked food? _____

10. How long have you been using these products? _____

11. Is the frozen product used at the main meal of the day?___

12. Is additional food served with the frozen product? _____
    If yes, does the addition include milk_____, fruit _____, vegetable or vegetable salad _____, bread _____

13. Where are other meals eaten? Breakfast _____, Lunch _____, Dinner _____

14. Describe other meals eaten during the day in terms of one of the following: complete meal____; a salad only _____; a sandwich only _____; other foods _____

15. Give the number of persons in your family who eat the frozen precooked food. Adults _____M, _____F; Children _____; Teenagers _____

Store_____ Day_____ Time_____ Week_____

APPENDIX B

APPENDIX B

Weight And Nutrient Content Of Frozen Prepared Foods

Food	Nutritive Value[1]											
	Weight (gm.)	Food Energy (Kcal.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Iron (mg.)	Vitamin A (I. U.)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
Brand A Beef Dinner - One-Course												
Beef	103	196	30.5	7.3	-	13.4	3.8	10	0.08	0.23	3.3	-
Peas	40	28	2.2	0.2	4.8	9.2	0.7	216	0.11	0.04	0.9	8
Margarine	1	7	-	0.8	-	0.2	-	33	-	-	-	-
Corn	43	36	1.3	0.4	8.1	1.3	2.6	172	0.05	0.04	0.6	3
Hash Browns	47	108	1.5	5.5	13.7	5.6	0.4	-	0.04	0.03	1.0	4
Gravy[2]	80	14	0.2	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Total	314	389	35.7	14.2	29.9	30.0	7.5	431	0.29	0.34	8.1	15
Brand B Beef Dinner - One-Course												
Beef	95	181	28.1	6.7	-	12.4	3.5	10	0.08	0.21	3.0	-
Gravy[2]	42	8	0.9	-	1.7	0.2	-	-	-	-	-	-
Carrots	15	5	0.1	-	1.1	5.0	0.1	1575	0.01	0.01	0.1	1
Corn	60	50	1.9	0.6	11.5	1.8	0.4	240	0.07	0.06	0.8	4
Butter	2	14	-	1.6	-	0.4	-	66	-	-	-	-
Mashed Potatoes	97	90	1.8	3.0	14.1	30.1	0.3	126	0.04	0.04	0.9	5
Total	311	348	32.8	11.9	28.2	49.9	4.3	2017	0.20	0.32	6.8	10
Meat Loaf Dinner - One-Course												
Meat Loaf	144	288	22.9	19.0	4.8	13.0	2.6	-	0.19	0.32	3.6	-
Tomato Sauce	15	17	0.2	1.3	1.3	1.5	0.1	191	0.01	0.01	0.1	1
Corn	58	48	1.9	0.6	10.9	1.8	0.4	233	0.07	0.06	0.8	4
Butter	1	7	-	0.8	-	0.2	-	33	-	-	-	-
Mashed Potatoes	95	88	1.8	3.0	13.8	29.5	0.3	134	0.04	0.04	0.9	5
Total	313	448	26.8	24.7	30.8	46.0	3.4	581	0.31	0.43	5.4	10
Spaghetti and Meat Balls Dinner - One-Course												
Spaghetti and Meat Balls	218	292	16.4	10.3	34.0	109.0	3.3	1395	0.22	0.26	3.5	20
Apples	84	78	0.2	0.1	20.4	6.2	0.4	17	0.01	0.03	0.2	6
Bread	15	41	1.3	0.5	7.6	12.6	0.4	-	0.04	0.03	0.4	-
Margarine	2	14	-	1.6	-	0.4	-	66	-	-	-	-
Total	319	425	17.9	12.5	62.0	128.2	4.1	1478	0.27	0.32	4.1	26
Flounder Dinner - One-Course												
Flounder	136	369	34.4	19.6	11.7	44.6	2.1	-	0.12	0.14	3.3	2
Potato Puffs	56	128	1.7	6.6	16.3	6.7	0.5	-	0.04	0.03	1.2	5
Peas	67	48	3.6	0.3	8.1	15.4	1.2	362	0.19	0.07	1.5	13
Total	257	545	39.7	26.5	36.1	66.5	3.8	362	0.35	0.24	6.0	20
Fried Chicken - One Course												
Chicken	153	234	34.9	8.9	1.3	14.4	2.1	123	0.06	0.33	11.8	-
Peas	40	3	2.2	0.2	4.8	9.2	0.7	216	0.11	0.04	0.9	8
Carrots	15	5	0.1	-	1.1	5.0	0.1	1575	0.01	0.01	0.1	1
Butter	2	14	-	1.6	-	0.4	-	66	-	-	-	-
Mashed Potatoes	106	99	2.0	3.4	15.4	32.9	0.3	138	0.04	0.04	1.0	5
Total	316	355	39.2	14.1	22.6	61.9	3.2	2118	0.22	0.42	13.8	14
Fried Chicken Dinner - Three-Course												
Soup	100	32	2.6	0.9	3.9	5.0	0.3	1100	0.02	0.02	0.4	-
Chicken	164	248	37.4	9.1	1.5	15.2	2.3	127	0.07	0.34	13.3	-
Corn	47	39	1.5	0.5	8.8	1.4	0.3	187	0.05	0.05	0.6	3
Butter	3	21	-	2.4	-	0.6	-	99	-	-	-	-
Mashed Potatoes	90	84	0.2	2.9	13.1	27.9	0.3	117	0.04	0.04	0.8	5
Apple Betty	88	133	1.4	5.1	26.1	15.8	0.5	88	0.03	0.03	0.4	1
Total	492	557	43.1	18.9	53.3	65.9	3.7	1718	0.23	0.48	15.5	9
Beef Dinner - Three-Course												
Soup	122	32	1.7	1.0	4.0	4.9	0.2	24	0.01	0.01	0.4	-
Beef	85	162	25.2	6.0	-	11.1	3.1	9	0.07	0.19	4.5	-
Gravy[2]	78	15	1.5	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Peas	47	35	2.5	0.2	5.7	10.8	0.9	25	0.13	0.05	1.1	9
Butter	2	14	-	1.6	-	0.4	-	66	-	-	-	-
Mashed Potatoes	89	83	1.7	2.9	12.9	27.6	0.3	116	0.04	0.04	0.8	5
Pineapple Cake	63	207	2.8	6.7	34.2	92.4	0.4	87	0.02	0.06	0.1	-
Total	486	546	35.4	18.4	60.1	147.5	4.9	327	0.28	0.36	7.0	14
Beef Pot Pie - Individual Main Dish												
Crust	60	300	3.7	20.0	26.3	8.4	1.0	-	0.12	0.08	1.1	-
Beef	50	95	14.8	3.5	-	6.5	1.9	5	0.04	0.11	2.7	-
Gravy[2]	83	14	0.9	-	3.3	0.3	-	-	0.01	0.01	0.1	-
Peas	16	11	0.9	0.1	1.9	3.7	0.3	86	0.04	0.02	0.4	3
Carrots	7	2	0.1	-	0.5	2.3	-	733	-	-	-	-
Potatoes	11	39	0.9	0.7	8.8	4.8	0.3	-	0.02	0.01	0.5	2
Total	227	461	21.3	24.3	40.8	26.0	3.5	826	0.23	0.23	4.8	5
Chicken Pot Pie - Individual Main Dish												
Crust	60	300	3.7	20.0	26.3	8.4	1.0	-	0.12	0.08	1.1	-
Chicken	40	8	1.2	0.4	-	0.5	0.1	10	-	0.01	0.4	-
Gravy[2]	122	22	1.0	-	5.0	0.4	-	-	0.01	0.01	0.1	-
Peas	3	2	0.2	-	0.4	0.1	0.1	2	0.01	-	0.1	1
Carrots	2	1	-	-	0.1	0.7	-	210	-	-	-	-
Total	227	333	6.1	20.4	31.8	10.1	1.2	222	0.14	0.10	1.7	1
Beef Stew - Family-Size Main Dish												
Beef	170	430	48.3	24.8	-	22.1	6.3	51	0.09	0.36	7.3	-
Gravy[2]	437	80	2.2	0.1	18.0	1.8	0.3	-	0.05	0.03	0.4	-
Carrots	52	16	0.3	0.1	3.7	17.2	0.3	546	0.03	0.03	0.3	3
Potatoes	248	161	4.7	0.3	34.0	14.9	1.2	-	0.22	0.07	3.0	40
Total	907	687	55.7	25.3	57.7	56.0	8.1	597	0.39	0.49	11.0	43
Turkey - Family-Size Main Dish												
Turkey	283	538	89.1	17.3	-	22.6	5.4	-	0.14	0.51	21.8	-
Gravy[2]	624	111	3.4	0.2	24.6	2.4	4.4	-	0.07	0.04	0.5	-
Total	907	649	92.5	17.5	24.6	25.0	9.8	-	0.21	0.55	22.3	-
Chicken with Dumplings - Family-Size Main Dish												
Chicken	226	470	67.8	20.1	-	27.1	3.4	565	0.09	0.34	21.7	-
Gravy[2]	396	72	3.1	0.1	16.4	1.6	0.3	-	0.04	0.03	0.4	-
Dumplings	283	450	14.5	5.1	84.5	662.4	2.9	167	0.47	0.45	3.7	1
Total	905	992	85.4	25.3	100.9	691.1	6.6	732	0.60	0.82	25.8	1
Fried Chicken - Family-Size Main Dish												
Chicken Total	907	1587	194.3	75.6	17.8	76.2	11.4	1079	0.38	2.29	58.4	-
Cheese Pizza - Family-Size Main Dish												
Pizza Total	354	835	42.5	29.4	100.2	782.4	3.5	2230	0.21	0.71	3.5	28
Cheese Pizza with Sausage - Family-Size Main Dish												
Pizza Total	393	920	30.7	36.6	116.3	66.8	4.7	2201	0.35	0.47	5.9	35

[1]Calculations based on cooked food prior to reheating.

[2]Calculations include values for the additive, hydrolysed plant protein.

Nutritive Value Of Frozen Foods In Relation To Percentage Of Recommended Dietary Allowances Supplied By The Food

Consumer Category	Percentage of Nutritive Value								
	Food Energy	Protein	Calcium	Iron	Vitamin A	Thiamin	Riboflavin	Niacin	Vitamin C
Brand A Beef Dinner - One-Course									
Women, 35-55	21	65	4	42	9	29	23	42	28
Men, 35-55	15	55	4	75	9	22	20	47	23
Teen Girl, 16-18	17	65	2	42	9	24	23	33	30
Teen Boy, 14-18	13	60	2	42	9	19	23	40	28
Child, 8-10	18	89	3	75	13	26	28	33	38
Preschooler, 3-4	28	119	4	75	18	41	43	89	38
Brand B Beef Dinner - One-Course									
Women, 35-55	19	60	6	24	40	20	22	52	18
Men, 35-55	13	50	6	43	40	15	19	40	17
Teen Girl, 16-18	15	60	4	24	40	17	22	45	20
Teen Boy, 14-18	12	55	4	24	40	13	22	34	18
Child, 8-10	16	82	5	43	58	18	28	45	25
Preschooler, 3-4	25	82	6	43	81	29	41	75	25
Meat Loaf - One-Course									
Women, 35-55	24	49	6	18	12	30	27	41	18
Men, 35-55	17	42	6	33	12	23	24	31	17
Teen Girl, 16-18	20	49	3	18	12	25	27	35	20
Teen Boy, 14-18	15	45	3	18	12	20	27	27	18
Child, 8-10	20	68	5	33	17	27	33	35	23
Preschooler, 3-4	32	90	6	33	23	43	30	59	23
Spaghetti and Meat Balls Dinner - One-Course									
Women, 35-55	23	33	16	23	10	27	21	31	46
Men, 35-55	16	28	16	41	10	21	19	34	42
Teen Girl, 16-18	18	33	10	23	10	25	21	27	51
Teen Boy, 14-18	14	30	9	23	10	18	21	20	46
Child, 8-10	19	45	13	41	14	25	27	27	64
Preschooler, 3-4	30	61	16	41	20	39	40	45	64
Flounder Dinner - One-Course									
Women, 35-55	29	72	8	21	7	40	14	46	37
Men, 35-55	21	61	8	38	7	31	12	35	34
Teen Girl, 16-18	24	72	5	21	7	33	14	40	41
Teen Boy, 14-18	18	66	5	21	7	27	14	30	37
Child, 8-10	25	100	7	38	10	36	17	40	52
Preschooler, 3-4	39	133	8	38	14	57	25	67	52
Fried Chicken Dinner - One-Course									
Women, 35-55	19	72	8	18	42	20	27	105	26
Men, 35-55	14	61	8	33	42	15	24	81	24
Teen Girl, 16-18	15	72	5	18	42	17	27	91	28
Teen Boy, 14-18	12	66	4	18	42	13	27	69	26
Child, 8-10	16	99	6	33	61	18	33	91	36
Preschooler, 3-4	25	132	8	33	85	29	50	152	36
Fried Chicken Dinner - Three-Course[1]									
Women, 35-55	30	78	8	21	34	23	32	119	16
Men, 35-55	21	66	8	37	34	18	28	91	14
Beef Dinner - Three-Course[1]									
Women, 35-55	29	64	18	27	6	28	24	53	26
Men, 35-55	21	54	18	49	6	22	21	41	24
Beef Pot Pie - Individual Main Dish									
Women, 35-55	25	39	3	19	17	23	15	37	10
Men, 35-55	18	33	3	35	17	18	14	28	10
Teen Girl, 16-18	20	39	2	19	17	19	15	32	11
Teen Boy, 14-18	15	36	2	19	17	15	15	24	10
Child, 8-10	21	53	3	35	24	21	19	32	14
Preschooler, 3-4	33	71	3	35	33	33	29	53	14
Chicken Pot Pie - Individual Main Dish									
Women, 35-55	18	11	1	7	4	16	7	13	1
Men, 35-55	12	9	1	12	4	11	6	10	1
Teen Girl, 16-18	14	11	1	7	4	12	7	11	1
Teen Boy, 14-18	11	10	1	7	4	9	7	8	1
Child, 8-10	15	15	1	12	6	13	8	11	2
Preschooler, 3-4	24	20	1	12	9	20	12	18	2
Beef Stew - Family-Size Main Dish[2]									
Women, 35-55	7	20	1	9	2	8	7	17	16
Men, 35-55	5	17	1	16	2	6	6	13	14
Teen Girl, 16-18	6	20	1	9	2	7	7	13	17
Teen Boy, 14-18	5	19	1	9	2	5	7	11	16
Child, 8-10	6	28	1	16	3	7	8	15	21
Preschooler, 3-4	10	37	1	16	5	11	12	24	21
Turkey - Family-Size Main Dish[2]									
Women, 35-55	7	34	1	11	-	4	7	34	-
Men, 35-55	5	28	1	20	-	3	6	24	-
Teen Girl, 16-18	6	34	-	11	-	3	7	30	-
Teen Boy, 14-18	4	31	-	11	-	3	7	22	-
Child, 8-10	6	46	-	20	-	4	9	30	-
Preschooler, 3-4	9	62	1	20	-	6	14	49	-
Chicken with Dumplings - Family-Size Main Dish[2]									
Women, 35-55	11	31	17	7	3	12	11	40	-
Men, 35-55	8	26	17	13	3	9	9	30	-
Teen Girl, 16-18	9	31	11	7	3	10	11	34	-
Teen Boy, 14-18	7	29	10	7	3	8	11	26	-
Child, 8-10	9	43	14	13	4	11	13	34	1
Preschooler, 3-4	14	43	17	13	6	17	20	57	1
Fried Chicken - Family-Size Main Dish[2]									
Women, 35-55	17	71	2	13	4	10	33	90	-
Men, 35-55	12	60	2	23	4	8	29	69	-
Teen Girl, 16-18	14	71	1	13	4	9	33	78	-
Teen Boy, 14-18	11	65	1	13	4	7	33	59	-
Child, 8-10	14	97	2	23	6	9	42	78	-
Preschooler, 3-4	22	130	2	23	9	14	63	130	-
Cheese Pizza - Family-Size Main Dish[2]									
Women, 35-55	9	15	20	4	9	4	7	5	10
Men, 35-55	6	13	20	7	9	3	6	4	10
Teen Girl, 16-18	7	15	12	4	9	3	7	5	11
Teen Boy, 14-18	6	14	11	4	9	3	7	4	10
Child, 8-10	8	21	16	7	13	4	9	5	14
Preschooler, 3-4	12	28	20	7	18	6	13	8	14
Cheese Pizza with Sausage - Family-Size Main Dish[2]									
Women, 35-55	10	11	2	5	9	10	7	9	13
Men, 35-55	7	9	2	9	9	8	6	7	12
Teen Girl, 16-18	8	11	1	5	9	9	7	8	14
Teen Boy, 14-18	6	10	1	5	9	7	7	6	13
Child, 8-10	8	15	1	9	13	9	9	8	18
Preschooler, 3-4	13	20	2	9	18	14	13	13	18

[1]Three-course dinners were not reported as being eaten by children and teenagers.

[2]Based on one-fifth of total since most of these dishes were purchased to serve five persons.