

R79-47^o

//RESEARCH//

TECHNICAL LIBRARY
 U.S. ARMY NATICK R&D COMMAND
 NATICK, MA 01700

Food preferences of enlisted personnel in the Armed Forces

HERBERT L. MEISELMAN, PH.D.,
 and DAY WATERMAN¹
*Food Sciences Laboratory,
 U.S. Army Natick Research and
 Development Command,
 Natick, Massachusetts*

Thirty-nine hundred men in uniform were queried about their food likes and dislikes and how frequently they would like to eat 378 food items. Here are their answers.

The Armed Forces have designed and used food preference and acceptance rating methods for the last quarter-century. This continuing work is founded on two assumptions, namely, that menus should reflect a knowledge of what people like and do not like (as well as other factors, especially cost and nutrition) and that menus are central in the design and management of any foodservice system. The menu, to a large degree, determines what foods are used and the resulting food cost, the level of expertise of the foodservice personnel required, the equipment needed for preparation and serving, and the dining facility atmosphere appropriate to the food and situation.

It is important to note that the Armed Forces have never been satisfied with simply gathering descriptive data. Rather, the food scientists and behavioral scientists of the Armed Forces (first, at the Food and Container Institute in Chicago, and more recently at the U.S. Army Natick [Massachusetts] Research and Development Command) have spent the great proportion of their effort developing and testing methods of measuring food habits, including food preferences (1-4).

¹The authors wish to thank their many colleagues in the Behavioral Sciences Division and in the Operations Research and Systems Analysis Office, U.S. Army Natick Research and Development Command, who assisted in the collection and analysis of these data.

This report is designed to update the literature on current food habits within the Armed Forces. Beginning in 1970, the food research program at the Natick Research and Development Command has been carried out under the Department of Defense Food Research, Development, Testing and Engineering Program. Hence, the recent food preference survey has included all four military services (Army, Air Force, Navy, and Marine Corps), not just the Army, which was the subject of most of the reports in the past.

Highlights of a 1972 study of the food preferences (attitudes toward food names) of almost 3,900 enlisted personnel (predominantly male) of all four services are presented here. The survey instrument (see Method) asked each respondent to indicate how much he liked or disliked each food and how often he wanted it served. Recent efforts in food preference measurement in this laboratory have combined these two measures of food preference into a single survey form, with both scales appearing on the same page.

Method

Data were collected by group administration of a mark-sense survey conducted by professional personnel of this laboratory. Survey sites were base dining halls, messdecks of ships, or base recreation centers. Testing was carried out under a variety of climatic conditions: Marine Corps and Navy testing in warm weather; Army testing in moderate weather; and Air Force testing in cold, temperate, and warm weather.

The sample was intended to draw equally and randomly from the entire enlisted population at each base and ship. To accomplish this, various techniques were used, depending on access to computer support. Some subjects were selected by Social Security number, others by name, and still others were sent by their supervisors without our prior knowledge of their identity. An effort was made to observe that the relative proportion of groups receiving free dining facility food and those receiving money in lieu of food was approximately equal to the population at large. A smaller emphasis was placed on the representation of ranks. A total of 3,885 usable surveys were obtained from an initial sample of over 4,000.

Subjects were predominantly male Caucasians with an approximate mean age of twenty-four years. The range of ages was seventeen to fifty-six years, with 99 per cent of the subjects who received free meals being twenty-five years and under; 60 per cent of those who received a rations allowance were younger than twenty-six years.

Two methods of survey administration were used. The Army and Air Force respondents completed a Consumer Opinion Survey (5) prior to the Food Preference Survey (4). Both surveys were administered at a single session. Each required approximately 1 hr. to complete. In the Marine Corps and Navy, the Food Preference Survey was the only instrument used. Session size varied from under ten to over 150 subjects; most sessions were attended by twenty-five to 100 people. Sessions were held both morning and afternoon from approximately 8 to 10 a.m. and

1	2	3	4	5	6	7	8	9
dislike extremely	dislike very much	dislike moderately	dislike slightly	neither like nor dislike	like slightly	like moderately	like very much	like extremely

	NEVER TRIED	HOW MUCH you like or dislike the food (1-9)	HOW OFTEN you want to eat the food in days per month (01-30)
055 Hot Fudge Sundae	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
056 Canned Green Beans	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
057 Breaded Veal Steaks	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
058 Chitterlings	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
059 Pork Chop Suey	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
060 Lemon Cookies	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
061 Lasagna	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
062 Hamb	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
063 Fi	<input type="radio"/>	1 2 3 4 5 6 7 8 9	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

FIG. 1. Sample of a page from the 1972 Food Preference Survey.

from approximately 1 to 3 p.m.

The 1972 Food Preference Survey consisted of 378 food names arranged in a random order. For analysis, the foods were grouped into thirty-three food classes, primarily according to their use in military menus. Thus, potatoes were grouped with potato substitutes, since they are used interchangeably in menus; however, yellow and green vegetables were considered separately. For methodologic reasons, ten duplicate food names were included in the survey to check reliability. Also, three nonsense food names ("buttered ermal," "braised trake," and "funistrada") were added to the list to provide an estimate of how often subjects responded to a word which sounds like a food name or answered automatically without reading the name.

The survey format (Figure 1), in which the respondent could check "never tried" or indicate a preferred frequency and hedonic score, was chosen after experience with a more complicated food preference survey format which utilized an hedonic preference and preferred frequency scale for each meal (3). The method of expressing desired frequency values from zero to 30 through a two-digit system (00, 01, 02, . . . 30) was adopted after testing with enlisted men at the Natick Command. The hedonic scale is the same one used in many prior studies conducted by the Quartermaster Food and Container Institute and the Natick Command (1).

Prior to completing the survey, the subjects received oral instructions which stressed several points: (a) The survey was not intended to be an evaluation of military food preparation quality—only of general preferences among a list of specific items; (b) the opinion of each person was needed, and therefore group decision-making should be avoided; (c) the survey format was best approached by doing each food item, one at a time. "For each food, first decide whether you have had it; if not, darken the circle under 'never tried' and move to the next food. If you have had the food item, then darken the circles indicating how much you like it and how many days per month you want it served." The use of the preferred frequency scale (Figure 1) was described with emphasis on the need for a two-digit answer (00, 01, . . . , 10, . . . , 30). Questions were welcomed during the survey; however, respondents were not told the identity of

any food item. If they described it correctly, their view was corroborated; otherwise, they were advised to check "never tried."

Results and discussion

The data from the 3,885 subjects were pooled and means computed from the hedonic and preferred frequency scales for all 378 food names. Two lists were compiled, rank ordering the means for the two types of data (from best to least liked). The lists of mean values are not included here, but may be found in Meiselman, Waterman, and Symington (4). Interestingly, dairy products occupy the best- and least-liked ends of the entire hedonic scale list, milk being most preferred, and skim milk and buttermilk being the two least-preferred items (No. 377 and No. 378). On the frequency scale list, milk is number one, but three vegetable products occupy the last three places. These findings are similar to previous survey data of both military and civilian populations. Milk has traditionally been rated at or near the top on most food preference surveys, while some vegetables have repeatedly been found to be unpopular (1,4,6,7).

The least familiar items, i.e., those with the highest percentage of "never tried" responses, were the three nonsense items, funistrada (84 per cent), braised trake (82 per cent), and buttered ermal (80 per cent). From 16 to 20 per cent of the sample responded to one of these three fictitious names listed at different places within the survey. From the first to the tenth food item of the "never tried" list, the percentage "never tried" dropped from 84 per cent to 59 per cent, and by item No. 20, the percentage fell to 46 per cent. Thus, a majority of the survey sample responded to a vast majority of the 378 foods. The relationship between preference and familiarity is evident from the high correlations between hedonic score and the percentage who had tried an item (Pearson product-moment correlation, $r=0.73$), and between preferred frequency score and the percentage who had tried an item ($r=0.75$). Both relatively high values indicate that familiar items were well liked, i.e., the more people who had tried an item, the higher the average preference scores tended to be on both scales. This relationship between familiarity and preference has been known for some time (8).

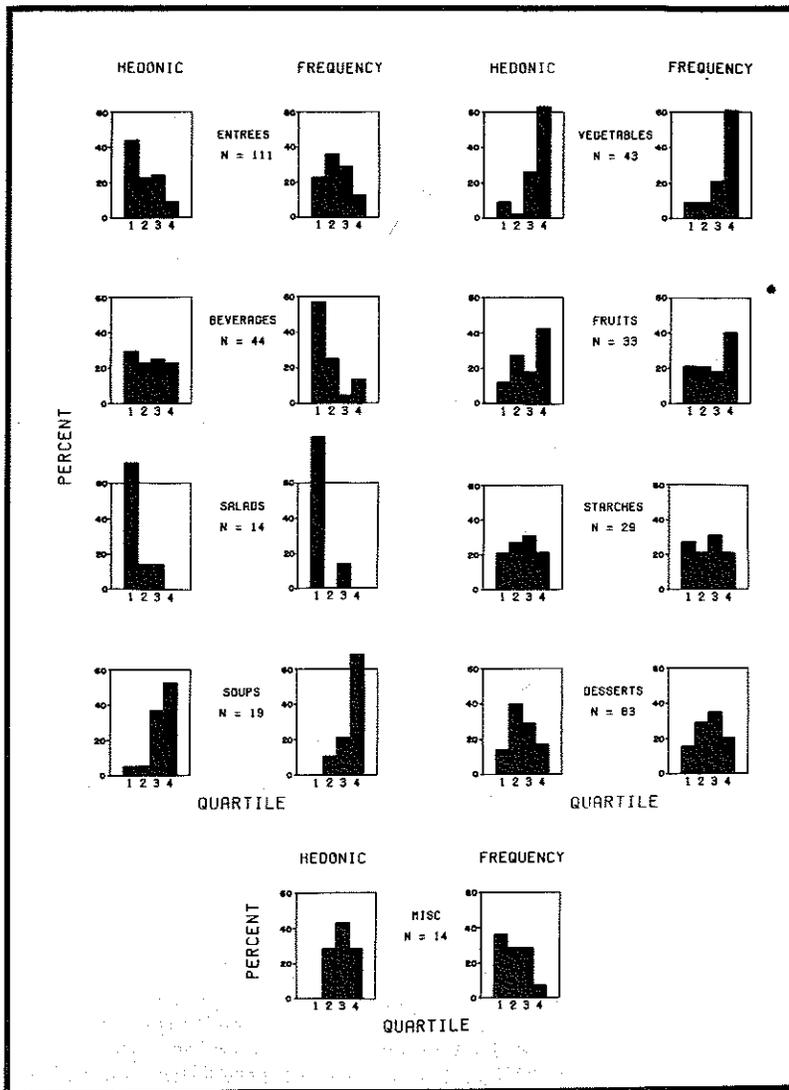


FIG. 2. Quartile distribution of food item ranks. Food within each class is expressed as a per cent of the total number of foods in that class.

QUARTILE DISTRIBUTION OF RANKS. In Figure 2, several large food groups are shown. Initially, all 378 foods were ranked according to arithmetic mean and divided into four parts (ranks 1-94, 95-188, 189-282, and 283-378). The individual histograms represent the percentage of foods in each group which falls in each of the four quartiles. It is possible, due to the popularity of individual foods, for all foods in a group to be in a single quartile or spread across the entire range. In the case of groups with small numbers of food items, such as salads, the percentage may be slightly misleading, e.g., the 72 per cent hedonic value in Quartile 1 of Salads represents only ten items. It can, nonetheless, be strongly stated that the salads in this survey were popular. For Entrées, which represented 111 of the 378 foods, forty-nine items (44 per cent) ranked in the first ninety-four (the first quartile) on the hedonic scale, twenty-five (22 per cent) in the second quartile, twenty-seven (24 per cent) in the third, and ten (9 per cent) in the last or bottom quartile.

The resulting histogram shows that while some items

fell in the "least preferred," or fourth quartile, the data were skewed toward the lower, more preferred ranks. The frequency scale data exhibit a more even distribution across the ranks, showing that entrées were rated more highly on the hedonic scale than on the frequency scale. That is, while entrées may be highly liked using the hedonic measure, they are not desired as frequently as other foods in the survey, and therefore rank lower. This difference can be clarified by the fact that the two scales are not highly correlated. In the previous survey design in which the scales were physically separated (3), the correlation was $r=0.39$; in this survey, in which the two scales were in close proximity to one another, thus encouraging more agreement, the correlation is only $r=0.56$. The two scales measure somewhat different concepts.

FOOD CLASS AND ITEM PREFERENCES. The data on individual food items, arranged by hedonic rank within food classes, are presented in Table 1. These items are arrayed in order of descending hedonic preference within their appropriate

Table 1. Food items in descending hedonic rank order within food classes*

<p>1. Appetizers fruit cocktail fruit cup tomato juice* guacamole dip vegetable juice</p> <p>2. Soups chicken noodle soup vegetable soup tomato soup turkey rice soup tomato vegetable noodle soup clam chowder beef rice soup beef barley soup bean soup minestrone soup cream of potato soup cream of mushroom soup corn chowder fish chowder Creole soup onion soup split pea soup egg drop soup</p> <p>3. Fruit and vegetable juices orange juice grape juice grapefruit-orange juice apple juice tomato juice pineapple juice grapefruit juice grapefruit-pineapple juice vegetable juice cranberry juice prune juice</p> <p>4. Fruit drinks and iced tea iced tea lemonade orange-flavored drink fruit punch grape-flavored drink cherry-flavored drink grape lemonade lime-flavored drink</p> <p>5. Hot beverages hot chocolate tea fresh coffee freeze-dried coffee instant coffee</p> <p>6. Milk products milk ice cream milk shake chocolate milk soft-serve ice cream fruit-flavored yogurt skim milk buttermilk</p> <p>7. Carbonated beverages cola root beer orange soda ginger ale grape soda cherry soda lemon-lime soda</p>	<p>pepper soda low-calorie soda</p> <p>8. Beer beer</p> <p>9. Hot breads and doughnuts doughnuts sweet breads blueberry muffins English muffins Danish pastries cornbread baking-powder biscuits coffee cake plain muffins</p> <p>10. Breakfast cereals cold cereal hot oatmeal hominy grits hot whole wheat cereal</p> <p>11. Griddle cakes waffles French toast griddle cakes</p> <p>12. Eggs eggs to order omelet</p> <p>13. Breakfast meats bacon ham Canadian bacon sausage links pork sausage patties creamed chipped beef scrapple grilled bologna</p> <p>14. Fish and seafood French fried shrimp lobster seafood platter fried fish French fried fish sticks shrimp creole French fried scallops salmon baked tuna and noodles baked fish fried oysters</p> <p>15. Meats grilled steak fried chicken roast beef roast turkey hot roast beef sandwich with gravy Swiss steak hot turkey sandwich with gravy barbecued spareribs baked ham grilled minute steak grilled ham baked chicken pot roast Italian sausage pepper steak baked stuffed pork chops roast pork breaded veal steaks veal Parmesan</p>	<p>Polish sausage barbecued beef cubes roast veal grilled lamb chops roast lamb spareribs with sauerkraut sauerbraten pork hocks corned beef pickled pigs' feet chitterlings braised liver with onions boiled pigs' feet</p> <p>16. Stews and extended meats spaghetti with meat sauce spaghetti with meatballs pizza lasagna Salisbury steak meat loaf beef stew Swedish meat balls chili con carne ravioli beef stroganoff turkey pot pie shrimp creole enchiladas chicken cacciatore ham loaf chili macaroni sukiyaki sweet and sour pork vealburger baked tuna and noodles pork chop suey stuffed green peppers stuffed cabbage corned beef hash</p> <p>17. Short order, sandwiches bacon, lettuce, and tomato sandwich pizza cheeseburger hamburger grilled ham and cheese sandwich ham sandwich sloppy Joe grilled cheese sandwich turkey club sandwich submarine sandwich meatball submarine tacos western sandwich tuna salad sandwich frankfurter burritos egg salad sandwich hot tamales frankfurter, cheese, and bacon fishwich peanut butter and jelly sandwich hot pastrami sandwich bologna sandwich salami sandwich hot Reuben sandwich baked bean sandwich</p>	<p>18. Potato and potato substitutes French fried potatoes hashed brown potatoes mashed potatoes potato chips baked potatoes baked macaroni and cheese pork and beans Boston baked beans Spanish rice scalloped potatoes fried rice giblet stuffing buttered noodles steamed rice cornbread stuffing sweet potatoes hot potato salad savory bread stuffing rice pilaf sausage stuffing refried beans boiled navy beans</p> <p>19. Green vegetables, buttered mixed vegetables canned green beans frozen green beans canned peas buttered peas and carrots collard greens frozen peas cabbage broccoli asparagus spinach Brussels sprouts fried okra creamed frozen peas mustard greens canned Lima beans fried cabbage turnip greens buttered zucchini squash frozen Lima beans</p> <p>20. Yellow vegetables corn-on-the-cob buttered whole kernel corn cream-style corn buttered mixed vegetables corn fritters buttered peas and carrots buttered wax beans buttered carrots buttered succotash baked yellow squash French fried carrots</p> <p>21. Other vegetables French fried onion rings simmered sauerkraut stewed tomatoes fried eggplant buttered cauliflower harvard beets creamed onions French fried cauliflower mashed rutabagas (turnip) fried parsnips</p>
--	---	--	--

Table 1, concluded

<p>22. Fruit salads mixed fruit salad sliced orange salad jellied fruit salad banana salad Waldorf salad cottage cheese and fruit salad pineapple cheese salad</p>	<p>26. Fresh fruit peaches oranges apples watermelon tangerines grapes bananas cantaloupe pears honeydew melon plums grapefruit half fruit cup</p>	<p>molasses cookies butterscotch brownies raisin cookies nut bars fruit bars</p>	<p>coconut custard pie fried pie (fruit) butterscotch cream pie pineapple cream pie pineapple pie sweet potato pie apricot pie raisin pie</p>
<p>23. Vegetable salads cole slaw macaroni salad celery and carrot sticks cucumber and onion salad frijole salad garden cottage cheese salad jellied vegetable salad pickled beet and onion salad carrot, raisin, and celery salad kidney bean salad</p>	<p>27. Canned fruits peaches pears applesauce fruit cocktail pineapple sweet cherries grapefruit sections apricots plums figs stewed prunes</p>	<p>29. Cakes strawberry shortcake devil's food cake pineapple upside down cake banana cake Boston cream pie peach shortcake angel food cake cherry upside down cake raspberry shortcake chocolate cream pie marble cake pound cake cheesecake white cake spice cake gingerbread yellow cake peanut butter cake</p>	<p>31. Pudding and other desserts apple crisp banana cream pudding chocolate pudding chocolate cake pudding vanilla cream pudding strawberry gelatin coconut cream pudding butterscotch pudding cherry cake pudding rice pudding bread pudding fruit-flavored yogurt</p>
<p>24. Tossed green salads tossed green salad lettuce salad chef's salad tossed vegetable salad sliced tomato salad</p>	<p>28. Cookies and brownies brownies chocolate chip cookies oatmeal cookies chocolate cookies peanut butter cookies vanilla wafers sugar cookies nut cookies lemon cookies</p>	<p>30. Pies apple pie lemon meringue pie banana cream pie cherry pie strawberry chiffon pie chocolate cream pie pumpkin pie blueberry pie blackberry pie lemon chiffon pie peach pie</p>	<p>32. Ice cream and sherbet ice cream milk shake banana split hot fudge sundae soft-serve ice cream strawberry sundae sherbet butterscotch sundae pineapple sundae</p>
<p>25. Salad dressings Thousand Island dressing French dressing Italian dressing vinegar and oil dressing Russian dressing Caesar dressing blue cheese dressing sour cream dressing</p>			<p>33. Nonsense Foods funistrada buttered ermal braised trake</p>

*Ten duplicate foods listed only by the higher ranking of each pair. Some foods listed in two groups, although only listed once in the survey.

classes. Due to space consideration, the corresponding frequency data are not presented. Additional information may be found, however, in Table 2, in which both types of data are represented. This table contains the class means and ranges for both types of data.

Many interesting and worthwhile comparisons may be made from these two tables. Several will be made here to emphasize particular points. The class of Appetizers contains relatively low-preference ratings and, therefore, would not perform the traditional foodservice role of the appetizer well, i.e., a highly acceptable beginning of the meal. Soups also show overall low preference; only two soups scored in the top 200 ranked items on the frequency scale, and those two plus one additional soup fall in the top 200 on the hedonic scale (Table 1). Many soups rank in the bottom 100 items. The class mean is the second lowest on the frequency data and falls twenty-ninth of thirty-two hedonic class means in Table 2. Soups continued to receive low-preference ratings as they have in recent studies of both military (4) and college (7) populations.

Beverages showed a wide variety of preference patterns. Within the fruit and vegetable juice class, orange and grape flavors were preferred, with grapefruit, apple, tomato, pineapple, and vegetable in the mid-range, and cranberry and prune juices falling extremely low. Iced tea

and lemonade were also very popular cold drinks, as contrasted with the unpopular, imitation fruit-flavored drinks. Popular hot drinks were hot chocolate, tea, and fresh coffee. The class means for these items in Table 2 are relatively low because of the unpopularity of instant and freeze-dried coffee. The Milk products group contains many popular items (milk, milk shake, chocolate milk), although the milk products related to dieting (fruit-flavored yogurt, skim milk) were unpopular with this predominantly male sample. Similarly, low-calorie soda was the lowest ranking carbonated beverage (hedonic = 3.85) and one of the lowest ranking of all foods on both scales. Cola was by far the most popular carbonated beverage, along with orange and root beer. Overall, few beverages rank within the bottom 100 foods, which is surprising for such a large food class. The mean frequency ratings for beverages are all above 11.20 times per month, suggesting that repeated servings of the beverages appear to be appropriate. The high preference for beer is believed to be related to its lack of availability within the military dining facility. When beer was made available on an experimental basis in a vending machine, consumption did not approach the level predicted by the preference data.

Overall, breakfast-related food groups contain many highly preferred items. Doughnuts were clearly the most

Table 2. Means and ranges of scores for each food class

food class	hedonic score		frequency score	
	mean	range	mean	range
appetizers	5.81	5.37—6.43	9.99	8.38—11.87
soups	5.33	4.52—6.57	7.13	5.30—10.25
fruit and vegetable juices	5.79	4.06—7.50	11.20	4.85—19.02
fruit drinks and iced tea	6.48	5.38—6.91	11.39	8.70—16.87
hot beverages	5.88	4.85—6.76	13.68	9.47—19.24
milk products	6.19	3.69—7.98	13.35	5.75—24.59
carbonated beverages	5.80	3.85—6.80	11.26	6.08—16.72
beer	7.26	7.26	19.78	19.78
hot breads and doughnuts	6.30	5.66—6.85	10.56	7.89—13.51
breakfast cereals	5.60	5.35—6.06	9.83	8.18—12.54
griddle cakes	6.49	6.40—6.54	11.59	11.14—12.45
eggs	6.98	6.44—7.51	16.57	12.11—21.02
breakfast meats	6.29	5.01—7.33	10.97	7.00—17.29
fish and seafood	6.22	5.65—7.13	9.20	7.44—11.98
meats	6.24	4.32—7.76	9.03	5.01—14.43
stews and extended meats	6.25	5.16—7.27	8.86	5.99—12.01
short order, sandwiches	6.34	4.39—7.24	9.61	5.30—12.47
potato and potato substitutes	5.99	4.99—7.42	9.03	6.12—14.55
green vegetables	5.22	4.69—5.95	7.41	6.00—10.40
yellow vegetables	5.67	4.03—7.50	8.50	4.61—13.36
other vegetables	4.76	3.85—6.74	6.04	4.10—11.21
fruit salads	5.45	4.89—6.28	7.67	6.08—9.94
vegetable salads	5.12	4.29—6.23	7.30	4.74—11.49
tossed green salads	6.57	6.29—7.03	13.37	11.81—17.18
salad dressings	5.60	4.68—6.47	10.14	6.49—13.39
fresh fruit	6.76	5.94—7.16	12.61	8.61—15.37
canned fruits	5.68	4.08—6.65	8.41	4.62—11.60
cookies and brownies	5.67	5.12—6.65	7.94	6.16—10.81
cakes	6.10	5.41—7.43	8.45	6.87—11.88
pies	5.90	4.49—6.98	8.34	5.12—11.67
puddings and other desserts	5.71	4.71—6.50	7.97	6.39—9.61
ice cream and sherbet	6.78	5.93—7.38	12.14	8.64—14.73
nonsense foods	4.70	4.41—5.01	6.95	6.13—7.72

popular breakfast bread, but none of the items in that class was unpopular. Cold cereal was the most highly preferred cereal (hedonic=6.06) as compared with several hot cereals. The Griddle cake items (French toast, waffles, griddle cakes) were all more popular than the cereals. Eggs and breakfast meats were very popular, with a few exceptions (scrapple, grilled bologna). A breakfast of orange juice, bacon, eggs-to-order, and doughnuts comprised an extremely high-preference meal. Unfortunately for the dining facility manager seeking frequent praise, breakfast is the least attended of all meals in the Armed Forces dining facilities (5).

While fish has traditionally been considered a low-preference item for the military (1,4) and college students alike (7), the fish and seafoods class does contain some preferred items (shrimp, lobster). No seafood falls within the bottom 100 ranked items on either of the preference scales.

The Meats class contains many popular entrées, mainly unadorned meats (baked chicken, grilled steak, baked ham, roast beef, fried chicken, grilled ham, and so on), as well as several unpopular items, both familiar (braised liver with onions, hedonic=4.64) and unfamiliar (boiled

pigs' feet, hedonic=4.32). The class means in Table 2 reflect the mixture of the popular and moderately popular items, with a resulting hedonic mean of 6.24 and a frequency mean of 9.03. Recall, however, that one should not expect as high a frequency scale value for entrées as for beverages. Whereas some beverages may be desired on a daily basis, most entrées would become extremely monotonous if they were served as often as every other day. A similar mean hedonic rating exists for the Stews and extended meats class which includes several very popular items (lasagna, pizza, spaghetti) and many moderately popular items. Overall, entrées do not contribute heavily to the bottom ranking items (Figure 2). This is especially true for the Short-order, sandwich class of entrées, which exhibits higher class means than does the Meats class. Einstein and Hornstein also found (7) high rankings for sandwiches relative to main dishes in their sample of college students.

The balance of the meal presents a less favorable picture. The highly preferred starches (in the Potato and potato substitutes class) were French fries, hashed browns, mashed potatoes, and other white potato products. Stuffings, rice, and beans received much lower ratings. Likewise, the Vegetable and Salad classes have a few favorites, but a large number of disliked items. The lowest class means in Table 2 are found in the Other vegetable class in which only French fried onion rings were well liked (hedonic=6.74). Only green beans and mixed vegetables achieved a rank within the top 200 foods (on either scale) of the Green vegetables class, and only the corn products and buttered mixed vegetables achieved this in the Yellow vegetables class. These preference patterns for starches and vegetables are similar to previous military and student surveys. The fact that many low-preference items from these classes are still found on menus suggests that foodservice planners have not yet found a solution to the menu planning problems created by vegetable preferences.

The Tossed green salads class may offer some promise to this dilemma by using salads as a vegetable substitute. Of the three salad classes presented in Table 2, Tossed green salads were the best and most frequently liked, with all five items being liked equally well (standard deviation=.30 hedonic scale points). The Fruit and Vegetable salads classes contained only two outstanding items (mixed fruit salad, cole slaw) which fell in the top 200 items of the hedonic ranked list.

Fresh fruits were considerably more popular than Canned. Ten of the fresh fruits ranked in the first 100 of the hedonic list, but only one canned fruit performed as well (canned peaches). Fresh fruits are an under-used source of nutrition in the military and may also be a good substitute for the low-preference vegetables.

Desserts exhibited a wide variety of preferences. All dessert classes contain high-preference, moderate-preference, and low-preferences items, the result being rather modest class means in Table 2. The Ice cream and sherbert class is clearly the popular favorite, with the Cookies and brownies class the least favored. While few of the dessert items were rated as low as some of the

Table 3. High- and low-preference foods of Armed Forces personnel

<i>food class</i>	<i>high-preference</i>	<i>low-preference</i>
1. appetizers		
2. soups	tomato vegetable noodle soup tomato soup chicken noodle soup	corn chowder fish chowder split pea soup egg drop soup onion soup Creole soup
3. fruit and vegetable juices	orange juice grape juice	cranberry juice prune juice
4. fruit drinks and iced tea	lemonade iced tea	grape lemonade lime-flavored drink cherry-flavored drink
5. hot beverages		instant coffee freeze-dried coffee
6. milk products	milk ice cream	skim milk buttermilk fruit-flavored yogurt
7. carbonated beverages	cola	low-calorie soda
9. hot bread and doughnuts	doughnuts sweet breads	plain muffins
10. breakfast cereals	cold cereal	
11. griddle cakes	griddle cakes	
12. eggs		
13. breakfast meats	bacon Canadian bacon	grilled bologna scrapple
14. fish and seafood	French fried shrimp seafood platter lobster	baked fish salmon baked tuna and noodles
15. meats	roast beef Swiss steak pot roast grilled steak grilled minute steak barbecued spareribs grilled ham baked ham Italian sausage fried chicken baked chicken hot turkey sandwich with gravy hot roast beef sandwich with gravy	grilled lamb chops spareribs with sauerkraut corned beef pork hocks pickled pigs' feet sauerbraten
16. Stews and extended meats	lasagna pizza spaghetti with meat sauce spaghetti and meat balls meatloaf Swedish meat balls Salisbury steak beef stew	chicken cacciatore chili macaroni ham loaf vealburger stuffed cabbage corn beef hash stuffed green peppers pork chop suey sweet and sour pork sukiyaki baked tuna and noodles
17. short order, sandwiches	hamburger cheeseburger ham sandwich bacon, lettuce, and tomato sandwich grilled cheese sandwich grilled ham and cheese sandwich sloppy Joe pizza	frankfurter, cheese, and bacon salami sandwich bologna sandwich hot Reuben sandwich hot pastrami sandwich fishwich

Table 3, concluded

<i>food class</i>	<i>high-preference</i>	<i>low-preference</i>
18. potato and potato substitutes	French fried potatoes baked potatoes hashed brown potatoes mashed potatoes potato chips	sweet potatoes hot potato salad boiled navy beans refried beans rice pilaf cornbread stuffing savory bread stuffing sausage stuffing
19. green vegetables	canned green beans frozen green beans canned peas collard greens buttered mixed vegetables	frozen Lima beans canned Lima beans creamed frozen peas fried cabbage Brussels sprouts mustard greens turnip greens buttered zucchini squash
20. yellow vegetables	cream-style corn corn-on-the cob buttered whole kernel corn	baked yellow squash French fried carrots
21. other vegetables	French fried onion rings	mashed rutabagas fried parsnips
22. fruit salads	mixed fruit salad	pineapple cheese salad
23. vegetable salads	cole slaw celery and carrot sticks	pickled beet and onion salad carrot, raisin, and celery salad kidney bean salad
24. tossed green salads		
25. salad dressings	Thousand Island dressing French dressing	sour cream dressing blue cheese
26. fresh fruit	oranges apples	plums honeydew melon fruit cup
27. canned fruits	peaches pears applesauce fruit cocktail	plums apricots figs stewed prunes
28. cookies and brownies	chocolate chip cookies peanut butter cookies chocolate cookies oatmeal cookies brownies	molasses cookies coconut raisin fruit bars nut bars butterscotch brownies
29. cakes	strawberry shortcake pineapple upside down cake devil's food cake banana cake	spice cake white cake peanut butter cake yellow cake cheesecake gingerbread
30. pies	cherry pie apple pie pumpkin pie strawberry chiffon pie banana cream pie lemon meringue pie	raisin pie pineapple pie apricot pie pineapple cream pie sweet potato pie
31. pudding and other desserts	chocolate pudding banana cream pudding apple crisp	bread pudding rice pudding fruit-flavored yogurt
32. ice cream and sherbet	ice cream milk shake	butterscotch sundae pineapple sundae

vegetables, the large number of comparatively low-rated desserts brings into question the advisability of the vast dessert repertoire currently being offered on Armed Forces menus.

HIGH AND LOW-PREFERENCE FOODS. While the section above described patterns in the food preference data arranged by food class, this approach is not sufficient to objectively define low- and high-preference foods. To produce such lists, "low-preference" has been redefined as an item falling more than one standard deviation below the *class* mean (Table 2), and "high preference" as one standard deviation above the class mean. Only items falling beyond the one-standard-deviation cut-off on *both* hedonic and frequency scales are included in this listing (Table 3). In this table, the thirty-two classes are listed, along with the items which deviated within that class. If the items received similar ratings and, therefore, did not deviate greatly from the class mean, as in the Tossed green salads class, no items are listed for that class.

Classes 2 through 7, Soups and Beverages, contain many low-preference items, especially soups, milk products, and fruit-flavored juices and drinks. The high-preference items are the old favorites: Chicken noodle soup, orange juice, grape juice, lemonade, milk, and so forth.

Interestingly, two "Hot breads and doughnuts" (Class 9) fall in the low-preference grouping. This does not mean that the items are not liked; it means that they are liked significantly less well than their class average. Cold cereal and griddle cakes are both high-preference breakfast entrées.

As noted earlier, shrimp and lobster are high-preference seafoods, whereas fish items are less desirable. There are more high-preference than low-preference meats, and more high-preference Short-order, sandwich items than low-preference items. The Stews and extended meats class contains a disproportionate number of low-preference items (39 per cent). The low-preference items tend to be ethnic or combination items, such as casseroles, whereas the high-preference items tend to be either simpler items or Italian foods.

White potatoes tend to be high-preference, whereas potato substitutes tend to be low-preference. Green beans, peas, mixed vegetables, and—surprisingly—collard greens are high-preference items, whereas Lima

beans, cabbage, Brussels sprouts, and mustard greens are low-preference foods. Corn is the only highly preferred yellow vegetable. The less common vegetable salads are unpopular. As noted earlier, the absence of high-preference tossed green salads does not mean that they were unpopular; rather they were uniformly popular, yielding no items more than one standard deviation above or below the class mean. Plums, apricots, figs, and prunes were again among the low-preference fruits. Popular desserts include many chocolate items; unpopular desserts, many with the unpopular fruits.

Summary

A food preference survey, consisting of 378 food names, was administered to approximately 3,900 personnel of the U.S. Army, Navy, Air Force, and Marine Corps. The survey required the respondent to indicate how much he liked each food (hedonic scale) and how often he wanted it served (preferred frequency scale). Overall, food preferences showed relative popularity of beverages, breakfast foods, and entrées, unpopularity of soups and vegetables, and moderate popularity of the other food classes. Items of particularly high or low preference are statistically identified within each food class. The collection and presentation of these data are intended to assist menu planners of the Armed Forces, as well as others interested in this age group (young men under twenty-six years of age).

References

- (1) PERYAM, D.R., POLEMIS, B.W., KAMEN, J.M., AND PILGRIM, F.J.: Food Preferences of Men in the Armed Forces. Chicago: QM Food & Container Inst. for the Armed Forces, 1960.
- (2) SEATON, R.W.: Hunger in Groups: An Arctic Experiment. QM Food & Container Inst. for the Armed Forces Rept. 34-62, 1962.
- (3) MEISELMAN, H.L., VANHORNE, W., HASENZAH, B., AND WEHRLY, T.: The 1971 Fort Lewis Food Preference Survey. U.S. Army Natick Lab. Rept. 72-43 FSL, 1972.
- (4) MEISELMAN, H.L., WATERMAN, D., AND SYMINGTON, L.E.: Armed Forces Food Preferences. U.S. Army Natick Developmet Ctr. Rept. 75-63 FSL, 1974.
- (5) BRANCH, L.G., MEISELMAN, H.L., AND SYMINGTON, L.E.: A Consumer Evaluation of Air Force Food Service. U.S. Army Natick Lab. Rept. 75-22 FSL, 1974.
- (6) HARPER, R.: Some attitudes to vegetables and their implications. *Nature* 200: 14, 1963.
- (7) EINSTEIN, M.A., AND HORNSTEIN, I.: Food preferences of college students and nutritional implications. *J. Food Sci.* 35: 429, 1970.
- (8) PERYAM, D.R.: The acceptance of novel foods. *Food Technol.* 17: 33 (June), 1963.