# NUTRITION KNOWLEDGE IN THE U.S. NAVY

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## Summary

### Background

As evidence implicating diet in the etiology of disease continues to mount, national organizations have launched nutrition education campaigns intended to guide the American public in making wiser dietary choices. Within the Department of Defense, nutrition education has been part of health promotion policy for a number of years. In 1989, the Navy published a comprehensive instructional manual, the Navy Nutrition and Weight Control Guide (NNWCG), containing information and suggestions that reflect the consolidated dietary recommendations of such national expert agencies as the American Heart Association.

### Objectives

The purpose of this report was to provide a baseline assessment of the level of nutrition knowledge in the active duty Navy. Specifically, this study sought to (a) estimate overall nutritional proficiency, (b) identify content areas where nutrition knowledge is weak, (c) identify low-scoring subpopulations, (d) review the Navy's progress toward selected national nutrition objectives, (e) estimate the proportion of Navy personnel who know their own blood pressure and cholesterol level, and (f) formulate recommendations to assist program managers in making nutrition education policy decisions.

### Method

A questionnaire concerning nutrition knowledge, nutrition attitudes, dietary practices, and several related health behaviors was mailed to a representative sample of the active duty Navy. Usable questionnaires were returned by 2,938 individuals (response rate = 72.7%). Knowledge items that were the focus of the present report were of two types: (a) 40 true/false items based on the NNWCG and (b) several nutrition-related multiple-choice questions drawn from the 1985 National Health Interview Survey Questionnaire on Health Promotion and Disease Prevention. A Total Knowledge Score (TKS) was computed for each individual by summing together the number of correct responses on the 40 true/false items. Items tapping common content domains were grouped into scales, and scale scores also were computed.

### Results

The mean TKS for the sample was 26.1 items correct, or 65%. Results of item analyses revealed wide variability in nutrition knowledge, ranging from 97.8% of the sample passing the easiest item to 24.9% passing the most difficult. The mean TKS was higher among older individuals, more highly educated individuals, Whites, officers, and women. Knowledge also was slightly but significantly higher among those who were overweight; it was lower among surface ship personnel compared to other Navy communities. In terms of content domains (possible mean score = .00 to 1.00), nutrition knowledge was weakest with respect to Calories & Food Intake (.53) and Carbohydrates (.57), and it was strongest on Vitamins & Minerals (.71) and Fiber (.71). Thirty-one percent of the respondents were able to report their own blood pressure, and 25.4% reported their total cholesterol level; the accuracy of their self-reported values was not known, however. About

one-third of the subjects reported that they usually read nutrition labels on food products; 55% said that they usually understood such labels. The Navy appeared roughly equivalent to the civilian sector in meeting (or falling short of) selected national nutrition goals for 1990.

**Conclusions**

Overall, the level of nutrition knowledge in this Navy sample appeared fairly strong relative to the criteria of national dietary guidelines and objectives. The mean knowledge score of 65% represents a solid baseline, but there is room for improvement. It is recommended that the Navy's current nutrition education campaign continue to reach beyond remedial weight control programs in order to engage entire commands. It is further suggested that program managers intensify efforts to reach low-scoring subgroups, place more emphasis on the role of complex carbohydrates in a healthy diet, provide wide dissemination of guidelines for utilizing nutritional labels on food products, and develop a Navy-wide, point-of-choice education protocol for military dining facilities.

## Contents


| | Page |
|---|---|
| **Introduction** | 5 |
| Background | 5 |
| Objectives | 7 |
| **Method** | 8 |
| Instrument | 8 |
| Sampling Design | 9 |
| Procedure | 10 |
| Participants | 11 |
| Scoring | 13 |
| **Results** | 13 |
| Item Analysis | 13 |
| Total Knowledge Score | 13 |
| Demographic Group Differences in Knowledge | 15 |
| Nutrition Content Domains | 17 |
| Knowledge among Overweight Respondents | 18 |
| 1990 Objectives: Comparisons with the Nation | 18 |
| Independent Items with Special Relevance to Nutrition Education | 22 |
| **Discussion** | 23 |
| **Conclusions and Recommendations** | 26 |
| **References** | 29 |

# Introduction

## Background

The role of diet and nutrition in health and disease development is well documented (1-5), particularly with respect to the overconsumption of certain food elements, such as calories, fats, cholesterol, sodium, and alcohol. Whereas nutritional deficiency-related diseases are relatively rare in the general American population (6), it is estimated that at least 80% of the population eat a diet sufficiently high in saturated fats to increase the risk of developing heart disease and cancer (7), and some epidemiologists attribute 40%-60% of all cancers to diet (2). Moreover, the average American is 20% above desirable body weight, a dysfunctional condition that produces a number of metabolic changes (e.g., hyperglycemia, hypercholesterolemia, hyperinsulinemia, decreased norepinephrine production) that increase the individual's risk of coronary heart disease, hypertension, and diabetes mellitus (8).

Compounding the costs in human suffering and lives associated with such chronic diseases are the spiraling costs of medical care. Billions of dollars are spent annually on treating life-style-related diseases (9), and it is anticipated that by the year 2000, 15% of the gross national product will be devoted to health care (10). Thus, both humanitarian and economic concerns have prompted accelerated inquiry into the cost-effectiveness of health promotion programs and preventive interventions (11,12).

In 1979, the U.S. Surgeon General's first report on health promotion and disease prevention was published to assist health professionals, planners, and policy makers in formulating preventive programs and policies (4). In that report, nutrition was identified as one of fifteen key areas in which prudent changes could effect a reduction in disease and improvements in public health during the following decade. A year later, the Public Health Service published goals for 1990 for each of the fifteen areas, including a set of nutrition objectives (13). Scientific, governmental, and volunteer organizations responded by launching national nutrition education campaigns designed to increase nutrition awareness, promote healthful dietary choices, and ultimately protect and enhance the quality of life and health of the American public through wiser eating habits (14-17).

The relationship between nutrition knowledge and eating behaviors is unclear, however. Knowledge alone appears insufficient to elicit behavior change; rather, knowledge is probably mediated by an affective factor such as attitude, value, or motivation (18-23). But insufficiency notwithstanding, Woolcott (24) points out that it is legitimate to be concerned about nutrition knowledge per se, for knowledge provides the necessary basis for making appropriate dietary changes and food selections. An individual who is motivated but misinformed might be as likely to make poor food choices as one who knows better but eats according to taste preferences or convenience. Edwards, Acock, and Johnston (25) suggest that changes in knowledge are most important in producing initial behavior changes, which are then sustained as self-reinforcing elements of one's life style, even though specific knowledge fades.

At present, there is no single universally accepted measure of nutrition knowledge. Numerous studies have been carried out on a broad spectrum of subpopulations, including nurses, physicians, teachers in various disciplines, homemakers, grocery store owners, students of all ages, and athletes (cf. 18-23). Knowledge has generally been found to be greater among women, older respondents, better-educated individuals, and those with higher socioeconomic status. But because the knowledge tests were usually designed with specific target groups and particular purposes in mind, most results are neither comparable nor generalizable to the population at large. National nutrition surveys do exist, but most have addressed either (a) consumer behavior and dietary intake, (b) circumscribed areas of knowledge (e.g., cholesterol), or (c) general perceptions of diet-health relationships, without scoring for correctness (26). Almost all have been conducted as interviews, usually by telephone and often with open-ended questions, precluding development of an objective, standardized instrument. Consequently, few conclusions can be drawn regarding how much the average person knows about nutrition.

There is general agreement about what people should know, however. A review of the dietary guidelines promulgated by agencies such as the American Heart Association (15), American Cancer Society (14), Department of Health and Human Services (17), National Cholesterol Education Program (16), and others (2) reveals a striking consensus, with emphasis on macronutrients

and lipids and their relationships to disease/disease prevention. Thus, an individual should know enough about nutrition to (a) maintain appropriate body weight; (b) limit dietary cholesterol to approximately 300 mg/day; (c) reduce total fat intake, particularly saturated fats, while increasing the proportion of polyunsaturated fats; (d) restrict salt consumption; (e) limit or reduce simple sugars; (f) increase intake of fiber and complex carbohydrates; and (g) limit alcohol to no more than 2 drinks per day. In addition, vitamins A and C, iron, and calcium are of special concern to many health educators because of both their frequent deficiency in the average diet and their associations with disease (2,6,14). This list is by now familiar to many, but it implies a fairly sophisticated level of nutritional knowledge and competence. Clearly, we have moved beyond the simplicity of the "Basic Four Food Groups" (27), making nutrition education increasingly indispensable.

In the Department of Defense, health promotion and nutrition education have been part of military readiness policy for a number of years (28). In the Department of the Navy, nutrition education and weight control programs have been explicitly mandated (29,30). In carrying out these directives, the Naval Military Personnel Command created a handbook, the Navy Nutrition and Weight Control Guide (NNWCG), for use by Command Fitness Coordinators and Food Service Officers (31). This comprehensive handbook was designed primarily for personnel in command-directed remedial programs who do not meet the Navy's percent body fat standards (32), but it is also intended to help provide nutrition education to all members of a command. The NNWCG conveys factual information and dietary advice that accurately reflect and amplify the guidelines summarized above.

## Objectives

The educational component of the Navy's Nutrition Education/Weight Control Program has not been systematically evaluated. Whereas nutrition knowledge among recruits has been explored (33), the purpose of the present report is to provide a baseline assessment of the level of nutrition knowledge in the Navy at large. Such an assessment will help nutrition education program managers clarify informational needs and educational goals. It also will constitute a referent for future comparisons when determining

trends in knowledge over time. Specific objectives of this study were to (a) estimate overall nutritional proficiency with respect to the dietary guidelines currently recommended by national authorities, (b) identify content areas where nutritional knowledge is weak and educational efforts should be increased, (c) identify subpopulations where nutritional knowledge is weak and selective educational emphasis might be warranted, (d) determine how well the Navy is meeting certain relevant 1990 nutrition objectives for the nation, (e) estimate the proportion of Navy personnel who know their own blood pressure and cholesterol level, and (f) formulate recommendations to help guide policy makers and educators in the distribution of health promotion resources and the modification of the nutrition education program.

## Method

### Instrument

The data collection instrument was a self-administered, optically scannable questionnaire consisting of 79 items. It was developed to measure nutrition knowledge, nutrition attitudes, dietary practices, and several related health behaviors (e.g., exercise, weight control, attention to food labels) as well as basic demographic information. The knowledge items that are the focus of the present study were of two types: (a) 40 true/false items based on the NNWCG, and (b) several nutrition-related items drawn from the 1985 National Health Interview Survey (NHIS) Questionnaire on Health Promotion and Disease Prevention (34). The NHIS survey represents the civilian noninstitutionalized population of the United States, ages 18 and older, in 1985. (The 1990 version of this questionnaire is still in the field; results are expected to be published by 1992.)

Prior to developing the true/false questions, the NNWCG was reviewed to determine its major nutritional content domains. While the manual emphasizes weight control and reduction of dietary fats, it contains information and suggestions related to a comprehensive array of content areas, including cholesterol, sodium, alcohol, fiber, complex carbohydrates, vitamins and minerals, protein, sugar, fats, weight and calories, food preparation, nutritional labeling, fast foods, and fad diets. The material presented in the NNWCG pertaining to these topical areas was found to reflect the consolidated dietary recommendations of such national agencies as the

American Heart Association. True/false items were constructed to tap relevant information in these content domains, with emphasis on weight control and calories, fats, cholesterol, and vitamins and minerals. Content validity was ensured by having the final set of questions reviewed by a dietitian, a nutritionist, and three experts in the field of health and physical fitness. The Kuder-Richardson reliability coefficient was .63.

Sampling Design

The sampling design was a stratified, two-stage, two-phase probability sample of all active-duty Navy personnel. The primary sampling unit at Stage I was the command Unit Identification Code (UIC). A total of 109 command UICs was randomly selected using a stratification procedure based on command size. This selection process produced a sampling frame that represented commands of various sizes throughout the Navy. Commands with fewer than 10 members were not included in the Stage I sampling. The primary sampling unit at Stage II was the individual. The December 1989 master personnel tapes were used to select randomly a sample of up to 45 persons from each of the targeted commands, resulting in a total initial sample of 4,338 individuals. Demographic frequencies on age, sex, race, pay grade, and education in the targeted sample were very similar (within an average of 1.8%) to those in the Navy at large.

All of the selected individuals were included in Phase I data collection, which began the first week of June, 1990, and lasted for 6 weeks. At the end of Phase I (and based on Phase I data), those individuals who had been discharged from the Navy, those known to have been transferred to a new permanent duty station but with no forwarding address, and those attached to a ship that had been decommissioned were considered to be ineligible for participation and were dropped from the study, resulting in an eligible sample of 4,041 personnel. Next, any command with a response rate of zero at the end of Phase I was temporarily pulled from the sample frame and contacted by telephone (see below). Of the individuals remaining in the sample frame at this point, those persons who had been targeted for participation but who had not responded during Phase I became the subsample for Phase II data collection. This two-phase design was used to maximize the response rate as well as to provide the means for adjusting analyses and estimates to compensate for possible nonresponse bias.

Procedure

Two weeks before data collection was to begin, letters were mailed to the commanding officers of all participating commands informing them of the nature and purpose of the study and requesting their cooperation. During Phase I, questionnaires bearing each targeted participant's name and Social Security number were mailed in a single package to their respective commanding officers, along with detailed instructions for the distribution, completion, and return of the surveys. The questionnaires were printed with instructions to each participant, including assurance that participation was strictly voluntary and that all responses would be kept confidential. Respondents were given the option of returning their questionnaires individually, using the postage-paid, pre-addressed mailing envelope that was inserted into each questionnaire. Alternatively, it was suggested that the Command Fitness Coordinator collect all completed (and individually sealed) questionnaires and return them together in a large mailing envelope that also was provided. In either case, questionnaires were to be returned within 6 weeks, a deadline that was emphatically stated in the instructions. Two weeks before the end of Phase I, a postcard reminding the commanding officer of the impending deadline was mailed to all participating commands.

One week after the deadline had passed, Phase II data collection was initiated. In Phase II, a subsample of 1,109 eligible individuals who had not yet responded to the questionnaire were sent another copy of the survey, along with a brief cover letter, a postage-paid, pre-addressed envelope, and a #2 pencil. As noted above, this subsample excluded anyone attached to a command with a Phase I response rate of zero (disposition of these commands is described below). In Phase II, the questionnaires were mailed directly to each participant. It was hoped that a more personal appeal via direct mail would elicit cooperation from "reluctant respondents." Also, if for any reason the first questionnaire had not been delivered to a targeted participant, direct mail presumably would be more reliable. Finally, it was hoped that individually addressed mail would be forwarded to those who had transferred to other commands.

Twenty-three commands had failed to respond at all during the Phase I data collection. Because both military exigencies and the nature of military mail dispursement could explain such a total lack of response, we attempted

to contact these commands by telephone to ascertain whether the Phase I package of questionnaires had been received and, if so, how soon we could expect to have the surveys returned to our facility. If the package had not arrived or had been mislaid, we assembled a replacement and mailed it to the command as per Phase I procedure. Efforts to contact these commands continued throughout Phase II, which lasted four weeks. All but three commands were eventually contacted, the three exceptions being deployed ships.

Participants

The final sample of individuals from whom usable questionnaires were received was $n$ = 2,938, a response rate of 72.7%. A proportion of the mailed questionnaires was received from all but four of the 109 commands. Age of the subjects ranged from 17 to 62 years (mean age = 29.5), with 14.7% women, 85.3% men. Rank ranged from E-1 to O-8, with 84.0% enlisted, 16.0% officers. Racial distribution was 78.2% White, 14.9% Black, and 6.9% Other. Almost 95% of the sample had completed high school, and 28.3% had taken educational coursework beyond high school. The mean Armed Forces Qualification Test (AFQT) score was 60.0. The majority of the respondents were married or living as married (58.4%), 32% had never married, and 9% were separated, divorced, or widowed. Less than one-third were shipboard personnel (30.9%), more than half were shore-based (58.7%), 5.3% were assigned to aviation, and 5.0% were in other communities (e.g., afloat support forces, mobile units, construction battalions). Demographic characteristics of the respondents, nonrespondents, and total active duty Navy are presented in Table 1.

Although the response rate was relatively high for this type of survey, the problem of nonresponse bias must be considered. The study was designed to use the classical Hansen-Hurwitz resampling method of compensating for potential bias due to nonresponse (35). This method assumes that initial nonrespondents who are later induced to provide data ("reluctant respondents") are representative of all nonrespondents. Compensation is achieved by weighting the survey results by the proportion of the sample accounted for by reluctant respondents, i.e., in the direction of the results that would have been obtained with a 100% response rate (36). In the present study, however, we had the unusual advantage of knowing the demographic composition of both the respondent and nonrespondent groups, and we were able

**Table 1**

**Demographic Statistics for Nutrition Knowledge Survey Respondents, Eligible Nonrespondents, and Total Active Duty Navy**

| Variable | Respondents (n = 2938) | Nonrespondents (n = 1103) | Navy[a] (N = 608,355) |
|---|---|---|---|
| **Age** (mean) | 29.5 | 27.9 | 28.9 |
| **Sex** (%) | | | |
| Male | 85.3 | 87.8 | 90.3 |
| Female | 14.7 | 12.2 | 9.7 |
| **Status** (%) | | | |
| Enlisted | 84.0 | 89.4 | 87.8 |
| Officer | 16.0 | 10.6 | 12.2 |
| **Race** (%) | | | |
| White | 78.2 | 76.9 | 79.4 |
| Black | 14.9 | 18.4 | 14.6 |
| Other | 6.9 | 4.7 | 6.0 |
| **Education** (%) | | | |
| < 12 yrs | 5.2 | 4.5 | 6.1 |
| 12 yrs | 66.5 | 75.0 | 71.9 |
| > 12 yrs | 28.3 | 20.5 | 22.0 |
| **AFQT**[b] (mean) | 60.0 | 57.9 | 59.3 |
| **Married** (%) | 58.4 | -- | -- |
| **Community** (%) | | | |
| Surface Ship | 25.8 | 35.4 | -- |
| Submarine | 5.1 | 10.1 | -- |
| Shore-based | 58.7 | 46.6 | -- |
| Air | 5.3 | 4.7 | -- |
| Afloat, non-ship | 1.9 | 1.2 | -- |
| Mobile/Other | 3.1 | 1.9 | -- |

[a] Annual Report, Navy Military Personnel Statistics, 30 September 1989.
[b] Armed Forces Qualification Test (percentile)

to determine that the reluctant respondents (those who did not return a questionnaire until Phase II) were not demographically representative of the true nonrespondents. Therefore, it was decided that the most appropriate adjustment would be to weight the sample to be demographically comparable with the total active-duty Navy. Prior to data analyses, the sample was

weighted accordingly on education, sex, and officer/enlisted status, as these were the variables on which the sample differed significantly from the Navy at large.

### Scoring

Twenty-two of the true/false items were true as stated, 18 were false. Items were scored +1 for a correct response, 0 for an incorrect response, and were summed together for a Total Knowledge Score (possible range = 0-40). In addition, items tapping similar content domains were clustered together into scales; scale scores were computed as the mean (from .00 to 1.00) of all items in the cluster. All knowledge scores were subjected to the weighting procedure noted above.

## Results

### Item Analysis

Table 2 lists the 40 true/false nutrition knowledge items, together with the correct answers and the percentage of respondents answering each item correctly. Items are presented in order of increasing difficulty (they were presented in random order in the questionnaire). Results indicated wide variability in nutrition knowledge, ranging from 97.8% of the sample passing the easiest item (which stated that food preparation can change its nutritional value) to only 24.9% passing the most difficult item (that chicken, even without the skin, contains about the same amount of cholesterol as red meat). The distribution of scores was negatively skewed: mean difficulty level was .67, and 80% of the items were passed by at least half of all respondents. Figure 1 divides the 40-item test into 10-item quartiles and shows the percentage of respondents passing at each level.

### Total Knowledge Score

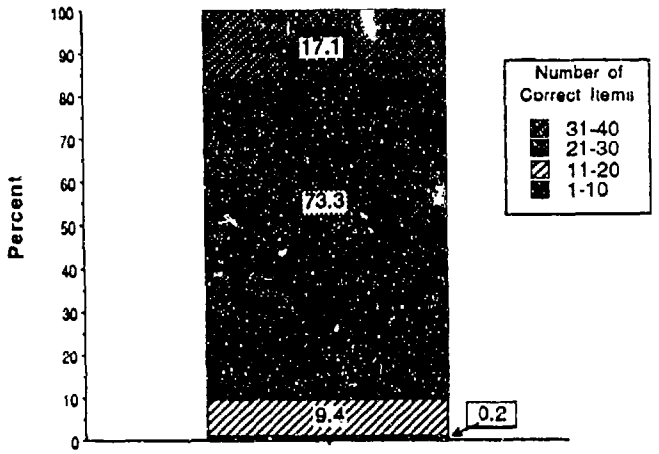
The mean Total Knowledge Score (TKS) for the sample was 26.13 $\pm$ .22 items correct (99% CI, S.D. = 4.55, range = 6-40), which is equal to 65%. There was no difference in TKS for early respondents (mean = 26.13 $\pm$ .23, S.D. = 4.55, range = 6-40) and reluctant respondents (mean = 26.11 $\pm$ .63, S.D. = 4.52, range = 10-38). In order to estimate the level of knowledge among nonrespondents, the respondent sample was weighted on education, sex,

## Table 2

### Percentage of Navy Respondents Answering True/False Nutrition Items Correctly

| | | T/F | % |
|---|---|---|---|
| 1. | The way that food is prepared can change its nutritional value. | T | 97.8 |
| 2. | Calcium deficiency can lead to osteoporosis (brittle bones). | T | 93.8 |
| 3. | Green leafy and yellow vegetables are a good source of vitamin A. | T | 93.2 |
| 4. | Most of the weight lost in "quick weight loss" diets is water, not fat. | T | 93.0 |
| 5. | The "Basic Four" food groups are Meat, Fruits/Vegetables, Dairy, and Sugars. | F | 88.9 |
| 6. | Fruit juice contains the same amount of fiber as whole fruit. | F | 88.4 |
| 7. | There is no protein in plant foods (vegetables, fruits, grains). | F | 88.3 |
| 8. | Saturated fat raises blood cholesterol more than unsaturated fat does. | T | 86.4 |
| 9. | Regular exercise actually helps control your appetite. | T | 85.7 |
| 10. | A single egg contains over 200 mg of cholesterol. | T | 84.8 |
| 11. | The only way to get calcium is from dairy products. | F | 82.0 |
| 12. | Sugar, not fat, is the main cause of obesity. | F | 80.6 |
| 13. | Cheese is a good substitute for meat for someone trying to cut down on cholesterol and saturated fat. | F | 79.5 |
| 14. | In order to get enough protein, an adult needs 2-3 servings of meat every day. | F | 78.3 |
| 15. | Saturated fats are found mostly in meat and dairy products. | T | 77.1 |
| 16. | Because salt does not occur naturally in most foods, it is advisable to add a little salt when cooking or at the table. | F | 72.2 |
| 17. | Peas and beans are excellent sources of fiber. | T | 69.9 |
| 18. | It is okay to eat bread, rice, and potatoes while on a reducing diet. | T | 69.3 |
| 19. | As people grow older, they need the same amount of nutrients but fewer calories. | T | 69.2 |
| 20. | Cholesterol is the same thing as fat. | F | 68.8 |
| 21. | A gram of fat has more than twice as many calories as a gram of carbohydrate (starch). | T | 67.0 |
| 22. | It is recommended that dietary cholesterol be limited to 300 mg per day. | T | 64.3 |
| 23. | If sugar is the first ingredient listed on a box of cereal, it means that there is more sugar in the cereal than any other ingredient. | T | 62.2 |
| 24. | Skim milk contains about the same amount of protein and calcium as whole milk. | T | 60.9 |
| 25. | Sunlight is necessary for an adequate supply of vitamin C. | F | 60.5 |
| 26. | A weight loss of 5 lbs per week is a reasonable goal for weight reduction. | F | 59.9 |
| 27. | Dried beans contain as much iron as meat does. | T | 58.0 |
| 28. | There is no cholesterol in fruits, vegetables, or grains. | T | 56.1 |
| 29. | Fish sandwiches at most fast foods outlets are higher in calories and fat than the regular hamburgers. | T | 55.6 |
| 30. | Fiber is found only in plant foods (vegetables, fruits, grains). | T | 54.6 |
| 31. | Even if you eat a variety of healthy foods, you probably need vitamin supplements. | F | 51.6 |
| 32. | The recommended daily intake of sodium (salt) is about 1 tablespoon (6000mg). | F | 51.1 |
| 33. | A diet high in protein puts excess stress on the kidneys. | T | 47.7 |
| 34. | A high-protein, low-carbohydrate diet is recommended for losing weight quickly and safely. | F | 45.4 |
| 35. | Many low calorie "diet" meals, such as frozen Weight Watchers dinners, are high in fat. | T | 43.4 |
| 36. | Mental effort like studying or problem solving requires extra food energy (calories). | F | 43.2 |
| 37. | Ounce for ounce, beer has more calories than wine. | F | 39.0 |
| 38. | It is recommended that no more than 30% of one's daily calories come from carbohydrates. | F | 33.4 |
| 39. | Margarine is lower in calories than butter. | F | 28.8 |
| 40. | Chicken without the skin contains about the same amount of cholesterol as lean pork or beef. | T | 24.9 |

**Figure 1.**
**Percentage of Navy Respondents Answering Correctly Within Each Quartile of True/False Nutrition Items**

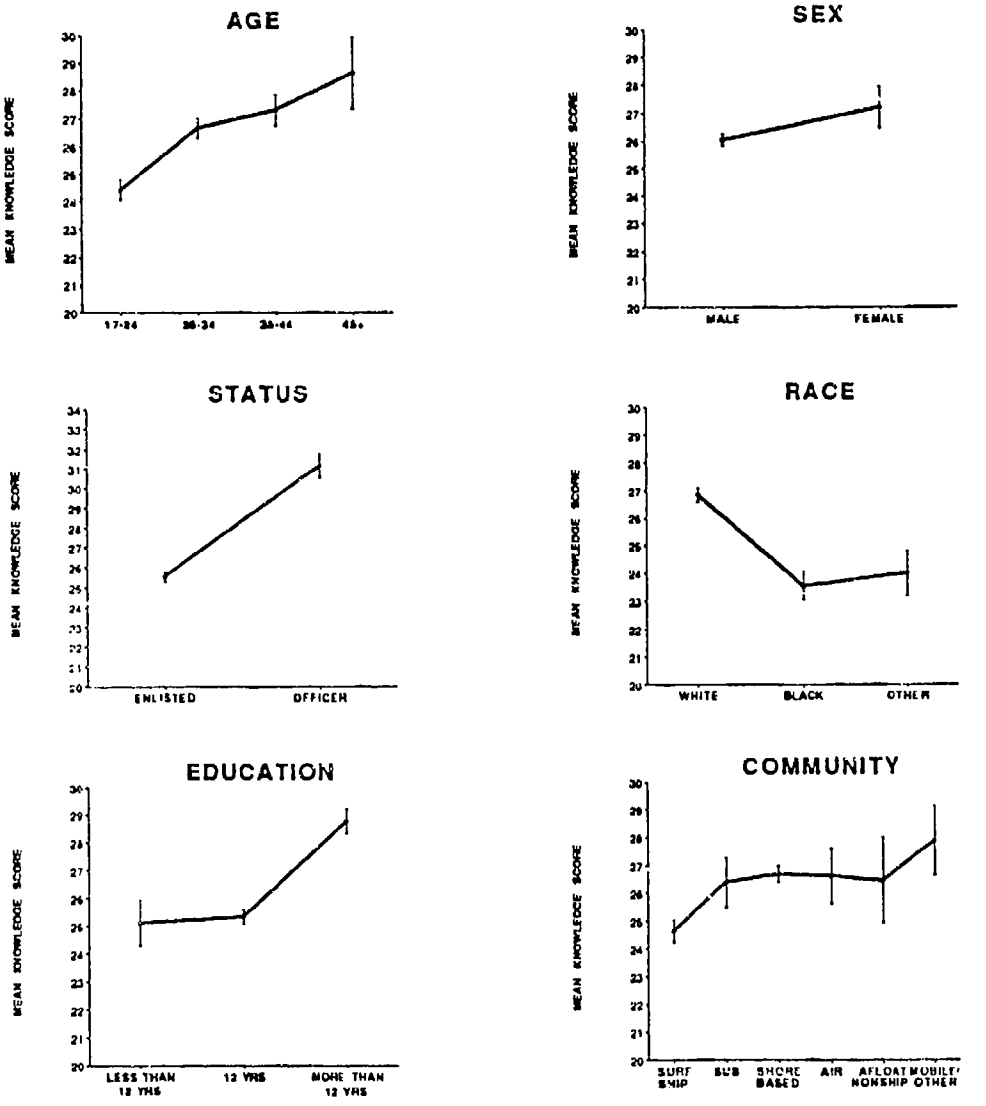



and officer/enlisted status to resemble the nonrespondents, and a TKS was computed. The predicted mean TKS for nonrespondents was 26.07 ± .22 (S.D. = 4.54, range = 6-40). This value should be compared with the unweighted respondent sample's TKS, which was 26.38. While this procedure estimates that nonrespondents' nutrition knowledge would be only about 0.3 of an item lower than respondents' knowledge, it should be borne in mind that the weighting procedure used only three demographic variables, and the statistically interpolated "nonrespondents" were not demographically identical to the real nonrespondents.

Demographic Group Differences in Knowledge

Total Knowledge Score demonstrated a low but significant correlation with sex ($r$ = .08) and moderate correlations with rank ($r$ = .42), education ($r$ = .37), AFQT ($r$ = .40), race (white/black, $r$ = -.28), and age ($r$ = .28) (all coefficients significant at $p<.001$). The nature of these relationships was more fully revealed in several analyses of variance. As shown in Figure 2, knowledge was found to increase with age from a mean TKS of 24.4 ± .4 in the youngest age group to 28.6 ± 1.3 in the oldest [$F(3) = 67.78$, $p<.001$]. Knowledge was slightly greater among women than among men (means = 27.2 ± .7 and 26.0 ± .2, respectively, $F(1) = 17.04$, $p<.001$), and considerably greater

## Figure 2.
## Group Differences in Total Nutrition Knowledge Among Active Duty Navy Personnel




among officers than among enlisted personnel (means = 30.1 $\pm$ .6 and 25.5 $\pm$ .2, respectively, $F(1) = 372.36$, $p<.001$). Whites had a higher mean TKS (26.8 $\pm$ .3) than both Blacks (mean = 23.6 $\pm$ .5) and other racial groups (mean = 24.0 $\pm$ .8) [$F(2) = 124.65$, $p<.001$]. Education showed the greatest impact on TKS among those with more than 12 years of schooling (mean = 28.8 $\pm$ .5), versus those with either a high school diploma (mean = 25.3 $\pm$ .3) or less

than 12 years of school (mean = 25.1 ±.8) [$F(2) = 165.70$, $p<.001$]. Finally, small differences emerged across communities, ranging from a mean of 24.6 ± .4 in the surface ship community to 27.9 ± 1.3 in the mobile/other commands [$F(5) = 24.39$, $p<.001$].

**Table 3**

**Mean Scores for Content-related Scales of True/False Items, Navy Nutrition Knowledge Survey**

| Scale (Content domain) | Items comprising scale[a] | Mean[b] |
|---|---|---|
| **Vitamins & Minerals** | 2, 3, 11, 24, 25, 27, 31 | .71 |
| **Fiber** | 6, 17, 30 | .71 |
| **Fats** | 8, 12, 13, 15, 21, 29, 35 | .70 |
| **Reducing Diet** | 4, 12, 18, 26, 34 | .70 |
| **Protein** | 7, 14, 24, 33 | .69 |
| **Cholesterol** | 10, 13, 20, 22, 28, 40 | .63 |
| **Sodium** | 16, 32 | .62 |
| **Carbohydrates** | 18, 21, 38 | .57 |
| **Calories & Food Intake** | 9, 19, 21, 29, 36, 37, 38, 39 | .53 |

[a] See Table 2.
[b] Scale scores were computed as the mean (ranging from .00 to 1.00) of all items comprising the scale (0 = incorrect, 1 = correct for each item). The mean is equivalent to a difficulty index, such that higher scores indicate relatively easier content areas.

Nutrition Content Domains

Table 3 presents mean scale scores for nine nutrition content domains. The items in each scale evidenced wide variability in difficulty level (the item number reflects its rank in Table 2, wherein Item 1. was the easiest, Item 40. the most difficult). However, the Sodium scale and the Carbohydrates scale both lack extremely easy items. Overall, the mean scale scores, ranging from .53 to .71, indicated a fairly broad grasp of

nutritional knowledge among Navy personnel (99% confidence interval for all scale means except Sodium was ± .01; Sodium CI was ± .02). Questions concerning the vitamin and mineral content of various foods were the most likely to be answered correctly by this sample (Vitamins & Minerals, mean = .71), while questions related to the caloric content of foods were the most likely to be missed (Calories & Food Intake, mean = .53). Respondents were more knowledgeable about weight-reduction principles (Reducing Diet, mean = .70) than about caloric specifics (Calories & Food Intake, mean = .53), and they scored higher on knowledge regarding Fats (mean = .70) than on Cholesterol (mean = .63).

Knowledge among Overweight Respondents

Although actual percent body fat was not obtained from participants for this report, the survey included the following self-report item: "How would you describe your present weight? a. very overweight, b. moderately overweight, c. a little overweight, d. about right, e. underweight." A series of t tests were performed to compare "Overweight" respondents (those answering either a. or b.) with those "Not Overweight" (respondents answering either d. or e.); the middle category, "a little overweight," was omitted to help eliminate normal-weight individuals who nevertheless perceived themselves as overweight. Dependent variables were TKS and the nine scale scores. As shown in Table 4, the Overweight group scored significantly higher on 5 of the 10 dependent variables, and their mean scores were higher (though not significantly so) on 4 of the other 5 variables as well. Mean TKS for the Overweight group (26.9 ± .7) surpassed both the Not Overweight mean (25.7 ± .3) and the overall sample mean (26.1 ± .2, reported above). The content areas in which Overweight participants knew more than their normal-weight or underweight peers were Calories & Food Intake (means = .57 ± .03 versus .51 ± .01), Fats (.72 ± .03 versus .68 ± .01), Sodium (.69 ± .05 versus .60 ± .02), and Protein (.72 ± .04 versus .67 ± .01).

1990 Objectives: Comparisons with the Nation

Several items relevant to nutrition knowledge and the 1990 national objectives for improved nutrition were drawn from the 1985 NHIS Health Promotion/Disease Prevention Questionnaire (34). These items are presented

Table 4

Mean Nutrition Knowledge Scores for
Overweight vs. Not Overweight Navy Respondents

| Variable (by Group)[a] | Mean | S.D. | n | t | p < |
|---|---|---|---|---|---|
| **Total Knowledge Score** | | | | | |
| Overweight | 26.9 | 4.5 | 272 | 4.05 | .001 |
| Not Overweight | 25.7 | 4.5 | 1573 | | |
| **Vitamins & Minerals** | | | | | |
| Overweight | .73 | .19 | 270 | 1.77 | (n.s.) |
| Not Overweight | .71 | .20 | 1562 | | |
| **Fiber** | | | | | |
| Overweight | .71 | .26 | 272 | .46 | (n.s.) |
| Not Overweight | .70 | .24 | 1560 | | |
| **Fats** | | | | | |
| Overweight | .72 | .19 | 269 | 2.55 | .01 |
| Not Overweight | .68 | .19 | 1562 | | |
| **Reducing Diet** | | | | | |
| Overweight | .71 | .23 | 270 | 1.81 | (n.s.) |
| Not Overweight | .69 | .22 | 1561 | | |
| **Protein** | | | | | |
| Overweight | .72 | .24 | 270 | 3.34 | .001 |
| Not Overweight | .67 | .23 | 1567 | | |
| **Cholesterol** | | | | | |
| Overweight | .63 | .19 | 272 | .28 | (n.s.) |
| Not Overweight | .62 | .19 | 1571 | | |
| **Sodium** | | | | | |
| Overweight | .69 | .34 | 272 | 3.82 | .001 |
| Not Overweight | .60 | .37 | 1566 | | |
| **Carbohydrates** | | | | | |
| Overweight | .57 | .30 | 271 | -.10 | (n.s.) |
| Not Overweight | .57 | .28 | 1556 | | |
| **Calories & Food Intake** | | | | | |
| Overweight | .57 | .18 | 271 | 4.99 | .001 |
| Not Overweight | .51 | .18 | 1566 | | |

[a]Range for Total Knowledge Score (TKS) = 0 to 40; range for all scale scores = .00 to 1.00.

in Table 5, along with results for both the Navy and the nation (ages 18-64). Although national data are from 1985, interim reports on the nation's progress indicate that the 1990 national data should be similar (37,38).

One of the national nutrition goals for 1990 is that virtually all routine health care contacts with health professionals include some nutrition counseling (see question 1. in Table 5). Results showed that this goal is not being met. More than half of all Navy and civilian respondents reported that health professionals seldom if ever discussed nutrition with them, though Navy doctors are apparently more likely to engage in such counseling than are their civilian counterparts. Fifty-five percent of Navy respondents reported that Navy health professionals "rarely or never" discussed proper nutrition with them during routine visits, while nearly 65% of civilian respondents said that their doctors failed to mention the subject. However, only 5.1% of the Navy sample said that they encountered such discussion "often" versus 9.6% of civilian respondents.

Another high priority nutrition objective is for 90% of adults to know that weight loss requires consuming fewer calories and/or increasing physical activity. As can be seen in Table 5 (question 2.), 94.1% of the Navy sample selected physical activity as one of the two best ways to lose weight, versus 76.6% of the national sample. Yet only 59.5% of Navy respondents named calorie restriction as the other best way, versus 73.9% of civilian respondents. Further analysis with the Navy data (not reported in Table 5) showed that 55% of the sample selected both correct answers, 42% selected one, and only 3% failed to choose either one of the correct responses.

Weight control (decreased prevalence of significant overweight) is considered another high priority for 1990 because of the health risks associated with obesity (39). The goal is that no more than 10% of men and 17% of women exceed 120% of desirable weight. Self-reported overweight (question 3., Table 5) ranging from "moderately overweight" to "very overweight" was substantially lower in the Navy sample (9.8%) than nation-wide (25.9%). When the Navy results were further analyzed by sex (not reported in Table 5), it was found that 9.4% of Navy men and 11.5% of Navy women reported being moderately to very overweight; thus, both sexes appear to meet the 1990 goal. Although these percentages are self-reported, they

## Table 5.
## Selected Nutrition Knowledge Items[a]: Navy vs. Nation[b]

| | | Navy (%) | Nation (%) |
|---|---|---|---|
| 1. | **When you visit a doctor or other health professional for routine care, is eating proper foods discussed?** | | |
| | a. Often | 5.1 | 9.6 |
| | b. Sometimes | 24.2 | 15.9 |
| | c. Rarely or never | 55.6 | 64.6 |
| | d. Don't visit for routine care | 15.6 | 9.9 |
| 2. | **In your opinion, what are the TWO best ways to lose weight?** | | |
| | a. Don't eat at bedtime | 29.4 | 33.2 |
| | b. Eat fewer calories | 59.5 | 73.9 |
| | c. Take diet pills | 1.0 | 1.7 |
| | d. Increase physical activity | 94.1 | 76.6 |
| | e. Eat no fat | 7.2 | 8.9 |
| | f. Eat grapefruit with each meal | 1.7 | 4.0 |
| 3. | **How would you describe your present weight?** | | |
| | a. Very overweight | 1.4 | 8.6 |
| | b. Moderately overweight | 8.4 | 17.3 |
| | c. A little overweight | 33.9 | 21.0 |
| | d. About right | 48.9 | 47.8 |
| | e. Underweight | 7.5 | 5.4 |
| 4. | **Are you currently trying to lose weight? (% Yes)** | 44.3 | 37.0 |
| | IF YES: | | |
| | A. Are you eating fewer calories to lose weight? (% Yes) | 77.7 | 80.3 |
| | B. Have you increased your physical activity to lose weight? (% Yes) | 80.1 | 58.6 |
| 5. | **Which of the following substances in food is most often associated with high blood pressure?** | | |
| | a. Sodium | 62.7 | 64.0 |
| | b. Cholesterol | 34.7 | 27.0 |
| | c. Sugar | 1.9 | 9.0 |
| | d. Additives/Preservatives (Navy only) | .7 | - - |
| 6. | **How do you think that each of the following conditions affects a person's chance of getting heart disease?** | | |
| | **A. A diet high in animal fat:** | | |
| | a. Definitely does not increase | 1.0 | 2.0 |
| | b. Probably does not increase | 2.3 | 6.0 |
| | c. Don't know/No opinion | 17.0 | 11.3 |
| | d. Probably does increase | 31.6 | 38.4 |
| | e. Definitely does increase | 48.1 | 42.2 |
| | **B. High serum cholesterol:** | | |
| | a. Definitely does not increase | 1.6 | 1.0 |
| | b. Probably does not increase | 2.2 | 2.7 |
| | c. Don't know/No opinion | 27.4 | 9.0 |
| | d. Probably does increase | 28.9 | 32.5 |
| | e. Definitely does increase | 39.9 | 55.8 |

[a]Items from the 1985 National Health Interview Survey Questionnaire on Health Promotion and Disease Prevention

[b]Ages 18-64.

correspond quite closely with objective results obtained from a different Navy-wide sample in 1988. In that study, 9.4% of the men and 9.7% of the women were found to exceed Navy standards for percent body fat, based on actual anthropometric measurements (40).

A related weight control goal for 1990 is for 50% of the overweight population to have adopted weight-loss regimens that include both dieting and exercise. Question 4. (Table 5) was directed to all survey participants (irrespective of weight) and showed that over 44% of all Navy respondents, versus 37% of civilian adults, were trying to lose weight at the time of their surveys. Further analysis with the Navy data showed that 84.1% of the individuals who were moderately to very overweight (by self-report) were attempting to lose weight--well above the stated 1990 goal of 50%. Moreover, in the Navy sample, 77.7% of those who were trying to lose weight were consuming fewer calories and 80.1% were increasing physical exercise in order to do so. Nation-wide, caloric restriction was favored over physical exercise (80.3% versus 58.6%) by those who were attempting to lose weight.

Increased public and professional awareness of the links between diet and disease is another high priority nutrition objective for 1990. The goal is for more than 75% of the population to be able to identify specific dietary risk factors for heart disease and high blood pressure, among other disorders. Survey results indicated widespread awareness among both Navy and civilian samples of the link between heart disease and dietary animal fats. Among Navy personnel, 79.7% responded that a diet high in animal fat "probably does" or "definitely does" increase a person's chances of developing heart disease: among civilians, the percentage was 80.6%. Comparable awareness of the association between cholesterol and heart disease was lower in the Navy (68.8% = "probably" or "definitely" does increase risk) than in the civilian sector (88.3% = "probably" or "definitely" increases risk). Finally, both the Navy and nation fell short of the goal in their ability to correctly identify sodium as the food substance most often associated with high blood pressure: 62.7% of the Navy sample selected sodium, while 64.0% of the national sample did.

Independent Items with Special Relevance to Nutrition Education

As part of the Navy's comprehensive health promotion program, all active duty personnel receive annual blood pressure checks, and they are given

regular cholesterol blood tests after age 25. In addition to making appropriate intervention possible for patients with elevated blood pressure or cholesterol levels, the program is intended to educate individuals regarding their own health parameters. Yet only 31.0% of the respondents in the present study were able to report their own blood pressure, and only 25.4% of those who were eligible for the Navy's cholesterol screening program (i.e., ages 25 and older) reported their total cholesterol level (when ages 17-24 were included, the percentage was 17.8%). There were no clinical data by which to verify the accuracy of the self-reported figures, however.

Two other items relevant to nutrition education efforts concerned the participants' use of nutrition labels on food products. When asked whether they read such labels, about one-third of the sample indicated that they usually or almost always do (11.9% = "always or almost always," 21.7% = "usually," 37.7% = "sometimes," 17.6% = "usually not," 11.2% = "never"). When asked whether they understood such labels, more than half said that they do most of the time (16.2% = "always or almost always," 38.9% = "usually," 30.4% = "sometimes," 11.9% = "usually not," 2.6% = "never"). Not surprisingly, reading and understanding were correlated: Those who read labels regularly ("usually" to "always") reported understanding them most of the time (78.7% = "usually" to "always" understand), while those who rarely understood nutritional labels ("usually not" to "never") seldom bothered to read them (92.8% = "usually not" to "never" read labels).

Finally, when asked whether they were interested in reading or hearing about nutrition, three-quarters of the sample (75.3%) indicated that they were, 14.5% said that they were not, and the rest expressed no preference. Interest in nutrition demonstrated a modest correlation with TKS ($r = .17$, $p<.001$).

## Discussion

Overall, the level of nutrition knowledge in this representative Navy sample appeared to be on track relative to the criteria of national dietary guidelines and objectives. More than half of all respondents recognized that optimal weight loss requires both caloric restriction and increased energy expenditure. Almost two-thirds of the sample knew that dietary cholesterol should be limited to 300 mg/day. More than three-quarters responded

correctly that saturated fat raises blood cholesterol more than unsaturated fat does, that saturated fat is found mostly in animal products, and that a diet high in animal fats increases the risk of heart disease. Almost everyone was aware that calcium deficiency can lead to osteoporosis, and most participants even knew that dairy products are not the only source of dietary calcium. With an average of 65% of the items answered correctly, the test proved to be easier than the psychometric "ideal" of a .50 difficulty level, though the individual items demonstrated a wide range of difficulty. The educational ideal, on the other hand, is for all personnel to achieve 100% mastery of the material. In that regard, 65% represents a solid baseline but not the desired end-point.

Scores on the content-related scales point to the areas that are most in need of improvement. Of the nine scales, the Calories & Food Intake cluster was the weakest. As can be seen in Table 2, the majority of items near the bottom of the list (that is, missed by most subjects) concern popular misconceptions about calories and the frequent confusion between calories and fats (e.g., margarine is not lower in calories than butter is, though it is lower in saturated fats). The second-lowest mean was on the Carbohydrates scale, revealing another widespread and deeply-ingrained misunderstanding, namely, that "starches" (complex carbohydrates) should be avoided, especially by the weight-conscious. Together, these two scales represent a knowledge gap that nutrition educators need to address. For example, population studies have shown that obesity is often paradoxically associated with lower food intake, including low carbohydrate intake (2). Moreover, recent research suggests that calories from fat are more readily stored as body fat than are calories from carbohydrates (41). Thus, a low-calorie entree that obtains a large percentage of its calories from fat could compromise a diet, not with total calories but with percent fat. Discriminations such as these are considerably more advanced and potentially more confusing than outdated advice to avoid bread and potatoes, but they have important consequences for health and weight control.

Although the third-lowest scale, Sodium, consisted of just two items, the relatively low mean on the NHIS question regarding the relationship between sodium and high blood pressure (Table 5, item 5.) supports the conclusion that awareness of sodium's role in nutrition and disease also needs to be increased. Somewhat ironic in this regard is the Navy's current

policy for the sodium content of foods served in military dining facilities. Because the recommended sodium levels of 1100-3300 mg/day are "currently impractical and unattainable within military food service systems" (42), the targeted maximum has been adjusted upward to approximately 4100-5500 mg/day. This point underscores the fact that very real economic and logistical constraints can make it difficult to provide Navy personnel with optimal menu choices. Although changes are in progress, and efforts are being made to adjust menus and recipes to comply with U. S. dietary guidelines (29), the onus falls to the individual, whose mealtime selections should be guided by both an understanding of nutritional principles and an ability to evaluate the relative contribution that each menu item might make to a balanced diet.

Group differences in overall nutrition knowledge, though significant, were generally small in this study. Since higher TKS was associated with age, sex, rank, education, race, and community, nutrition education efforts should be particularly directed toward young, male, enlisted, high-school-educated personnel, which would also result in addressing the great majority of the active duty Navy population. However, it is notable that the lowest mean knowledge score for any demographic subgroup was among Blacks. This finding, coupled with the fact that Blacks are at higher risk than Whites for a number of nutrition-related diseases (2,6), suggests that the Black subpopulation be targeted for special educational attention. The nine content domain means for this group assumed a nearly identical rank ordering as that of the total sample, a parallelism that implies a similarity in general nutrition educational needs among Blacks and the entire Navy. Therefore, what may be required to educate this group is not a new set of educational objectives but rather a more intensified and pointed effort to reach the Black Navy community.

It also is noteworthy that the difference in mean TKS between men and women was quite small (a spread of 1.2 points). Most research on nutrition knowledge has been conducted with women, even though men are vulnerable to several nutrition-related health problems, particularly heart disease. An exception to this dearth of research with adult men is a 1981 study of nutrition knowledge in Canadian businessmen by Woolcott, Kawash, and Sabry (43). Woolcott et al. administered a 20 item multiple-choice test to 195 male executives. In spite of the fact that the sample was older (mean age = 38 years), more highly educated (76% beyond high school), and of higher

socioeconomic status than the Navy sample, their nutrition knowledge score was 59%, versus 65% in the present study. Another study of particular relevance was conducted by Conway, Hervig, and Vickers (33) with male Navy recruits. In this case, the sample was considerably younger than in the present study (mean age = 19 years), and the instrument was the National Dairy Council's 47-item Nutrition Achievement Test 4, designed for junior and senior high school students. Results were remarkably similar to those in the present study: average score among the Navy recruits was 61% correct, compared to an average of 64% among U.S. school students. Differences in instrumentation and study dates make the above comparisons very tentative, of course; nevertheless, both studies provide a backdrop for interpreting the present results and suggest that the level of nutrition knowledge in the predominantly male Navy compares favorably with the civilian sector.

Comparisons with the nation with respect to the 1990 nutrition objectives (Table 5) should also be undertaken cautiously for several reasons: (a) the Navy and nation differ demographically, especially in their representation of women; (b) the national survey was administered as an open-ended, prompted telephone interview rather than as a written multiple-choice test; (c) the national data were obtained in 1985, while Navy data were collected in 1990. These caveats temper but do not negate the conclusion that the Navy and nation are roughly equivalent in meeting the U.S. Surgeon General's goals. The Navy appears to be doing better than the country as a whole in terms of weight control, though it lags behind in cholesterol awareness. Navy personnel were more keenly aware of the importance of physical exercise in weight-loss regimens, and though a much larger percentage of national respondents knew that eating fewer calories was the other best way to lose weight, most Navy individuals who were attempting to lose weight were reducing their caloric intake in order to do so. The Navy and nation fared equally well in associating dietary animal fat with heart disease, and equally poorly in linking sodium with high blood pressure.

## Conclusions and Recommendations

Evidence implicating poor dietary choices in the development of disease continues to mount, yet eating habits are habitual life-style behaviors that are difficult to change. Whereas knowledge alone has not proven sufficient

to produce such changes, adequate knowledge of nutritional facts and principles is likely a prerequisite. The Navy's existing nutrition education program, with instruction based on the Navy Nutrition and Weight Control Guide, provides clear, detailed, and accurate information in all areas relevant to the dietary guidelines promulgated by expert national panels and agencies. Furthermore, nutrition knowledge scores from the present study indicate that although members have not mastered the material presented in the NNWCG, the manual's level of detail and sophistication is within the purview of the Navy population. Therefore, it is recommended that the program be continued, because its probable success and long-term impact depend on its being sustained over time. On the basis of results from the present study, the following modifications are recommended:

a. **Continue to extend instruction beyond the Level I (command-directed) remedial program for which the NNWCG was primarily designed.** As suggested in the manual, information can be be incorporated into plan-of-the-day notes, posters, handouts, and media spots. Regular and timely distribution of useful and interesting material is recommended--perhaps a weekly "Food for Thought" box in the Plan of the Day or Navy Times.

b. **Intensify efforts to educate low-scoring subgroups.** This outreach could be accomplished both by placing educational materials where targeted groups would most likely be exposed to them (e.g., young sailors are most readily reached at recruit training points and schools) and by gearing messages to appeal to specific target groups (e.g., handouts at dental clinics could note the relationship between high blood pressure and sodium, then draw attention to Blacks' greater risk of hypertension).

c. **Place more emphasis on the role of complex carbohydrates in a healthy diet.** Focusing on the role of carbohydrates would help dispel the confusion about carbohydrates, calories, and fats evidenced in the knowledge scores reported above. It would also, by association, encourage new attitudes toward eating vegetables and fruits, which Americans eat less often than they should (44), and protein (particularly animal protein and its associated fats), which is consumed in larger quantities than necessary or healthy (45).

d. **Provide the widest possible dissemination of guidelines for utilizing nutritional labels on food products.** This ability is a tool that will become increasingly valuable as government regulations force full disclosure of product ingredients. If individuals could simply learn the formula that 1 gram of fat = 9 calories, for example, they could compute for themselves the percentage of calories from fat in a product rather than relying on the manufacturer's claim of "Low Fat" (or an irrelevant "No Cholesterol" on a high-fat product). Foods proclaimed to be high in fiber, low in cholesterol, or low in calories should be similarly evaluated.

e. **Develop a Navy-wide model for point-of-choice nutrition information interventions to be installed in all military dining facilities** (46). Interventions might include posters, modified menu alternatives, changes in cafeteria layout, posted nutritional labels (complete, or highlighting health-relevant ingredients, such as fat or sodium content), labels for "heart-healthy" or "diet" selections, or written information handouts. Such a program could reach a large number of people with relatively small expenditure, would have immediate behavioral application, and would reinforce other aspects of the broader Nutrition Education/Weight Control Program.

The Navy's nutrition education program has the potential to increase awareness, improve eating habits, and ultimately enhance the health and fitness of Navy personnel. Enthusiastic leadership and a commitment to health promotion at individual commands can bring this potential closer to fruition.

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The purpose of this report was to provide a baseline assessment of the level of nutrition knowledge in the active-duty Navy. Questionnaires containing 40 true/false and several multiple-choice nutrition items were mailed to a representative sample. Usable questionnaires were returned by 2,938 individuals (response rate = 72.7%). Mean score on the 40 T/F items was 26.1 correct, or 65%. Nutrition knowledge was greater among older individuals, more highly educated individuals, Whites, officers, and women. Knowledge was weakest on the Calories & Food Intake and Carbohydrates scales and strongest on the Vitamins & Minerals and Fiber scales. The Navy appeared roughly equivalent to the civilian sector in meeting (or falling short of) selected national nutrition goals for 1990. It was recommended that the current nutrition education program be continued, but that program managers intensify efforts to reach low-scoring subgroups, place more emphasis on the role of complex carbohydrates in a healthy diet, provide wide dissemination of guidelines for utilizing nutritional labels on products, and develop a Navy-wide "point-of-choice" education intervention protocol for dining facilities.


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