

OBJECTIVE VALIDATION OF A NUTRITION SCREENING  
INSTRUMENT IN TWO RURAL COMMUNITIES

by

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## ABSTRACT

The Nutrition Screening Initiative (NSI) developed an instrument, the "Determine Your Nutritional Health" checklist, to identify the presence of risk factors for malnutrition among the elderly while promoting education about these risk factors. The purpose of this study was to validate the instrument's determination of nutritional risk against recognized anthropometric, biochemical, and physical indicators of malnutrition. Data were collected in two rural communities, one with a physician-staffed clinic and one with a small acute-care hospital/clinic. Free-living participants responded to a 43-item expansion of the Determine checklist and a nutrient specific food frequency measuring adherence to the Food Guide Pyramid and the Dietary Guidelines for Americans. A total of 119 subjects were interviewed, of which 89 (74.8%) agreed to have anthropometric measurements, a fasting blood draw, and a physical examination for clinical indicators of malnutrition. The mean age of the seniors who completed the study (61 females, 28 males) was 73.6 years, ranging from 58 to 89 years. Mean nutritional risk score by the Determine checklist was 4.58, which is within the moderate nutritional risk range (3 to 5). Mean scores for the clinic (4.22) and the hospital/clinic (4.98) communities did not significantly differ. The Determine checklist identified 78.6% (70 of 89) at nutritional risk. Correlation analysis showed that Determine score had limited association only with hemoglobin status ( $R = -.2377$ ,  $p = .0249$ ) and glucose status ( $R = .2259$ ,  $p = .0333$ ). Internal reliability of the food frequency was acceptable ( $\alpha = 0.7375$ ). Analysis of eating habits showed subjects ate foods high in sugar, sodium, fat, and fiber 1 to 2 times weekly, but reported low compliance with eating the recommended daily number of servings of foods from the bread and dairy groups. The "Determine Your Nutritional Health" checklist and the food frequency used in this study may be useful in identifying individual risk factors of nutritional health and

eating habits associated with the Food Guide Pyramid and Dietary Guidelines for Americans, educating senior citizens, and directing them to appropriate social, medical, and nutritional services. However, the Determine checklist was found to have limited association with accepted objective measures of nutritional status among senior participants.

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## CHAPTER I

### INTRODUCTION

#### Nutritional Status of the Elderly

Current research on national dietary trends focuses on information available from the second National Health and Nutrition Examination Survey (NHANES II), which occurred between 1976 and 1980, and the Nationwide Food Consumption Survey (NFCS) of 1977 to 1978. The NHANES II study included elders aged 55 to 74 years as a target population in its data collection. The NFCS had no upper age limit. Fanelli-Kuczmarski (1993) showed that in NHANES II, for both men and women above the age of 55 years, energy intake decreased with age. Additional analyses of the NHANES II data indicated that low-income elderly had lower median energy intakes than those with incomes above the poverty level, and lower median dietary intakes of nutrients such as vitamin C and iron (Fanelli & Wotecki, 1989). Other nutrients shown to be consumed at levels less than the Recommended Dietary Allowances (RDAs) by the overall elderly population included calcium, iron, zinc, copper, thiamin, riboflavin, folate, vitamin B-12, and vitamin D (Ahmed, 1992). Davis, Murphy, Neuhaus, and Lein (1990) confirmed decreasing calorie intake with age using the NFCS data. In examining the relationships between living arrangements of senior citizens and quality of diet, a poor quality diet, defined as consuming less than two-thirds of the RDAs for five of nine target nutrients, was caused by a decreased energy intake more so than by living alone (Davis et al., 1990)

A more recent national sampling was conducted in 1990 by Ross Laboratories (Ryan, Craig, & Finn, 1992). Dietary information was collected from 474 seniors aged 65 to 98 years, across different levels of urbanization, using a 24-hour dietary recall. Results demonstrated that both men and women had energy intakes below recommended levels and that calcium, zinc, vitamin A, and vitamin E were the nutrients most consistently eaten

in amounts below two-thirds of the RDAs (Ryan et al., 1992). Although the 24-hour dietary recall method tends to underestimate average intake, these findings concur with those of NHANES II, which used a combination of 24-hour dietary recall and diet records. However, the results of this study were different from a sampling of 105 men in the Baltimore Longitudinal Study of Aging, which used seven-day diet records. As a result of using a different dietary intake methodology, the Baltimore Study subjects had mean energy and cholesterol intakes higher than the comparably aged men in the Ross Laboratories study (Hallfrisch, Muller, Drinkwater, Tobin, & Andres, 1990).

These studies centered around the dietary intakes of the elderly. However, to more fully assess the nutritional status of elders, information about dietary intake must be combined with other information. Ahmed (1992) wrote that a "lack of correlation [exists] between dietary intake data and clinical and laboratory assessment methods" (p. 1103). The Nutrition Screening Initiative (NSI) identified inappropriate food intake as one risk factor for poor nutritional health (Nutrition Screening Initiative, 1991b). Other risk factors include poverty, social isolation, dependency or disability, acute or chronic diseases or conditions, polypharmacy, and advanced age of 80 years or older (NSI, 1991b; White, Ham, Lipschitz, Dwyer, & Wellman, 1991). All of these factors can affect either the access to nutritional foods or the bioavailability of nutrients within food.

A 1987 study by the Food Research and Action Center (FRAC) reported results from a national survey designed to identify 12 risk factors for hunger and malnutrition. FRAC surveyed 3,602 elderly, 60 to 99 years of age, at 93 feeding and senior program sites in 21 states. Of the respondents, 53.6% lived alone, and 47.4% reported having incomes below the poverty level. High risk, which was defined as presenting with five or more of the risk factors, was reported by 21.7% of the respondents. The most common risk factors for these elderly were not having enough money to buy needed food (56.7%), living alone (53.6%), eating less than three meals a day (35.0%), not feeling like eating

anything at least one day in the past month (32.2%), having no one to help if sick in bed (28.3%), and having an illness or condition which interfered with eating (25.6%).

Although these risk factors were identified as being prominent among this elderly group, no collection of anthropometric, biochemical, or clinical data was obtained for correlation with the presence of the various risk factors, and limited dietary data was obtained to determine one of the risk factors (i.e., consumed less than five different kinds of food the day before the survey was administered).

The American Dietetic Association (1993) noted that "at present, no comprehensive or coordinated mechanisms exist to ensure the availability, accessibility, and provision of appropriate nutrition services to the elderly" (p. 80). The Nutrition Screening Initiative is a national program attempting to provide such a mechanism. NSI defines itself as a "five-year, multifaceted effort to promote routine nutrition screening and better nutrition care in America's health care system" (NSI, 1991b, p. 1). The NSI represents a concerted effort between the American Academy of Family Physicians, The American Dietetic Association, and the National Council on the Aging, Inc., to identify nutrition problems in older Americans and to improve delivery of nutrition services by standardizing assessment of nutritional health.

The procedures of the NSI include a progressive evaluation of nutritional status. Materials have been published which include the standardized forms and methods for three levels of screening (NSI, 1991a; White et al., 1992). The first level of intervention involves the "Determine Your Nutritional Health" checklist (Appendix A). This form was validated on a group of 979 New England elderly residents by comparing the nutritional adequacy of 24-hour dietary recall data and subjective self-perceptions of health with positive responses to checklist items (Posner, Jette, Smith, & Miller, 1993). The "Determine" checklist was designed for ease of use in most settings associated with service provision to the elderly and can be self-administered.

Based on the results of the checklist, the elderly individual may be further assessed by a Registered Dietitian or other allied health professionals, for the Level I Screen, or by a physician, for the Level II Screen (NSI, 1991a, 1992). The Level I Screen incorporates assessments of anthropometry, eating habits, and socioeconomic and functional status to identify individuals who may need social service programs such as congregate meals or home meal delivery. Among these assessments are included measurements of energy and somatic protein stores, such as the body mass index (BMI), triceps skinfold, and upper midarm muscle circumference. The Level II Screen includes these assessments and evaluations of biochemical and clinical indications of poor nutritional status as well as assessments of mental status and depression. This screen level would include measures of albumin level for assessment of visceral protein stores, total lymphocyte count for assessment of possible immunosuppression, and cholesterol status. To assist professionals in the use of these instruments, networking and referral strategies were determined at an Interventions Roundtable in April, 1992. Interventions identified at this conference to help elders include social services, oral health, mental health and medications use evaluations, nutrition education and counseling, and nutrition support. Procedures for referral to these services have been published (NSI, 1992).

### Nutritional Programs for Rural Elderly

A 1967 study by the Field Foundation, reported that protein-calorie malnutrition, vitamin and mineral deficiencies, and hunger were endemic in poverty areas across the country (Hart, 1991). Identified poverty areas included inner city ghettos, the American South, the mountains of Appalachia, Indian reservations, and northern Maine (Goldberg & Mayer, 1990; Mayer, 1990). A 1968 airing of the CBS Special "Hunger in America" showed American children and elderly with limited access to food. Due to public response to these reports, the Title III-C Nutrition Program for the Elderly was enacted.

The Title III-C nutrition program allows for the provision of nourishing meals in a congregate setting or for home-delivery of meals. Recent figures show that "more than 2.7 million older Americans participate in congregate meals, and nearly 800,000 receive home-delivered meals" (Read & Schlenker, 1993, p. 317). However, a disparity of these services exists between urban and rural areas (Stevens, Grivetti, & McDonald, 1992). Poverty was reported to be at higher rates in rural settings, 16.9% in rural areas in contrast to 12.5% in metropolitan areas in 1987. In addition, transportation, health care, and other services were more limited than in metropolitan areas (U.S. Department of Commerce, Bureau of the Census, 1990; McGrath-Morris, Neuhauser, & Campbell, 1992). These inequities may present potential increased risks for poor nutritional health among seniors in rural America.

Fuguitt and Beale (1993) provide evidence that about 27% of all Americans aged 65 years and older, approximately 8.3 million, live in nonmetropolitan areas. Examination of census data over the past 30 years showed that overall growth in the population 65 years of age and over in nonmetropolitan areas peaked during the 1970's, with a net increase of 24.55% (Fuguitt & Beale, 1993). Comparatively, during the 1980's, the net rural increase in the elderly population was only 17.33%. This lower level of growth was due to two factors: (1) a decline in the natural increase of the rural elderly population, and (2) a decline in the net migration of elderly from rural areas. Compared to metropolitan areas, however, rural areas continued to experience growth (Fuguitt & Beale, 1993; Smiciklas-Wright, Lago, Bernardo, & Beard, 1990). Fuguitt and Beale (1993) postulated that the decline in rural growth may have some basis in economic status as they indicated that

the extent to which the migration trends of the elderly population paralleled those of younger people in the downturn of the 1980s suggests that we may have overemphasized the presumed freedom of older people from economic trends and locational constraints. (p. S287)

These authors, though, did not explain whether the decreases in rural outmigration of the elderly reflected a high economic cost as a result of moving from the rural areas as opposed

to staying within the rural areas. Elderly rural outmigration trends would need to be further investigated to determine whether those leaving rural areas could or could not afford relocation expenses.

The previously noted estimates of Title III-C nutrition program use represents approximately 11% of the 1990 population estimates of Americans aged 65 years and older by Fuguitt and Beale; however, given that Title III-C services are available to individuals aged 60 years and older, the proportion of use of these services among the 65 and over group may be an even less than 11%.

With the implementation of the Medicare prospective payment system based on diagnosis-related groups (DRGs) in 1983, the short-term demand for home-delivered meals increased. This was a result of earlier hospital discharges with incomplete recoveries, as financial coverage was limited to shorter hospital lengths of stay. The American Dietetic Association (1985) presented testimony to the Subcommittee on Human Resources of the House Education and Labor Committee that meal service increased in rural areas of Washington state by 33% and in Kansas by 57%. Rural hospitals in Ottawa, Kansas, were reported as having to stop sponsorship of small home-delivery programs due to lost revenue under the DRG system (American Dietetic Association, 1985). The increase in meal recipients was ascribed to an increase in the number of seniors requiring short-term assistance. A nutrition program director from Spokane, Washington, stated

These people, when discharged from the hospital, are quite ill, cannot prepare a meal, and need some temporary assistance, after which they become well enough to prepare their own meals, go onto the Chore Program, or experience a relapse and return to the hospital. . . . This new development of short-term meal assistance is definitely attributable to DRGs. (American Dietetic Association, 1985, p. 1638)

Research performed by the New York State Supplemental Nutrition Assistance Program (SNAP) provided similar findings (Frongillo, Williamson, Roe, & Scholes, 1987). Assessment of 2,002 recipients of home-delivered meals from 23 New York counties

showed that use of services declined by 14.2% per month over the first five months of service provision. Similar to the Spokane program, SNAP participants classified as being in the "short-duration group" included elderly with temporary need for home-delivered meals during recuperation after recent hospital discharge (Frongillo et al., 1987).

Provision of home-delivered meals was not found to differ in nutritional quality between urban and rural areas in northern California (Stevens, Grivetti, & McDonald, 1992). Using a 3-day food record, elders in the Sacramento area were compared to seniors from non-incorporated areas with less than 2,500 people. The final sample size consisted of 48 urban and 47 rural participants. Although records showed that the urban elders consumed significantly more energy than rural elders,  $p < .05$ , no differences were noted in intakes of vitamins and minerals (Stevens et al., 1992). Also, 70% of these subjects were defined as being at nutritional risk as a result of having an intake below two-thirds of the RDA for three or more nutrients although the overall mean intakes of nutrients fell within acceptable ranges. The authors did not indicate the distribution of these "at risk" participants between the urban and rural groups, but they did indicate that "evaluating nutritional status by mean nutrient intake of a population can conceal the degree to which individual diets are inadequate" (Stevens et al., 1992, p. 716).

One service which has been found to be different between rural and metropolitan areas is the availability of supermarkets and low-cost food items. Fifty-one supermarkets and 82 small-to-medium size grocery stores were surveyed in 33 poor rural counties for availability of food items to meet the Thrifty Food Plan for the Food Stamps Program. Using a marketbasket survey, pricing 77 foods in 31 different food categories, the researchers found the average weekly cost in small/medium stores to be \$102 and in supermarkets to be \$81; these figures exceeded the Thrifty Food Plan value of \$75 weekly for a family of four. Another difference was that rural areas had an average of 3.8 supermarkets per county and one supermarket for every 265 square miles whereas, urban

areas had an average of 29 supermarkets per county and one supermarket every 27 square miles (McGrath-Morris et al., 1992).

Use of the NSI protocol has led to expansion of senior nutrition programs sponsored by the Older Persons' Commission (OPC), centered in Rochester, Michigan (NSI, 1993). The OPC is a multipurpose senior center that serves meals to seniors at the center and coordinates home-delivery of meals for a six-county area. A modified "Determine" checklist was administered to clients of the program, and results of those found to be at nutritional risk were reported to each senior's physician. Also, based on results of the survey, nutrition education classes were developed for the senior center, nutrition articles were placed in the center newsletters, and medical nutritional supplements were included as part of the home-delivery service. The NSI model has also been used successfully to provide timely nutritional interventions through home health care agencies in Boston, northwest Indiana, and Denver. NSI materials have been used by a mobile health clinic in Ohio and by congregate and home-delivered meal services in Delaware, Georgia, and California to refer clients to necessary nutritional and medical services (NSI, 1993).

A pilot study was performed in four West Texas rural congregate meals sites using the NSI "Determine Your Nutritional Health" checklist (Fox, Bonilla, & Shields, 1994b). Of the 51 seniors interviewed, 51.0% were found to be in good nutritional health, 34.7% were at moderate nutritional risk, and 14.3% were at high nutritional risk. The highest risk factor response rates were associated with three or more medications daily (43.3%), an illness or condition that caused a change in eating practices (37.3%), eating alone (37.3%), and limited use of fruits, vegetables, and dairy products (19.6%). Other high response rates to risk factor questions on an expansion of the checklist included chronic disease (37.3%); annual income less than \$10,000 (56.9%) and less than \$6,000 (24.0%); inability to spend \$35 or more per week for food (44.0%); daily over-the-counter drug use

(39.2%); daily vitamin or mineral use (48.0%); perception of being above desirable weight (45.1%); and being 80 years of age or more (24.5%). Addressing a lack of data concern of the Health Texans 2000 Objectives (Texas Department of Health, 1991), the study revealed that only 24.5% of the participants had signed either a Directive to Physicians or a Durable Power of Attorney for Health Care.

Other programs which have been adopted to improve the nutritional status of the elderly include the previously mentioned SNAP program in New York state, Massachusetts Association of Elderly Nutrition Programs, and the Rural Clinic and Community Health Promotion Project (RCCHPP) in Oklahoma. The surveillance system of the SNAP program had identified that in the mid 1980's, only 10% of those seniors requiring home-delivered meals throughout New York state were receiving them (Dodds & Melnick, 1993). SNAP increased the number of home-delivered meals by the late 1980's by targeting counties with high hospital discharge rates and high population percentage of individuals 60 years of age and older (Dodds & Melnick, 1993). Expansion of services in Massachusetts has resulted from cooperation between the Massachusetts Association of Elderly Nutrition Programs and Massachusetts state agencies (Balsam & Osteraas, 1987). Buyer consortiums and use of common menus were implemented throughout the state to help reduce the costs of meals provided through senior services, thus allowing more funds for additional services. State-wide service expansions have included incorporation of ethnic foods in meal sites for areas with minority-dense populations; increased breakfast and weekend meal services; creation of Luncheon Clubs organized through the homes of seniors; and provision of frozen meals and nutritional supplements by the home-delivered meals programs (Balsam & Osteraas, 1987). The RCCHPP staff worked with local rural leaders to identify the need for health promotion activities and to gauge the interest in potential activities (Bender & Hart, 1987). Identified topics, including nutrition, were publicized for community meetings through local radio and television advertisements and

through articles in local newspapers. Although the announcements for the meetings were directed at adults of all ages, 40% to 50% of meeting attendees were over the age of 55. Bender and Hart (1987) found this to be interesting as only an average of 25% of the residents of each community was over the age of 55.

The model above illustrates an important point in the development of nutrition services for the elderly, the identification of perceived needs of the potential program recipients. Crockett, Heller, Merkel, and Peterson (1990) used a focus group approach to identify nutrition education needs of rural elders. Recruitment procedures attracted 68 seniors for participation in five focus groups. When asked about interest in nutrition education topics, the seniors requested practical nutrition information, such as making healthy food choices, adding fiber to the diet, more nutritious snacking, cooking for one or two people, and new methods of food preparation (Crockett et al., 1990). Techniques for nutrition education which met with the most favorable responses by the seniors included provision of coupons (\$.50 or more) or free samples of nutritious food items, potluck dinners featuring nutritious dishes, and nutrition newsletters sent to seniors at home. A follow-up study performed by Fischer, Crockett, Heller, and Skaulge (1991) surveying 698 rural seniors showed that those aged 75 to 85 years did not feel that improving eating patterns could have a positive impact on their health, did not feel that they could improve their eating habits, and had less inclination to make changes in eating habits when compared to seniors aged 60 to 70 years. These authors suggested that for nutrition education to be effective for older seniors, the health benefits of good nutrition need to be emphasized (Fischer et al., 1991). However, education might also be more effective if offered at ages of 60 to 70 years.

Other aspects of the nutrition knowledge of rural elders which have been investigated include the usage of vitamin/mineral supplements and sources of nutrition information. Oakland and Thomsen (1990) questioned 102 rural elderly about their usage

of vitamin/mineral supplements and their beliefs about the value of such supplements in maintaining health. Forty-nine percent of the subjects reported regular use of supplements within the past 6 months; about 46% of the regular users were determined to be using supplements inappropriately (consuming supplements in combinations that provided greater than 150% of the U.S. RDA (United States Recommended Daily Allowance) or consuming three or more individual supplements without a prescription by physician) (Oakland & Thomsen, 1990). Misconceptions held by the participants included the ideas that natural vitamins and minerals are better than manufactured ones, and that feeling "run down" is indicative of a need for additional vitamins and mineral. A study by Briley, Owens, Gillham, and Sharplin (1990) showed that rural seniors had significantly more limited contact ( $p < .05$ ) with Registered Dietitians in central Texas than did central Texas urban seniors (3% vs. 20%). The primary source of nutrition information for rural seniors in this study was cookbooks (Briley et al., 1990). Another problem regarding the nutrition knowledge of rural elders and the paucity of available information resources was the determination of a high prevalence rate among southern rural elderly of needing one or more medically-therapeutic diets (Lee et al., 1993). Data were obtained from 3,021 people aged 65 years and above across 11 southern states; 43.5% of these elderly reported that they were trying to follow one or more special diets, but their overall compliance to the diets was low (Lee et al., 1993).

Current data pertaining to numbers of services for rural elderly and utilization rates of such services are not available in the literature although estimates place at least one out of every four seniors as residing in the rural setting. Smiciklas-Wright and her colleagues (1990) remarked that "with fewer institutions and difficult access, self-care and informal supports are critical for rural elderly" (p.1536). As poverty is estimated to be at higher rates in rural areas, and research has shown limits in the nutrition knowledge of rural elders, "self-care and informal supports" may also be limited. These combinations of

factors can affect the nutritional well-being of rural elderly; however, direct measurement of the nutritional status of rural elderly has not been reported. Current models are being implemented on state and national levels to address the nutritional needs of all elderly, and hopefully, will place emphasis on elderly in rural areas.

The objective of this study is to present findings on the prevalence of nutritional risk factors in two rural communities which differ by the type of health care facility locally available. The "Determine Your Nutritional Health" checklist was used as the basis for data collection so that it could be validated against objective measures of nutritional status. Although the Nutrition Screening Initiative has been in effect for three years, no efforts to objectively validate the instrumentation have been reported to date. Chapter II will present the investigation of two hypotheses: the "Determine Your Nutritional Health" checklist of the Nutrition Screening Initiative provides an accurate measure of the nutritional status of rural elderly, and the levels of nutritional risk will not differ between rural communities that have different levels of locally available health care. Chapter III will present the investigation of a third hypothesis: seniors in the target communities are following the recommendations presented in the Food Guide Pyramid and the Dietary Guidelines for Americans.

CHAPTER II  
APPLICATION AND EVALUATION OF A NUTRITION  
SCREENING INSTRUMENT IN TWO  
RURAL COMMUNITIES

The Nutrition Screening Initiative's "Determine Your Nutritional Health" Checklist was designed to be a simple, self-assessment tool to help promote public awareness of the role of nutrition in health and the varying factors which could affect nutritional status. The checklist consists of ten statements to which seniors, their family members, or caregivers respond in relation to the presence of the risk indicator. The statements were weighted so as to indicate comparable importance of causal relationships to poor nutritional health. The mnemonic device, "DETERMINE," is used to help educate about signs of potential nutritional risk: disease, eating poorly, tooth loss or mouth pain, economic hardship, reduced social contact, multiple medicines, involuntary weight loss or gain, needs assistance in self care, and elder years above age 80 (NSI, 1991a, 1991b).

The checklist was calibrated using participants from the 1990 New England Elders Dental Study (Posner et al., 1993). The original proposal for the checklist included 14 characteristics of senior citizens identified as being associated with poor nutritional health. The checklist items were regressed against two criterion outcome measures: the number of nutrients for which 24-hour recall showed intake less than 75% of the RDA (n = 449), and a Likert-type, self-perceived health rating (n=500). A technical review committee of the Nutrition Screening Initiative came to consensus on the final weights of the items as well as score ranges for levels of nutritional health: good (0-2), moderate nutritional risk (3-5), and high risk (6 or more). Scores on the Determine checklist can range from 0 to 21.

White et al. (1992) stated that the checklist was "neither designed nor intended for use as a diagnostic device" (p. 164); however, the checklist was designed to be predictive

of morbidity and mortality (White et al., 1992; Posner et al., 1993). This design was based on subjective assessment of health and nutritional status. At present, no results have been published comparing outcomes of the Determine checklist with objective measures of nutritional status, such as anthropometric, biochemical, and clinical findings.

One of the purposes of this research was to compare the results of the Determine checklist to objective measures of nutritional status so as to ascertain its predictability. Another purpose of this research was to obtain data on the prevalence of a variety of nutritional risk factors in two rural communities and to identify whether the prevalence of the risk factors differed by the presence of a small hospital/clinic or a clinic within each community.

### Methods

Two rural communities with differing levels of health care locally available were selected for the study. These two communities were chosen based on local proximity to a metropolitan area for convenience in investigator travel and for representation of differing levels of health care: a physician-staffed clinic and a small hospital. The first community was located ten miles outside a metropolitan area and had a free-standing clinic which was staffed by a physician twenty hours each week. The second community was located about 37 miles from a metropolitan area and housed a 50-bed acute care hospital with an adjoining clinic, hereafter to be referred to as "hospital", staffed with three physicians. The populations of the two communities were 1932 and 2026 residents, respectively (Southwestern Public Service Company, 1992a, 1992b).

Non-institutionalized individuals over the age of 60 were solicited for participation in the study. The researchers visited local senior community centers and churches to inform community leaders about the study. Advertisements were placed in local newspapers, bulletins were posted in senior centers and the health care facilities, and letters describing the research were sent to potential subjects, followed by telephone calls for

clarification and scheduling for interview and clinic appointments. Subjects also provided the researchers with names of other local senior citizens with potential interest in the study. Door-to-door solicitation was used as well to enroll subjects.

Subjects were asked to respond to a survey package which included a 43-item expansion to the NSI "Determine Your Nutritional Health" checklist, a 23-item demographic profile, and the first of two consent forms for participation in the study (Appendix A). This first consent form was used to obtain each senior's permission for participation in the part of the study which dealt with the questionnaires. This approach was taken to prevent the participants from finding out about the free physical examination and blood tests in the latter part of the study, and to prevent the seniors from falsifying their answers in an attempt to receive the free health services. After completion of the survey instruments, each participant was advised of the health services offered in the completion of the study, and presented with a second consent form for the physician's examination and blood tests.

The instruments in the survey package had been pilot tested in four rural congregate meal sites and with participants in a hospital-based wellness and education program (Bonilla, Fox, & Shields, 1994; Fox et al., 1994b). The instruments were comprised of questions from the Determine checklist, the Level I and II screens, and a survey performed by the Food Research and Action Center (NSI, 1991a; Food Research and Action Center, 1987). The pilot study in the congregate meal sites used the questions as suggested by the NSI. Solicitation of a forced "yes" response and compound statements confused the participants. Subsequently, the instruments were changed to provide both "yes" and "no" options and single item inquiries, such as separating "lost or gained 10 pounds" and eating "few fruits or vegetables, or milk products" into two questions, to address the concerns of the seniors. Subject responses were transposed onto pre-printed

"Determine Your Nutritional Health" checklists and discussed with each subject at the end of the interview.

After the volunteers were interviewed, they were offered the opportunity to receive anthropometric measurements of current height, weight, midarm circumference, wrist circumference for determination of body frame size, triceps skinfold, and percent body fat; a physical examination, at no cost to the participant, by a physician in the local health care facility; and a fasting blood draw, also at no cost to the participant, which would be analyzed for a SMAC (automated chemistries) profile, a complete blood count, and a lipid profile. Approval for use of the local health care facilities was obtained from the respective administrators, and compensation was arranged for physician services through grant funds. Participants were informed of the nature of the physical examination and were instructed to arrive for appointment after an overnight fast. Upon arrival for scheduled appointments, the subjects received a fasting blood draw by trained medical staff.

Anthropometric measurements were obtained by the researchers (Appendix A). The percent body fat was determined using the Futrex 5000A (Futrex, Inc., P.O. Box 2398, Gaithersburg, MD 20879). The Futrex 5000A uses infrared interactance to measure the depth of subcutaneous fat tissue at the upper arm midpoint on the biceps. An optical "light wand" placed at this point transmits the measurement to a portable computer instrument which calculates the percent body fat. Validation of the instrument against hydrostatic weighing resulted in correlation coefficient ranging from 0.83 to 0.92, depending on whether factors of activity type, frequency, and duration were included in the calculation (Davis & Paynter, 1987). Variables entered into the Futrex 5000A for calculation of percent body fat in this subject group included age, gender, height, weight, and frame size.

The researchers administered the Mini Mental State Examination and the Geriatric Depression Scale (Folstein, Folstein, & McHugh, 1975; Yesavage et al., 1983). The

subjects received a physical evaluation by a staff physician which included an objective assessment of the presence of 23 physical signs and symptoms of nutritional deficiency (Grant & DeHoog, 1991; Appendix A).

Blood samples from all subjects were transported in cold packaging to a local clinical laboratory, in a local medical center, for analyses. Copies of the results were sent to the subjects with a letter requesting the subjects to discuss any abnormal results with their physicians (Appendix A). Copies of the bloodwork results were also sent to the appropriate local health care facility for patient files.

Data were computer-coded for analyses on a university VAX system. Frequency and univariate analyses were performed to obtain descriptive data on the subjects by community, gender, marital status, age level, annual income level, and level of obesity. Analysis of variance and t-testing were used for comparing mean Determine scores by subject grouping. Results of the Determine checklist were subjected to regression and correlation with clinical indicators of nutritional status: measurements of body mass index (BMI, the ratio of weight in kilograms to height in squared meters), midarm circumference, triceps skinfold, midarm muscle circumference, percent body fat, percent of ideal body weight, hemoglobin status, hematocrit status, total lymphocyte count, glucose, albumin, total cholesterol, high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), triglycerides, total number of diagnoses obtained from the physical evaluation, total number of medications used, total number of clinical signs of malnutrition, and transformations of these values (values were squared to achieve a more linear model). Determine scores and risk factors were also regressed and correlated with results from the Mini Mental Exam and Geriatric Depression Scale. Chi-square analyses were used to examine the distribution of responses to Determine risk indicators and risk indicators from the expansion.

## Results and Discussion

A total of 119 subjects volunteered for participation: 59 from the clinic community and 60 from the hospital community. In the clinic community, 28 of the 59 volunteers (47.4%) were interviewed at the local senior center whereas, in the hospital community, 41 of the 60 volunteers (68.3%) were interviewed at the local senior center. As these distributions were an artifact of the data collection process, chi-square analysis showing a significant difference in congregate meal use in the two communities was disregarded.

The subjects reported a mean age of 73.6 years, range 58 to 89 years. Although the congregate meals program is designated for people over 60 years of age, provision is made to allow persons access to service if they are the spouse of an eligible participant. Due to this program policy, as well as an interest in the effects of marital status on response to the screening instruments, a married subject of 58 years was allowed to participate in the study.

Of the 119 original volunteers, only 89 (74.8%) agreed to participate through all stages of the project. As analyses relating objective measures of nutritional status to Determine results could only be applied to these subjects, presentation of results will focus on the responses of the 89 participants who completed the study. Response rates for the total 119 original participants are presented in Appendix B.

The mean age of the 89 subjects who completed the study was 73.8 years, range 58 to 89 years of age (Table 1). These seniors reported an average of 11.9 years of schooling, ranging from 3 to 22 years (Table 1). From the clinic community, 46 of the 59 (78.0%) original volunteers completed the study. In the hospital community, 43 of the 60 (71.7%) seniors continued to completion. The subject group was comprised of 61 females and 28 males. At the time of the study, 49 of the seniors were married and 40 were not married.

The seniors of this study were found have, during the physician evaluations, from 1 to 10 medical conditions or illnesses, with an average of 3.37 illnesses (Table 1). The most commonly self-reported illnesses or conditions among the study group were arthritis (45 of

89, 50.6%), high blood pressure (34 of 89, 38.2%), high blood cholesterol (24 of 89, 27.0%), and heart disease (17 of 89, 19.1%). The study participants reported current use of 0 to 9 medications, averaging 2.61 (Table 1). Physical examination of the seniors revealed from 0 to 8 clinical symptoms of potential malnutrition, with an average of 2.18 clinical signs (Table 1). The clinical signs most commonly noted during examinations were presence of dentures or partial dentures (51 of 89, 57.3%), signs of osteomalacia or osteoporosis (21 of 89, 27.0%), and recent fractures or bone pain (21 of 89, 23.6%). Pale conjunctiva, a symptom of anemia, were also identified in 17 seniors (19.1%); however, these were all seniors from the community with the clinic. As a different physician performed the physical examination in each community, the difference in the presence of this clinical sign may have been due to physician technique.

Also in Table 1, the women ranged from 57 to 69 inches in height, average of 63.1 inches, and the men ranged 65 to 73 inches tall, average 67.4 inches. The females weighed from 95 to 265 pounds, mean 152.0 pounds, and the men weighed 132 to 268 pounds, mean 178.0 pounds. Presence of obesity was calculated by comparing measured weights to ideal body weights associated with measured height and gender. One female and one male each were at 86% of ideal body weight, and thus, were considered to be of low weight. Calculated percent of ideal body weight 120% of ideal body weight or greater was used as indication of obesity. By this standard, 38 of the females and 9 of the males were considered to be obese. Recommended percent body fat levels established by Davis and Paynter (1987) for the Futrex 5000A are 6 to 23.5% for males 60 years of age and above and 9 to 30.8% for females of the same age group. The percent body fat for the females in this study ranged from 22.2 to 47%, with 49 women having body fat percentages above the recommended range. The percent body fat of the males ranged from 13 to 37.7%, with 21 men having body fat percentages above the recommended range. The NSI defined acceptable ranges for body mass index as 22 to 27 (NSI, 1991a). The BMI for the women

ranged from 18 to 47, with 9 women below and 24 above the recommended range. The male BMI scores ranged from 20 to 38, with 2 men below and 11 above the acceptable range.

Albumin values ranged from 3.1 to 4.7 g/dl. Five seniors had values below the NSI recommended level of 3.5 g/dl (NSI, 1991a). Cholesterol values ranged from 121 to 340 mg/dl for these seniors. The NSI defined critical values for cholesterol as being below 160 mg/dl and above 240 mg/dl (NSI, 1991a). By these standards, 7 seniors had cholesterol levels below and 23 seniors had cholesterol levels above the recommended levels.

Mean Determine scores are presented in Table 2. The mean nutritional risk score for all 89 subjects was 4.58, which is within the moderate nutritional risk range (3 to 5). The mean risk score for the clinic community was 4.22 and for the hospital community was 4.98, both within the moderate risk range. Performance of t-test between the mean scores of the two communities indicated no significant difference in the nutritional health of the participants of the two communities by the Determine checklist, although the seniors of the hospital community had the higher of the risk scores. Testing for equal variances in Determine scores between the two communities resulted in no differences; therefore, data for subjects from both communities were pooled for examination of patterns of response.

This mean nutritional risk score was higher than the average score reported by participants in rural congregate meals programs (2.93) and lower than the average score reported by seniors in a hospital-based wellness program (5.08) in the general geographical area (Bonilla et al., 1994; Fox et al., 1994b). Only 25.3% of the wellness/benefits program subjects used any type of food assistance program whereas 48 of the 89 subjects in this study (53.9%) used congregate meals on a regular basis. Based on these data, use of the congregate meals program appears to protect seniors from higher nutritional risk scores. This would most likely be reflected or explained by response rates to the questions about

eating few meals; eating few fruits, vegetables, and milk products; having enough money to buy needed food; and eating alone.

Table 2 presents mean scores by gender, marital status, age level, annual income level, and presence of obesity. Age levels were determined by decades of life as the original Determine made reference to the nutritional risk associated with age of 80 years and older. Annual income level was assigned based on response to the two questions pertaining to individual yearly income. Although mean Determine scores showed higher risk scores for women, seniors not married, older seniors, and seniors that weigh less than 120% of ideal body weight, analysis of variance did not indicate that these groups were at a significant disadvantage. Annual income level of \$6,000 or less was associated with a higher Determine score than income levels greater than \$6,000, indicating that very low income seniors are at higher nutritional risk.

Table 3 shows the distribution of risk scores for the subjects by risk range. For the study group, 21.3% (19 of 89) were found to be in good nutritional health whereas 48.3% (43 of 89) were at moderate nutritional risk and 30.3% (27 of 89) were at high nutritional risk. More seniors from the hospital community (35 of 43, 81.4%) than the clinic community (35 of 46, 76.1%) had Determine scores in the nutritional risk ranges. Chi-square analysis indicated no significant differences in responses ( $p=.390$ ).

Posner and associates (1993) calculated similar distributions in the checklist development study: 24% in good nutritional health, 38% at moderate risk, and 37% at high nutritional risk. The Seniors are Special study reported distributions of 26% good, 37% moderate risk, and 37% high risk (Bonilla et al., 1994). Application of the Determine checklist to home-delivered meal recipients in a rural county yielded a distribution of 28% in good health, 39% at moderate risk, and 33% at high risk (Herndon, 1994). Studies which resulted with lower proportions of the subjects at risk include the rural congregate meal subjects of Fox and associates (1994b), which placed 49% of the subjects at some

risk, and Lowry's (1994) investigation of free-living seniors at congregate meal sites and senior community centers, which placed 59% of the subjects at some nutritional risk. Use of the congregate meal program, once again, appears to have a protective effect against higher Determine scores. This effect does not appear to be shared by participation in the home-delivered meal programs, as indicated in the Herndon (1994) study, possibly because of the indicator regarding ability to shop and cook for one's self.

Two studies, however, which were conducted through Veterans Administration outpatient clinics resulted in higher proportions of at-risk subjects. Johnston's (1994) investigation of 43 seniors placed 93% at nutritional risk by the Determine checklist, although 91% of the seniors had albumin levels measured within normal limits. A study at a Hines, Illinois, outpatient clinic found that 86% of 40 male veterans were at some nutritional risk by the Determine screen (O'Grady, Foley, & Cooper, 1994). In both of these studies, the subjects were asked to respond to the Determine checklist during their clinical visits, and therefore, their responses may have been influenced by their immediate pursuit of treatment.

Table 3 also shows that more females (36.1%, 22 of 61), seniors not married (40.0%, 16 of 40), and seniors 80 years of age or more (50.0%, 13 of 26) were identified as having high nutritional risk scores, although chi-square analysis did not produce significant differences with their counterparts. These data concur with a state-wide application of the Determine checklist in Georgia congregate meal and home-delivered meal programs (Baxter, Pang, & Reddy, 1994). This survey of 11,817 senior citizens found that higher scores were noted for the women, blacks, rural seniors, and older seniors.

More of the males (17 of 28, 60.7%), married seniors (26 of 49, 53.1%), and the seniors 58 to 69 years of age (18 of 30, 60.0%) and 70 to 79 years of age (16 of 33, 48.5%) were identified as being at moderate nutritional risk. However, nutritional risk level

did significantly differ by annual income level ( $p=.020$ ). For seniors reporting incomes \$6,000 or less, 52.4% (11 of 21) were in the high nutritional risk category as opposed to 34.6% (9 of 26) of those with incomes between \$6,000 and \$10,000 annually and 15.0% (6 of 40) reporting annual incomes greater than \$10,000. The majority of the seniors reporting annual incomes greater than \$10,000 were in the moderate risk category (26 of 40, 65.0%).

Table 4 presents the risk response rates to the Determine questions, including both the original 10 questions and the revised questions which solicited the single item inquiries. For the four Determine questions that were separated, response rates were calculated from risk responses, the "yes" or "no" response which indicated potential risk, to either of the respective two single item questions. For example, the risk response rate of "I eat few fruits, vegetables, or milk products" was the proportion of subjects who indicated a risk response to "I eat less than 2 fruits or 2 vegetables each day" (risk response of "yes") or to "I eat or drink 1 or less milk products each day" (risk response of "yes"). Thus, these combined responses would include those subjects who indicated risk to either or both of the separate indicators. The most commonly noted risk factors were eating few fruits, vegetables, and milk products (60.7%, 54 of 89); daily use of three prescription or over-the-counter medications (57.3%, 51 of 89); eating alone (38.2%, 34 of 89); and changing diet due to illness (36.0%, 32 of 89). The separated indicator of limited milk product use contributed highly to the overall indicator of limited fruit, vegetable, and dairy product use, with 49.4% (44 of 89) of the subjects providing this nutritional risk response. Both of the separated pharmaceutical use indicators had high response rates: 38.2% (34 of 89) took three or more prescription medications daily and 33.0% (29 of 89) used over-the-counter drugs on a daily basis.

The risk factors reported by the seniors in this study were also the most commonly noted factors of risk in the two pilot studies (Bonilla et al., 1994; Fox et al., 1994b). For

the congregate meal pilot study, 37.3% reported eating alone and 19.6% reported limited intake of fruits, vegetables, and milk products. With the senior wellness program, 40.4% reported limited use of dairy products and 34.8% reported eating alone.

Posner et al. (1993) reported that over 30% of their subjects responded positively to the questions about changing diet secondary to illness; eating few fruits, vegetables, and milk products; eating alone; and taking three or more drugs daily. These four indicators are the most commonly reported risk factors from other applications of the Determine checklist (Baxter et al., 1994; Herndon, 1994; Johnston, 1994; Lowry, 1994; Melnick, Helferd, Firmery, & Wales, 1994; O'Grady et al., 1994). One exception to this pattern of reporting was in Herndon's (1994) study of home-delivered meals recipients in which 51% of the subjects indicated that they could not shop, cook, or feed themselves.

Regression analysis was performed to examine the relationships between the checklist questions and the total Determine score for the subject group. For the 14 questions which were used for calculation of the Determine score, stepwise regression showed that inability to buy needed food was the factor which had the greatest effect on the variability of the Determine score ( $R^2=.3223$ ). In descending order, the stepwise regression included eating few meals; mouth problems; change in diet due to illness; using few milk products; inability to shop, cook, or feed one's self; eating alone; eating few fruits and vegetables; taking three or more prescription medications; gaining ten pounds within the past six months; having tooth problems; using over-the-counter drugs daily; and losing ten pounds within the past six months. As none of the participants in the study responded with high alcohol use ("I have 3 or more drinks of beer, liquor, or wine almost every day"), this indicator did not appear in the regression results. A yes/no response to the 13 items accounted for about 97% of the variability in the Determine score ( $R^2=.9754$ ).

The order within the regression seemed to follow a decrease in the weights assigned to the ten questions used on the checklist; therefore, a second stepwise regression was

performed using the ten items with their weights. Of the weighted questions, inability to buy needed food again had the greatest effect on variability in the Determine score ( $R^2=.3223$ ), followed by the other questions in descending order of weight. For those questions weighted with a "2", presence of tooth and mouth problems had the most effect on Determine variability. When compared with the previous regression, reported mouth problems seemed to be more significant than tooth problems. Also, medication use and eating alone had more considerable effects on Determine score than weight change in the previous six months, although the former were weighted with "1" whereas weight change was weighted "2". This was most likely due to higher positive response rates to the presence of these two factors.

A third stepwise regression was performed with the 14 items and the Determine score not weighted, meaning, Determine was calculated from the response to the checklist questions without the varying weights. In this regression, presence of mouth problems had the most impact on Determine score ( $R^2=.2640$ ). As only 6.7% of the subjects indicated mouth problems, these subjects were among those with the highest Determine scores. The regression then included in descending order: use of few milk products; use of three or more prescription medications; eating alone; inability to buy needed food; change in diet due to illness; eating few meals; inability to shop, cook, or feed one's self; daily over-the-counter drug use; gaining ten pounds in the past six months; presence of tooth problems; eating few fruits and vegetables; and losing ten pounds. Responses to these 13 items accounted for about 95% of the variability in the non-weighted Determine score ( $R^2=.9566$ ). Of the first six factors included in the regression, with the exceptions of mouth problems and food buying ability, rate of response to the question appeared to affect the order of precedence. This was shown in a fourth regression in which the ten checklist questions were compared to the non-weighted Determine score.

In this last regression, use of three or more prescription medications or over-the-counter drugs had the greatest effect on Determine score ( $R^2=.2874$ ), followed by limited use of fruits, vegetables, and dairy products, and eating alone. These three questions had the highest positive response rates (57.3%, 60.7%, and 38.2%, respectively). For this subject group, the regression then included tooth or mouth problems; change in diet due to illness; poor food buying ability; eating few meals; inability to shop, cook, or feed one's self; and weight change.

Tables 5 through 10 present risk response rates to the Determine checklist by type of community, gender, marital status, age level, income level, and presence of obesity. In Table 5, the hospital community participants' responses to the combined tooth/mouth problem indicator, the separate tooth problem indicator, and the question about eating alone were significantly higher than the clinic community participants' responses, by chi-square analysis. The hospital community participants' response rates to risk factors were generally higher than the clinic community participants', with the exceptions of eating two meals or less each day; eating less than 2 fruits or 2 vegetables; unwanted weight change; and inability to shop for, cook for, or feed one's self. Except for responses to eating few fruits, vegetables, or milk products (both the combined and separated indicators); tooth problems and the combined tooth/mouth problem indicator; and undesired weight loss and the combined weight change indicator, females provided higher risk response rates than men (Table 6). More women (30 of 61, 49.2%) than men (4 of 28, 14.3%) ate alone ( $p=.002$ ). Responses to risk factors were split in relation to marital status (Table 7). Whereas as fewer married seniors than non-married seniors were at risk for changing their diet due to illness, eating few meals, eating less than two fruits or two vegetables daily, having tooth/mouth problems, eating alone ( $p=.000$ ), taking three or more prescribed medications daily, and having unplanned weight loss, married seniors had higher risk response rates to the remaining risk factors, with a significantly higher response to

unplanned weight gain ( $p=.038$ ). Increasing age level (Table 8) had the most significant influence on response to eating alone ( $p=.009$ ) and losing 10 pounds in the last six months ( $p=.007$ ). A higher percentage of seniors 80 to 89 years of age than the younger age groups gave risk responses to all risk indicators except for changing diet due to illness, eating few meals, taking three or more prescribed medications and the combined medication indicator, and having unplanned weight gain. Seniors reporting annual income less than \$6,000 were more disadvantaged than seniors with higher incomes on all Determine factors but diet change due to illness, limited milk product use, eating alone, polypharmacy, and unplanned weight loss (Table 9). Income level significantly influenced responses to tooth problems ( $p=.012$ ), mouth problems ( $p=.031$ ), and having enough money to buy needed food ( $p=.003$ ). Finally, in Table 10, obese seniors (120% and above of ideal body weight) reported significantly higher response rates to daily prescription medication use (48.9%, 23 of 47,  $p=.034$ ) and combined prescription/over-the-counter drug use (72.3%, 34 of 47,  $p=.003$ ) whereas seniors identified as not being obese (below 120% of ideal body weight) reported unplanned weight loss (17.1%, 7 of 41,  $p=.045$ ).

Regression analysis was performed to examine any relationships between the objective measures of nutritional status and the Determine checklist score. Of these, only hemoglobin value was associated with Determine score ( $R^2=.0783$ ,  $p=.0181$ ). Transformation (squaring) of hemoglobin value slightly improved the association ( $R^2=.0820$ ,  $p=.0155$ ).

Correlation between the Determine score and the objective measures revealed a negative relationship between Determine score and hemoglobin value ( $R= -.2377$ ,  $p=.0249$ ), transformed hemoglobin value ( $R= -.2432$ ,  $p=.0216$ ), and a positive relationship with glucose value ( $R=.2259$ ,  $p=.0333$ ). These results would be expected as a high nutritional risk score on the Determine would most likely be associated with respondents having a low hemoglobin value or a high glucose value. Table 11 shows the significant

correlations between individual risk factors and objective measures of nutritional status. Due to the data coding and programming process, for a positive correlation, risk response would be associated with a low value for the objective measure whereas a negative correlation would indicate a risk response associated with a high value of the objective measure. For example, if a subject reported diet change due to illness, that subject was more likely to have a high triceps skinfold measure ( $R = -.2908$ ), or if a senior indicated limited intake of fruits or vegetables, that subject was more likely to have a low triceps skinfold measure ( $R = .2245$ ).

Many of the significant correlations in Table 11 tended to be with anthropometric measures of obesity. To see if the Determine checklist was sensitive to seniors of lower weight, correlations were again performed within subject groups divided into the three age levels (58 to 69 years, 70 to 79 years, and 80 to 89 years) and presence of obesity (120% of ideal body weight and above, and below 120% of ideal body weight). Table 12 displays the significant correlations between Determine score and objective measures of nutritional status within these age-weight groupings. Correlations were identified in this manner for both obese and non-obese subjects within each age group; however, only a positive correlation with glucose value ( $R = .5236$ ) was indicated for the 80 to 89 year old/non-obese group. For this group, a high glucose value was associated with a high Determine score.

Regression and correlation analyses did not show any significant relationship between Mini Mental Exam scores and Determine scores. Mean mental score was 27.6, ranging from 20 to 30. According to Folstein et al. (1975), a score less than 26 is associated with diminished cognitive function. Less than 25% of the seniors in this study scored less than 26.

Correlation analysis did indicate significant relationships between Geriatric Depression Scale scores and reported mouth problems ( $R = -.2764$ ,  $p = .0091$ ) and reported unplanned gain of ten pounds ( $R = -.2423$ ,  $p = .0304$ ), but not to the overall Determine

scores. Mean depression score was 5.6, with a range of 0 to 22. Scores of 11 or more are indicative of possible depression, and again, less than 25% of this subject group scored as such.

Table 13 shows the risk factors from the expansion checklist with the highest risk response rates. The most commonly noted risk factors reported by these subjects included being above desirable weight and having a primary physician located in another town, thus requiring travel (53.9%, 48 of 89). Additionally, daily vitamin and mineral use also was reported by 53.9% (48 of 89) of the subjects, and although this is not necessarily an indication of nutritional risk, 25.0% (12 of 48) of these seniors reported self-treatment of illnesses with vitamin or mineral supplements. Other risk factors reported by at least 50% of the participants included yearly individual income less than \$10,000 (52.8%, 47 of 89) and currently being diagnosed as having arthritis (50.6%, 45 of 89). Also, of the 22 seniors who indicated that they were on a special diet, 59.1% (13) reported having trouble following the diet.

Tables 14 through 19 relate significant differences in responses, as determined by chi-square analysis, to expansion questions by type of community, gender, marital status, presence of obesity, age level, and annual income level. Community response in Table 14 reflected more disadvantage to the hospital community participants than the clinic community participants, with the exception of inadequate cooling. The higher use of a physician located in another town by seniors in the clinic community was more than likely a function of closer proximity to a metropolitan area. Gender differences in Table 15 show the economic disadvantage of females. Also, senior women in this study reported daily vitamin and mineral supplement more than men. Table 16 demonstrates that seniors in this study who were not married tended to use the congregate meals program more often. The higher proportion of married seniors using physician services in another community was most likely influenced by community of residence as 69.6% (32 of 46) of the clinic

community's subjects were married while 39.5% (17 of 43) of the hospital community's subjects were married ( $p=.004$ ). The obese subjects related more medical problems, such as hypertension and arthritis, in Table 17. Obese subjects were also aware of their obesity as indicated by their responses to questions about being overweight: 80.8% (38 of 46) felt that they weighed more than their desirable weight, 50.0% (23 of 46) were trying to lose weight, and 45.6% (21 of 46) were told by their physician that they were overweight. The 80 to 89 years old group were at more of a disadvantage for all the significant risk factors in Table 18 with the exception of diagnosis of being overweight. The 58 to 69 year old group reported no signed durable powers of attorney for health care whereas 6 were reported in the 70 to 79 years age group and 5 in the 80 to 89 years age group. Lower income levels were associated with poor food-buying ability, lack of working stove in the home, and loss of spouse (Table 19). Those seniors reporting incomes between \$6,000 and \$10,000 annually had the highest response rates to inadequate heat in the home and trying to lose weight.

**Table 1: Characteristics of subjects**

	Mean	Range
Age	73.8 years	58-89 years
Years of School	11.9 years	3-22 years
Illnesses/Conditions	3.4	1-10
Medications	2.6	0-9
Clinical Signs of Malnutrition	2.2	0-8
<b>Females</b>		
Height	63.1 in.	57-69 in.
Weight	152 lb.	95-265 lb.
Percent Body Fat		22-47%
Body Mass Index Range		18-47
<b>Males</b>		
Height	67.4 in.	65-73 in.
Weight	178 lb.	132-268 lb.
Percent Body Fat		13-38%
Body Mass Index		20-38

**Table 2: Mean "Determine Your Nutritional Health" scores (N = number of subjects, SD = standard deviation) <sup>a</sup>**

	N	Mean	SD	Range
<b>Study Group</b>	89	4.58	2.72	0-12
<b>Type of Community</b>				
Clinic	46	4.22	2.48	0-11
Hospital	43	4.98	2.92	0-12
<b>Gender</b>				
Female	61	4.70	2.82	0-12
Male	28	4.32	2.50	0-11
<b>Marital status</b>				
Married	49	4.31	2.87	0-12
Not married	40	4.93	2.52	0-11
<b>Age level</b>				
58-69 years	30	4.17	2.57	0-12
70-79 years	33	4.18	2.63	0-12
80-89 years	26	5.58	2.83	1-11
<b>Annual income level</b>				
<\$6,000	21	5.90 A	3.11	0-12
\$6-10,000	26	4.42 B	3.15	0-12
>\$10,000	40	3.95 B	1.89	0-10
<b>Presence of obesity</b>				
Obese	47	4.49	2.61	0-12
Not obese	41	4.71	2.89	0-11

<sup>a</sup> Values presented with differing letters are significantly different by ANOVA,  $p=.025$ .

**Table 3: Nutritional health evaluation by the "Determine Your Nutritional Health" checklist for study participants by type of community, gender, marital status, age level, and annual income level (N = number of respondents, % = percentage responding)**

	Good health (0 - 2)		Moderate Risk (3 - 5)		High risk (6 or more)	
	N	%	N	%	N	%
<b>Study group</b>	19	21.3	43	48.3	27	30.3
<b>Type of Community</b>						
Clinic	11	23.9	24	52.2	11	23.9
Hospital	8	18.6	19	44.2	16	37.2
<b>Gender</b>						
Female	13	21.3	26	42.6	22	36.1
Male	6	21.4	17	60.7	5	17.8
<b>Marital Status</b>						
Married	12	24.5	26	53.1	11	22.4
Not married	7	17.5	17	42.5	16	40.0
<b>Age level</b>						
58-69 years	7	23.3	18	60.0	5	16.7
70-79 years	8	24.2	16	48.5	9	27.3
80-89 years	4	15.4	9	34.6	13	50.0
<b>Annual income level <sup>a</sup></b>						
<\$6,000	4	19.0	6	28.6	11	52.4
\$6-10,000	7	26.9	10	38.5	9	34.6
>\$10,000	8	20.0	26	65.0	6	15.0

<sup>a</sup> Chi-square analysis indicates nutritional health response differs by reported annual income level,  $p=.020$ .

**Table 4: Responses to the "Determine Your Nutritional Health" checklist**  
 (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	N	%
I have an illness or condition that made me change the kind and/or amount of food I eat	32	36.0
I eat 2 meals or less each day	17	19.1
I eat few fruits or vegetables, or milk products	54	60.7
I eat less than 2 fruits or 2 vegetables each day	19	21.3
I eat or drink 1 or less milk products each day	44	49.4
I have 3 or more drinks of beer, liquor or wine almost every day	0	0.0
I have tooth or mouth problems that make it hard for me to eat	13	14.6
I have tooth problems, such as loose or bad teeth, poorly fitting dentures, etc., that make it hard to eat	11	12.4
I have mouth problems, such as bleeding or swollen gums, sores, etc., that make it hard to eat	6	6.7
I don't always have enough money to buy the food I need	7	7.9
I eat alone most of the time	34	38.2
I take 3 or more different prescribed or over-the-counter drugs a day	51	57.3
I take 3 or more prescribed medications daily	34	38.2
I take over-the-counter drugs daily	29	33.0
Without wanting to, I have lost or gained 10 pounds in the last 6 months	15	16.9
Without wanting to, I have lost 10 pounds or more in the last 6 months	8	9.0
Without wanting to, I have gained 10 pounds or more in the last 6 months	7	7.9
I am not always physically able to shop, cook, and/or feed myself	8	9.0

**Table 5: Responses to the "Determine Your Nutritional Health" checklist by type of community (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	Clinic		Hospital	
	N	%	N	%
I have an illness or condition...	16	34.8	16	37.2
I eat 2 meals or less each day	9	19.6	8	18.6
I eat few fruits or vegetables, or milk...	26	56.5	28	65.1
I eat less than 2 fruits or...	10	21.7	9	20.9
I eat or drink 1 or less milk...	21	45.6	23	53.5
I have 3 or more drinks of beer...	0	0.0	0	0.0
I have tooth or mouth problems... <sup>a</sup>	3	6.5	10	23.3
I have tooth problems... <sup>b</sup>	2	4.4	9	20.9
I have mouth problems...	1	2.2	5	11.6
I don't always have enough money...	3	6.5	4	9.3
I eat alone most of the time <sup>c</sup>	11	23.9	23	53.5
I take 3 or more different prescribed...	24	52.2	27	62.8
I take 3 or more prescribed...	15	32.6	19	44.2
I take over-the-counter drugs daily	14	31.1	15	34.9
Without wanting to, I have lost or...	10	21.7	5	11.6
Without wanting to, I have lost...	5	10.9	3	7.0
Without wanting to, I have gained...	5	10.9	2	4.6
I am not always physically able to shop...	5	10.9	3	7.0

<sup>a</sup> Community participant responses differ by chi-square analysis,  $p=.026$ .

<sup>b</sup> Community participant responses differ by chi-square analysis,  $p=.018$ .

<sup>c</sup> Community participant responses differ by chi-square analysis,  $p=.004$ .

Table 6: Responses to the "Determine Your Nutritional Health" checklist by gender  
(N = number of respondents at risk, % = percentage responding at risk)

Risk factor	Female		Male	
	N	%	N	%
I have an illness or condition...	24	39.3	8	28.6
I eat 2 meals or less each day	12	19.7	5	17.9
I eat few fruits or vegetables, or milk...	35	57.4	19	67.9
I eat less than 2 fruits or...	10	16.4	9	32.1
I eat or drink 1 or less milk...	28	45.9	16	57.1
I have 3 or more drinks of beer...	0	0.0	0	0.0
I have tooth or mouth problems...	7	11.5	6	21.4
I have tooth problems...	6	9.8	5	17.9
I have mouth problems...	5	8.2	1	3.6
I don't always have enough money...	6	9.8	1	3.6
I eat alone most of the time <sup>a</sup>	30	49.2	4	14.3
I take 3 or more different prescribed...	37	60.2	14	50.0
I take 3 or more prescribed...	24	39.3	10	35.7
I take over-the-counter drugs daily	22	36.7	7	25.0
Without wanting to, I have lost or...	8	13.1	7	25.0
Without wanting to, I have lost...	3	4.9	5	17.8
Without wanting to, I have gained...	5	8.2	2	7.1
I am not always physically able to shop...	6	9.8	2	7.1

<sup>a</sup> Gender responses differ by chi-square analysis,  $p=.002$ .

**Table 7: Responses to the "Determine Your Nutritional Health" checklist by marital status**  
 (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	Married		Not Married	
	N	%	N	%
I have an illness or condition...	15	30.6	17	42.5
I eat 2 meals or less each day	8	16.3	9	22.5
I eat few fruits or vegetables, or milk...	30	61.2	24	60.0
I eat less than 2 fruits or...	10	20.4	9	22.5
I eat or drink 1 or less milk...	25	51.0	19	47.5
I have 3 or more drinks of beer...	0	0.0	0	0.0
I have tooth or mouth problems...	6	12.2	7	17.5
I have tooth problems...	4	8.2	7	17.5
I have mouth problems...	3	6.1	3	7.5
I don't always have enough money...	5	10.2	2	5.0
I eat alone most of the time <sup>a</sup>	3	6.1	31	77.5
I take 3 or more different prescribed...	30	61.2	21	52.5
I take 3 or more prescribed...	18	36.7	16	40.0
I take over-the-counter drugs daily	18	36.7	11	28.2
Without wanting to, I have lost or...	11	22.4	4	10.0
Without wanting to, I have lost...	4	8.2	4	10.0
Without wanting to, I have gained... <sup>b</sup>	7	14.3	0	0.0
I am not always physically able to shop...	5	10.2	3	7.5

<sup>a</sup> Marital status responses differ by chi-square analysis,  $p=.000$ .

<sup>b</sup> Marital status responses differ by chi-square analysis,  $p=.038$ .

**Table 8: Responses to the "Determine Your Nutritional Health" checklist by age level**  
(N = number of respondents at risk, % = percentage responding at risk)

Risk factor	58-69 years		70-79 years		80-89 years	
	N	%	N	%	N	%
I have an illness or condition...	10	33.3	14	42.4	8	30.8
I eat 2 meals or less each day	7	23.3	5	15.2	5	19.2
I eat few fruits or vegetables, or milk...	18	60.0	17	51.5	19	73.1
I eat less than 2 fruits or...	6	20.0	4	12.1	9	34.6
I eat or drink 1 or less milk...	13	43.3	15	45.4	16	61.5
I have 3 or more drinks of beer...	0	0.0	0	0.0	0	0.0
I have tooth or mouth problems...	2	6.7	5	15.2	6	23.1
I have tooth problems...	2	6.7	4	12.1	5	19.2
I have mouth problems...	1	3.3	2	6.1	3	11.5
I don't always have enough money...	2	6.7	2	6.1	3	11.5
I eat alone most of the time <sup>a</sup>	5	16.7	15	45.4	14	53.8
I take 3 or more different prescribed...	17	56.7	20	60.6	14	53.8
I take 3 or more prescribed...	11	36.7	13	39.4	10	38.5
I take over-the-counter drugs daily	7	23.3	12	37.5	10	38.5
Without wanting to, I have lost or...	5	16.7	3	9.1	7	26.9
Without wanting to, I have lost... <sup>b</sup>	0	0.0	2	6.1	6	23.1
Without wanting to, I have gained...	5	16.7	1	3.0	1	3.8
I am not always physically able to shop...	2	6.7	1	3.0	5	19.2

<sup>a</sup> Age level responses differ by chi-square analysis,  $p=.009$ .

<sup>b</sup> Age level responses differ by chi-square analysis,  $p=.007$ .

Table 9: Responses to the "Determine Your Nutritional Health" checklist by annual income level (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	<\$6,000		\$6-10,000		>\$10,000	
	N	%	N	%	N	%
I have an illness or condition...	6	28.6	6	23.1	19	47.5
I eat 2 meals or less each day	5	23.8	6	23.1	6	15.0
I eat few fruits or vegetables, or milk...	16	76.2	17	65.4	20	50.0
I eat less than 2 fruits or...	6	28.6	4	15.4	9	22.5
I eat or drink 1 or less milk...	12	57.1	16	61.5	15	37.5
I have 3 or more drinks of beer...	0	0.0	0	0.0	0	0.0
I have tooth or mouth problems...	5	23.8	2	7.7	5	12.5
I have tooth problems... <sup>a</sup>	5	23.8	0	0.0	5	12.5
I have mouth problems... <sup>b</sup>	3	14.3	2	7.7	0	0.0
I don't always have enough money... <sup>c</sup>	5	23.8	2	7.7	0	0.0
I eat alone most of the time	8	40.0	13	50.0	12	30.0
I take 3 or more different prescribed...	11	52.4	16	61.5	22	55.0
I take 3 or more prescribed...	7	33.3	11	42.3	14	35.0
I take over-the-counter drugs daily	7	33.3	9	36.0	11	27.5
Without wanting to, I have lost or...	5	23.8	3	11.5	6	15.0
Without wanting to, I have lost...	2	9.5	0	0.0	5	12.5
Without wanting to, I have gained...	3	14.3	3	11.5	1	2.5
I am not always physically able to shop...	3	14.3	2	7.7	3	7.5

<sup>a</sup> Annual income level responses differ by chi-square analysis,  $p=.012$ .

<sup>b</sup> Annual income level responses differ by chi-square analysis,  $p=.031$ .

<sup>c</sup> Annual income level responses differ by chi-square analysis,  $p=.003$ .

**Table 10: Responses to the "Determine Your Nutritional Health" checklist by presence of obesity (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	Obese		Not obese	
	N	%	N	%
I have an illness or condition...	19	40.4	13	31.7
I eat 2 meals or less each day	9	19.2	8	19.5
I eat few fruits or vegetables, or milk...	26	55.3	27	65.8
I eat less than 2 fruits or...	8	17.0	10	24.4
I eat or drink 1 or less milk...	21	44.7	23	56.1
I have 3 or more drinks of beer...	0	0.0	0	0.0
I have tooth or mouth problems...	4	8.5	9	22.0
I have tooth problems...	4	8.5	7	17.1
I have mouth problems...	2	4.3	4	9.8
I don't always have enough money...	4	8.5	3	7.3
I eat alone most of the time	18	39.1	16	39.0
I take 3 or more different prescribed... <sup>a</sup>	34	72.3	17	41.5
I take 3 or more prescribed... <sup>b</sup>	23	48.9	11	26.8
I take over-the-counter drugs daily	18	38.3	11	26.8
Without wanting to, I have lost or...	5	10.6	9	22.0
Without wanting to, I have lost... <sup>c</sup>	1	2.1	7	17.1
Without wanting to, I have gained...	4	8.5	2	4.9
I am not always physically able to shop...	4	8.5	4	9.8

<sup>a</sup> Presence of obesity responses differ by chi-square analysis,  $p=.003$ .

<sup>b</sup> Presence of obesity responses differ by chi-square analysis,  $p=.034$ .

<sup>c</sup> Presence of obesity responses differ by chi-square analysis,  $p=.045$ .

**Table 11: Significant correlations between individual nutritional risk indicators and objective measures of nutritional status (R = Pearson's correlation coefficient,  $x_t$  = transformation of x)**

Risk factor	Objective measure	R	p value
<b>I have an illness or condition...</b>			
	Triceps skinfold	-.2908	.0063
	Triceps skinfold <sub>t</sub>	-.2923	.0060
	Cholesterol	-.2279	.0317
	Triglycerides	-.2467	.0198
	Triglycerides <sub>t</sub>	-.2248	.0342
<b>I eat 2 meals or less each day</b>			
	Body mass index	-.2122	.0459
	Body mass index <sub>t</sub>	-.2271	.0324
	Percent of ideal body weight <sub>t</sub>	-.2168	.0424
	Total number of diagnoses	.2338	.0334
<b>I eat less than 2 fruits or...</b>			
	Triceps skinfold	.2245	.0367
	Triceps skinfold <sub>t</sub>	.2385	.0261
<b>I have tooth problems...</b>			
	Triceps skinfold	.2213	.0394
	Percent body fat	.2326	.0302
	LDL	.2687	.0166
	LDL <sub>t</sub>	.2496	.0265
<b>I have mouth problems...</b>			
	Total lymphocyte count <sub>t</sub>	-.2422	.0222
	Glucose	-.2600	.0139
	Glucose <sub>t</sub>	-.2214	.0371
<b>I eat alone most of the time</b>			
	Percent body fat	-.3049	.0043
	Percent body fat <sub>t</sub>	-.3187	.0028
<b>I take 3 or more prescribed...</b>			
	Triglycerides	-.2420	.0224
	Triglycerides <sub>t</sub>	-.2234	.0353
	Total number of medications	-.5132	.0001

Table 11. Continued

Risk factor	Objective measure	R	p value
I take over-the-counter drugs daily			
	Hemoglobin	.2337	.0284
	Hemoglobin <sub>t</sub>	.2390	.0249
Without wanting to, I have lost...			
	Body mass index	.2509	.0205
	Body mass index <sub>t</sub>	.2264	.0372
	Midarm circumference	.2364	.0304
	Midarm circumference <sub>t</sub>	.2154	.0491
	Triceps skinfold	.4076	.0001
	Triceps skinfold <sub>t</sub>	.3558	.0010
	Percent body fat	.3981	.0002
	Percent body fat <sub>t</sub>	.3598	.0008
	Albumin	.2287	.0352
	Albumin <sub>t</sub>	.2233	.0400
	Percent of ideal body weight	.3048	.0048
	Percent of ideal body weight <sub>t</sub>	.2656	.0146
Without wanting to, I have gained...			
	Hemoglobin	.2454	.0273
	Hemoglobin <sub>t</sub>	.2385	.0320

Table 12: Significant correlations between "Determine Your Nutritional Health" checklist scores and objective measures of nutritional status by age level and presence of obesity (R = Pearson's correlation coefficient,  $x_t$  = transformation of x)

Age level	Objective measure	Obese		Not obese	
		R	p value	R	p value
<b>58 to 69 years</b>					
	Albumin	.5196	.0189		
	Albumin <sub>t</sub>	.5205	.0186		
	Cholesterol	.6055	.0047		
	Cholesterol <sub>t</sub>	.6175	.0037		
	LDL	.6458	.0038		
	LDL <sub>t</sub>	.6447	.0039		
	Glucose			.7022	.0350
	Glucose <sub>t</sub>			.6821	.0430
	Triglycerides			-.7310	.0252
	Triglycerides <sub>t</sub>			-.7171	.0297
<b>70 to 79 years</b>					
	Midarm circumference <sub>t</sub>	.5012	.0404		
	Midarm muscle circumference	.5628	.0187		
	Midarm muscle circumference <sub>t</sub>	.5804	.0146		
	Hemoglobin <sub>t</sub>			-.4990	.0491
<b>80 to 89 years</b>					
	Glucose			.5236	.0374
	Glucose <sub>t</sub>			.5301	.0347

**Table 13: Responses greater than 20% to expansion questions to the "Determine Your Nutritional Health" checklist (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	N	%
I have an illness that the doctor told me needs a special diet	22	24.7
I am supposed to be on a special diet, but I am having trouble following it (Total special diets = 22)	13	59.1
I often eat the same foods each day	21	23.6
I have dentures	42	47.2
I have dentures that [do not] fit (Total dentures = 42)	13	31.0
It has been more than 1 year since I last saw a dentist	43	48.3
My individual yearly income is less than \$6,000	22	24.7
My individual yearly income is less than \$10,000	47	52.8
I take vitamin or mineral tablets daily	48	53.9
I treat my illnesses with vitamin or mineral supplements I have chosen myself (Total supplement users = 48)	12	25.0
I think that I weigh more than my desirable weight	48	53.9
Are you trying to lose weight?	30	33.7
Has a physician told you that you presently have arthritis?	45	50.6
Has a physician told you that you presently have high blood cholesterol?	24	27.0
Has a physician told you that you presently have high blood pressure?	34	38.2
Has a physician told you that you presently [are] overweight?	24	27.0
In what town is your primary physician located? (i.e., is your physician located out of town?)	48	53.9

**Table 14: Significant differences in type of community responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	Clinic		Hospital		p value
	N	%	N	%	
I am unable to spend \$30 or more for my food each week	4	8.7	12	27.9	.018
My home has [in]adequate cooling	6	13.0	0	0.0	.042
I have dentures that [do not] fit	3	13.0	10	52.6	.037
I [do not] have someone who would help if I were sick in bed	3	6.7	11	26.2	.013
In what town is your primary physician located? (i.e., is your physician located out of town?)	34	73.9	14	33.3	.000

**Table 15: Significant differences in gender responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	Female		Male		p value
	N	%	N	%	
My individual yearly income is less than \$6,000	19	31.7	3	10.7	.034
My individual yearly income is less than \$10,000	38	63.3	9	32.1	.006
I take vitamin or mineral tablets daily	39	63.9	9	32.1	.005

Table 16: Significant differences in marital status responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	Married		Not married		p value
	N	%	N	%	
Do you use congregate meals? (often)	9	19.2	18	47.4	.002
In what town is your primary physician located? (i.e., is your physician located out of town?)	32	66.7	16	40.0	.012

Table 17: Significant differences in presence of obesity responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	Obese		Not obese		p value
	N	%	N	%	
I think that I weigh more than my desirable weight	38	80.8	9	22.0	.000
Are you trying to lose weight?	23	50.0	6	14.6	.000
Has a physician told you that you presently have arthritis?	28	60.9	16	39.0	.042
Has a physician told you that you presently have high blood pressure?	23	50.0	11	26.8	.027
Has a physician told you that you presently [are] overweight?	21	45.6	3	7.3	.000

**Table 18: Significant differences in age level responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	58-69 years		70-79 years		80-89 years		p value
	N	%	N	%	N	%	
I have days when I don't feel like eating anything at all	0	0.0	2	6.1	4	15.4	.038
I have dentures	11	36.7	12	36.4	19	79.2	.002
I [do not] have a stove that works	0	0.0	1	3.0	4	15.4	.027
My home [does not] have adequate heating	0	0.0	1	3.0	4	15.4	.027
I think that I weigh less than my desirable weight	0	0.0	4	22.2	5	29.4	.044
Do you use congregate meals?	3	10.3	10	31.2	14	58.3	.001
Has a physician told you that you presently [are] overweight?	14	46.7	8	25.0	2	7.7	.005
Have you signed a durable power of attorney for health care?	0	0.0	6	19.4	5	19.2	.006

**Table 19: Significant differences in annual income level responses to expansion questions to the "Determine Your Nutritional Health" checklist as determined by chi-square analysis (N = number of respondents at risk, % = percentage responding at risk)**

Risk factor	<\$6,000		\$6-10,000		>\$10,000		p value
	N	%	N	%	N	%	
I am unable to spend \$30 or more for my food each week	9	42.9	3	11.5	3	7.5	.003
I [do not] have a stove that works	3	14.3	2	7.7	0	0.0	.031
My home [does not] have adequate heating	1	4.8	4	15.4	0	0.0	.019
I have lost a spouse or loved one within the last year	7	33.3	6	23.1	2	5.1	.011
Are you trying to lose weight?	7	33.3	14	56.0	9	22.5	.022

CHAPTER III  
APPLICATION AND EVALUATION OF A NUTRIENT-  
SPECIFIC FOOD FREQUENCY INSTRUMENT  
IN TWO RURAL COMMUNITIES

The United States Departments of Agriculture and Health and Human Services (1990, 1992) have established the Dietary Guidelines for Americans and the Food Guide Pyramid as public awareness tools to promote healthy eating habits by Americans. The Dietary Guidelines provide general advisements for nutritious food intake by healthy Americans. These include recommendations for eating a variety of foods; choosing a diet low in fat, saturated fat, and cholesterol; choosing a diet with plenty of vegetables, fruits, and grain products; and practicing moderation in the use of sugars, sodium, and alcoholic beverages. The Dietary Guidelines also suggest maintenance of healthy weight. The Food Pyramid divides food into five groups and specifies how many servings of each group should be consumed on a daily basis. The Bread, Cereal, Rice, and Pasta Group forms the foundation of the pyramid, and suggests 6 to 11 servings each day. The second tier of the Food Pyramid is split between the Vegetable Group and the Fruit Group. For a healthy diet, Americans should eat 3 to 5 servings of vegetables and 2 to 4 servings of fruit each day. The Milk, Yogurt, and Cheese Group and the Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group form the third level of the pyramid, and the Food Guide Pyramid recommends eating 2 to 3 servings from each of these groups on a daily basis. The tip of the pyramid represents foods consisting of fats, oils, and sweets, and is representative of sparing use of these types of foods in comparison to intake of foods from the lower levels of the pyramid.

The National Live Stock and Meat Board commissioned a study of eating patterns of adult Americans as compared to the Food Guide Pyramid (MRCA Information

Services, Inc., 1994). From a nationwide sampling of over 4,700 adults aged 19 years and older, the researchers found that the average adult American met the consumption recommendation for only the meat and meat alternate group (2.2 servings daily). The study group reported average daily intakes of 5.1 servings of breads and cereals, 2 servings of vegetables, 1 serving of fruit, and 1.3 servings of dairy foods. However, this study also showed that adults averaged 3.5 servings daily of fats, oils, and sweets.

The purpose of this study was to determine whether the eating patterns of seniors in two rural communities followed the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid. A food frequency instrument was specifically designed to identify how often the senior citizens met these recommendations. A food frequency was selected as it could be quickly scored and used to educate the study participants as to how they could make dietary changes to be more compliant with the Dietary Guidelines for Americans and the Food Guide Pyramid.

### Methods

The development of the food frequency instrument and its application coincided with the methods related in the previous chapter. A 50-item food frequency (Appendix A), adapted and expanded from an instrument developed by Program and Staff Development of the Texas Agricultural Extension Service (1991), was included in the survey packet used for subject interviews. The instrument had been pilot tested in four rural congregate meal sites and with participants in a hospital-based wellness and education program (Fox, Bonilla, & Shields, 1994a, 1994b). The food frequency was comprised of questions focused on identifying eating habits in five dimensions: intake of foods high in sugar, sodium, fat, fiber, and overall compliance with meeting the recommendations of the Food Guide Pyramid and the Dietary Guidelines for Americans. Each dimension included 10 questions about representative foods within each category. The compliance dimension specifically targeted minimum suggested number of daily servings in the various food

groups (i.e., breads and cereals, fruits, vegetables, dairy products, meat and meat substitutes) as well as daily intake of foods high in vitamin A, vitamin C, and fiber. Seniors were asked to indicate frequency of usage of food items as seldom or never, 1 to 2 times per week, 3 to 4 times per week, or almost daily.

Responses were scored and discussed with each subject at the end of each interview. The scoring system was established so that high scores would be associated with low frequency of usage of products high in sugar, sodium, and fat; high frequency of usage of foods high in fiber; and high frequency of compliance with the Dietary Guidelines for Americans and the Food Guide Pyramid. Ranges of scores reflected relative frequency of use of foods within each dimension. The high range (35 to 40) is associated with seldom or never using foods high in sugar, sodium, and fat, and also is associated with daily use of high fiber products and daily compliance with eating guidelines. As needed, subjects were provided with feedback about their eating behaviors, and using the food frequency forms and score forms, shown how to decrease their intake of products high in sugar, sodium, and fat, while increasing their intake of products high in fiber and increasing their compliance with national recommendations (Program and Staff Development, Texas Agricultural Extension Service, 1991; Appendix A).

Data were computer-coded for analyses on a university VAX system. Reliability testing was performed on each of the five food frequency dimensions as well as the overall food frequency. Results of the five food frequency dimensions were subjected to correlation and regression with scores from the "Determine Your Nutritional Health" checklist and its individual questions. Analysis of variance and t-testing, or nonparametric one-way analysis if the dimension was not normally distributed, were used for comparing mean dimension scores and individual food item scores by subject groupings. Chi-square analyses were used to examine the distribution of responses to the 50 individual food frequency items.

## Results and Discussion

Reliability testing of the entire food frequency resulted in a Cronbach's alpha coefficient of  $\alpha=0.7375$ , which was an acceptable level of internal homogeneity for this research. Although improvements in internal consistency were suggested for each of the five food frequency dimensions, all questions were retained for educational interventions with the subjects. Alpha value for the sugar dimension was calculated to be  $\alpha=0.6478$ ; for the sodium frequency,  $\alpha=0.4105$ ; for the fat dimension,  $\alpha=0.6424$ ; for the fiber questions,  $\alpha=0.6219$ ; and for compliance with the national eating recommendations,  $\alpha=0.7482$ . Reliability on the sugar dimension could be improved by removing the question about consumption of sugared soft drinks,  $\alpha=0.6790$ . Improvements in the reliability coefficient for the sodium dimension would result from deleting questions about canned vegetables ( $\alpha=0.4626$ ), microwaveable meals ( $\alpha=.4802$ ), and seasoning salts ( $\alpha=0.4212$ ). Removal of salad dressings from the scale would increase the alpha value for the fat scale,  $\alpha=0.6461$ . The reliability of the fiber dimension would improve with omission of the questions about whole grain breads ( $\alpha=0.6241$ ) or whole grain cereals ( $\alpha=0.6362$ ). The reliability of the compliance scale would increase with deletion of the questions pertaining to the bread and cereal group ( $\alpha=0.7542$ ) or the fruit group ( $\alpha=0.7613$ ).

Although no associations between the food frequency dimension scores and the overall Determine scores were identified by regression analyses, some correlations were derived between the dimensions and individual risk factor items. Sugar score ( $R=.2724$ ,  $p=.0060$ ) and fat score ( $R=.2724$ ,  $p=.0098$ ) both positively correlated with lack of tooth problems. High fiber ( $R=.2647$ ,  $p=.0127$ ) and national eating guideline compliance ( $R=.2898$ ,  $p=.0062$ ) scores positively correlated with the non-risk response to eating few fruits and vegetables. Compliance score was also associated with diet change due to illness ( $R= -.2106$ ,  $p=.0488$ ). For these seniors, changing one's diet due to illness was reported by seniors with high compliance to the national eating guidelines.

Mean food frequency scores showed that the seniors in this study consumed high sugar products 1 to 2 times per week (Table 20), high sodium products 1 to 2 times per week (Table 21), high fat products 1 to 2 times per week (Table 22), high fiber products 1 to 2 times per week (Table 23), and complied with national eating guidelines 3 to 4 times per week (Table 24). These results are in agreement with the findings from the two previous studies (Bonilla et al., 1994; Fox et al., 1994a). When all scores were compared by type of community, gender, marital status, age level, and annual income level, analysis of variance only showed a significant difference in sugar score by annual income level ( $p=.003$ ). Means separation by Student-Newman-Keuls' multiple range test showed that seniors reporting annual income between \$6,000 and \$10,000 had a significantly higher sugar score, indicating that they seldom or never used high sugar foods. The other two income groups indicated that they used foods high in sugar at least 1 to 2 times per week. Mean scores for the five dimensions by type of community, gender, marital status, age level, and annual income level were similar to the overall mean scores of the entire study group.

The most commonly eaten foods included daily intakes of baked sweets such as cakes and cookies (38.2%, 34 of 89) and jam or jelly (28.1%, 25 of 89) on the sugar scale; canned vegetables (25.8%, 23 of 89) on the sodium scale; butter or margarine (34.8%, 31 of 89) and desserts high in fat (27.0%, 24 of 89) on the fat scale; and whole grain breads (52.8%, 47 of 89); whole grain cereals such as oatmeal (29.2%, 26 of 89), raw vegetables (32.6%, 29 of 89), cooked vegetables (33.7%, 30 of 89), and whole fresh fruit with skins or seeds (28.1%, 25 of 89) on the fiber scale. In relation to the Dietary Guidelines for Americans, 39.3% (35 of 89) of the seniors reported daily intake of a vitamin A-rich food and 62.3% (56 of 89) indicated daily intake of a vitamin C-rich food. The seniors in this study reported high compliance to the recommendation for eating at least five different foods each day (75.2%, 67 of 89).

In relation to compliance with the Food Guide Pyramid recommendations, the seniors reported high seldom or non-compliance with recommendations for at least six servings of bread and cereal products daily (46.1%, 41 of 89) and two servings of dairy foods daily (27.0%, 24 of 89). In contrast, 35.9% (32 of 89) of the seniors ate three servings of vegetables daily and 43.8% (39 of 89) ate two servings of fruit daily. Melnick et al. (1994) reported that 35% of their 49 elderly subjects met the recommendation for three vegetables daily, and 90% of their subjects met the recommendation for two fruits daily. This last result the authors attributed to the fact that data collection occurred during the summer. Also, they reported that the seniors in their study averaged 3.2 servings of breads and cereals and 1.7 servings of dairy products each day.

Tables 25 through 29 present frequency distributions of the five dimensions by community, gender, marital status, age level, and annual income level. These tables confirm the interpretations of the results from the analyses of the mean dimension scores. In general, the majority of the seniors ate foods high in sugar, sodium, fat, and fiber 1 to 2 days each week and met the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid 3 to 4 days each week. No differences were noted in the eating patterns by type of community, gender, marital status, age level, and annual income level.

Table 30 shows significant mean differences in individual food item scores by type of community, gender, and marital status as determined by t-test. Subjects from the clinic community tended to eat high-fat meat products more frequently than those from the hospital community ( $p=.0447$ ). Females in the study ate ice cream, sherbet, or popsicles; cured or processed meats; fried or breaded vegetables; and visible fat from meat and poultry less frequently than the males, but consumed foods high in beta-carotene more often than the men. Married seniors ate cured or processed meats and high-fat meats more frequently than the unmarried seniors; however, married seniors also used high-fat milk

and cheese and beta-carotene-rich foods less frequently than seniors without spouses. The unmarried seniors also ate five different kinds of food on a daily basis more frequently than married subjects.

Chi-square analyses also identified significant patterns of response to various food frequency items. Analyses by community revealed that the clinic community's participants used prepared foods with sugars and syrups more frequently than the seniors in the hospital community ( $p=.008$ ); cured meats more frequently than the hospital community's participants ( $p=.014$ ); whole grain breads less frequently than the hospital community's participants ( $p=.031$ ); and high-fiber foods on a daily basis less frequently than the seniors in the hospital community ( $p=.015$ ). By gender, females ate sweet snacks such as pastries more frequently than males ( $p=.039$ ) and high-fat meats, such as bacon, sausage, and luncheon meats, less frequently than males ( $p=.013$ ). Between married and unmarried subjects, the married seniors consumed foods prepared with sugars and syrups less frequently than the unmarried seniors ( $p=.009$ ); used salt in cooking water less frequently than unmarried seniors ( $p=.047$ ); and ate high-fiber foods on a daily basis more frequently than unmarried seniors ( $p=.011$ ). Seniors 80 to 89 years of age salted their food before tasting more often than younger seniors ( $p=.018$ ), ate salad dressings ( $p=.023$ ) and whole grain cereals such as oatmeal ( $p=.011$ ) more often than younger seniors, but ate five different kinds of food on a daily basis less often than younger seniors ( $p=.043$ ). Lastly, seniors reporting annual income less than \$6,000 ate baked sweets, such as cakes and pies ( $p=.045$ ), and pastries ( $p=.005$ ) more frequently than seniors reporting higher incomes, and used prepackaged soups ( $p=.044$ ) less frequently than seniors with higher incomes.

Table 20: Mean frequency scores of sugar intake (N = number of subjects, SD = standard deviation) <sup>a</sup>

	N	Mean <sup>b</sup>	SD	Range
Study Group	89	32.73	4.40	17-40
Type of Community				
Clinic	46	32.72	3.53	26-40
Hospital	43	32.74	5.21	17-40
Gender				
Female	61	32.84	4.59	17-40
Male	28	32.50	4.01	24-40
Marital status				
Married	49	33.00	3.39	26-40
Not married	40	32.40	5.41	17-40
Age level				
58-69 years	30	32.40	4.73	17-40
70-79 years	33	32.64	4.47	18-40
80-89 years	26	33.23	4.01	24-40
Annual income level				
<\$6,000	21	31.00 B	5.43	17-37
\$6-10,000	26	35.04 A	3.22	28-40
>\$10,000	40	32.03 B	3.98	24-40

<sup>a</sup> Values presented with differing letters are significantly different by ANOVA,  $p=.003$ .

<sup>b</sup> Values presented represent frequency of consumption by the following scale:

- 35-40 - seldom or never eat
- 28-34 - eat 1 to 2 times per week
- 20-37 - eat 3 to 4 times per week
- 19 and less - eat almost daily

**Table 21: Mean frequency scores of sodium intake (N = number of subjects, SD = standard deviation)**

	N	Mean <sup>a</sup>	SD	Range
<b>Study Group</b>	89	33.00	3.49	22-40
<b>Type of Community</b>				
Clinic	46	32.93	3.64	24-40
Hospital	43	33.07	3.37	22-39
<b>Gender</b>				
Female	61	33.05	3.31	24-40
Male	28	32.89	3.91	22-39
<b>Marital status</b>				
Married	49	32.80	3.37	22-39
Not married	40	33.25	3.66	24-40
<b>Age level</b>				
58-69 years	30	33.27	3.19	26-39
70-79 years	33	32.58	4.23	22-40
80-89 years	26	33.23	2.79	28-38
<b>Annual income level</b>				
<\$6,000	21	33.33	2.87	28-38
\$6-10,000	26	33.77	3.00	27-40
>\$10,000	40	32.48	4.03	22-39

<sup>a</sup> Values presented represent frequency of consumption by the following scale:  
35-40 - seldom or never eat  
28-34 - eat 1 to 2 times per week  
20-27 - eat 3 to 4 times per week  
19 and less - eat almost daily

Table 22: Mean frequency scores of fat intake (N = number of subjects, SD = standard deviation)

	N	Mean <sup>a</sup>	SD	Range
Study Group	89	32.30	4.33	22-40
Type of Community				
Clinic	46	32.28	4.48	23-40
Hospital	43	32.33	4.22	22-40
Gender				
Female	61	32.85	4.05	22-40
Male	28	31.11	4.73	23-40
Marital status				
Married	49	32.04	4.23	23-39
Not married	40	32.63	4.48	22-40
Age level				
58-69 years	30	32.87	4.54	24-40
70-79 years	33	32.27	4.67	22-40
80-89 years	26	31.69	3.66	25-39
Annual income level				
<\$6,000	21	32.10	3.82	22-38
\$6-10,000	26	33.31	3.69	27-40
>\$10,000	40	31.98	4.93	23-40

<sup>a</sup> Values presented represent frequency of consumption by the following scale:

- 35-40 - seldom or never eat
- 28-34 - eat 1 to 2 times per week
- 20-27 - eat 3 to 4 times per week
- 19 and less - eat almost daily

**Table 23: Mean frequency scores of fiber intake (N = number of subjects, SD = standard deviation)**

	N	Mean <sup>a</sup>	SD	Range
<b>Study Group</b>	89	23.14	4.68	13-33
<b>Type of Community</b>				
Clinic	46	23.63	5.15	14-33
Hospital	43	22.60	4.10	13-31
<b>Gender</b>				
Female	61	23.41	4.60	14-33
Male	28	22.52	4.88	13-32
<b>Marital status</b>				
Married	49	22.73	4.83	14-32
Not married	40	23.64	4.50	13-33
<b>Age level</b>				
58-69 years	30	22.67	5.11	13-33
70-79 years	33	23.22	4.15	15-32
80-89 years	26	23.58	4.91	16-33
<b>Annual income level</b>				
<\$6,000	21	21.81	5.30	14-33
\$6-10,000	26	23.38	3.94	17-31
>\$10,000	40	23.49	4.80	13-33

<sup>a</sup> Values presented represent frequency of consumption by the following scale:  
35-40 - eat almost daily  
28-34 - eat 3 to 4 times per week  
20-27 - eat 1 to 2 times per week  
19 and less - seldom or never eat

**Table 24: Mean frequency scores of reported compliance to national eating guidelines**  
(N = number of subjects, SD = standard deviation)

	N	Mean <sup>a</sup>	SD	Range
<b>Study Group</b>	89	29.85	5.29	10-39
<b>Type of Community</b>				
Clinic	46	30.11	5.23	16-39
Hospital	43	29.57	5.41	10-39
<b>Gender</b>				
Female	61	30.34	5.06	16-39
Male	28	28.74	5.71	10-37
<b>Marital status</b>				
Married	49	29.33	4.79	17-39
Not married	40	30.51	5.86	10-39
<b>Age level</b>				
58-69 years	30	29.17	6.54	10-39
70-79 years	33	30.47	5.55	16-39
80-89 years	26	29.88	2.90	21-34
<b>Annual income level</b>				
<\$6,000	21	29.05	5.31	17-39
\$6-10,000	26	30.35	4.86	16-39
>\$10,000	40	29.77	5.70	10-39

<sup>a</sup> Values presented represent frequency of consumption by the following scale:

- 35-40 - eat almost daily
- 28-34 - eat 3 to 4 times per week
- 20-27 - eat 1 to 2 times per week
- 19 and less - seldom or never eat

**Table 25: Distribution of frequencies of reported high sugar product usage by study participants by type of community, gender, marital status, age level, and annual income level (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Study group</b>	2	2.2	6	6.8	48	53.9	33	37.1
<b>Type of Community</b>								
Clinic	0	0.0	3	6.5	29	63.0	14	30.4
Hospital	2	4.6	3	7.0	19	44.2	19	44.2
<b>Gender</b>								
Female	2	3.3	3	4.9	33	54.1	23	37.7
Male	0	0.0	2	7.1	15	53.6	11	39.3
<b>Marital Status</b>								
Married	0	0.0	3	6.1	28	57.1	18	36.7
Not married	2	5.0	3	7.5	20	50.0	15	37.5
<b>Age level</b>								
58-69 years	1	3.3	2	6.7	17	56.7	10	33.3
70-79 years	1	3.0	2	6.1	17	51.5	13	39.4
80-89 years	0	0.0	2	7.7	14	53.8	10	38.5
<b>Annual income level</b>								
<\$6,000	2	9.5	1	4.8	13	61.9	5	23.8
\$6-10,000	0	0.0	0	0.0	10	38.5	16	61.5
>\$10,000	0	0.0	5	12.5	24	60.0	11	27.5

**Table 26: Distribution of frequencies of reported high sodium product usage by study participants by type of community, gender, marital status, age level, and annual income level (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Study group</b>	0	0.0	6	6.7	53	59.6	30	33.7
<b>Type of Community</b>								
Clinic	0	0.0	4	8.7	25	54.3	17	37.0
Hospital	0	0.0	2	4.6	28	65.1	13	30.2
<b>Gender</b>								
Female	0	0.0	4	6.6	38	62.3	19	31.1
Male	0	0.0	2	7.1	15	53.6	11	39.3
<b>Marital Status</b>								
Married	0	0.0	3	6.1	31	63.3	15	30.6
Not married	0	0.0	3	7.5	22	55.0	15	37.5
<b>Age level</b>								
58-69 years	0	0.0	1	3.3	18	60.0	11	36.7
70-79 years	0	0.0	5	15.2	16	48.5	12	36.4
80-89 years	0	0.0	0	0.0	19	73.1	7	26.9
<b>Annual income level</b>								
<\$6,000	0	0.0	0	0.0	15	71.4	6	28.6
\$6-10,000	0	0.0	1	3.8	14	53.8	11	42.3
>\$10,000	0	0.0	5	12.5	18	45.0	13	32.5

**Table 27: Distribution of frequencies of reported high fat product usage by study participants by type of community, gender, marital status, age level, and annual income level (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Study group</b>	0	0.0	12	13.5	46	51.7	31	34.8
<b>Type of Community</b>								
Clinic	0	0.0	7	15.2	22	47.8	17	37.0
Hospital	0	0.0	5	11.6	24	55.8	14	32.6
<b>Gender</b>								
Female	0	0.0	6	9.8	33	54.1	22	36.1
Male	0	0.0	6	21.4	13	46.4	9	32.1
<b>Marital Status</b>								
Married	0	0.0	8	16.3	26	53.1	15	30.6
Not married	0	0.0	4	10.0	20	50.0	11	27.5
<b>Age level</b>								
58-69 years	0	0.0	3	10.0	17	56.7	10	33.3
70-79 years	0	0.0	5	15.2	15	45.4	13	39.4
80-89 years	0	0.0	4	15.4	14	53.8	8	30.8
<b>Annual income level</b>								
<\$6,000	0	0.0	2	9.5	13	61.9	6	28.6
\$6-10,000	0	0.0	1	3.8	15	57.7	7	26.9
>\$10,000	0	0.0	8	20.0	17	42.5	9	22.5

**Table 28: Distribution of frequencies of reported high fiber product usage by study participants by type of community, gender, marital status, age level, and annual income level (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Study group</b>	0	0.0	17	19.3	53	60.2	18	20.5
<b>Type of Community</b>								
Clinic	0	0.0	12	26.1	24	52.2	10	21.7
Hospital	0	0.0	5	11.9	29	69.0	8	19.0
<b>Gender</b>								
Female	0	0.0	11	18.0	38	62.3	12	19.7
Male	0	0.0	6	22.2	15	55.6	6	22.2
<b>Marital Status</b>								
Married	0	0.0	11	22.4	26	53.1	12	24.5
Not married	0	0.0	6	15.4	27	69.2	6	15.4
<b>Age level</b>								
58-69 years	0	0.0	7	23.3	16	53.3	7	23.3
70-79 years	0	0.0	4	12.5	22	68.8	6	18.8
80-89 years	0	0.0	6	23.1	15	57.7	5	19.2
<b>Annual income level</b>								
<\$6,000	0	0.0	2	9.5	11	52.4	8	38.1
\$6-10,000	0	0.0	6	23.1	16	61.5	4	15.4
>\$10,000	0	0.0	8	20.5	25	64.1	6	15.4

**Table 29: Distribution of frequencies of reported compliance to national eating guidelines by study participants by type of community, gender, marital status, age level, and annual income level (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Study group</b>	13	14.8	50	56.8	21	23.9	4	4.5
<b>Type of Community</b>								
Clinic	9	19.6	23	50.0	12	26.1	2	4.3
Hospital	4	9.5	27	64.3	9	21.4	2	4.8
<b>Gender</b>								
Female	10	16.4	26	59.0	13	21.3	2	3.3
Male	3	11.1	14	51.8	8	29.6	2	7.4
<b>Marital Status</b>								
Married	5	10.2	26	53.1	16	32.6	2	4.1
Not married	8	20.5	24	61.5	5	12.8	2	5.1
<b>Age level</b>								
58-69 years	7	23.3	13	43.3	7	23.3	3	10.0
70-79 years	6	18.8	16	50.0	9	28.1	1	3.1
80-89 years	0	0.0	21	80.8	5	19.2	0	0.0
<b>Annual income level</b>								
<\$6,000	3	14.3	11	52.4	6	28.6	1	4.8
\$6-10,000	4	15.4	14	53.8	7	26.9	1	3.8
>\$10,000	6	15.4	23	59.0	8	20.5	2	5.1

**Table 30: Significant mean differences in food frequency items by type of community, gender, and marital status as determined by t-test <sup>a</sup>**

Food frequency item	Clinic	Hospital	p value
Meats such as bacon, sausage, frankfurters, jerky and luncheon meats	2.87	3.28	.0447
Food frequency item	Female	Male	p value
Ice cream, sherbets or popsicles	3.34	2.86	.0321
Cured or processed meats	3.10	2.50	.0040
Pan fried in fat, deep-fat fried and/or breaded vegetables	3.61	3.25	.0169
The skin of poultry or the visible fat from meat	3.97	3.71	.0085
Foods high in beta-carotene <sup>b</sup>	3.20	2.70	.0197
Food frequency item	Married	Not Married	p value
Cured or processed meats	2.65	3.22	.0022
Meats such as bacon, sausage, frankfurters, jerky and luncheon meats	2.73	3.48	.0001
Whole milk or high-fat cheeses	3.55	3.18	.0457
Foods high in beta-carotene <sup>b</sup>	2.78	3.38	.0017
At least five different kinds of food daily <sup>b</sup>	3.41	3.77	.0472

<sup>a</sup> Values presented represent frequency of consumption by the following scale:

- 1 - eat almost daily
- 2 - eat 3 to 4 times per week
- 3 - eat 1 to 2 times per week
- 4 - seldom or never eat

<sup>b</sup> Values presented represent frequency of consumption by the following scale:

- 1 - seldom or never eat
- 2 - eat 1 to 2 times per week
- 3 - eat 3 to 4 times per week
- 4 - eat almost daily

## CHAPTER IV

### CONCLUSIONS

The "Determine Your Nutritional Health" checklist and a nutrient-specific food frequency were administered to free-living seniors in two rural communities: one with a physician-staffed clinic and one with a 50-bed hospital. Senior participants were asked to respond to a survey package which included a 43-item expansion of the Nutrition Screening Initiative's "Determine Your Nutritional Health" checklist, a 23-item demographic profile, and a 50-item food frequency. The researchers performed anthropometric measurements of the subjects, and each participant received a fasting blood draw and physical examination for signs of malnutrition by qualified medical personnel. The participants also received education regarding improving their eating habits to better meet the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid.

This study was performed in two rural communities to test the hypothesis that the Determine checklist is an accurate measure of the nutritional status of the elderly, by comparing the results of the Determine checklist to objective measures of malnutrition. Based on the data collected in this study, the assessment of nutritional status by the "Determine Your Nutritional Health" checklist has limited comparability to the nutritional status findings resulting from the accepted anthropometric, biochemical, and clinical indicators investigated. By the Determine checklist, 21.3% of the seniors in this study were in good nutritional health, 48.3% were at moderate nutritional risk, and 30.3% were at high nutritional risk. Comparison of blood values to the NSI protocol showed only five seniors (5.6%) with mildly depleted albumin levels, seven seniors (7.9%) with total cholesterol levels below 160 mg/dl, and 23 seniors (25.8%) with total cholesterol levels above 240 mg/dl. Comparison of body mass index values to the NSI recommended range of 22 to 27

revealed that 11 seniors (12.3%) fell below the healthy range and 35 seniors (39.3%) had BMIs above the healthy range. Two seniors (2.2%) were considered to be of low weight and 47 (52.8%) were obese by this standard. These seniors also averaged 3.37 illnesses or medical conditions and 2.18 clinical signs of possible malnutrition. These data regarding the objective assessment of poor nutrition do not total to the 79% of the subjects identified as being at nutritional risk by the Determine checklist.

Regression and correlation of the "Determine Your Nutritional Health" checklist score with the various objective indicators of nutritional status revealed very little predictability of poor nutritional status by the Determine checklist. A high Determine score had some association with low hemoglobin and high glucose measures, but the associations were not very strong. Only when subjects were grouped by age level and presence of obesity did stronger associations between Determine and objective nutritional indicators appear. However, the strength of these correlations are based on groupings of only 9 to 20 seniors. A larger sample would be necessary to appropriately confirm any relationships between the objective nutritional measurements and the Determine score.

The best correlations occurred with seniors 58 to 69 years of age who were greater than 120% of ideal body weight, indicating that the Determine checklist is more sensitive to seniors who are obese as opposed to those who are of lower weight. This is contrary to the purpose and development of the checklist as the risk factor items were intended to identify persons with limits on their ability to obtain and eat nutritious foods (White et al., 1992; Posner et al., 1993). With the exception of the question regarding diet change as a result of illness, which may be interpreted as either a decrease or an improvement in diet, all of the other risk factors have a focus on problems that interfere with adequate intake of energy and nutrients. Inclusion of a risk factor in the checklist was dependent upon whether the risk factor was associated with a high number of nutrients, of five target nutrients, consumed below 75% of the RDAs (Posner et al., 1993).

Addressing the second hypothesis of this study, evaluation of nutritional risk in the two rural communities showed no significant differences in the level of nutritional risk between the two communities. By the Determine checklist, 76.1% of the participants from a rural community with a local physician-staffed clinic were found to be at some nutritional risk. In a rural community with a local hospital, 81.4% of the participants were found to be at some nutritional risk. These rates of risk were slightly lower than that reported by Posner's group (1993) in the development of the checklist. Among New England Medicare beneficiaries, about 85% were found to be at some nutritional risk. This higher proportion of nutritional risk in the New England study may have reflected the fact that the participants were chosen from a pool of health care recipients.

Individual risk factors which differed between the two communities in this study included tooth and mouth problems, eating alone, poor food-buying ability, inadequate cooling, improperly-fitting dentures, lack of social support during times of sickness, and having to travel out of town for physician care. With the exception of traveling out of town to visit one's doctor, the seniors from the hospital community reported presence of these risk factors more frequently. The differences in the response rates to these risk factors may be more appropriately explained by the remoteness of the community as opposed to the health care facility locally available as the clinic community was closer to a metropolitan area and had more access to additional services to alleviate these risk factors.

The most common risk factors among participants in this study were eating few fruits, vegetables, and dairy products; taking three prescription or over-the-counter medications daily; eating alone; and having changed one's diet as a result of illness. Females, seniors who were not married, older seniors, and seniors reporting income of \$6,000 or less tended to be more at a disadvantage for presence of risk factors from both the Determine checklist and the expansion questions. Women ate alone more and reported lower incomes more so than men. Females were also more likely to change their diet due

to illness or condition, eat fewer meals, have limited food-buying ability, and use more medications. Non-married seniors ate alone more often and were more likely to have illness/condition-induced diet changes, eat fewer meals, and have tooth or mouth problems. Seniors 80 to 89 years of age usually ate alone and experienced unplanned weight loss more frequently than younger seniors. They also had more limited intakes of fruits, vegetables, and milk products; had more tooth and mouth problems; had limited food-buying ability; had more physical disabilities interfering with shopping, cooking, or feeding themselves; had days on which they did not feel like eating; wore dentures; had a non-working stove or inadequate heat; and weighed less than they desired. Seniors with incomes less than \$6,000 reported more tooth and mouth problems and limited food-buying ability. Low income seniors also ate fewer meals; had more limited intakes of fruits, vegetables, and dairy products; reported more unplanned weight change; had more physical disabilities which interfered with shopping, cooking, and feeding themselves; lacked a working stove or adequate heat; and lost a spouse or loved one within the past year.

Obese seniors in this study had higher risk response rates to polypharmacy and illness-induced diet change; however, their mean nutritional risk score was lower than that of seniors below 120% of ideal body weight. In the expansion questions, obese seniors also reported arthritis and high blood pressure more often than their lower weight counterparts. Of interest is that Posner's group (1993) indicated that arthritis and hypertension were the two most commonly reported chronic conditions in their study, and that 36% of their subjects were classified as obese by the body mass index. According to Posner et al. (1993), use of three or more medications daily and diet change due to illness were the two best predictors of self-perceived poor health. The sensitivity to obesity apparent in the correlations with the objective measures of poor nutrition may be partially due to the self-perceived health aspect of the development of the checklist. However, the self-perceived health question was not included in the development of the questionnaires

for this study. Continuation of this work should consider including the self-perceived health question for comparison with obesity results.

These patterns of risk factor prevalence noted between and within both communities are limited to describing the patterns of nutritional risk among the white populations of these communities. Attempts were made to attract more Hispanic participants to the study, but were unsuccessful due to low minority population in the area.

Regression analysis of the Determine checklist with the individual risk factors confirmed that Determine score was mostly influenced by the weights of the risk factors as assigned by Posner et al. (1993). Use of three or more drinks of alcohol did not have an effect on any of the regressions with this subject group as none of the subjects admitted such practice. When regression was performed with the weights removed, indication of mouth problems had the highest influence on overall Determine score. Determine score for this group was affected also by high response rate to checklist questions (i.e., polypharmacy, limited dairy products, and diet change due to illness) and to self-reported limits in food-buying ability. As 96% of the variability in the Determine score could be attributed to the nonweighted responses to the 13 risk factor questions used in calculation of the Determine score in this study, the checklist may be as useful for risk identification and education without the weights. Investigation in other geographical areas and cultural groups with this concept would contribute to the refinement of the Determine checklist.

In the investigation of the third hypothesis that the senior citizens in the target communities were following the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid, food frequency results indicated that this group of seniors ate foods high in sugar, sodium, fat, and fiber, at least 1 to 2 days each week, and were in compliance with national eating recommendations 3 to 4 days each week. A high proportion of seniors in this study ate desserts high in sugar and fat, jams and jellies, canned vegetables, and butter or margarine on a daily basis, contributing to a increased

frequency of intake of foods high in sugar, sodium, and fat. Intakes of foods high in fiber, such as whole grain breads and cereals, fresh fruits, and vegetables, were also commonly reported as being eaten on a daily basis. However, reported non-use of other high-fiber products by the seniors kept the overall fiber scores low. Also, although whole grain breads and cereals were commonly reported to be eaten on a daily basis, these seniors had difficulty in achieving at least six servings on a daily basis. Once again, these patterns of eating are limited to the white elderly in these communities.

The seniors in this study were aware of foods high in sugar, sodium, and fat and exhibited limited intake of many of these foods. Conversely, they did not appear to be as knowledgeable about the fiber content of foods and the health benefits of high fiber intake. From 20% to 60% of the subjects, depending on the food item, seldom or never ate dried beans and peas, raw vegetables, dried or fresh whole fruits, popcorn, or nuts. These patterns of intake may have some association with reported tooth or mouth problems, but this association would be low as only 14.6% reported such problems.

In relation to the food frequency results, a correlation occurred between response of changing one's diet as a result of illness or medical condition and compliance with recommendations of the Food Guide Pyramid and Dietary Guidelines for Americans. Respondents who indicated they had to change their diets were more likely to be in compliance with the eating guidelines. Seniors in this study were more likely to acknowledge illness/condition-induced diet change as an improvement toward nutritional health as opposed to a detriment. High fiber and high compliance scores which correlated with adequate intake of fruits and vegetables on the Determine checklist confirmed such dietary improvements.

These findings reveal that although the "Determine Your Nutritional Health" checklist may be useful in identifying individual risk factors for nutritional health for educating senior citizens and directing them to appropriate social, medical, or nutritional

services to alleviate the presence of the risk factors, scoring of the instrument is not strongly associated with accepted biochemical, anthropometric, and clinical measures of poor nutritional status. Regression analysis showed that non-weighted risk factors may be as useful in identification of nutritional risk on the Determine checklist as the weighted factors. However, regression and correlation of Determine scores with objective indicators of nutritional and health status revealed that the checklist score has little association with established objective markers of poor nutritional status.

In both communities, the respective congregate meal programs could assist in improving Determine, fiber dimension, and compliance dimension scores by increasing provision of high-fiber foods, bread and cereal products, and dairy products, and by encouraging increased participation of local residents in the congregate meals program and other health benefit services. The findings regarding limited fiber, bread, and cereal product usage was common across all three studies performed in the general geographical area, and may only reflect a local nutrition education deficiency. Comparisons of administration of this food frequency instrument in other areas would better reveal whether this is a more expansive problem. The hospital community participants would also benefit from locally available oral health care services.

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APPENDIX A  
INSTRUMENTS, CONSENT FORMS, AND  
COMMUNICATION OF  
RESULTS FORMS

CONSENT FORM FOR PARTICIPATION IN RESEARCH STUDY  
(COPY TO BE PROVIDED TO PERSON SIGNING)  
TO BE WRITTEN IN FIRST PERSON NARRATIVE

TITLE OF STUDY:

Nutritional Status of an Elderly Population in Three Rural Communities

PRINCIPAL INVESTIGATOR responsible for this research project is:

Elizabeth A. Fox, Ph D, RD, LD, Department of Education, Nutrition, Restaurant/Hotel Management (ENR/HM); Title: Associate Professor; Phone (806) 742-3068.

Other investigators involved in this study if the principal investigator is not available:

Charles E. Shields, MD, Department of Family Medicine; Phone (806) 743-3111.

Joseph Bonilla, RD, Department of ENR/HM; Doctoral Student; Phone (806) 742-3068.

(Please contact the principal investigator or other investigators at the number listed above if any of the conditions listed in the "Risks and Discomforts" section of this consent form develop or if any unexpected complications occur.)

PURPOSE of the Research is: To determine the nutritional status of the volunteer participant.

PROCEDURES which involve me in exact order are:

1. In the first screen, I will be asked to answer simple questions about what, when, and how I eat, about my health and health practices, the diseases I have, my ability to care for myself, and my living conditions.
2. If I take care of a relative, I will be asked questions related to how I feel about that.
3. I will be asked to tell the researchers something about myself, like age, level of income, whether or not I am married, live alone, etc.
4. I will receive information about my nutritional state and suggestions will be made as to how I can correct identified problems.
5. If I am eligible and invited to participate in the second screen, I will have my percent body fat determined by use of a wand which will be placed on the muscle in my upper arm, a caliper (like a big tweezer) will be used to measure the fat on the backside of my upper arm, and my arm circumference will be measured.
6. My height and weight will be taken.
7. I will be asked some simple questions to determine my mental state.
8. I may be asked for more detail about my lifestyle and health habits.
9. If I am found to have certain problems, I will be asked to participate in another screen. At that time, I will be given details and asked to sign another consent form.

THE RESEARCH OR EXPERIMENTAL PART(S) of this research are:

All procedures are usual and have been used before. The collection and analyses of data is the research part of this study.

RISKS AND DISCOMFORTS:

There is no risk to me. I may feel pressure when the caliper is used to measure the fatty part of my arm. I may not feel comfortable answering the questions, and I may discontinue participation in the study at any time.

BENEFITS (if any) which I may reasonably expect from this research are:

Potential benefits include learning about the adequacy of my food intake. Also, I will receive nutrition education about the various factors which may influence the state of my nutrition.

OPTIONAL PROCEDURES or courses of treatment (if any) which might be more advantageous to me are:

None are known. I will continue to receive standard care at this facility even if I choose not to participate in this study.

MY MEDICAL RECORDS for purposes of this research will be made available to: (Note: The FDA may inspect all records pertaining to this study, including all medical records which are directly related to the study.)

The researchers are the only ones who may need to read my medical records.

CONFIDENTIALITY of records identifying me will be maintained in the following manner:

Confidentiality will be most important and a code number will be used to ensure my privacy. If anyone other than the researchers review the information collected, they will only have the code number and not my name.

MY ADDITIONAL COST due to participating in this study (over and above normal treatment cost) will be:

None. I may need to drive to a close-by location for an interview.

COMPENSATION due to me for my participation in this study will be:

None.

DURATION—the time which it will take for my participation in this study should be:

It will take approximately 1 hour of my time for the first screen; if I am eligible and willing to participate in the second screen, that will take about an hour of my time. The time between screen may be up to several months.

VOLUNTARY PARTICIPATION: I do not have to be involved in this study. If I sign this form, it means that I do wish to volunteer. If I change my mind later, I can discontinue my participation in this study at any time I choose. My withdrawal will not affect my future treatment at this institution. The investigators may also terminate my participation in this study at any time.

NONCOMPENSATION CLAUSE: I understand that in the event of injury resulting from the research procedures described to me, that Texas Tech University Health Sciences Center, University Medical Center and their affiliates are not able to offer financial compensation or to absorb the cost of medical treatment. However, necessary facilities, emergency treatment, and professional services will be available to research subjects just as they are to the general community. For information regarding your rights as a research subject or for further information about any of the above matters, please contact the Office of Sponsored Programs at (806) 743-2960, Texas Tech Health Sciences Center, Lubbock, Texas 79430.

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

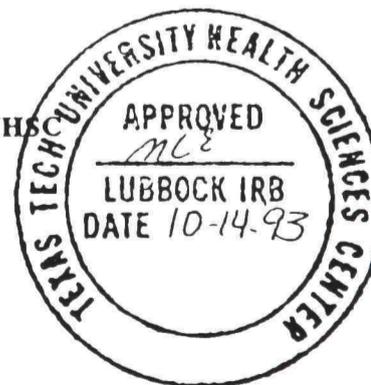
\_\_\_\_\_  
Signature of Parent/Guardian or Authorized Representative

\_\_\_\_\_  
Additional Signature of Parent/Guardian (if necessary)

\_\_\_\_\_  
Signature of Project Director or Authorized Representative

\_\_\_\_\_  
Signature of Witness to Oral Presentation and Signature

NOT VALID  
WITHOUT TTUHS  
STAMP OF  
APPROVAL!!



VOID AFTER: 10-31-94

No. \_\_\_\_\_

Dear Participant:

These questions will tell us about your eating habits. The guidelines we will give you will help you to determine if the nutrients in your diet are adequate; specific suggestions for improvement are included.

Your information will become part of a pool of data and will no longer be associated with your name. The assigned code number will ensure anonymity. This identification sheet will be removed once your answers are combined with the information from other participants.

Please answer all of the questions as accurately as possible; a few may seem repetitious, but please answer them anyway. There are no right or wrong answers. Your answers will describe your food practices.

Name \_\_\_\_\_

Address \_\_\_\_\_

Phone # \_\_\_\_\_

Date \_\_\_\_\_

Thank you.

## My Nutritional Health

Name \_\_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_\_

Please read each question and check the appropriate "yes" or "no" answer.

- I have an illness or condition that made me change the kind  
and/or amount of food I eat..... Yes  No
- I eat 2 meals or less each day..... Yes  No
- I eat less than 2 fruits or 2 vegetables each day..... Yes  No
- I eat or drink 1 or less milk products each day..... Yes  No
- I have 3 or more drinks of beer, liquor, or wine almost  
every day..... Yes  No
- I have tooth problems, such as loose or bad teeth,  
poorly-fitting dentures, etc., that make it hard to eat..... Yes  No
- I have mouth problems, such as bleeding or swollen  
gums, sores, etc., that make it hard to eat..... Yes  No
- I eat alone most of the time..... Yes  No
- I take 3 or more prescribed medications daily..... Yes  No
- I take over-the-counter drugs daily..... Yes  No
- Without wanting to, I have lost 10 pounds or more in  
the last 6 months..... Yes  No
- Without wanting to, I have gained 10 pounds or more in  
the last 6 months..... Yes  No
- I am physically able to shop, cook, and/or feed myself..... Yes  No
- I sometimes have memory loss that makes it hard to shop,  
cook, or eat..... Yes  No
- I have an illness that the doctor has told me needs  
a special diet..... Yes  No
- I am supposed to be on a special diet, but I am having  
trouble following it..... Yes  No
- During the daytime, I sometimes go 6 hours or longer  
without food or liquids..... Yes  No
- I often eat the same foods each day..... Yes  No
- I often do not eat anything on 1 or more days each  
month..... Yes  No

OVER ☞

- |                                                                                     |                              |                             |
|-------------------------------------------------------------------------------------|------------------------------|-----------------------------|
| My appetite is poor and food doesn't taste good to me...                            | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have days when I don't feel like eating anything at all.....                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have dentures.....                                                                | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have dentures that fit.....                                                       | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| It has been more than 1 year since I last saw a dentist.....                        | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| My individual yearly income is less than \$6,000.....                               | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| My individual yearly income is less than \$10,000.....                              | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I am unable to spend \$30 or more for my food each week.....                        | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have a stove that works.....                                                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have a refrigerator that works.....                                               | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| My home has adequate heating.....                                                   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| My home has adequate cooling.....                                                   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have lost a spouse or loved one within the last year.....                         | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have someone who would help if I were sick in bed.....                            | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I do not know if I should take my medications before or after eating.....           | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I cannot read the labels on my medication.....                                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I take vitamin or mineral tablets daily.....                                        | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I treat my illnesses with vitamin and mineral supplements I have chosen myself..... | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I think that I weigh more than my desirable weight.....                             | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I think that I weigh less than my desirable weight.....                             | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have difficulty feeding myself.....                                               | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have difficulty cooking.....                                                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I need help from another person to leave my home.....                               | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have difficulty getting transportation to the grocery store.....                  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have difficulty shopping for food.....                                            | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| I have many nutrition questions or need advice about what to eat.....               | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

## Tell Us About Yourself

Name \_\_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_\_

1. Are you?      Female                       Male
  
2. Are you?      White.....   
                  Hispanic.....   
                  Black.....   
                  Asian.....   
                  Native American.....
  
3. What is your date of birth?    Year \_\_\_\_\_ Month \_\_\_\_\_ Day \_\_\_\_\_
  
4. Including yourself, how many people live in your household? \_\_\_\_\_
  
5. Do you provide more than the usual assistance to someone  
on a regular basis?..... Yes                       No
  
6. Are you presently?    Married.....   
(Choose only one)    Unmarried (never married, widowed)   
                                  Divorced or separated.....   
  
                                  Number of years widowed? \_\_\_\_\_  
                                  Number of years divorced/separated? \_\_\_\_\_
  
7. How many years of schooling have you completed? \_\_\_\_\_
  
8. How tall are you?      Feet \_\_\_\_\_ Inches \_\_\_\_\_
  
9. How much do you weigh?    Pounds \_\_\_\_\_
  
10. Do you feel that your home is safe?..... Yes                       No
  
11. How would you describe your ability to buy the food that you need?  
(Choose only one)  
I do not have enough money to buy the food I need.....   
I usually have enough money to buy the food I need.....   
I always have enough money to buy the food I need.....

OVER ↗

12. Do you use any of the programs listed below?

Food stamps.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Senior group meal programs or congregate meals.....	Often <input type="checkbox"/>	Seldom <input type="checkbox"/>	Never <input type="checkbox"/>
Home-delivered meals or Meals-on-Wheels.....	Often <input type="checkbox"/>	Seldom <input type="checkbox"/>	Never <input type="checkbox"/>
Other (please specify) _____	Often <input type="checkbox"/>	Seldom <input type="checkbox"/>	Never <input type="checkbox"/>
_____	Often <input type="checkbox"/>	Seldom <input type="checkbox"/>	Never <input type="checkbox"/>
_____	Often <input type="checkbox"/>	Seldom <input type="checkbox"/>	Never <input type="checkbox"/>

13. Are you trying to lose weight?..... Yes  No

14. If yes, which of the following are you doing to lose weight?

Eating fewer calories.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Increasing physical activity.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>

15. Do you smoke?..... Yes  No

16. Has a physician told you that you presently have?

If you are on a special diet for a condition, please check the appropriate box.

			Special Diet Required
Anemia.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Arthritis.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Cancer.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Constipation.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Diabetes, take insulin.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Diabetes, do not take insulin.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Diarrhea.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Heartburn.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Heart disease.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
High blood cholesterol.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
High blood pressure.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Kidney problems.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Osteomalacia.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Osteoporosis.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Overweight.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Stroke.....	Yes <input type="checkbox"/>	No <input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) _____			<input type="checkbox"/>

17. When was your last visit to a physician in his office or clinic?

(Choose only one)

- in the last month.....
- in the last 3 months.....
- in the last 6 months.....
- in the last 12 months.....
- more than 12 months.....

18. When was the last time you were hospitalized?

(Choose only one)

- in the last month.....
- in the last 3 months.....
- in the last 6 months.....
- in the last 12 months.....
- more than 12 months.....

19. In what town is your primary physician located? \_\_\_\_\_

20. Have you signed the following?

- |                                             |                              |                             |
|---------------------------------------------|------------------------------|-----------------------------|
| Directive to Physician.....                 | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Durable Power of Attorney for Health Care.. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

OVER 

## Tell Us How Active You Are

21. Which of these best describes your activity?  
(Choose only one)
- Little or no activity
  - Activities like normal walking, golfing, etc.
  - Activities like light housework, moderate speed walking, recreational volleyball
  - Activities like farming or gardening, normal bike riding, jogging, low impact aerobics
  - Activities like tennis, racquetball, squash
  - Activities like high impact aerobics, running, speed swimming, distance cycling
22. How often do you engage in this activity?  
(Choose only one)
- Daily or almost daily (6 or 7 times per week)
  - 3 to 5 times per week
  - 1 or 2 times per week
  - A few times per month
  - Less than once per month
23. How long do you engage in this activity?  
(Choose only one)
- Over 30 minutes
  - 20 - 30 minutes
  - 10 - 20 minutes
  - Under 10 minutes

## SUGAR

(Circle only one letter for each question)

How often do you eat/drink:	Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost Daily
1. Fruit flavored drinks with added sugar?	A	B	C	D
2. Sugared soft drinks?	A	B	C	D
3. Desserts such as pies, cakes and cookies?	A	B	C	D
4. Ice cream, sherbets or popsicles?	A	B	C	D
5. Sweet snacks such pastries, frosted doughnuts or cupcakes?	A	B	C	D
6. Candy?	A	B	C	D
7. Jam, jelly or honey on bread or rolls?	A	B	C	D
8. Coffee or tea sweetened with sugar or honey?	A	B	C	D
9. Prepare foods with white or brown sugar, honey, molasses or syrup?	A	B	C	D
10. Canned or frozen fruit packed in heavy syrup?	A	B	C	D

## SODIUM

(Circle only one letter for each question)

How often do you eat:	Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost daily
1. Cured or processed meats such as ham, bacon, sausage and frankfurters?	A	B	C	D
2. Vegetables canned with salt or frozen vegetables with sauce?	A	B	C	D
3. Commercially-prepared or microwave meals or main dishes?	A	B	C	D
4. Salted nuts, salted popcorn, pretzels, corn chips or potato chips?	A	B	C	D
5. Seasoned salt such as onion or garlic salt?	A	B	C	D
6. Vegetables, rice or pasta with salt added to the cooking water?	A	B	C	D
7. Food that you have salted before tasting?	A	B	C	D
8. Processed cheeses such as American and cheese spreads?	A	B	C	D
9. Bouillon, canned or dehydrated soup mixed?	A	B	C	D
10. Condiments such as soy sauce, teriyaki sauce and meat tenderizer?	A	B	C	D

FAT AND CHOLESTEROL

(Circle only one letter for each question)

How often do you eat:	Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost Daily
1. Pan fried in fat, deep-fat fried and/or breaded meats such as fried chicken, chicken fried steak, breaded fish and deep fat fried nuggets?	A	B	C	D
2. Pan fried in fat, deep-fat fried and/or breaded vegetables, such as french fries, okra, zucchini, hush puppies and snack chips?	A	B	C	D
3. Meats such as bacon, sausage, frankfurters, jerky and luncheon meats such as bologna and salami?	A	B	C	D
4. The skin of poultry or the visible fat from meat?	A	B	C	D
5. Whole milk (4%), or high-fat cheeses such as cheddar, creamed cottage cheese, cream cheese and American processed?	A	B	C	D
6. Sauces, gravies or sour cream?	A	B	C	D
7. Butter or margarine on dinner rolls, breads or vegetables?	A	B	C	D
8. Desserts such as pies, frosted cakes, pastries and ice cream?	A	B	C	D
9. Oily salad dressings?	A	B	C	D
10. Egg dishes such as scrambled, fried and salad?	A	B	C	D

FIBER

(Circle only one letter for each question)

How often do you eat:	Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost daily
1. Dishes made with dry beans and peas?	A	B	C	D
2. Starchy vegetables like potatoes, corn and peas?	A	B	C	D
3. Whole grain breads?	A	B	C	D
4. Whole grain cereals and pastas such as oatmeal, brown rice, whole cornmeal, and whole wheat pasta?	A	B	C	D
5. Raw vegetables?	A	B	C	D
6. Cooked fresh or frozen vegetables?	A	B	C	D
7. Dried fruits?	A	B	C	D
8. Whole fruit with skins and/or seeds, such as berries, apples, pears, and peaches?	A	B	C	D
9. Popcorn?	A	B	C	D
10. Nuts?	A	B	C	D

DAILY DIET

(Circle only one letter for each question)

How often do you eat:	Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost Daily
1. 6 or more servings daily of bread, cereal, rice, or pasta such as macaroni, noodles, and spaghetti? (1/2 cup or 1 slice = 1 serving)	A	B	C	D
2. 3 or more servings daily of vegetables or vegetable juices? (1/2 cup=1 serving)	A	B	C	D
3. 2 or more servings daily of fruits or fruit juices? (1/2 cup=1 serving)	A	B	C	D
4. 2 or more servings daily of milk (8 oz), yogurt (8 oz) or cheese (1 oz)?	A	B	C	D
5. 1 or more servings daily of meat, poultry, fish (2 - 3 oz) or eggs (1)?	A	B	C	D
6. 1 or more servings daily of beans, dried peas, (1/2 cup), peanut butter (2 T)?	A	B	C	D
7. Foods high in beta-carotene such as dark green or deep yellow vegetables, cabbage, spinach, carrots, broccoli, tomatoes, tomato juice, and brussel sprouts? (1/2 cup=1 serving)	A	B	C	D

(Circle only one letter for each question)

How often do you eat:

Seldom or Never	1 or 2 times a week	3 or 4 times a week	Almost Daily
-----------------------	---------------------------	---------------------------	-----------------

- 
8. Foods high in vitamin C such as citrus fruits, citrus juices, berries, peaches, melons, green and leafy vegetables, tomatoes, tomato juice, cauliflower, green peppers, and sweet potatoes?  
(1/2 cup=1 serving)
- 
- A B C D
- 
9. Foods high in dietary fiber such as vegetables, fruit, whole grains, and baked goods containing whole grain flours?  
(1/2 cup or 1 slice=1 serving)
- 
- A B C D
- 
10. At least five (5) different kinds of foods daily such as fruit, vegetables, bread or cereals or beans, meat, milk or cheese?
- 
- A B C D

## SUGAR

Sugar Score = \_\_\_\_\_

### What Your Score Means to You

Scores of 35 - 40

Excellent! Your answers show that you are selecting foods each day that are low in sugar. You are eating fewer desserts and other concentrated sweets.

Scores of 28 - 34

Your sugar intake is low, but there is room for improvement. For what foods did you answer by circling "3 or 4 times a week"? Are there other choices you could make that have less sugar?

Scores of 20 - 27

Your sugar score definitely indicates a sugar intake that is very high. How many times did you circle "almost daily"? What changes can you make to reduce the amount of sugar in your diet?

Scores of 10 - 19

Your answers show that you may be increasing your risks for obesity, tooth decay and high blood triglycerides. Perhaps you are not aware of the risks and should learn ways to make improvements in your diet to decrease the amount of sugar.

I plan to decrease my sugar intake by:

1.

2.

3.

## SODIUM

Sodium Score = \_\_\_\_\_

### What Your Score Means to You

Scores of 35 - 40

Excellent! Your answers show that you are selecting foods each day that are low in sodium. You are avoiding high-sodium condiments and snack foods.

Scores of 28 - 34

Your salt intake is low, but there is room for improvement. For what food items did you answer by circling "3 or 4 times a week"? Are there other choices you could make and decrease your sodium intake to raise your sodium score?

Scores of 20 - 27

Your sodium intake is too high. It may be prudent to begin making changes to reduce your sodium intake. Review the areas that are contributing to your high sodium intake. Take steps to make changes.

Scores of 10 - 19

Your answers show that you may be taking unwise nutrition and health risks. Perhaps you are not aware of the risks and should learn what you can do to make improvements in your diet to decrease sodium intake.

I plan to decrease sodium in my diet by:

1.

2.

3.

## FAT AND CHOLESTEROL

Fat and Cholesterol Score = \_\_\_\_\_

### What Your Score Means to You

Scores of 35 - 40

Excellent! Your answers show that you are selecting foods each day that are low in fat. You are eating fewer high-fat foods and choosing food preparation methods that reduce fat.

Scores of 28 - 34

Your fat intake is low, but there is room for improvement. For what foods did you answer by circling "3 or 4 times a week"? Consider other options to further reduce your fat intake.

Scores of 20 - 27

Your fat score indicates a high-fat diet. Where is most of the fat in your diet coming from? What changes can you make to reduce the amount of fat in your diet?

Scores of 10 - 19

Your answers show that you may be taking unwise nutrition and health risks. Perhaps you are not aware of the risks and should learn what you can do to make improvements in your diet to decrease fat intake.

I plan to decrease fat/cholesterol in my diet by:

- 1.
- 2.
- 3.

## FIBER

Fiber Score = \_\_\_\_\_

### What Your Score Means to You

#### Scores of 35 - 40

Excellent! Your answers show that you are selecting foods each day that are high in fiber and complex carbohydrates (starch). You are also choosing a variety of raw vegetables and eating fruits with skins left on.

#### Scores of 28 - 34

Your fiber intake is good, but there is room for improvement. To what food items did you answer by circling "seldom or never"? Could you eat these fiber-rich sources more often?

#### Scores of 20 - 27

Your fiber score is too low. Review all areas where you scored low. It is important you learn ways to make changes in your diet to increase your fiber intake.

#### Scores of 10 - 19

Your answers show that you may be taking unwise nutrition and health risks. Perhaps you are not aware of the risks and should learn what you can do to improve your diet by increasing fiber intake.

I plan to increase fiber in my diet by:

- 1.
- 2.
- 3.

## DAILY DIET

Daily Diet Score = \_\_\_\_\_

### What Your Score Means to You

Scores of 35 - 40

Excellent! Your answers show that you are selecting a good variety of nutritious foods each day.

Scores of 28 - 34

The variety of your daily foods is good, but there is room for improvement. How many times did you answer by circling "1 or 2 times a week". Are there other choices you could make to get more of these foods into your daily diet?

Scores of 20 - 27

Your daily diet score indicates you may be omitting some very important foods each day. Review all of the items on which you circled "seldom or never". Which types of foods could you increase in your daily diet?

Scores 10 - 19

Your answers show that you may be increasing your chances for nutrition-related problems such as osteoporosis, poor wound healing, increased occurrence of infection and frequent colds. You need to become aware of the risks and learn ways to make improvements in your diet to increase the intake of nutritious foods.

I plan to increase my intake of more nutritious foods by:

1.

2.

3.

CONSENT FORM FOR PARTICIPATION IN RESEARCH STUDY  
(COPY TO BE PROVIDED TO PERSON SIGNING)  
TO BE WRITTEN IN FIRST PERSON NARRATIVE

TITLE OF STUDY:

Nutritional Status of an Elderly Population in Three Rural Communities

PRINCIPAL INVESTIGATOR responsible for this research project is:

Elizabeth A. Fox, Ph D, RD, LD, Department of Education, Nutrition, Restaurant/Hotel Management (ENR/HM); Title: Associate Professor; Phone (806) 742-3068.

Other investigators involved in this study if the principal investigator is not available:

Charles E. Shields, MD, Department of Family Medicine; Phone (806) 743-3111.

Joseph Bonilla, RD, Department of ENR/HM; Doctoral Student; Phone (806) 742-3068.

(Please contact the principal investigator or other investigators at the number listed above if any of the conditions listed in the "Risks and Discomforts" section of this consent form develop or if any unexpected complications occur.)

PURPOSE of the Research is: To determine the nutritional status of the volunteer participant.

PROCEDURES which involve me in exact order are:

1. At this last screen, I will be given an examination by a physician to determine if I have any physical/clinical signs of nutritional deficiency.
2. I will have about 2 teaspoons of blood collected.

THE RESEARCH OR EXPERIMENTAL PART(S) of this research are:

All procedures are usual and have been used before. The collection and analyses of data is the research part of this study.

RISKS AND DISCOMFORTS:

I may experience slight pain from the needle stick and there is a possibility of bruising and/or infection at the puncture site. I may not feel comfortable answering the questions, and I may discontinue participation in the study at any time.

BENEFITS (if any) which I may reasonably expect from this research are:

I will be given the results of the blood collection and will be told by the physician if I have any physical/clinical signs of malnutrition. If necessary, I will be told to consult my preferred physician for follow-up.

OPTIONAL PROCEDURES or courses of treatment (if any) which might be more advantageous to me are:

None are known. I will continue to receive standard care at this facility even if I choose not to participate in this study.

MY MEDICAL RECORDS for purposes of this research will be made available to: (Note: The FDA may inspect all records pertaining to this study, including all medical records which are directly related to the study.)

The researchers are the only ones who may need to read my medical records.

CONFIDENTIALITY of records identifying me will be maintained in the following manner:

Confidentiality will be most important and a code number will be used to ensure my privacy. If anyone other than the researchers review the information collected, they will only have the code number and not my name.

MY ADDITIONAL COST due to participating in this study (over and above normal treatment cost) will be:

None. I may need to drive to the site for the physical examination and blood collection.

COMPENSATION due to me for my participation in this study will be:

None, other than the fact that there will not be a charge for examination and blood collection.

DURATION—the time which it will take for my participation in this study should be:

It will take approximately 1 hour of my time to participate.

**VOLUNTARY PARTICIPATION:** I do not have to be involved in this study. If I sign this form, it means that I do wish to volunteer. If I change my mind later, I can discontinue my participation in this study at any time I choose. My withdrawal will not affect my future treatment at this institution. The investigators may also terminate my participation in this study at any time.

**NONCOMPENSATION CLAUSE:** I understand that in the event of injury resulting from the research procedures described to me, that Texas Tech University Health Sciences Center, University Medical Center and their affiliates are not able to offer financial compensation or to absorb the cost of medical treatment. However, necessary facilities, emergency treatment, and professional services will be available to research subjects just as they are to the general community. For information regarding your rights as a research subject or for further information about any of the above matters, please contact the Office of Sponsored Programs at (806) 743-2960, Texas Tech Health Sciences Center, Lubbock, Texas 79430.

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Parent/Guardian or Authorized Representative

\_\_\_\_\_  
Additional Signature of Parent/Guardian (if necessary)

\_\_\_\_\_  
Signature of Project Director or Authorized Representative

\_\_\_\_\_  
Signature of Witness to Oral Presentation and Signature

NOT VALID  
WITHOUT TTUHS  
STAMP OF  
APPROVAL!!



VOID AFTER: 10-31-94

## ANTHROPOMETRIC MEASURES

Date \_\_\_\_\_

\* No. \_\_\_\_\_

1. Age (yr): \_\_\_\_\_

2. Height (cm): \_\_\_\_\_

If the subject is bedridden, or if the subject has kyphosis or scoliosis, obtain the subject's KNEE HEIGHT for estimation of the subject's height.

Knee Height (cm): \_\_\_\_\_

Estimated Height (cm): \_\_\_\_\_  
(use table below)

Men:  $64.19 (0.04 \times \text{age}) + (2.02 \times \text{knee height})$   
Women:  $84.88 - (0.24 \times \text{age}) + (1.83 \times \text{knee height})$

*Height Estimate: measure knee height (inches) from the bottom of the foot to the anterior of the knee with the ankle and the knee at 90°; measure age in years. These standards probably do not apply to non-Caucasians.*

*Chumlea WC, Roche AF, Mukherjee D. Nutritional assessment of the elderly through anthropometry. Columbus, OH: Ross Laboratories, 1984.*

3. Weight (lbs): \_\_\_\_\_

4. Body Mass Index: \_\_\_\_\_  
(use nomogram on third page)

5. Check any boxes that are true for the individual:

Has lost or gained 10 pounds (or more) in the past 6 months.....

Body Mass Index less than 24.....

Body Mass Index greater than 27.....

6. Upper arm mid-point measure - back (cm): \_\_\_\_\_

7. Upper arm circumference(cm): \_\_\_\_\_

8. Triceps skinfold measure (mm):

First: \_\_\_\_\_

Second: \_\_\_\_\_

Third: \_\_\_\_\_

9. Average of three skinfold measures(mm):\_\_\_\_\_
10. Upper arm muscle circumference (cm):\_\_\_\_\_
10. Percentile ranges of upper arm anthropometry:  
(use table below)  
Upper arm circumference:\_\_\_\_\_
- Upper arm muscle circumference:\_\_\_\_\_
- Triceps skinfold:\_\_\_\_\_

Percentile	Men		Women	
	55-65 y	65-75 y	55-65 y	65-75 y
<i>Arm circumference (cm)</i>				
10th	27.3	26.3	25.7	25.2
50th	31.7	30.7	30.3	29.9
95th	36.9	35.5	38.5	37.3
<i>Arm muscle circumference (cm)</i>				
10th	24.5	23.5	19.6	19.5
50th	27.8	26.8	22.5	22.5
95th	32.0	30.6	28.0	27.9
<i>Triceps skinfold (mm)</i>				
10th	6	6	16	14
50th	11	11	25	24
95th	22	22	38	36

*From: Frisancho AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. Am J Clin Nutr 1981; 34:2540-2545. © 1981 American Society for Clinical Nutrition.*

11. Wrist circumference (cm):\_\_\_\_\_
12. Ankle circumference (cm):\_\_\_\_\_
13. Frame Size:  
(Choose only one)  
Small.....   
Medium.....   
Large.....
14. Upper arm mid-point measure - front (cm):\_\_\_\_\_
15. Percent Body Fat (from Futrex 5000A):\_\_\_\_\_
16. Check any boxes that are true for the individual:  
Clinical evidence of impairment, e.g. Folstein <26.....   
Clinical evidence of depressive illness, e.g. Geriatric Depression Scale >5

Participant \_\_\_\_\_ Physician Name \_\_\_\_\_

Physician Evaluation Form

Subject Number \_\_\_\_\_

History: Please list all past illnesses with nutritional implications, past surgeries, and present illnesses.

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Medication Use: Please list all prescribed medications and dosages.

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Physical Signs: For each of the following physical signs, please indicate the presence of the sign by marking "yes" or "no".

Nasolabial Seborrhea	Yes _____	No _____
Follicular Hyperkeratosis/Perifolliculosis	Yes _____	No _____
Petechiae	Yes _____	No _____
Acute Pellagrous Dermatitis	Yes _____	No _____
Flaky-Paint Dermatitis	Yes _____	No _____
Edema	Yes _____	No _____
Non-Specific Lesions/Decubiti (circle one)	Yes _____	No _____
Pale Conjunctiva	Yes _____	No _____
Conjunctival Xerosis	Yes _____	No _____
Corneal Xerosis	Yes _____	No _____
Angular Palpebritis	Yes _____	No _____
Angular Stomatitis/Angular Scars (circle one)	Yes _____	No _____
Glossitis	Yes _____	No _____
Magenta Tongue	Yes _____	No _____
Spongy and/or Bleeding Gums	Yes _____	No _____
Dentures/Partials (circle one)	Yes _____	No _____
Difficulty Chewing and/or Swallowing	Yes _____	No _____
Fractures/Bone Pain (circle one)	Yes _____	No _____
Diffuse or Local Skeletal Deformities	Yes _____	No _____
Osteomalacia/Osteoporosis (circle one)	Yes _____	No _____
Koilonychia	Yes _____	No _____
Enlarged Thyroid or Parotid (circle one)	Yes _____	No _____
Hepatomegaly	Yes _____	No _____

Please comment on any disease/condition or finding that may have a nutritional implication:

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Dear

We greatly appreciated your participation in the nutrition study. As promised, we are sending you a copy of your bloodwork laboratory results. Please review this information. If you notice any values beyond the normal range (usually marked with "H" for high, or "L" for low), we request that you discuss these results with your primary physician. The Shallowater clinic is available to you for your personal health care services, if you so choose. The Shallowater clinic will retain a copy of your results from both the physician's physical and laboratory findings.

Our interpretation of your results include the following:

- \_\_\_\_\_ Your bloodwork was within acceptable ranges. Please provide a copy to your primary physician for his or her records.
- \_\_\_\_\_ Your cholesterol level was elevated. Please check with your physician to determine if treatment is necessary.
- \_\_\_\_\_ Your blood results indicated one or more values beyond the normal range. In reviewing this information, we do not necessarily consider this critical. However, we suggest that you check with your physician to determine if treatment is necessary.

Best wishes for a healthy future.

Sincerely,

Elizabeth A. Fox, Ph.D., RD, LD  
Associate Professor

APPENDIX B  
SCREEN AND FOOD FREQUENCY RESULTS  
PERTAINING TO THE ORIGINAL  
119 VOLUNTEERS

The mean Determine scores for all 119 senior volunteers are presented in Table 31. The mean nutritional risk score was 4.59, which is within the moderate nutritional risk range of 3 to 5. The mean risk score for the clinic community's participants was 4.46 and for the hospital community's participants, 4.72. Both of these scores were within the moderate nutritional risk range.

Table 31 also presents mean nutritional risk scores by type of community, gender, marital status, age level, and annual income level. Although mean nutritional risk scores were higher for women, seniors who were not married, and seniors 80 to 89 years of age, analysis of variance did not indicate any significant differences. Those seniors reporting annual incomes less than \$6,000 were found to have a significantly higher mean nutritional risk score ( $p=.017$ ).

Table 32 shows the distribution of risk scores for the subjects by risk range. For all 119 volunteers, 20.2% were in good nutritional health, 48.7% were at moderate nutritional risk, and 31.1% were at high nutritional risk. Patterns of risk distribution by community indicate that 77.9% of the clinic community's volunteers were at some nutritional risk whereas 81.7% of the hospital community's participants were at nutritional risk. In relation to gender, more males than females were at some nutritional risk, but they were more at moderate risk than the females.

Table 33 shows significant differences in nutritional risk scores by marital status, age level, and annual income level. Whereas married seniors in this group were found to be mostly at moderate nutritional risk, seniors who were not married were more likely to be at high risk ( $p=.032$ ). Seniors 79 years of age and younger were more likely to be at moderate nutritional risk; however, seniors 80 to 89 years of age were at a high risk disadvantage ( $p=.045$ ). Seniors reporting annual incomes below \$6,000 were more likely to be at high risk whereas seniors with higher incomes tended to receive Determine scores in the moderate risk range ( $p=.010$ ).

Determine question response rates are presented in Table 33. The most commonly reported risk factors were using three or more prescription medications or over-the-counter medications daily (59.7%, with 42.9% indicating daily use of three prescription medications and 33.1% indicating daily use of over-the-counter medications); eating few fruits, vegetables, and milk products (57.1%, with 47.9% reporting limited dairy product use); changing diet due to illness or condition (42.9%); and eating alone (37.0%).

Table 34 presents the distribution patterns of frequency of intake of foods high in sugar, sodium, fat, and fiber, and the frequency of compliance to the Dietary Guidelines for Americans and the Food Guide Pyramid. Foods high in sugar were consumed by the volunteers in this study mostly 1 to 2 times a week, but a large proportion of these seniors reported seldom or never using high sugar products. This pattern of consumption was also reflected in high sodium product and high fat product use. The majority of these seniors indicated that they ate foods high in fiber 1 to 2 times a week. The largest proportion of the respondents reported that they followed the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid 3 to 4 times a week.

**Table 31: Mean "Determine Your Nutritional Health" scores (N = number of subjects, SD = standard deviation) <sup>a</sup>**

	N	Mean	SD	Range
<b>Study Group</b>	119	4.59	2.62	0-12
<b>Type of Community</b>				
Clinic	59	4.46	2.55	0-12
Hospital	60	4.72	2.71	0-12
<b>Gender</b>				
Female	79	4.61	2.69	0-12
Male	40	4.55	2.52	0-12
<b>Marital status</b>				
Married	69	4.36	2.71	0-12
Not married	50	4.90	2.48	0-11
<b>Age level</b>				
58-69 years	39	4.41	2.70	0-12
70-79 years	47	4.19	2.32	0-12
80-89 years	33	5.36	2.84	1-11
<b>Annual income level</b>				
<\$6,000	29	5.76 A	2.82	0-12
\$6-10,000	31	4.42 B	2.91	0-12
>\$10,000	56	4.07 B	2.18	0-12

<sup>a</sup> Values presented with differing letters are significantly different by ANOVA,  $p=.017$ .

**Table 32: Nutritional health evaluation by the "Determine Your Nutritional Health" checklist for study participants by type of community, gender, marital status, age level, and annual income level (N = number of respondents, % = percentage responding)**

	Good health (0 - 2)		Moderate Risk (3 - 5)		High risk (6 or more)	
	N	%	N	%	N	%
<b>Study group</b>	24	20.2	58	48.7	37	31.1
<b>Type of Community</b>						
Clinic	13	22.0	30	50.8	16	27.1
Hospital	11	18.3	28	46.7	21	35.0
<b>Gender</b>						
Female	17	21.5	34	43.0	28	35.4
Male	7	17.5	24	60.0	9	22.5
<b>Marital Status <sup>a</sup></b>						
Married	15	21.7	39	56.5	15	21.7
Not married	9	18.0	19	38.0	22	44.0
<b>Age level <sup>b</sup></b>						
58-69 years	8	20.5	23	59.0	8	20.5
70-79 years	10	21.3	25	53.2	12	25.5
80-89 years	6	18.2	10	30.3	17	51.5
<b>Annual income level <sup>c</sup></b>						
<\$6,000	5	17.2	8	27.6	16	55.2
\$6-10,000	7	22.6	14	45.2	10	32.3
>\$10,000	12	21.4	34	60.7	10	17.9

<sup>a</sup> Chi-square analysis indicates nutritional health responses differ by marital status,  $p=.032$ .

<sup>b</sup> Chi-square analysis indicates nutritional health responses differ by age level,  $p=.045$ .

<sup>c</sup> Chi-square analysis indicates nutritional health responses differ by reported annual income level,  $p=.010$ .

**Table 33: Responses to the "Determine Your Nutritional Health" checklist**  
 (N = number of respondents at risk, % = percentage responding at risk)

Risk factor	N	%
I have an illness or condition that made me change the kind and/or amount of food I eat	51	42.9
I eat 2 meals or less each day	19	16.0
I eat few fruits or vegetables, or milk products	68	57.1
I eat less than 2 fruits or 2 vegetables each day	22	18.5
I eat or drink 1 or less milk products each day	57	47.9
I have 3 or more drinks of beer, liquor or wine almost every day	0	0.0
I have tooth or mouth problems that make it hard for me to eat	16	13.4
I have tooth problems, such as loose or bad teeth, poorly fitting dentures, etc., that make it hard to eat	12	10.1
I have mouth problems, such as bleeding or swollen gums, sores, etc., that make it hard to eat	8	6.7
I don't always have enough money to buy the food I need	10	8.4
I eat alone most of the time	44	37.0
I take 3 or more different prescribed or over-the-counter drugs a day	71	59.7
I take 3 or more prescribed medications daily	51	42.9
I take over-the-counter drugs daily	39	33.1
Without wanting to, I have lost or gained 10 pounds in the last 6 months	21	17.6
Without wanting to, I have lost 10 pounds or more in the last 6 months	13	10.9
Without wanting to, I have gained 10 pounds or more in the last 6 months	8	6.7
I am not always physically able to shop, cook, and/or feed myself	11	9.2

**Table 34: Distribution of frequencies of reported high sugar, sodium, fat, and fiber product usage and compliance to national eating guideline recommendations by study participants (N = number responding, % = percentage responding)**

	Daily		3-4/week		1-2/week		Seldom/never	
	N	%	N	%	N	%	N	%
<b>Sugar</b>	2	1.7	10	8.4	59	49.6	48	40.3
<b>Sodium</b>	0	0.0	7	5.9	64	53.8	48	40.3
<b>Fat</b>	0	0.0	15	12.6	57	47.9	47	39.5
<b>Fiber</b>	0	0.0	19	16.0	72	60.5	28	23.5
<b>Compliance</b>	15	12.6	69	58.0	30	25.2	5	4.2