Nutritional risk status of the non-institutionalized older adult population in Monroe County, New York

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NUTRITIONAL RISK STATUS OF THE
NON-INSTITUTIONALIZED OLDER ADULT
POPULATION IN MONROE COUNTY, NEW YORK

by

SUSAN A. BEST

A thesis submitted to the faculty of the
School of Food, Hotel, and Travel Management
at Rochester Institute of Technology in partial
fulfillment of the requirements for the degree
of
Master of Science

June, 1994
ROCHESTER INSTITUTE OF TECHNOLOGY
School of Food, Hotel and Travel Management
Department of Graduate Studies

M.S. Hospitality-Tourism Management

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Title of Research: The Nutritional Risk Status of the Non-Institutionalized Older Adult Population in Monroe County

Specific Recommendations: (Use other side if necessary.)

Thesis Committee: (1) Dr. Carol Whitlock (Chairperson)
(2) Ms. Elizabeth Kmiecinski

OR (3) Dr. Edward Stockham
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Faculty Advisor: Elizabeth Kmiecinski

Number of Credits Approved: __ 0_8 Credits ____________

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NUTRITIONAL RISK STATUS OF THE NON-INSTITUTIONALIZED OLDER ADULT POPULATION IN MONROE COUNTY, NEW YORK

Susan A. Best

ABSTRACT

The purpose of this study was to identify the number of older adults who were at high nutritional risk in Monroe County and to determine what risk factors or nutritional problems are most prevalent. Another goal was to assess the relationship between the demographics and risk factors.

The Nutrition Screening Initiative's (NSI) "Determine Your Nutritional Health" Checklist contains 10 risk factors that have been shown to be associated with nutritional risk. Regular routine nutrition screening is promoted by the NSI and other health professionals to help identify individuals at nutritional risk and to initiate the appropriate intervention. Early intervention may delay or prevent costly health problems and improve the quality of life of older adults. The Checklist was included in a 26-item telephone survey which was administered to 403 households randomly selected from the Monroe County, NY voter registration list of adults aged 60 or older.

The risk factors had a corresponding value which produced a low, moderate or high nutritional risk score. Of the sample, 15.7% received a high nutritional risk score. The risk factors that were most prevalent in the total sample include: illness affecting food intake, inadequate
consumption of fruits, vegetables and milk products, multiple drug use and consuming meals alone.

High nutritional risk scores were most associated with risk factors that were affected by financial constraints such as not having enough money to buy food, consuming less than two meals per day, and tooth or mouth problems affecting food intake. High risk was more likely to occur with respondents of low socioeconomic status, who are non-white and live alone; thus, adequately funded programs that provide financial assistance with food purchases, meals and dental work may help to reduce risk for this population.

The moderate risk group (34%) included whites and non-whites of all income levels who shared risk factors that pertained to illness, use of medications and eating few fruits, vegetables or milk products. Thus, nutrition screening for older adults and medical nutrition therapy (for all individuals) must be included in basic health benefit packages. Nutrition professionals must document their work to provide cost/benefit data and help with the promotion of medical nutrition therapy. A large survey found 80% of health professionals believe nutrition therapy should be included in benefit packages and physician support is especially important.

A correlation was not found between risk and the age of the respondents, but as age increased, respondents were more likely to eat alone and to have difficulty with grocery shopping and cooking.
ACKNOWLEDGEMENT

I would like to thank a number of people who provided me with guidance and support throughout the various stages of this study. Each of the members of my thesis committee, which included Carol Whitlock, PHD, RD (Committee Chairperson); Ed Stockham, PHD; Liz Kmiecinski, MS, RD; and Barb Cerio, MS, RD, were very generous with their time and expertise. Dr. Whitlock and Dr. Stockham provided much assistance with the structure, form and organization of this report.

I am grateful to Ed Stockham and Anne Kern, RD, Nutritionist at the Monroe County Health Department, who brought the study to my attention, helped to coordinate the various stages of the research and provided much guidance throughout the study. It was a pleasure to work with and coordinate the research with Anne and other members of the Older Adult Coalition.

My thanks as well to Richard Marecki, PHD, Graduate Chairman, School of Food, Hotel and Travel Management, and Liz Kmiecinski who made it possible for me to complete both the Nutrition Management Coordinated Program and the Masters Degree.

Finally, I would like my family and friends to know how much I appreciated their love and support during this study and always.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>i</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>iv</td>
</tr>
<tr>
<td>Chapter 1: INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>Background and Scope</td>
<td>3</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>11</td>
</tr>
<tr>
<td>Purpose</td>
<td>11</td>
</tr>
<tr>
<td>Research Questions</td>
<td>11</td>
</tr>
<tr>
<td>Assumptions</td>
<td>12</td>
</tr>
<tr>
<td>Chapter 2: REVIEW OF THE LITERATURE</td>
<td>14</td>
</tr>
<tr>
<td>Chapter 3: METHODOLOGY</td>
<td>48</td>
</tr>
<tr>
<td>Chapter 4: RESULTS AND DISCUSSION</td>
<td>64</td>
</tr>
<tr>
<td>Chapter 5: CONCLUSION</td>
<td>130</td>
</tr>
<tr>
<td>Summary</td>
<td>130</td>
</tr>
<tr>
<td>Significance</td>
<td>135</td>
</tr>
<tr>
<td>Limitations</td>
<td>136</td>
</tr>
<tr>
<td>Recommendations</td>
<td>137</td>
</tr>
<tr>
<td>REFERENCES CITED</td>
<td>141</td>
</tr>
<tr>
<td>APPENDICES</td>
<td></td>
</tr>
<tr>
<td>Appendix A: Nutritional Health Checklist</td>
<td>147</td>
</tr>
<tr>
<td>Appendix B: Screen I</td>
<td>149</td>
</tr>
<tr>
<td>Appendix C: Screen II</td>
<td>152</td>
</tr>
<tr>
<td>Appendix D: Screening Approach</td>
<td>155</td>
</tr>
<tr>
<td>Appendix E: Questionnaire</td>
<td>157</td>
</tr>
<tr>
<td>Appendix F: Poverty Guidelines</td>
<td>165</td>
</tr>
<tr>
<td>Appendix G: Survey Notification Letter</td>
<td>167</td>
</tr>
<tr>
<td>Appendix H: RIT Approval of Study</td>
<td>169</td>
</tr>
</tbody>
</table>
List of Figures

Page

Figure 1: Servings of Fruit, Vegetables and Milk.......69
Figure 2: Distribution of Risk Score Categories.......75
Figure 3: Distribution of Risk Score....................76
Figure 4: Distribution of Risk Score by Race..........80
Figure 5: Distribution of Risk Score by Education.....82
Figure 6: Distribution of Risk Score by Income........83
Figure 7: Gender of Sample vs. Census..................98
Figure 8: Age of Sample vs. Census.....................99
Figure 9: Race of Sample vs. Census....................100
Figure 10: Poverty Level of Sample vs. Census..........102
Figure 11: Education and Income by Race.............104
Figure 12: Distribution of Risk Score by Age..........107
Figure 13: Servings of Milk by Age Group.............123
List of Tables

Table 1: Recommended Dietary Allowances..................18
Table 2: Energy & Protein Intake of the Elderly in National and Regional Surveys....................22
Table 3: Risk Factors Associated with Poor Nutritional status in Aging Americans.................40
Table 4: Frequency, Percentage and Prevalence Ranking of "Yes" Responses to Risk Factors..........68
Table 5: Demographic Profile of Respondents..........71
Table 6: Correlation between Risk Score and Demographic Categories.................................77
Table 7: Relation between Mean Risk Scores, Risk Category and Demographics............................79
Table 8: Association between Risk Factors and Demographics................................................85
Table 9: Relationship between Percentage of "Yes" Responses for each Risk Factor & Demographics.......86
Table 10: Association between Risk Score and Risk Factors.....................................................95
Table 11: Relationship between Demographic Subgoups and Risk Score using Group T-Tests.............108
Table 12: Demographic Characteristics of Various Checklist Surveys........................................112
Table 13: Comparison of "Yes" Responses to Risk Among Various Surveys..................................114
Table 14: Percent Distribution of High Risk Scores Among Various Surveys...............................117
Table 15: Comparison of Mean Risk Scores..................118

iv
Chapter 1
INTRODUCTION

Background and Scope

A major demographic shift is occurring in the population of the United States which presents a significant nutritional challenge for health care providers and policy makers. At the turn of the century, one person in twenty-five in the United States was over the age of 65. However, it is projected that one in five Americans (22%) will be over 65 years of age early in the next century (Rosenberg, 1992).

Individuals over the age of 85 are the fastest growing population with a projected increase from 10% of the population in 1988 to 16% by the year 2010 (White, Ham, Lipschitz, Dwyer & Wellman, 1991). When these percentages are converted to numbers, the result is about 55 million people in the 65 and older age group (Powers, Folk, Burger, Wilson Stocking & Collin, 1989). An increased life expectancy has contributed to this phenomenon primarily due to the decline in birth rates and infant mortality, the control of communicable diseases, advances in technology and improvements in nutrition and living standards (Wahlqvist & Kouris, 1990).

Not only are the elderly the most rapidly growing segment of the U.S. population, they are also at a disproportionate risk for nutritional problems (White, Ham, Lipschitz, Dwyer & Wellman, 1991). In the independently living older population,
it is estimated that 85% of them have one or more chronic conditions that could benefit from proper nutrition. In addition, up to half of the older adults have clinically identifiable problems that require medical nutrition therapy (Posner, Jelte, Smith & Miller, 1993).

In the early 1900's, the major cause of death in the elderly was infectious diseases. However, noncommunicable diseases, also called the diseases of "affluence" or "lifestyle", are the primary cause of premature death, hospitalization and disability in the 1990's (Wahlqvist & Kouris, 1990, p.543). Some of the most prevalent diseases or conditions are coronary heart disease, hypertension, diabetes mellitus, breast cancer, colorectal cancer, obesity, gallstones and diverticular disease. Currently, the majority (75%) of deaths are due to cardiovascular disease and cancer (Wahlqvist & Kouris, 1990). Nutrition, either in excess or deficient amounts, and other lifestyle habits are major contributors in the development of these diseases and this relationship is well established in the literature (Koehler & Garry, 1993; Wahlqvist & Kouris, 1990).

Thus, the progressive increase in the elderly population and the relative morbidity, disability and need for medical services of this group are two primary reasons for the increased interest in the health status of the elderly (Wahlqvist & Kouris, 1990). The potential social and economic costs of nutritional problems in this population are
significant and indicate a need to determine the most efficient and effective strategies for delivering nutrition services to older adults. In terms of health care expenditures, 30 to 40% of bed days in acute hospitals are taken by the elderly (Wahlqvist & Kouris, 1990).

Despite the recognition of the importance of nutrition in health and disease, few health professionals routinely assess nutritional status in older people (White et al., 1991). In addition, the majority of newer health care alternatives, for example home care, do not recognize nutrition as a component of care, rendering nutrition services unreimbursable (ADA 1987b). "Nutritional inadequacies often have a slow and insidious onset; many of the presenting features mimic changes of normal aging." (Gupta, Dworkin & Gambert, 1988, p.87). Preventative nutrition programs for the elderly may lack importance with some health professionals who believe that the diseases of old age are inevitable (Koehler & Garry, 1993).

However, increased attention to the nutritional status of older adults is likely to improve not only the quality but the length of life in this population (Lehman, 1989). Early identification of nutritional problems and the appropriate intervention can provide many benefits including the prevention or delayed onset of certain chronic diseases and improved physical, social and mental well-being which may result in significant health care savings (ADA, 1987a). "Nutritional well-being is an integral component of the
health, independence, and quality of life of the aging. The potential benefits of nutrition services have been well documented." (ADA, 1987a).

Physical, psychological and social factors may all contribute to the development of poor nutritional status. However, each older person must be viewed as a "unique" individual since the etiology of nutritional problems in the elderly are multifactorial and vary with each person (White, 1991, p. 2095). "It is most likely that aging will not be understood as any single biological process but, rather, as a complex mixture of programmed change influenced by environmental and dietary factors" (Rosenberg, 1992, p. 349). Physical problems may result from cellular aging which contributes to organ dysfunction, atrophy of the brain and decreased homeostatic capacity caused by the degeneration of the brain and thymus. The organ atrophy that occurs from cellular death is probably due to both genetic programming and the "accelerating" or "delaying" effects of environmental factors (Imahori, 1992, p. 352).

"The effects of a lifetime of individual physical and environmental conditions combined in the elderly produce a widely diverse group." (Hosoya, 1992, p.448). One definition of aging is the "regression of physiological function accompanied by advancement of age" (Imahori, 1992, p. 351). However, because of the heterogeneity of this population, regression of physiologic function is a better indicator of
health status than actual chronological age (Krondl, Lau, Yurkiw & Coleman, 1982). Older adults of the same age can be very different compared to the more homogeneous younger ages.

Manifestations of physiologic changes can be seen with the following conditions: impairment of vision and hearing, musculoskeletal and neurologic problems, impaired digestion absorption, and excretion of nutrients, changes in immunocompetence, prevalence of chronic disease and the decline in lean body mass among others (Chandra, 1992; Koehler & Garry, 1993). "No single feature of aging can more dramatically affect basal metabolism, insulin sensitivity, calorie intake, appetite, breathing, ambulation, mobility and independence than (decline of) muscle mass." (Rosenberg, 1992).

Of particular importance for nutritionists are any changes that affect the normal digestion, absorption, and utilization of nutrients. For example, in some older adults the stomach may secrete less hydrochloric acid (HCL) which could decrease the absorption of calcium (Tada, 1992). The change in lean body mass is an example of the complex, interrelated and potentially extensive effect of physiologic changes on the body and the nutritional status of an individual.

Nutritional problems can be compounded by psychological and social factors. Potentially traumatic life changes, such as the death of a spouse, retirement and decreased social
interaction may affect dietary intake. In addition to its nutritional value, food is traditionally involved with many social and cultural functions and this factor should be a consideration in the assessment of nutritional status and the development of interventions (ADA, 1987a). Social factors, such as financial constraints, faddish and erroneous dietary beliefs and habits, difficulty with food preparation or shopping due to disability, transportation problems or lack of facilities can all contribute to nutritional problems (Davies, 1990; Rolls, 1992).

The interplay of physical, social and psychological forces can "...exceed and elderly individual's reserve capacity, that is the ability to respond to stressors, and this leads to a debilitated state or a downward spiral in health" (Davies & Knutson, 1991, p. 1413). However, the health risks may be reduced or prevented with early identification of nutritional problems and the deployment of appropriate nutrition intervention (Davies & Knutson, 1991).

According to Davies and Knutson (1991), malnutrition is rarely reported in free-living older adults in contrast with patients in nursing homes and hospitals who are more likely to be evaluated for this condition. Conventionally, malnutrition is diagnosed as unintentional weight loss of 1% to 2% in one week, 5% in one month or 10% in 6 months. The clinical forms of malnutrition are marasmus (deficiency of calories and protein) and Kwashiorkor (severe protein deficiency).
In the community, it is estimated that kwashiorkor occurs in 5% to 10% of the older adult population (Hoffman, 1993). According to Chandra (1992), the deleterious effect of malnutrition on morbidity and mortality has been documented by epidemiologic studies. Some adverse effects include the following: increased risk of infection due to atrophy of lymphoid tissue, decreased cell mediated immunity, longer healing time, riskier surgery, increased complication rate and longer hospital stays (Chandra, 1992; Nelson & Franzi, 1989; Podolsky, 1992).

The causes of poor nutritional status and the subsequent physical, social and psychological toll of malnutrition to the individual and economic toll to society may be prevented or reduced with routine nutrition screening (White, 1991). The Nutrition Screening Initiative (NSI, 1991), a consortium of 36 medical and government organizations led by the Academy of Family Physicians, the American Dietetic Association (ADA) and the National Council on Aging, recommends a systematic approach to the identification of older individuals at nutritional risk. The NSI defines nutrition screening as the process of identifying characteristics known to be associated with dietary or nutritional problems (NSI, 1991).

One of the nations health goals for the year 2000 includes an "...increase to approximately 75% the proportion of primary care providers who provide nutrition assessment and counseling and/or referral to qualified nutritionists" (White,
1991, p.783). As a direct response to this goal, NSI is attempting to promote the routine nutrition screening of older adults and referral to appropriate nutrition services for nutritional problems by physicians and other health care providers by 1995 (Podolsky, 1992). Intervention can be facilitated when individuals, who are at high risk of nutritional problems or who already have poor nutritional status, are identified by nutrition screening.

A three-tiered screening approach has been developed by the NSI and it includes a public awareness "checklist", "Determine Your Nutritional Health", which is a brief, easily scored instrument designed to identify older persons at low, moderate and high nutritional risk (see Appendix A). The checklist includes factors that contribute to poor nutritional status, such as chronic disease and subsequent drug use, social isolation, poverty, inappropriate food intake and disability. An individual who is identified at low risk (0 to 2 points) is instructed to recheck the score in six months. A score ranging from 3 to 5 points results in moderate nutritional risk while any score with 6 or more points is considered high risk.

Basic professional screens, "Screen I" (survey form) and "Screen II" (a medical screen that includes laboratory work), are designed to be used as a follow up to the checklist when nutritional risk has been identified. An at-risk individual is advised to bring this to the attention of their health and
social service providers for further screening. Screen I (see Appendix B) is designed for community settings to determine the need for referral to a physician (for high risk individuals) and need for preventive interventions (for moderate risk individuals) such as food assistance programs or dietary counseling. Screen II is the most comprehensive tool designed for use by health care professionals to identify and treat common nutrition problems, such as malnutrition, osteoporosis and hyperlipidemia. Appendix D contains a flow chart developed by the NSI which outlines the systematic approach to screening.

In the late 1960’s, policy makers were becoming more aware of the nutritional problems of older adults as a result of the data collected from the Ten-State Nutrition Survey. The subsequent White House Conference on Nutrition and Health developed the Nutrition Program for Older Americans under the Administration on Aging. This resulted in the creation of community food assistance programs like congregate and home-delivered meals which have been shown to improve the nutritional intake and status of participants (Nestle & Gilbride, 1990). However, funding for these programs is diminishing despite their proven benefit (Manson & Shea, 1991).

Although these programs may help decrease malnutrition in older adults, the NSI’s approach may help to detect and/or prevent nutritional problems before they cause major health
damage. According to the NSI (1991), screening can be efficient and cost-effective. Since screening may lead to an in-depth assessment, it may be perceived by some health care professionals as too expensive. However, most of the information on the screens is ordinarily collected by care providers. "It is just not organized so that it can be put to useful purpose. In terms of total economic resources spent, even excluding unnecessary human misery, the failure to recognize and treat preventable or curable malnutrition is more costly than the few additional resources to accomplish nutritional screening" (White, Dwyer et al., 1992, p. 167).

In the meantime, the Surgeon General’s Report on Nutrition (1988) recommended further research into the nutritional problems and requirements of older adults. According to White, Dwyer, Posner, Ham, Lipschitz & Wellman (1992), public policy initiatives are beginning to address the need for more research and reimbursement of nutrition services. "The American Dietetic Association supports the continuum of health services for the aging, including the integration of professional nutrition services, education and counseling and research." (ADA, 1987b) A better understanding of the nutritional needs of older adults should help to identify "...the most expedient and resourceful ways of providing such services, resulting in the provision of optimal nutrition services within the continuum of health care " (ADA, 1987b).
Statement of the Problem

According to the Monroe County Health Department, who sponsored this study, there is limited data on the nutritional problems of older adults in Monroe County, NY. This data is needed in order to facilitate issue identification and strategic planning by local policy makers and their constituencies regarding the nutritional health needs of older adults in this county.

Purpose

The purpose of this research was three-fold. First, the study accumulated data on the percentage of non-institutionalized older adults who may be at nutritional risk. Second, the study examined which of the risk factors of poor nutritional status were most associated with high risk. Third, the relationship between demographic variables, risk factors and the risk score were examined to assess which characteristics were most associated with risk.

Research Questions

The study investigated the following questions:
1. What percentage of the population was at high nutritional risk and what were the demographic characteristics of this group?
2. Were there significant relationships between the demographic characteristics of the population and the
nutritional risk score and risk factors? How did they compare to other checklist surveys across the country?

3. What risk factors, based on the NSI Checklist questions, were most prevalent and which ones were most associated with high nutritional risk?

Assumptions

The increase in the older adult population and their relative morbidity puts them at a higher risk for nutritional problems. The assumption for this study was that nutritional screening will help to identify individuals at nutritional risk and initiate appropriate intervention. Routine screening may help to prevent or delay deleterious health problems with subsequent health care savings and improved quality of life for older adults at nutritional risk.

Hypothesis

Several hypotheses were established for this study:

1. Greater than 10% of the older adult population (60 or older) in Monroe County will be at high nutritional risk. This number was based on the estimation that between 15 and 20% of Americans over the age of 65 suffer from poor nutrition (John Hopkins Medical Letter, 1992). Since Monroe County has a number of relatively affluent areas, 10% seemed to be an appropriate estimation.
2. The demographic variables will not be equal in their association with risk. Based on findings in the literature, some demographic factors may be more associated with risk than others.

3. Low income status will be the variable most associated with risk. Lehmann’s (1989) review of the literature indicated consistent findings that financial constraints were strongly associated with nutritional status. A risk factor in the survey tool, which concerned the ability to purchase food, carried the most weight of all the risk factors.

Null Hypothesis

Several null hypotheses were established for this study:
1. Less than or equal to 10% of the older adult population in Monroe County will be at high nutritional risk.
2. The demographic variables will be equal in their association with nutritional risk.
3. Low income will not be the variable most associated with risk.
Chapter 2
REVIEW OF THE LITERATURE

Recommended Dietary Allowances for Older Adults

A diet that includes a variety of foods, as recommended in the U.S. Dietary Guidelines, is considered an important component of a nutritionally adequate diet. The Guidelines caution older people to avoid unsafe dietary practices and health fads and encourages them to eat a variety of foods, to limit salt and alcohol and to maintain a healthy weight (Chernoff, 1991). Although an older adult may look well and appear to be at an adequate weight, the risk of specific diseases increases if he or she regularly omits an entire category of food (Nutrition Screening Initiative, 1991).

Another nutritional guideline often used by health professionals to assess dietary intake is the Recommended Daily Allowances (RDAs). These guidelines were established for all age groups as the "...minimum to prevent deficiency disease in the absence of stress or malabsorption." (Nelson & Franzi, 1989, p.1532). Considering the potential for stress or malabsorption among older adults, the appropriateness of the RDAs for the older population has been questioned in the literature for a number of reasons.

First, the RDAs for older adults were largely developed from research on the nutrient requirements of healthy younger adults and estimated by extrapolation. Secondly, the RDAs do
not account for the heterogeneity of this population and prevalence of conditions associated with aging (Koehler & Garry, 1993; Rosenberg, 1992). According to Rosenberg (1992), the RDA's seldom address the nutritional needs of older adults since limited research has been conducted with this population.

The National Health and Nutrition Examination Surveys (NHANES I, 1971-1974 and NHANES II, 1976-1980) have provided much of the data used to assess the nutritional status of older Americans. Limitations of these surveys were that information was not collected on individuals greater than 75 years of age and they did not estimate the prevalence of malnutrition (Hoffman, 1993; Manson & Shea, 1991). However, the next NHANES will be completed in 1994 and it does not have an age limit (Hoffman, 1993).

Another large national survey, the Nationwide Food Consumption Survey (NFCS, 1977-1978) has also provided important nutritional information, and it contained data on individuals 74 years of age and older. Many of the more recent studies were smaller and the samples were not randomly selected, making it difficult to generalize to the population at large (Ryan & Bower, 1989).

"Current research regarding nutritional status of the elderly is sparse and a review of the literature reveals a lack of consistent standards of methodology and data collection as well as inconsistent findings" (Ryan & Bower,
In addition, Ryan and Bower (1989) emphasized that it is difficult to make generalizations to an extremely heterogeneous population reinforcing the need to consider each older adult's needs and circumstances. Lehman (1989) questioned the appropriateness of using reference data, for example biochemical indices, that are based on data of younger healthy adults. "Methodological problems in studying the changes of aging and the absence of adequate reference standards sometime result in a lack of correlation among dietary, biochemical and clinical measures in the nutritional assessment of the elderly population" (Koehler & Garry, 1993, p.435).

The lack of correlation between dietary, biochemical and clinical measure was the third major concern regarding the RDA's. Although studies frequently cited low intakes of nutrients by older adults compared to the RDA's, they correlated infrequently with clinical deficiencies and low biochemical indices. For example, in the NHANES II Study, up to 50% of the individuals over 65 years of age had an intake of vitamin A below 2/3 of the RDA. However, only 0.3% had lower than normal blood levels of this vitamin (Zheng & Rosenberg, 1989). Evidence of clinical deficiencies are most prevalent in people with the following conditions: multiple chronic diseases or conditions, physical or emotional limitations, homebound status, multiple medication usage, or institutionalization.
During the last revision of the RDAs in 1989, the subcommittee (composed of the Food and Nutrition Board, Commission on Life Science and the National Research Council) of the tenth edition of the RDAs decided to continue with one set of RDAs for individuals 51 years of age and older. "It was anticipated that the 10th edition of the Recommended Dietary Allowances would establish separate recommendations for those aged 51 to 75 years and those older than age 76 years" (Chernoff, 1991, p. 459). However, the subcommittee decided against making changes to address specific age groups due to insufficient data (Hoffman, 1993).

As seen in Table 1, the differences between the 1980 RDA's and the 1989 RDA's are presented. The subcommittee did feel there was enough evidence to add RDA's for vitamin K and selenium and to change the recommendations for calcium, magnesium, iron and zinc. New recommendations also increased protein for both men and women and reduced vitamin B-12 and folate. Except for a slightly lower level of thiamin, niacin, vitamin B-6 and zinc (females only), the RDA's are similar to those of younger adults (Chernoff, 1991).

Another controversial subject in the literature concerned recommendations for improving the RDA's for older individuals. Schneider, Vining, Hadley and Farnham (1986) recommended that the RDA's be individualized for each nutrient by including "coefficients" for risk factors that may affect nutrient needs, such as the presence of specific diseases or...
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<thead>
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<tr>
<td>Water-soluble vitamins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Thiamine (mg)</td>
<td>1.4</td>
<td>1.5</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.6</td>
<td>1.7</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Niacin (mg ne)d</td>
<td>18</td>
<td>19</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Vitamin B6 (mg)</td>
<td>2.2</td>
<td>2.0</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Folate (mg)</td>
<td>400</td>
<td>200</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>Vitamin B12 (mg)</td>
<td>3.0</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Minerals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>350</td>
<td>350</td>
<td>350</td>
<td>350</td>
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<tr>
<td>Iron (mg)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Iodine (mg)</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Selenium (mg) (New)</td>
<td></td>
<td>70</td>
<td></td>
<td>70</td>
</tr>
</tbody>
</table>


*a* Ages 23 to 50 years.

*b* Ages 51 to 75 years.

*c* re, Retinol equivalents.

*d* ne, Nicotinamide equivalents.
medications. Most of the literature reviewed for this report identified a need to modify the RDA’s with subgroups of RDA’s for individuals with diseases or other conditions affecting nutritional status (Chernoff, 1991; Powers et al., 1989; Schneider et al., 1986).

A common theme throughout the literature was the need for more research to help determine nutrient levels required to prevent deficiency syndromes, to achieve optimal serum or tissue levels for nutrients specific to older adults, to reduce the risk or treat degenerative diseases and to prevent toxic effects (Chernoff, 1991; Lehmann, 1989; Powers et al., 1989; Schneider et al., 1986; Zheng, & Rosenberg, 1989).

In the meantime, the Surgeon Generals Report (1988) made the recommendation, "Until more appropriate age specific RDA’s are established, the current RDA’s should continue to be used as standards for nutrient intake of healthy older persons" (pp. 69-70).

**Nutritional Status of Older Adults**

In this section, the adequacy of dietary intake of older adults will be discussed with most of the data from national surveys. Other research reviewed by this author were typically smaller studies that examined specific relationships between nutritional status and other variables, such as socioeconomic status, and they will be discussed where appropriate.
One study by Powers et al. (1989) examined the effect of age alone on nutritional status in healthy older adults. The study consisted of 102 subjects (63 females and 39 males) who were all white, over the age of 60, and did not have a serious illness that would affect biochemical data. Because the researchers were selectively choosing relatively healthy older adults, the subjects were not randomly selected. The results, which were compared to the micronutrient levels of younger subjects, showed:

1. Increased levels of plasma and red blood cell (RBC) carnitine, Vitamin A, Vitamin E, and Vitamin C.
2. Decreased levels of albumin, transferrin and zinc.
3. Unchanged levels of retinol binding protein (RBP), serum and RBC folate, and copper.
4. Decreased levels of transferrin, Vitamin C and Vitamin E only in subjects older than 75.

Although the study found no deficiencies of thiamine, pyridoxine or riboflavin, a great variety in all micronutrient levels occurred among the subjects despite similar nutrient intake. This discrepancy may be due to "...possible age-related differences in nutrient absorption and catabolic excretion, variable relationships between plasma levels of micronutrients and tissue concentrations and the reduced total body water content of older individuals..." (Powers et al., 1989, p.993).
Energy

In addition to data from the national surveys previously discussed, Table 2 shows the mean energy and protein intakes of the elderly from other relatively large surveys (New Mexico and Tufts). One finding that was consistent among the national surveys was a lower mean caloric intake (below recommended levels) by the older adults in comparison with the younger adults (Koehler & Garry, 1993). The typical decline in energy expenditure and subsequent decrease in the basal metabolic rate (BMR) were considered the primary reasons for the decrease in dietary intake (Hoffman, 1993; Koehler & Garry, 1993).

Lehmann's (1989) review of the literature discussed the associated decrease in dietary intake with an increased prevalence of disability in older adults. Lehmann (1989) concluded that "...it is likely that the relationship between disability and undernutrition is multifactorial including such factors as anorexia due to disease, the psychological and financial burdens of dependency, the anorectic effect of drugs, and the effects of drugs on nutrient absorption and physical activity" (p.341). Other social and psychological factors have been strongly associated with a decline in dietary intake such as financial constraints, lack of help with food preparation and shopping and immobility among others. Kimura (1992) emphasized that poor dietary habits and a sedentary lifestyle are related to the variety and magnitude
Table 2.

Mean (±SD) Energy and Protein Intake of the Elderly
National and Regional Surveys

<table>
<thead>
<tr>
<th>Survey</th>
<th>n</th>
<th>Age</th>
<th>Sex</th>
<th>Energy (kcal/day)</th>
<th>Protein (g/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHANES I</td>
<td>1822</td>
<td>65-74</td>
<td>F</td>
<td>1,307 ± 522</td>
<td>53.1 ± 23.9</td>
</tr>
<tr>
<td>(1971-74)</td>
<td>1657</td>
<td></td>
<td>M</td>
<td>1,805 ± 738</td>
<td>71.6 ± 32.6</td>
</tr>
<tr>
<td>NHANES II</td>
<td>1416</td>
<td>65-74</td>
<td>F</td>
<td>1,295 ± 640</td>
<td>51 ± 26.3</td>
</tr>
<tr>
<td>(1976-80)</td>
<td>1199</td>
<td></td>
<td>M</td>
<td>1,828 ± 831</td>
<td>73 ± 34.6</td>
</tr>
<tr>
<td>NFCS</td>
<td>346</td>
<td>65-74</td>
<td>F</td>
<td>1,453 ± 449</td>
<td>61.8 ± 21.0</td>
</tr>
<tr>
<td>(1977-78)</td>
<td>270</td>
<td></td>
<td>M</td>
<td>1,932 ± 600</td>
<td>80.4 ± 25.9</td>
</tr>
<tr>
<td></td>
<td>173</td>
<td>75+</td>
<td>F</td>
<td>1,372 ± 444</td>
<td>55.6 ± 18.9</td>
</tr>
<tr>
<td></td>
<td>114</td>
<td></td>
<td>M</td>
<td>1,878 ± 695</td>
<td>75.2 ± 25.6</td>
</tr>
<tr>
<td>New Mexico</td>
<td>145</td>
<td>60-85</td>
<td>F</td>
<td>1,653 ± 369</td>
<td>67 ± 18</td>
</tr>
<tr>
<td>(1980)</td>
<td>125</td>
<td></td>
<td>M</td>
<td>2,171 ± 491</td>
<td>83 ± 20</td>
</tr>
<tr>
<td>Tufts</td>
<td>158</td>
<td>60-69</td>
<td>F</td>
<td>1,512 ± 381</td>
<td>67 ± 18</td>
</tr>
<tr>
<td>(1981-83)</td>
<td>100</td>
<td></td>
<td>M</td>
<td>1,997 ± 555</td>
<td>85 ± 24</td>
</tr>
<tr>
<td></td>
<td>177</td>
<td>70-79</td>
<td>F</td>
<td>1,469 ± 427</td>
<td>64 ± 20</td>
</tr>
<tr>
<td></td>
<td>97</td>
<td></td>
<td>M</td>
<td>1,811 ± 429</td>
<td>77 ± 19</td>
</tr>
<tr>
<td></td>
<td>117</td>
<td>80+</td>
<td>F</td>
<td>1,497 ± 294</td>
<td>64 ± 18</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td></td>
<td>M</td>
<td>1,792 ± 522</td>
<td>75 ± 17</td>
</tr>
</tbody>
</table>

Note: Adapted from "Nutrition and Aging," by K.M. Koehler and P.J. Gary, 1993, Clinics in Laboratory Medicine, 13, p. 437.

*aMedian = 72.*
of physiologic changes which were simply attributed to "age" in the past.

With a lower intake of calories, it is more difficult to meet the RDA's for vitamins and minerals, especially caloric levels below 1400 calories. Despite a typical decline in energy intake, the NHANES II survey indicated the prevalence of overweight and severe overweight was 25% and 8% for men and 38% and 13% for women, respectively (Koehler and Garry, 1993). This indicated obesity was also a problem for a significant minority of the subjects, although this is less of a problem as an individual ages (Lehmann, 1993).

To help meet nutrient needs and prevent weight problems, many of the recommendations in the literature include encouragement for the elderly to partake in physical activity as tolerated to maintain muscle mass and mental and physical well-being (Kimura, 1992; Koehler & Garry, 1993). The Surgeon General recommended that "...older Americans should consume sufficient nutrients and energy and maintain levels of physical activity that maintain desirable body weight and may prevent or delay the onset of chronic disease" (USDHHS, 1988, p. 64).

Protein

As seen in Table 2, the average protein consumption of the subjects in the national surveys met the RDA for each gender. A controversial issue frequently found in the literature concerned the adequacy of the recommended intake of
protein for this age group. The literature appeared to be contradictory and inconclusive. Some authors concluded the RDA of 0.8 grams (g) of protein per kilogram (kg) of body weight per day was adequate while others recommended 1.0 g per kg per day. "Because of the decline in energy intake with aging, there is a decline in protein intake. Thus protein should be 12% to 14% of the total energy intake which would be 1g/kg per day" (Hoffman, 1993).

Koehler and Garry (1993) discussed the contradictory findings from older and newer nitrogen balance studies. Nitrogen balance studies by Cheng et al. and Zanni et al. reported satisfactory nitrogen balance with recommended levels of protein intake (Koehler & Garry, 1993). However, these subjects either received high caloric intakes or were protein depleted before the study which can increase the efficiency of protein (Koehler and Garry, 1993). In contrast, another study by Gersovitz et al indicated that "...0.8 g of protein kg is only marginal in maintaining nitrogen balance in older men and women" (Koehler and Garry, 1993).

**Lipids**

This issue of fat and cholesterol intake in relation to heart disease did not appear to assume as much importance in the literature as overall dietary adequacy. According to Hoffman (1993), the affect of serum cholesterol in the development of coronary artery disease decreases after 55 years of age. Other studies have shown a correlation between
mortality and extremely low and extremely high cholesterol levels which are often associated with chronic disease (Hoffman, 1993, p.750). The recommendation to consume less than 30% of the calories from fat with an intake of less than 250 milligrams of dietary cholesterol is still applicable for this age group (Hoffman, 1993).

**Calcium and Vitamin D**

Because of the functional relationship between vitamin D and calcium, a discussion of both of them together is appropriate. The importance of vitamin D and calcium in maintaining bone mass and Vitamin D's role in the maintenance of calcium levels were well-established in the literature (Hoffman, 1993; Koehler & Garry, 1993; Rosenberg, 1992; Russell, 1992; Schneider et al., 1986). Active Vitamin D (1,25-dihydroxyvitamin D₃) produced by the kidney is required for calcium absorption.

Most of the literature that discussed Vitamin D and calcium were consistent with their findings that dietary intake of these nutrients tended to be low in the older adult population (Koehler & Garry, 1993; Rosenberg, 1992; Russell; 1992; Zheng & Rosenberg, 1989). Data from the New Mexico and Tufts studies indicated low vitamin D intakes with 45% to 74% of the study participants consuming below 67% to 75% of the RDA (Koehler & Garry, 1993). In the New Mexico study, 15% showed borderline deficiency from biochemical analyses.
The literature concluded that low Vitamin D intakes may be due to the following possibilities: (a) dairy product avoidance to decrease fat and cholesterol or as a result of lactose intolerance; (b) malabsorption of fat soluble vitamins by drugs, such as cholestyramine, or decreased intestinal absorption; (c) combination of lack of sunlight, decreased ability of the skin to produce Vitamin D3 and decreased production of 1,25 dihydroxyvitamin D by the kidney (Hoffman, 1993; Koehler & Garry, 1993; Russell, 1992; Schneider et al., 1986).

National and regional studies all show a calcium intake below the RDA with 17% to 43% (depending on the study) below 75% of the recommended levels. A controversial and inconclusive subject in the literature was the issue of calcium requirements for post-menopausal women since they are at a higher risk of osteoporosis. Studies were contradictory with some research providing evidence to support the recommendation that an increase in calcium from the RDA of 800 milligrams (mg) to 1000 to 1500 mg can preserve bone mass (Hoffman, 1993; Schneider et al., 1986; Zheng & Rosenberg, 1989). On the other hand, other research concluded that a calcium intake beyond 800 mg has not been shown to retard bone loss (Russell, 1992).

Housebound, institutionalized and frail elderly and any older adult not receiving the RDA may need a supplement.
Vitamin A

National studies showed the mean Vitamin A intake was above average. The mean intake in the NFCS was 128% to 168% of the 1980 RDA; however, 22% to 36% of the respondents were below 70% of the RDA. In general, the literature did not appear to reflect much concern for the intake of vitamin A except for potential toxicity by individuals who take vitamin A supplements. Russell (1992) discussed the possibility that there might be a lower requirement for vitamin A in the elderly. His review of the literature indicated there might be a decreased clearance of vitamin A by hepatic and other peripheral tissues (Russell, 1992). Until longitudinal studies provide more conclusive evidence, Russell (1992) does not recommend Vitamin A-containing supplements.

Vitamin E

Vitamin E was not examined in the national surveys. In addition, it is difficult to measure since this vitamin is incomplete in food composition tables. The New Mexico and Tufts studies found adequate intakes of vitamin E with no biochemical deficiencies (Koehler & Garry, 1993).

Vitamin C

Vitamin C functions as an electron donor and, as an antioxidant, it may help to protect against stress related diseases and degeneration (Russell, 1992). Therefore, Russell
(1992) recommended a high tissue saturation greater than the RDA of 60 mg. However, Zheng and Rosenberg (1989) emphasized that there are variable reports on the adequacy of vitamin C levels in the older population and that there was not enough evidence to raise the RDA. "This discrepancy is thought to be the result of disagreements over the criteria for both the desirable level of intake and the laboratory evidence of deficiency" (Zheng & Rosenberg, 1989, p. 58).

In the NFCS, the mean vitamin C intake was 140% to 156% of the RDA with 22% to 31% of the respondents below 70% of the RDA. In various studies, vitamin C supplementation ranged from 34% to 59% of the participants; however, no significant biochemical differences were found between the supplemented and unsupplemented individuals (Koehler & Garry, 1993).

**Vitamin B-1 (Thiamine)**

Studies have shown a mean intake of 105% to 130% of the RDA for Vitamin B-1. The prevalence of a low biochemical value for B-1 was variable among studies and ranged from 2% to 24% for this vitamin (Zheng & Rosenberg, 1989). Although problems are seen most frequently with alcoholics, individuals with limited activity and older adults from low socioeconomic groups, clinical evidence of deficiency was not well known (Zheng & Rosenberg, 1989). According to Koehler & Garry (1993), the adequacy of the RDA appears acceptable since thiamin is strongly associated with energy expenditure.
Vitamin B-2 (Riboflavin)

The NHANES indicated that adequate biochemical values were obtained from the majority of the respondents although low values were seen in 4% to 8% of whites and 17% to 20% of blacks (Koehler & Garry, 1993). However, clinical evidence of deficiency was rare.

Vitamin B-3 (Niacin)

A mean intake of 105% to 130% of the RDA for niacin was found in national surveys and the literature did not reflect a concern about adequate intake in the older population.

Vitamin B-6 (Pyridoxine)

Vitamin B-6 was not discussed in length in the literature compared to other nutrients such as calcium. According to Russell (1992), many elderly populations have been found to be deficient in vitamin B-6 and he recommended that the RDA for this vitamin be re-evaluated. Low levels are common in nursing homes and supplementation may be advisable for this group (Koehler & Garry, 1993). The mean intake in the NFCS was low with 54% to 69% of the elderly consuming less than 70% of the RDA (Koehler & Garry, 1993).

Vitamin B-12 (Cobalamin)

Vitamin B-12 functions in DNA synthesis and cell division; therefore, a deficiency can disrupt red blood cell maturation and result in megaloblastic anemia, peripheral neuropathy, ataxia and cognitive impairment (Hoffman, 1993).
Hoffman (1993) reported infrequent deficiencies of Vitamin B-12 despite a generally low intake of the vitamin by some elderly. The risk tends to increase with age with an average deficiency of 9% of the population over 87 years of age.

Koehler and Garry (1993) also discussed evidence of low intakes in national studies with intakes of 12% to 39% of the participants below 75% of the RDA. However, these studies also showed healthy people are at little risk of developing a deficiency (Koehler & Garry, 1993). Much of the literature attributed the development of a deficiency to intrinsic factor loss (required for vitamin B absorption) or achlorhydria (a lack of gastric environment which normally allows for proteolysis of vitamin B-12 from dietary protein so that it can bind with intrinsic factor). Russell (1992) reported 25% of persons aged 60 to 69 and 40% of individuals over the age of 80 have achlorhydria. This condition can also impair folate absorption which may pose a concern since one study showed a mean intake of folate below 75% of the RDA (Koehler & Garry, 1993). However, few of the individuals with low intakes had low biochemical values. Poverty, chronic disease and malabsorption disorders may contribute to increased risk of folate and vitamin B-12 deficiency (Koehler & Garry, 1993).

Trace Minerals

Koehler and Garry (1993) reported that information on trace minerals was limited for all age groups and especially for the elderly. However, their review of the literature
found the minerals most likely to cause problems for the elderly are selenium, chromium and silicon. With increasing age, the tissue concentration of chromium and silicon decreases, but the implications of this were unknown. Trace mineral status may be affected by the following: (a) decreased absorption from the gastrointestinal tract; (b) reduced body pool of trace minerals with a decrease in lean body mass and (c) lower mineral consumption with decreased caloric intake (Koehler & Garry, 1993).

Other trace minerals which may be low in some older adults are copper, zinc, flouride and magnesium due to marginal dietary intake or disease. Manganese, molybedenum, cobalt, iodine and iron are unlikely to be low in the older population (Koehler and Garry, 1993). Lehmann’s (1989) review of the literature found that low intakes of zinc have been associated with the institutionalized elderly, anorexia and the increased catabolic response to malnutrition, but the need for a supplement was unclear. According to Zheng and Rosenberg (1989), no overt deficiencies of zinc have been observed despite the reported low dietary intake.

National surveys have found that the mean intake of iron met the RDA and only 1.8% to 3.6% of elderly men and 2.7% and 3.7% of elderly women had impaired iron status (Koehler & Garry, 1993). Hoffman (1993) reported iron supplementation was unnecessary since iron deficiency is rare in healthy elderly. However, anemia can be caused by disease and
deficiency can occur if iron absorption is inadequate to replace daily losses. In summary, assessment of trace mineral status was difficult due to limited information, but overt deficiencies are rare in healthy elderly with a nutritious diet.

**Multivitamin Supplement**

Hoffman (1993) reported that supplementation at low levels in patients did not consistently improve clinical status and that a multivitamin is unnecessary for healthy elderly consuming an adequate diet. However, some elderly may need to supplement calcium, vitamin D and Vitamin B-12, folate and zinc (Hoffman, 1993). Although clinical studies have shown no statistical difference between supplementation and placebo administration, one study found up to 50% of the respondents were taking a supplement (Hoffman, 1993).

**Nutritional Screening of Older adults**

The literature review of the nutritional status of older adults revealed that limited information was available on the nutritional requirements of the elderly in relation to the complexity of changes that can occur as individuals age and questionable reference data. However, the increase in morbidity and mortality from nutrition-related diseases and the prevalence of malnutrition in the older population has raised concern among health professionals and prompted the development of national goals for the promotion and
maintenance of health, prevention of disease and preservation of quality of life and functional status (White et al., 1991). The leading cause of death among African Americans include diabetes mellitus, heart disease and stroke which are all nutrition-related diseases (Rebovich, Hurley, Wodarski & Wade, 1990). Without proper medical and nutrition management of these diseases, decreased quality of life and increased health care costs may result.

The cost-effectiveness of preventive programs are not easily quantified, but an effort is now being made in recent research to document the benefits of lifestyle changes, such as diet modifications and increased exercise (Chernoff, 1991). Professional organizations, including the NSI and ADA, are encouraging health professionals to document the cost/benefit of nutrition screening and intervention and to share these results with the public and health care professionals and administrators (White, Dwyer, et al., 1992).

A national telephone survey of 757 health care providers and administrators of the geriatric population provided a general consensus that nutrition screening and treatment should be part of a basic benefits package and should be reimbursed by the government or other third-party payers (Hart, 1993). These health care providers estimated that one in four of their non-institutionalized patients are malnourished and that nutrition contributes to the prevention, treatment, and recovery from illness and disease (Hart, 1993).
In this study, malnourishment was defined as "...a state in which, because of deficiencies, excesses, or imbalances in food or diet, someone is not getting proper nutrients, which weakens his or her body and is harmful to his or her health" (Hart, 1993, p.2).

The lack of reimbursement for nutrition services was cited as the primary barrier to routine nutrition screening and intervention (Hart, 1993). However, of the health care providers surveyed by Hart (1993), 80% of them felt it would be cost-effective to provide routine screening because savings from fewer illnesses and speedier recoveries would offset the cost of screening. Without physician referrals and adequate reimbursement for nutrition intervention, patients may not seek medical nutrition therapy on their own. In addition, older adults are not routinely screened for nutritional problems, such as malnutrition, by physicians. In a study of 98 older adult medical patients who were recognized as malnourished, none of them had been diagnosed by the doctor as malnourished and only 24% of them received a nutritional supplement (Manson & Shea, 1991).

Another significant barrier to routine screening identified by the respondents included the lack of referrals for and emphasis on nutrition screening and treatment by physicians. The lack of screening may be related to insufficient reimbursement as the majority of physicians and other health care providers in the study felt that nutrition
screening should be part of the basic benefits package in health care reform and should be reimbursed by government or other third party payers (Hart, 1993).

White (1991) pointed out that malnutrition can result in significant "...dysfunction and disability, reduced quality of life and, in some instances increased morbidity and mortality" which may entail significant health care costs (p.2087).

Although the older adult population accounted for 12% of the population in 1988, they utilized more than 30% ($175 billion) of health care expenditures (Chernoff, 1991).

The literature reflected limited and sometimes conflicting nutritional data, but the overall consensus seemed to favor nutrition screening. In her book, Chernoff (1991) discussed several levels of prevention. "Primary prevention" or health promotion attempts to prevent disease by decreasing the number of risk factors, such as inadequate diet or lack of exercise. Risk factors "...are characteristics that are associated with an increased likelihood of poor nutritional status" (NSI, p.2). Early detection and treatment of disease is the focus with "secondary prevention" included in the design of many community screening programs (Chernoff, 1991). Lastly, "tertiary prevention" includes efforts by various health professionals, including Dietitians, to treat the effects of the diseases and focus on rehabilitation.

As a public awareness tool, the Determine Your Nutritional Health Checklist seems to encompass primary
prevention (by alerting older adults to risk factors of poor nutritional status) and secondary prevention (in its effort to identify nutritional problems and initiate intervention). The NSI (1991) considers poor nutritional status to include deficiency, dehydration, undernutrition, and nutritional imbalances.

To recommend items to be included in the checklist, the NSI conducted a study in New England which included a random sample of 749 participants. The expert committee that developed the Checklist established two outcome criteria which were: (a) identification of individuals whose diets are low in nutritional value and (b) who perceive themselves to be in fair or poor health. These criteria were selected because "...a sizable body of literature has shown that self-reported health status is associated with subsequent morbidity and mortality independently of clinical assessments of physical health" (Posner et al., 1993, p. 973).

Inadequate nutrient intake was evaluated by the RDA's since they are the standards widely used for the U.S. population. A 24-hour recall was conducted using validated visual aids and information on heights and weights and current health problems was collected. Five "marker" nutrients, protein, vitamin A, vitamin C, thiamin and calcium, were used to evaluate the adequacy of the diet since they are the nutrients most likely to be low in inadequate diets (Posner et
al., 1993). An intake of less than 75% of the RDA was the criterion for nutritional inadequacy.

Based on data from previous research, 14 Checklist items were selected and the study examined the relative importance of these factors in predicting the outcome criteria. Regression analyses was used to determine "effect sizes" for each item which showed that lack of monetary resources, eating fewer than two meals per day and eating few fruits and vegetables were the strongest predictors of nutrient intake (Posner et al., 1993). Controlling for factors such as recent hospitalizations or physical functioning, taking three or more drugs per day and having changed one's diet because of illness were the best predictors of perceived health.

The checklist's predictive ability, sensitivity and specificity were also evaluated. The analyses produced a 10 question Checklist which contained the items most predictive of the outcome criteria. The scores associated with each item identify their relative importance as an independent indicator of nutritional risk (Posner et al., 1993). The committee selected a checklist score of six points as the criterion for high nutritional risk "... to balance sensitivity and specificity so that not too many persons (fewer than 15%) with higher estimated intakes of nutrients or better perceived health were misclassified as being at high nutritional risk" (Posner et al., 1993, p. 975).
One limitation of the Checklist is that it measures nutritional inadequacy and may underestimate the extent of nutritional problems resulting from dietary excesses and/or obesity (Posner et al., 1993). In addition, Posner et al. noted the Checklist had not been independently validated at the time of their writing and that this should be a priority for future research. This author did not find any validation studies in the literature, although Podolsky (1992) reported that follow-up studies concluded that the checklist accurately identified three out of every five older adults at high risk and did not mislabel healthy persons.

According to A. Coleman (Personal communication, June 1994) at the NSI Headquarters, there are plans to conduct validation studies to assess the cost-effectiveness and efficacy of the Checklist. This author found only one article in the literature that expressed concern with the checklist. Rush (1993), a former member of the NSI testing and validation subcommittee, questioned the Checklists sensitivity (ability to identify true cases) and specificity (ability to classify correctly those without the condition).

According to Rush (1993), the Checklist "...identified only 45.8% of those who reported poor health and only 36.2% of those who reported low nutrient ingestion" (p.944). He also questioned the ability of a 24 hour recall to accurately assess long-term intake and whether effective programs exist to reverse poor nutritional status when identified. Rush
(1993) suggested that other approaches should be explored and he offered a couple recommendations: (a) replace the Checklist with an educational strategy for the entire population and (b) add several nutritional questions to periodic medical visits.

**Risk Factors Associated with Poor Nutritional Status**

A discussion of the variables that are commonly associated with each risk factor (see Table 3) is appropriate here. Davies and Knutson (1991) reported that the likelihood of malnutrition increases with a "multiplicity of risk factors" and that warning signals are likely to be "interrelated and cumulative" (P.1414). Although these risk factors are not exclusive to the older population, they may be more affected by them due to the physiologic and psychosocial aspects of aging (Davies, 1990).

**Inappropriate food intake**

Nutritional status can be affected by the regularity of food intake. "A consistent absence of food intake, lack of a habitual pattern of eating, inability to obtain or prepare food daily, lack of acceptable food or lack of social support are all potential contributors to inadequate food intake and poor nutritional status" (White, 1991, p.2087). Data from NFCS showed that the variety of foods in the diet decreased as age increased probably due to a decline in caloric intake or restriction of food choices (Rolls, 1992). Ryan and Bower
### Table 3

**Risk Factors Associated with Poor Nutritional Status in Aging Americans Including Elements by which Risk is Assessed**

<table>
<thead>
<tr>
<th>Inappropriate food intake</th>
<th>Dependency/Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meal/snack frequency</strong></td>
<td><strong>Functional status:</strong></td>
</tr>
<tr>
<td><strong>Quantity/quality:</strong></td>
<td>- Activities of daily living</td>
</tr>
<tr>
<td>Milk/Milk Substitutes</td>
<td>- Instrumental activities of daily living</td>
</tr>
<tr>
<td>Fruit/Vegetables</td>
<td>- Disabling conditions:</td>
</tr>
<tr>
<td>Bread/Cereals</td>
<td>- Lack of manual dexterity</td>
</tr>
<tr>
<td>Fats</td>
<td>- Use of assistive devices</td>
</tr>
<tr>
<td>Sweets</td>
<td>- Inactivity/immobility</td>
</tr>
<tr>
<td><strong>Dietary modifications:</strong></td>
<td><strong>Acute/chronic diseases or conditions</strong></td>
</tr>
<tr>
<td>- Self-imposed</td>
<td>- Abnormalities of body weight</td>
</tr>
<tr>
<td>- Prescribed</td>
<td>- Alcohol abuse</td>
</tr>
<tr>
<td>- Compliance</td>
<td>- Cognitive or emotional impairment:</td>
</tr>
<tr>
<td>- Impact</td>
<td>- Depression</td>
</tr>
<tr>
<td>- Alcohol abuse</td>
<td>- Dementias</td>
</tr>
<tr>
<td><strong>Poverty</strong></td>
<td>- Oral health problems</td>
</tr>
<tr>
<td>- Income:</td>
<td>- Pressure sores</td>
</tr>
<tr>
<td>- Source Adequacy</td>
<td>- Sensory impairment</td>
</tr>
<tr>
<td>- Food expenditures/resources</td>
<td>- Others</td>
</tr>
<tr>
<td>- Economic assistance program</td>
<td><strong>Chronic medication use</strong></td>
</tr>
<tr>
<td>- Reliance:</td>
<td>- Prescribed/self-administered</td>
</tr>
<tr>
<td>- Food Adequacy</td>
<td>- Polypharmacy</td>
</tr>
<tr>
<td>- Housing Adequacy</td>
<td>- Nutritional supplements</td>
</tr>
<tr>
<td>- Medical Adequacy</td>
<td>- Quackery</td>
</tr>
<tr>
<td>- Other Adequacy</td>
<td><strong>Advanced Age</strong></td>
</tr>
</tbody>
</table>

**Social isolation**

- Support systems: 
  - Availability 
  - Utilization
- Living arrangements: 
  - Cooking/food storage 
  - Transportation 
  - Other

**Note:** From “Consensus of the Nutrition Screening Initiative: Risk Factors and Indicators of Poor Nutritional Status in Older Americans, White, et al., 1991, *Journal of the American Dietetic Association*, p. 784. Reprinted by permission from NSI, a project of the American Academy of Family Physicians, the American Dietetic Association and the National Council on the Aging, Inc. (funded in part by Abbott Laboratories).
(1989) reported that up to 50% of the health problems in the elderly may be directly related to inadequate nutrient intake.

Numerous factors may contribute to inadequate food intake, food rejection or food selectivity such as: (a) cultural, ethnic or religious preferences; (b) mistaken health beliefs; (c) excessively restrictive dietary prescriptions (d) loss of appetite due to physical or emotional problems and medications (d) financial constraints which may limit food purchases of nutritious foods and (e) alcoholism (White, 1991). High alcohol intakes may depress appetite and impair digestion and absorption of nutrients. According to Chen (1986), up to 10% of the population over the age of 60 may have alcoholism.

Poverty

The ADA reported that poverty can affect nutritional status by limiting the amount and frequency of food purchases housing and cooking facilities and overall health (ADA, 1987a). One study of non-institutionalized elderly found 25% of the subjects had incomes below $10,000 per year (Cerrato, 1990). Older adults are more likely than younger adults to be poor and live on fixed incomes and the rates increase with nonwhites, women, people living alone and adults 85 years of age or older (Chernoff, 1991).

According to Ryan and Bower (1989) and Lehmann's (1989) review of the literature, nutritional inadequacy is strongly correlated with low socioeconomic status. Low intakes of
calcium, vitamin A, vitamin C, protein and folate are associated with low socioeconomic status (Lehmann, 1989). A study in Australia found low income status was correlated with a high fat and sodium diet and with a low Vitamin C and fiber intake (Davies, 1990). Krondl et al. (1982) found lower income status was also associated with a decreased selection of a variety of foods and beverages. National surveys have found decreased vitamin and mineral intakes in the lower income participants.

Ryan and Bower's (1989) study examined the relationship between socioeconomic status in a random sample (representative of the population) of 268 adults 55 years of age or older. The results of the study found a significant relationship between income and nutrient adequacy with 89% of the sample demonstrating low intakes of vitamin B-6, calcium, vitamin A and iron (Ryan & Bower, 1989).

**Social isolation**

The relationship between nutritional status and social isolation was controversial in the literature with limited data and generally small samples (Davis, Murphy, Neuhaus & Lein, 1990). "Evidence addressing the issue of dietary quality of the elderly living alone is fragmented and inconsistent" (Davis, Murphy, Neuhaus and Lein, 1990, p. 1667). Davis et al. (1990) examined data from NFCS, which was a probability sample, and found energy intake was the most important association between living arrangements and dietary
quality. Older adults who live alone ate less calories but not less nutrient-dense food choices. In addition, men who lived alone tended to consume a poorer quality diet than women who lived alone (Davis et al., 1990; Lehmann, 1989). A study by Ryan and Bower (1989) found no statistical relationship between living arrangements and dietary intake.

Other authors reported that the literature generally implied a positive correlation between social isolation and poor nutritional status despite limited evidence (Cerrato, 1990; Walker & Beauchene, 1991). White (1991) discussed the importance of support systems such as friends, family, and income independence. According to White (1991), a loss of any one of these support systems can affect appetite and interest in food which may result in a limited food intake. One study in Virginia found older people who eat alone tended to use more convenience foods, eat less regularly scheduled meals with a reduced amount and variety of foods (Davies, 1990). Chernoff (1991) reported that of the older adult population, 67% of them live with a spouse, 30% live alone and 5% (usually over the age of 85) live in nursing homes. According to Cerrato (1990), a 1990 survey of non-institutionalized elderly found 30% of them live alone and regularly skip meals.

"Eating is a personal care behavior as well as a social event that is often enhanced by the presence of other people" (White, 1990, p. 2090). White (1991) and Podolsky (1992) recommended that care providers encourage older adults to seek
interaction with other people at programs designed for seniors, such as congregate meals. One small study with a convenience sample found no reports of problems with dietary intake when the older adult perceived the frequency of visits with relatives and friends as adequate (Walker & Beauchene, 1991).

**Dependency and disability**

Food preparation, procurement and consumption or interaction with other people may be difficult for older adults with physical and mental limitations especially if they live alone (White, 1991). White et al. (1991) reported that dependency and disability was a problem for many older adults, particularly those who are 80 years of age or older. According to Wahlqvist and Kouris (1990), one-fifth of adults in the 65 to 74 age group and one-third of the adults in the 75 and older age group have some degree of impaircement.

In addition, Bunker and Clayton (1989) reported that 8% of all elderly and 32% of elderly over 85 years of age are housebound. Bunker and Clayton's (1989) research review found that the house bound elderly tended to have low intakes of calories, protein, vitamin C, vitamin D, various B vitamins, zinc, copper, calcium, phosphorous, selenium and iron and they were at risk for malnutrition.

Davies and Knutson (1991) point out that "... rarely is there a direct cause-effect relationship, so we cannot assume that all housebound elderly people are malnourished (p. 1413).
They do recommend, however, that special attention be paid to this groups due to their increased risk of nutritional problems.

**Acute or chronic diseases or conditions**

Symptoms of diet-related diseases or acute and chronic conditions that require a change in diet may result in disinterest or difficulty with food procurement, preparation or consumption and a change in weight or nutritional status. The association between nutrition and diet-related diseases or conditions, common in the elderly, indicate the need for professional nutritional screening and intervention (ADA, 1987a). The Surgeon Generals Report included the recommendation that dietary counseling should be provided from credentialed health professionals to older people with diet-related chronic diseases (USDHHS, 1988).

Poor nutrition can aggravate chronic condition and, in turn, poor eating habits may stem from diseases and conditions such as arthritis and diabetes. Studies have shown low intakes of calcium, iron, zinc, vitamin D, folate and thiamin are related to specific physical and mental diseases and conditions frequently seen in the elderly (ADA, 1987a).

Sensory impairments and oral health problems may also increase with age (White, 1991). Problems with vision and hearing may interfere with grocery shopping and preparation and consumption of food. The senses of taste and smell may decline with age which could affect the desire to eat. Older
individuals with improperly fitting dentures may have difficulty chewing foods which may affect their desire to eat and restrict the variety of foods included in the diet (Hoffman, 1993). As a result of dental problems, there may also be decreased salivary flow, hypogeusia and atrophy of the oral mucosa. Of the adults over the age of 60, it is estimated 50% of them have lost teeth (ADA, 1987a).

Chronic medication usage

The increased occurrence of chronic disease and other health problems in the elderly result in the frequent and often multiple use of prescription drugs, over-the-counter medications and nutritional supplements. The results of the NSI study showed greater than 30% of the older adult population were taking three or more drugs per day (Posner et al., 1993). The potential for drug-nutrient interactions is high and may cause an interference with the digestion, utilization and/or excretion of nutrients which can cause nutrient deficiencies (ADA, 1987a).

Risk factors for the development of drug-nutrient complications include: (a) polypharmacy (multi-drug regimens); (b) chronic drug therapy; (c) nutritionally marginal diets and (d) age or disease-related malabsorption disorders (Nelson & Franzi, 1989). Commonly prescribed drugs, such as antibiotics, diuretics and laxatives can impact nutritional status due to side effects such as nausea, anorexia and abnormalities of nutrient metabolism. For example, drugs,
such as digoxin, can reduce an individual's appetite while other drugs, such as sulphasalazine, can decrease absorption of folate. Many elderly individuals take nutritional supplements which may lead to toxicity and some older adults may resort to fraudulent health practices that promise "cures" (White, 1991).

**Advanced age**

As previously discussed, chronological age and functional impairment do not necessarily equate. The affects of aging coupled with lifestyle habits cause much variety in this population requiring all care providers to be familiar with each person's unique needs and circumstances (White, 1991).
Chapter 3

METHODOLOGY

Survey Instrument Design

The survey instrument developed for this study was a twenty-six item telephone questionnaire that also included a standardized script to reduce the possibility of introducing interviewer bias (Appendix E). The questionnaire was developed as a cooperative effort between this researcher, the nutritionist at the Monroe County Department of Health (MCDH) and members of the Adult and Older Adult Coalition of Rochester, N.Y. All the members of the survey committee are nutritionists/dietitians who have work experience in nutrition of the elderly. The coalition is part of Nutrition Watch, a nutrition monitoring project of MCDH and the Monroe County Cornell Cooperative Extension of Rochester, N.Y., which addresses nutrition issues and problems facing the Rochester community.

In the Spring of 1993, the committee met several times to determine which questions to include in the survey tool. The committee chose to survey the sixty and older age group since this is the age older adults can participate in Meals on Wheels and Congregate meal feeding programs. Thus, the results of this survey can be compared to data collected at these agencies.
The committee decided that the Determine Your Nutritional Health Checklist was the best survey tool available since it has been statistically shown to measure nutritional status. In addition, the telephone interview method was selected since response rates tend to be better than mailed questionnaires (80% and better are typical) with the ability to call-back (Blankenship, 1977). Another advantage over mailed questionnaires included the assurance that the interviewer was speaking to the intended person. With mailed questionnaires, there was no control over who was answering the survey and the response rate may be lower (Blankenship, 1977). Posner et al. (1993) reported that the checklist is well-suited for telephone interviews in population-based research. After several revisions, this researcher tested the 26-item telephone survey in a pilot study.

The questionnaire was divided into three sections with a brief introduction before each section. In the first introduction, the interviewer introduced herself, explained why she was calling, and asked to speak to a household member who is 60 years of age or older. A potential limitation was a gender bias with this method since traditionally more males may be working out of the house than women and women may be more likely to answer the phone than men. Question 1 through 10 asked the ten Checklist questions although each "question" was actually a statement requiring a "yes" or "no" response. If the respondent answered "yes" to the statement, this
indicated a contribution to nutritional risk with a corresponding numerical value ranging from 1 to 4.

After completing the ten statements, all the values from any "yes' response were totaled to produce the nutritional risk score. Any "no" response has a value of zero thereby not contributing to nutritional risk. The computer program used for this study was coded to add up the numerical score and categorize each respondent into a low, moderate or high risk category.

The first statement determined whether an illness or condition had an effect on the kind and/or amount of food consumed by the respondent. In statements 2 through 4, a "yes" response to eating fewer than two meals per day, eating few fruits or vegetables or milk products and having three or more alcoholic drinks per day contributed to nutritional risk. The fifth statement assessed whether tooth or mouth problems were affecting food intake.

Statement 6 determined whether the respondent felt he or she had enough money to buy food which also carried the highest point value. A "yes" response to eating alone in statement 7 and taking three or more prescribed or over-the-counter drugs a day in statement 8 contributed the lowest point value towards nutritional risk. Statement 9 determined if the respondent had involuntarily lost or gained ten pounds in the last six months. In the last statement, difficulty with shopping, cooking or feeding oneself was assessed. Both
the third and last statements included "or" indicating a problem with any one of the categories contributed to risk and resulted in a "yes" response. For example, if a respondent consumed sufficient servings of fruit and vegetables, but no milk products, then the correct answer was "yes".

Likewise, the use of "or" in the last statement requires a "yes" response to difficulty in any one of the categories (Shopping, cooking or feeding oneself). For any "yes" response, the committee hoped to obtain a better understanding of which category was the most difficult for the respondents. Thus, a series of three questions (11 to 13) asked the respondent if he/she was having difficulty with each of the categories. For any "yes" response, the next question (11A, 12A, and 13A) asked if the person was receiving regular help for the problem. For example, if a respondent had difficulty with grocery shopping, the next question asked if he/she had regular help with grocery shopping.

Since the third Checklist statement also inquired about several potential problem areas with the consumption of fruits, vegetables or milk products, questions 14 through 16 were developed to determine an estimated number of servings of each food group consumed by the respondent. The possible responses included one, two, three or more or no servings for each question. Time limitations and the inability to show visual aids (food models) made it difficult to quantify and communicate serving sizes for a vast variety of foods. Most
respondents wanted to go through the survey as quickly as possible and a longer survey would have been unacceptable to many individuals. For this reason, the questions asked for the respondents "average" number of servings per day since intake may vary from day-to-day. Although the response to these questions were based on the respondents perception of a serving size, the results helped to provide a general idea of problem areas. Further study, such as personal interviewing to collect diet histories, may be required to obtain a better understanding of food intake problems.

Question 17 asked respondents to state whether they had attended a senior center, adult day care, soup kitchen or other community program for a meal. If they answered no then the interviewer moved on to question 18. If they said yes, then the respondent was asked in questions 17A to 17C which programs they had attended. Question 17D asked how many days a week the respondent attended the program. The possible responses to this question ranged from 1 to 7 days per week.

Question 18 asked the respondents if any meals were delivered to their home with a "yes" or "no" response. If the response was "yes", the respondent was then asked in question 18A who provided the most meals. The possible responses to this question included Meals on Wheels, Club 24 "Helping Hands for Seniors" program, family, friends/neighbor, church and other. The respondent was also asked in question 18B how many days a week meals were received with 1 to 7 days as possible
responses. Question 18c asked if meals were received on the weekend and for which days. The possible responses to this question included Saturday only, Sunday only or both Saturday and Sunday. If the response to question 18 was "no", the interviewer skipped questions 18A through 18C and moved onto question 19.

Demographic data was obtained in the last set of questions. Question 19 asked for the respondents zip code and the computer program was initially coded to place the zip code into the category of city or suburb to make this information more meaningful. However, because some of the city zip codes overlap with the suburban zip codes, the data was not used to analyze differences between city and suburban areas.

Question 20 asked for the respondents gender while question 21 asked for their date of birth. Some members of the survey committee who work with older adults that have some memory impairment have found they remember date of birth more easily than actual age. In questions 22, the respondent was asked their race from the following possible choices also used in census data: White, African American, Asian, American Indian, Alaska Native and Other. The use of these categories enabled this researcher to compare the sample data to census data to assess how representative the sample was of the community. Question 23 asked the respondent if he/she was of Hispanic origin with a "yes" or "no" response.
The purpose of question 24 was to obtain information regarding the respondents educational level. The question inquired about the last "level" of school completed. The respondent selected the appropriate response from six choices including elementary (K-3), Middle (4-8), High (grades 9-12) or GED, some college, undergraduate degree or graduate/doctoral degree. Question 25 asked how many people live in the household including the respondent with the choices 1, 2, 3, 4 or 5 or more people.

An introduction was provided for the last question which asked about income. The respondent was assured of confidentiality and the importance of the information as encouragement to provide the information. If the individual refused, the interviewer went to the closing paragraph. If the respondent agreed to provide the information, the interviewer explained what information was needed. First, the respondent was asked how many people the total household income, including social security and retirement funds, supported. Next, the interviewer listed five income ranges based on household size using the 1992 poverty guidelines (see Appendix F) and asked the respondent to select the appropriate range. Again, due to time limitations, this study had to rely on the respondents best estimation of income.

The closing paragraph provided a number for respondents to call if they were interested in more information on nutrition programs and services. The participant was thanked.
for his/her time and willingness to provide the information.

The goal of the survey was to collect data and identify what nutritional problems were most prevalent in the older adult population before it is used as a public awareness tool. However, the survey committee had agreed that if the interviewer should get asked potentially serious nutritional questions, she would recommend the respondent call the Elder Line which refers people to nutrition related services. These services include food cupboards, soup kitchens, food stamps, home delivered meals, senior centers, commodity distributions, grocery delivery, outpatient dietitians and agencies that provide nutrition information to the public.

Sample Selection

The survey population consisted of a random selection of respondents who were 60 years of age or older from the Monroe County voter registration list which included the city and suburbs of Rochester, N.Y. The 1993 voter registration list was obtained from the Monroe County Board of Elections by the nutritionist at MCDH. The other options to reach this population were ruled out for various reasons. The county and city tax departments had a list of names and addresses of homeowners age 65 and older, but this list was based on an income level of less than $21,300 per year and phone numbers were not available.
Another option, Senior housing centers, were not willing to provide phone numbers due to confidentiality. A marketing firm who was contacted required the purchase of 5,000 names but this study only needed about 700 names. In addition, most of the lists were developed from driver license data or "Carol Wright" surveys and may not be representative of the population. With the goal to obtain a representative list, the New York Data Center, Department of Economic Development (where census data is collected) was contacted. According to a representative from this office, names or telephone numbers are not given out due to confidentiality.

Although the use of phone numbers from the voters list may include a bias towards higher income residents (since more lower income residents may be without a phone), the committee felt this was the best resource available. When called by this researcher, a representative from the Rochester Telephone Company commented that she was not allowed to discuss the percentage of telephone usage among low income seniors due to confidentiality. Another Rochester Telephone employee estimated at least 95% of the individuals living in Monroe County have a telephone especially among seniors. An increased need for lifeline and other emergency services in this population is one incentive to have a phone. Moreover, through social services, low income older adults can obtain a phone at a significantly reduced rate.
According to Blankenship (1977), the proportion of United States families having their own phone was 95% in 1976 which enables a high proportion of the population to be sampled therefore reducing the sampling error. "If surveyors cannot reach a large segment through their sampling methods, there is great risk of major sampling error which will negatively affect accuracy" (Blankenship, 1977, p.18).

MCDH utilized a computer program called Epi Info version 5.01 which can do both probability sampling and data analysis. The program randomly selected 703 households out of 70,773 from the voter registration list (the names were placed in alphabetical order). Anticipating a possible low to moderate response rate, 703 households were randomly selected to ensure a sufficient number of completed survey’s. According to census data, there are approximately 118,000 residents 60 years of age or older in Monroe County. The difference between the census and voter list number may be mostly due to institutionalized older adults who were not intended to be included in this study and non-voters. In total, the sampling program determined that 382 survey’s would be needed to yield a 95% confidence level.

Survey Administration

Pilot study

To assess the overall effectiveness of the questionnaire and data analysis to yield the information desired and the
reaction of respondents to the questions, a pilot study was conducted in June of 1993. Prior to the pilot, this researcher pretested the questionnaire with a small focus group of older adults who were asked to evaluate each question in the questionnaire. The focus group agreed that some respondents may be reluctant to supply personal data such as living alone, income or alcohol usage. This researcher, who also was responsible for making all the telephone calls, tried to avoid offending respondents by respecting their wishes when they refused questions in the final study.

A pilot study sample should be a representative sample of the target population and selected under conditions comparable to those intended for the final study (Babbie, 1990). A total of 40 names were randomly selected from the voter registration list for the pilot but were not used in the final study. The standardized script and questionnaire was used for the pilot as intended for the final study.

Of the 40 households called, 18 surveys were completed for a response rate of 45% with an average time of nine minutes per phone call. A log was kept of each phone call listing the phone number, date called, time the call began and ended and any comments from the respondent regarding questions they disliked or had trouble understanding. The questionnaire had been pre-coded for the computer program to facilitate data entry. The data was analyzed on the computer to determine if
the questionnaire and statistical procedures selected provided the desired information.

The response to the survey identified some concerns and modifications that were needed to improve the efficiency and understandability of the survey. The discussion of the questionnaire in the previous section included the modifications made as a result of the pilot. One concern was the response rate was lower than expected. The survey committee decided to send a letter (Appendix G) from MCDH prior to the survey to inform respondents of the reasons for the survey and that they would be receiving a phone call. Since it seemed many people were wary of telephone surveys, the committee felt the letter might provide credibility for the study and improve the response rate.

In the pilot, respondents were called only once so the survey committee decided to establish some criteria for each phone call for the final study to help improve response rate. Blakenship (1977) recommended up to three phone calls per respondent. The intention for the final study was to utilize the "differential" call back procedure, as discussed by Blankenship (1977), when contact was not made on the first try. This procedure entails making subsequent calls at different times and on different days to accommodate varying schedules common in an urbanized area. For example, if the first call was made on a weekday morning, then the second call
would be made in the afternoon or evening. The third call was made during the weekend.

Thus, the phone calls were made Sunday through Saturday, although no calls were attempted on Sunday mornings. Phone calls were made between 9:00 AM and 8:00 PM but meal times were avoided since this annoyed some respondents which may have contributed to the need to allow five phone calls. A call-back was made under any of the following conditions:
1. If the respondent was busy and asked the interviewer to call back
2. When there was no answer
3. If the line was busy
4. When the correct respondent was not home

For the final study, two busy signals were considered one attempt, a common practice with telephone surveys (Blankenship, 1977). The phone was allowed to ring up to approximately 5 times for each call. In addition, a log was kept which included the phone number, date, time phone call started and ended, any comments/problems voiced by the respondent, if the survey was completed and the number of phone calls made.

Another concern was the difficulty some respondents had with the checklist statements 3, 6 and 10. The phrasing of statement 6 and 10 in the negative tense caused the difficulty and the interviewer was periodically asked to repeat or explain the statement. The word "few" caused the most
confusion in statement 3 for a couple of reasons. First, few is a word that may have different meanings to different people. The survey committee decided that if a respondent was confused, the interviewer could define few fruits, vegetable or milk products as "not regularly eaten on a daily basis".

Secondly, some respondents answered "no" to the statement meaning they did consume adequate amounts of fruits, vegetables and milk products, but answered no servings of milk products in question 13. The reason for this is unclear but may have to do with the respondents perception of how much milk products they actually require or the statement was confusing.

The pilot also revealed an expected reluctance to provide income data and it was decided that an encouraging introduction to this question assuring confidentiality should be added. The income ranges listed in the pilot was quite extensive and time consuming and seemed to annoy some of the respondents. The committee decided to ask an open-ended income question by requesting an estimated monthly income and then placing it in the poverty guideline ranges on the questionnaire. However, in the final study it seemed many respondents were reluctant to provide a monthly figure and seemed more comfortable choosing from the condensed and revised income ranges.
Final study

After all the modifications were completed from the pilot, MCDH provided the interviewer with the sample phone numbers. Approval for the study (see Appendix H) was given by the Rochester Institute of Technology Institutional Review Board with the stipulation that none of the respondents phone numbers would be reported to the Health Department (to assure confidentiality). Data collection began at the end of July 1993 and ended in mid-September of 1993. The survey questions were administered as outlined in the previous section. Due to concern that the study may not yield the desired completion rate, up to five call backs were allowed for each household.

Data Analysis

The data was analyzed using the Statistical Program for the Social Sciences (SPSS). Frequency data was collected for all variables to determine the number of times a particular response occurred, the percentage of missing data and to test hypotheses. Inferential and descriptive statistics were used to interpret the data. Two inferential statistics, the Chi-Square Test of Association and the T-test, were used to test the hypotheses and to examine the relationships between the variables.

The descriptive statistics used to analyze the data included measures of central tendency and correlation. Pearson's Product Moment Correlation Coefficient or "Pearson's
r" was used to determine if any relationship exists between the demographics and the nutritional risk scores of the sample. Since it cannot be assumed that a high correlation implies causality, this analysis was used as a starting point for further investigation. Variables that had a high correlation were investigated further using inferential statistics and they were a major focus of the data analysis.
Chapter 4

RESULTS AND DISCUSSION

Introduction to Results

This chapter provides a report of the sample characteristics and the descriptive and inferential findings of this study. One of the goals of the data analysis was to identify who is at high nutritional risk and the primary demographic characteristics of this population. Another goal was to determine which risk factors were most associated with nutritional risk in this sample. Thus, the data analysis highlighted in this chapter was designed to investigate significant associations in detail to understand better the meaning of the relationships between the risk factors, risk score and demographics.

Sample Characteristics

Of the 703 randomly selected households, 430 telephone survey’s were completed. According to Blankenship (1977), certain phone numbers, such as nonworking numbers, non-household numbers (business numbers), duplicate numbers and ineligible households (no person of designated age) should be dropped from the sample. A total of 94 numbers met the above criteria and were dropped resulting in a sample with 609 eligible phone numbers.
Although the households were selected from a list of voters who were 60 years of age or older, 49 individuals no longer resided in the households when they were called by the interviewer. Some of the contacts at these households volunteered some reasons for the respondents absence which included moving to a nursing home, another household or out of town or the individual had passed away. The remaining dropped numbers consisted of 28 disconnected or incorrect numbers, 5 numbers that had become unlisted, 1 duplicate number and 11 business numbers. The completion rate was 71% based on the adjusted sample base.

Of the 430 completed surveys, 224 (52%) of them were accomplished on the first dialing attempt. Another 110 surveys (26%) were completed on the second dialing. The third, fourth and fifth dialing attempts yielded 54 (13%), 20 (5%) and 22 (5%) completed surveys respectively. On average, the time needed to complete the survey was seven minutes. The study also included a total of 179 incomplete surveys due to refusals or no answer after five phone call attempts. Of the incomplete surveys, 81% (145) consisted of refusals and 19% (34) were due to no answer after five dialing attempts.

The primary comment made when the respondent refused the survey was "I'm not interested" without stating a reason. Of the respondents who volunteered a reason for not wanting to participate, three of them refused because of hearing problems and one individual refused due to language difficulty. Other
respondents stated they were ill, to busy, did not like to do surveys or were dealing with a family crisis.

Although the affect of the survey notification letter was not formally asked by the interviewer, some respondents commented that it influenced them to complete the telephone survey which ordinarily they would not have agreed to. Early in the study, calls were often made at different times on the same day. Because the interviewer’s schedule changed towards the end of the survey and respondents were being called on separate days, all households without a completed survey or refusal with either method were given up to 5 phone calls on separate days to provide an equal chance of participating.

Descriptive Findings

Descriptive statistics were used to summarize the data primarily by analyzing the distribution of variables and the association between the variables. This section will highlight the results of the descriptive analysis and will include the frequency and percent of responses to the checklist survey questions. In addition, the relationship between nutritional risk and the demographics will be addressed with the use of measures of central tendency (mean, mode and median) and correlation analysis.

Frequency of survey responses

The ten Checklist questions (1 to 10), which will be referred to as risk factors, and their corresponding
frequencies are displayed in Table 4. Out of the ten Checklist questions, only three missing responses were found and they were excluded from statistical calculations. The first question had the highest number of "yes" responses (43.6%) indicating illness was the most prevalent risk factor in this sample. In contrast, the lowest number of "yes" responses (3.3%) was seen with second question which asked the respondent if less than two meals were consumed per day.

The third question, which asked about the consumption of fruits, vegetables and milk products, had the second highest number of "yes" responses (34.4%). More information about this risk factor was obtained in question 13 through 14 which inquired about the number of servings from each food category. Figure 1 graphically displays how many servings of fruit, vegetables and milk were consumed by the sample and revealed that almost a quarter (23%) of the sample did not consume any milk products. In addition, a significant number of respondents (37%) had only one serving of milk product per day. On the other hand, fruit appears to be the most enjoyed category with 43% of the respondents consuming three or more servings per day.

Only 4% of the sample stated that they had three or more drinks per day in the fourth question. In the fifth question, 7.9% of the sample had tooth or mouth problems which affected food intake. Although only 6.7% of respondents felt they did not have enough money to buy food in the sixth question, it
Table 4

Frequency, Percentage, and Prevalence Ranking of "Yes" Responses to Nutritional Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Frequency</th>
<th>%</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness affecting food intake(^a)</td>
<td>187</td>
<td>43.6</td>
<td>1</td>
</tr>
<tr>
<td>Eat fewer than 2 meals per day</td>
<td>14</td>
<td>3.3</td>
<td>10</td>
</tr>
<tr>
<td>Eat few fruits, vegetables or milk products</td>
<td>148</td>
<td>34.4</td>
<td>2</td>
</tr>
<tr>
<td>3 or more alcohol drinks per day</td>
<td>17</td>
<td>4.0</td>
<td>9</td>
</tr>
<tr>
<td>Tooth or mouth problems affecting intake</td>
<td>34</td>
<td>7.9</td>
<td>7</td>
</tr>
<tr>
<td>Not enough money to buy food</td>
<td>29</td>
<td>6.7</td>
<td>8</td>
</tr>
<tr>
<td>Usually eat alone</td>
<td>105</td>
<td>24.4</td>
<td>4</td>
</tr>
<tr>
<td>3 or more drugs per day</td>
<td>132</td>
<td>30.7</td>
<td>3</td>
</tr>
<tr>
<td>10 pound weight change in 6 months(^b)</td>
<td>60</td>
<td>14.0</td>
<td>5</td>
</tr>
<tr>
<td>Not always able to shop or cook</td>
<td>43</td>
<td>10.0</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: \(^a\)0.2% missing responses
\(^b\)0.2% missing responses
Figure 1. Percentage of Older Adults who Consume Various Servings of Fruit, Vegetables and Milk Products.
had the highest points (4) of all the risk factors so a "yes" response to this question contributed more to the risk score than the other factors.

The fourth highest number of "yes" responses (24.4%) was seen in the seventh question which asked the respondent if he/she usually eats alone. In the eighth question, 30.7% of the sample take three or more different prescribed or over the counter drugs (including vitamins) per day and resulted in the third highest number of "yes" responses. Question nine revealed 14% of the population had an involuntary weight loss or gain of 10 pounds within the last six months.

In the tenth question, difficulty with cooking, shopping and/or feeding oneself was found in 10% of the sample. For any "yes" response to question 10, questions 11 through 13A were asked to determine which category (cooking and/or shopping) was causing problems. If the response to question 10 was no, then the interviewer went on to question 14.

Difficulty with cooking was found in 4% (18) of the sample. Of this group, 28% (5) did not receive regular help with meal preparation. As seen in Table 5, primary demographic characteristics found in respondents who were not receiving help with food preparation were as follows: female, in all age groups, white, a high school or college education, from one and two-person households and/or an income of less than 185% of the poverty level. None of the respondents had difficulty feeding themselves.
### Table 5
Demographic Profile of Respondents with Corresponding Number Lacking Assistance with Food Shopping or Cooking and Receiving Meals by Food Assistance Programs

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Total Sample</th>
<th>Lack of Assistance</th>
<th>Receive Food Assistance</th>
<th>Meals on Wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Gender (n=430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>308</td>
<td>71.6</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Male</td>
<td>122</td>
<td>28.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Age (n=428)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-64</td>
<td>122</td>
<td>28.4</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>65-74</td>
<td>181</td>
<td>42.1</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>75-84</td>
<td>94</td>
<td>21.9</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>85 &amp; older</td>
<td>31</td>
<td>7.2</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>Race (n=430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>412</td>
<td>95.8</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Non-White*</td>
<td>18</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hispanic (n=4)</td>
<td>4</td>
<td>0.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Education (n=430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-8</td>
<td>30</td>
<td>7.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High School</td>
<td>195</td>
<td>45.3</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>College</td>
<td>205</td>
<td>47.7</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Living Arrangements (n=430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 person</td>
<td>112</td>
<td>26.0</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>2 people</td>
<td>257</td>
<td>59.8</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>3+ people</td>
<td>61</td>
<td>14.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Poverty level (n=349)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;125%</td>
<td>57</td>
<td>16.3</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>&lt;185%</td>
<td>53</td>
<td>15.2</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>&gt;185%</td>
<td>239</td>
<td>68.5</td>
<td>-</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Note: *75% of Non-Whites are African Americans. *See Appendix F for income ranges.
In addition, difficulty with grocery shopping was reported by 10% (40) of the sample. Of this group, 15% (6) did not receive regular help with shopping. The primary demographic characteristics of this group, as shown in Table 5, include the following: female, in the 60 to 84 age group, white, high school and college educated, from all household sizes and/or all income groups.

In question 17, only 1.2% of the respondents indicated they had gone to a senior center (up to two times per week) for a meal in the month prior to the survey. However, this percentage only included those who received meals, thus it is not a true assessment of attendance at these facilities. None of the respondents had consumed a meal at an adult day care facility, soup kitchen or other community program. The primary demographics of this respondent included the following: majority were female, all were white in the 65-84 age group, lived alone, with an income less than 185% of the poverty level and/or a high school or college education.

Only three respondents or .7% of the sample received meals delivered to the home which were all provided by Meals on Wheels. In this small group, all three respondents lived alone and were white. In addition, 67% of them were male, in the 85 and older age group and/or had an income less than 185% poverty level.
Demographics

The demographic profile of the respondents is also presented in Table 5 which indicated the majority of participants were female (71.6%). The ages in the sample ranged from 60 to 103 years old and 73 was the mean age. The median age was 69 and the age with highest frequency (mode) was 66.

The majority (95.8%) of the respondents were white with the remaining 4.2% from the non-white categories indicated in the questionnaire. Of the 4.2% non-whites, 3.3% (14) were black, 0.7% (3) were Asian and 0.2% (1) were Indian. Close to half (45.3%) of the sample had attended or graduated from high school and another 47.6% had attended or graduated from college. In this study, 7% of the sample had a kindergarten through eighth grade (K-8) education. The majority of respondents (59.8%) lived in a two member household while another 26.0% of them lived alone.

Over half (68.5%) of the respondents were in the highest income range provided in the questionnaire (greater than 185% of the poverty level). A household income of less than 125% of the poverty level was found in 16.3% of the sample. None of the participants refused to answer the gender, race, Hispanic origin or education questions.

Of the missing responses, two respondents (.5%) refused the age question but did confirm that they were 60 or older, so they were included in the study. Only three (.7%) of the
participants refused the living arrangement question whereas 81 (18.8%) of the sample either refused or did not know their income. All missing cases were omitted from the statistical calculations.

**Nutritional risk score**

*Distribution of scores.*

In Figure 2, the distribution of low, moderate and high nutritional risk scores indicated 15.7% of the sample was at high nutritional risk and 34% were at moderate risk. Thus, the null hypothesis that less than or equal to 10% of the population is at high nutritional risk was rejected. Since this is not a symmetrical distribution, the mean, mode and median differ from each other numerically. The mean of 3.18 was the average nutritional risk score, the median was 2 and the mode was 0. As seen in Figure 3, the score of 2 is not far behind the score of 0 with a frequency of 90 respondents. The risk scores ranged from 0 to 16 points out of a possible 21 points.

**Correlation analysis**

The correlation between the dependent variable risk and the independent demographic variables is shown in Table 6. Income \( (r=-.40) \) was the risk factor most correlated with nutritional risk followed by education \( (r=-.26) \), race \( (r=.23) \) and number living in household \( (r=-.11) \). Race was positively correlated with risk while education and income level were inversely associated with risk. This indicated that
Figure 2. Percent Distribution of Nutritional Risk Scores

<table>
<thead>
<tr>
<th>Nutritional Risk Score</th>
<th>Percentage of Older Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low&lt;sup&gt;a&lt;/sup&gt;</td>
<td>50.4</td>
</tr>
<tr>
<td>Moderate&lt;sup&gt;b&lt;/sup&gt;</td>
<td>34.0</td>
</tr>
<tr>
<td>High&lt;sup&gt;c&lt;/sup&gt;</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Note:
- <sup>a</sup> 0 - 2 points
- <sup>b</sup> 3 - 5 points
- <sup>c</sup> ≥ 6 points
Figure 3. Distribution of Nutritional Risk Score

Note: Possible maximum score of 21 points
Table 6: Pearson Correlation Between Nutritional Risk Score and Demographic Categories: An Overview.

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.0736</td>
</tr>
<tr>
<td>Increasing Age</td>
<td>.0846</td>
</tr>
<tr>
<td>Non-white race</td>
<td>.2338**</td>
</tr>
<tr>
<td>Hispanic origin</td>
<td>.0056</td>
</tr>
<tr>
<td>Higher educational attainment</td>
<td>-.2562**</td>
</tr>
<tr>
<td>Two-person Household</td>
<td>-.1080*</td>
</tr>
<tr>
<td>Higher income</td>
<td>-.3998**</td>
</tr>
</tbody>
</table>

Note: *p < .05. **p < .01. ***p < .001.

See Table 11 for detailed breakdown.
nutritional risk increased among respondents as education and income level decreased and risk was more prevalent among non-whites than whites. In addition, nutritional risk increased as the number of people living in the household decreased.

**Mean risk scores.**

As seen in Table 7, the mean risk scores of each demographic sub-group and their corresponding risk score category (low, moderate, high) are displayed. The mean risk score of females (3.32) was higher than males (2.82) and a larger percentage (17.7%) of females were at high risk compared to males (10.7%). The mean risk score was highest in the 85 and older age group (3.87) and the risk score decreased as the age decreased. However, slightly more 75-84 year olds experienced high risk compared to the other age groups.

The mean score of non-whites (6.61) was significantly higher than whites (3.03). In addition, 50% of this group was at high risk compared to whites (14.2%) as seen in Figure 4. A similar distribution was found between whites and non-whites in the moderate risk group, but a significant difference can be seen in the low risk group. Of the whites, 52.1% were in the low risk group compared to 11.1% of the non-whites. This study included a small number of Hispanics (4) who had a mean score of 3.0 and none of them were at high risk.

The pattern of increased risk, as expressed by the mean risk score, with decreased education was also shown in Table 7. For example, the mean risk score of respondents with less
Table 7:  
Relation Between Mean Nutritional Risk Scores (±SD), Risk Score Category and Demographics

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>N</th>
<th>Mean Risk Score</th>
<th>% Low</th>
<th>% Moderate</th>
<th>% High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>± SD</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>122</td>
<td>2.82 ± 2.48</td>
<td>50.8</td>
<td>38.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Female</td>
<td>305</td>
<td>3.32 ± 3.29</td>
<td>50.2</td>
<td>32.1</td>
<td>17.7</td>
</tr>
<tr>
<td>Age (year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-64</td>
<td>121</td>
<td>2.93 ± 2.87</td>
<td>53.7</td>
<td>32.2</td>
<td>14.0</td>
</tr>
<tr>
<td>65-74</td>
<td>180</td>
<td>3.09 ± 3.29</td>
<td>54.4</td>
<td>30.0</td>
<td>15.6</td>
</tr>
<tr>
<td>75-84</td>
<td>94</td>
<td>3.45 ± 2.91</td>
<td>42.6</td>
<td>39.4</td>
<td>18.1</td>
</tr>
<tr>
<td>85+</td>
<td>31</td>
<td>3.87 ± 3.16</td>
<td>35.5</td>
<td>48.4</td>
<td>16.1</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>409</td>
<td>3.03 ± 2.92</td>
<td>52.1</td>
<td>33.7</td>
<td>14.2</td>
</tr>
<tr>
<td>Non-white</td>
<td>18</td>
<td>6.61 ± 4.59</td>
<td>11.1</td>
<td>38.9</td>
<td>50.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
<td>3.00 ± 2.16</td>
<td>25.0</td>
<td>75.0</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K - 8</td>
<td>29</td>
<td>6.00 ± 4.28</td>
<td>20.7</td>
<td>31.0</td>
<td>48.3</td>
</tr>
<tr>
<td>High School</td>
<td>195</td>
<td>3.40 ± 3.12</td>
<td>48.7</td>
<td>34.9</td>
<td>16.4</td>
</tr>
<tr>
<td>College</td>
<td>203</td>
<td>2.56 ± 2.57</td>
<td>56.2</td>
<td>33.5</td>
<td>10.3</td>
</tr>
<tr>
<td>Living Arrangements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 person</td>
<td>110</td>
<td>4.16 ± 3.40</td>
<td>29.1</td>
<td>48.2</td>
<td>22.7</td>
</tr>
<tr>
<td>2 people</td>
<td>257</td>
<td>2.69 ± 2.84</td>
<td>59.5</td>
<td>29.2</td>
<td>11.3</td>
</tr>
<tr>
<td>3+ people</td>
<td>57</td>
<td>3.54 ± 3.13</td>
<td>47.4</td>
<td>29.8</td>
<td>22.8</td>
</tr>
<tr>
<td>Income&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;125% poverty</td>
<td>57</td>
<td>5.93 ± 4.33</td>
<td>22.8</td>
<td>37.7</td>
<td>58.0</td>
</tr>
<tr>
<td>&lt;185% poverty</td>
<td>53</td>
<td>3.93 ± 3.14</td>
<td>38.6</td>
<td>39.6</td>
<td>31.5</td>
</tr>
<tr>
<td>&gt;185% poverty</td>
<td>238</td>
<td>2.54 ± 2.36</td>
<td>38.6</td>
<td>22.6</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Note:  
<sup>a</sup>0-2 points  
<sup>b</sup>3-5 points  
<sup>c</sup>6+ points  
<sup>d</sup>See Appendix F for poverty guidelines
Figure 4: Distribution of Nutritional Risk Score in each Race

Nutritional Risk Score

- White
- Minorities
than a high school education was 6.0 compared to college educated individuals who had a mean score of 2.56. As seen in Figure 5, a higher percentage (48.3%) of the lower educated respondents were at high risk compared to the higher educated groups (10.3% to 16.4%).

A higher mean score and percentage at risk was seen in households containing one (4.16) or three or more (3.54) compared to a two person household (2.69). In accordance with the correlation findings, mean risk scores progressively increased from 2.54 to 5.93 as income decreased. Of the respondents with an income less than 125% of poverty, 38.6% of them were at high risk (see Figure 6) compared to 10.5% of the higher income groups.

**Inferential Findings**

This study utilized inferential statistics to determine significant relationships and to estimate the generalizability of the findings from the data analysis to the larger population from which the sample was selected. Tests of statistical significance, such as the chi square independence test, were used to examine the relationship among the variables to determine if there was an association or statistical dependence between two variables. These procedures also tested the null hypothesis that two variables were not associated and enabled this researcher to decide
Figure 5. Percentage of Nutritional Risk Scores in Various Educational Levels

Nutritional Risk Score

- K-8
- High School
- College
Figure 6. Percent Distribution of Nutritional Risk Score in Various Income Levels

Note: §81 missing responses to income question

- ■ <125% Poverty
- □ <185% Poverty
- □ >185% Poverty
whether to reject the null hypotheses established for this study.

To meet the required assumptions that all expected frequencies were at least one with a maximum of 20% of the frequencies less than five, several of the demographic categories had to be consolidated from the original questionnaire. For example, the income, education and living arrangement questions were recoded to three categories. In the following section, the results of chi square analysis between the nutritional risk factors and the demographics and between the nutritional risk score and the risk factors will be reviewed.

**Relationship between Demographics, Risk Factors and Risk Score**

For each risk factor, significant relationships between the demographics and risk score will be discussed. These relationships were determined by chi square analysis in Table 8 and the percentage of "yes" responses to risk factors in Table 9. Unless otherwise indicated, the references to chi squares are shown in Table 8 and percentages in Table 9.

**Illness negatively affecting food intake.**

Chi square analysis indicated that non-whites were more apt \( (x^2=4.07, \ df \ 1, \ p<.05) \) to have an illness affecting food intake than whites. In this sample, 66.7% of the non-whites answered "yes" to this question compared to 42.6% of the whites. \( \text{Chi square analysis also revealed an association between risk and the number of people who lived in the} \)
Table 8

Association Between Nutritional Risk Factors and Demographics

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Demographics</th>
<th>Living Arrangement</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age DF x²</td>
<td>Gender DF x²</td>
<td>Race DF x²</td>
</tr>
<tr>
<td>Illness Affecting Intake</td>
<td>3 3.07 1</td>
<td>0.22 1</td>
<td>4.07* 2</td>
</tr>
<tr>
<td>&lt;2 Meals/Day</td>
<td>3 3.51 1</td>
<td>0.00 1</td>
<td>21.46*** 2</td>
</tr>
<tr>
<td>Few Fruits, Vegetables and Milk</td>
<td>3 0.55 1</td>
<td>0.46 1</td>
<td>8.66** 2</td>
</tr>
<tr>
<td>3 or more Alcohol Drinks/Day</td>
<td>3 4.27 1</td>
<td>5.26* 1</td>
<td>0.77 2</td>
</tr>
<tr>
<td>Tooth or Mouth Problems</td>
<td>3 5.17 1</td>
<td>0.43 1</td>
<td>16.68*** 2</td>
</tr>
<tr>
<td>Not Enough Money</td>
<td>3 4.54 1</td>
<td>0.28 1</td>
<td>7.13** 2</td>
</tr>
<tr>
<td>Usually Eat Alone</td>
<td>3 55.77***</td>
<td>1.42 1</td>
<td>0.11 2</td>
</tr>
<tr>
<td>3 Drugs/Day</td>
<td>3 10.17* 1</td>
<td>5.88* 1</td>
<td>0.63 2</td>
</tr>
<tr>
<td>10 lb Weight Change in 6 mo</td>
<td>3 1.86 1</td>
<td>6.19* 1</td>
<td>9.69** 2</td>
</tr>
<tr>
<td>Difficulty with Shopping/Cooking</td>
<td>3 28.36***</td>
<td>8.55** 1</td>
<td>3.12 2</td>
</tr>
</tbody>
</table>

Note: *P<.05  **P<.01  ***P<.001
### Table 9

**Relationship Between Percent of “Yes” Responses for Each Risk Factor and the Sample Demographics**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>% Gender</th>
<th>% Age (years)</th>
<th>% Race</th>
<th>% Education</th>
<th>% Living Arrangements</th>
<th>% Poverty Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Sample</td>
<td>Male</td>
<td>Female</td>
<td>60-64</td>
<td>65-74</td>
<td>75-84</td>
</tr>
<tr>
<td>Illness (N=187)</td>
<td>43.6</td>
<td>41.8</td>
<td>44.3</td>
<td>45.9</td>
<td>45.0</td>
<td>43.6</td>
</tr>
<tr>
<td>&lt;2 Meals/Day (N=14)</td>
<td>3.3</td>
<td>3.3</td>
<td>3.2</td>
<td>4.1</td>
<td>4.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Few Fruits, Veg, &amp; Milk (N=148)</td>
<td>34.4</td>
<td>36.9</td>
<td>33.4</td>
<td>34.4</td>
<td>33.7</td>
<td>36.2</td>
</tr>
<tr>
<td>2-3 Alcohol Drinks /day (N=17)</td>
<td>4.0</td>
<td>7.4*</td>
<td>2.6</td>
<td>6.6</td>
<td>3.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Tooth/ Mouth Problems (N=34)</td>
<td>7.9</td>
<td>6.6</td>
<td>8.4</td>
<td>3.3</td>
<td>9.9</td>
<td>9.6</td>
</tr>
<tr>
<td>Not Enough Money (N=29)</td>
<td>6.8</td>
<td>5.7</td>
<td>7.2</td>
<td>3.3</td>
<td>7.7</td>
<td>7.4</td>
</tr>
<tr>
<td>Eat Alone (N=105)</td>
<td>24.4</td>
<td>20.5</td>
<td>26.0</td>
<td>11.5</td>
<td>17.7</td>
<td>40.4</td>
</tr>
<tr>
<td>2-3 Meds/day (N=112)</td>
<td>30.7</td>
<td>22.1</td>
<td>34.1*</td>
<td>33.6</td>
<td>23.2</td>
<td>37.2</td>
</tr>
<tr>
<td>10 lb Wgt Chg (N=60)</td>
<td>14</td>
<td>7.4</td>
<td>16.6*</td>
<td>17.4</td>
<td>12.7</td>
<td>13.8</td>
</tr>
<tr>
<td>Diffi- culty w/Shop. (N=43)</td>
<td>10</td>
<td>3.3</td>
<td>12.7**</td>
<td>4.1</td>
<td>8.3</td>
<td>12.8</td>
</tr>
</tbody>
</table>

Note: *P<.05  **P<.01  ***P<.001
respondents household. Illness affecting food intake was more likely ($x^2=6.15$, df 2, $P<.05$) to occur as household size increased, especially in households with over three members. The incidence of "yes" responses by respondents from one, two or three or more per household to this question increased from 39.6% to 42.4% to 58.6% respectively.

Although no other significant relationships between this risk factor and the demographics were demonstrated, the percent "yes" responses in the age category yielded some interesting results. For example, one might assume the incidence of illness affecting intake would increase with age, but it actually decreased with age in this sample as seen in Table 9. The incidence ranged from 43.6% to 45.9% between the ages of 60 to 84 then dropped to 29.0% over 85 years of age.

**Intake of less than two meals per day.**

Chi square analysis again revealed a significant relationship between this risk factor and non-whites who were more likely ($x^2=21.46$, df 1, $P<.001$) than whites to eat fewer than two meals per day. Of the non-whites in the sample, 22.2% responded that they consumed fewer than two meals per day compared to 2.4% of the whites. A significant relationship was not found in this study between living alone and consuming less than two meals per day.

However, a significant relationship was found between income and meal consumption. The lower income respondents were more likely ($x^2=7.14$, df 2, $P<.05$) to consume less than
two meals per day than the higher income participants. The percentage of "yes" response to this question ranged from 7.0% to 7.5% in income groups below 185% poverty level but decreased to 1.7% in groups above 185% of the poverty level. No other significant relationships between this risk factor and the demographics were found.

Inadequate consumption of fruits, vegetables or milk products.

Significant associations were found between a perceived inadequate consumption of fruits, vegetables or milk products and race, education and income. Non-whites were more likely (\(x^2=8.66, \text{df} 1, P<.01\)) to encounter this risk factor with 66.7% of the non-whites answering "yes" to this question compared to 33% of whites. Respondents with less education were also more likely (\(x^2=19.84, \text{df} 2, P<.001\)) to consume few fruits, vegetables and milk products.

As educational level decreased, the percent "yes" response to this Checklist question increased. For example, 66.7% of the respondents with less than a high school education answered "yes" compared to 26.8% of the college educated participants. Respondents with an income below 125% of the poverty level were more likely (\(x^2=15.54, \text{df} 2, P<.001\)) to experience this risk factor with a progressive increase in "yes" responses (from 30.1% to 57.9%) as income dropped.

Intake of three or more drinks per day.

Chi square analysis indicated that a significant
relationship exists only between alcohol consumption and
gender in this sample. Males are more likely \((x^2=5.26, \text{ df } 1,\) 
\(P<.05)\) to have three or more drinks per day than females. Of
this sample, 7.4\% of the males answered "yes" to this question
as opposed to 2.6\% of the females. No other significant
relationships were found between this risk factor and the
demographics.

**Tooth or mouth problems affecting food intake.**

An association was found between tooth or mouth problems
and race, education and income. Chi square analysis revealed
that non-whites are more likely \((x^2=16.68, \text{ df } 1, \ P<.001)\) to
have tooth or mouth problems affecting food intake than
whites. Of the non-whites, 33.3\% experienced this risk factor
compared to 6.8\% of the whites. Lower educated respondents
were also more likely \((x^2=10.41, \text{ df } 2, \ P<.01)\) to encounter
this risk factor. Consequently, as education decreased, the
occurrence of the risk factor increased. Only 4.4\% of the
college educated respondents reported tooth or mouth problems
as opposed to 20\% of the participants with less than a high
school education.

An association \((x^2=15.40, \text{ df } 2, \ P<.001)\) between lower
income and tooth or mouth problems was found by chi square
analysis. An increased incidence of this problem occurred
among the lower income groups (17.5\%) compared to incomes over
185\% of poverty (4.6\%). Although tooth or mouth problems
might be expected to increase with age, this study did not find a significant relationship between these two variables.

Lack of money to buy food.

As expected, Chi square analysis indicated a highly significant relationship between inadequate funds to buy food and income level. In addition, an association was found between this risk factor and race, education and number of individuals living in the respondents household. Respondents with a progressively lower income were more likely ($x^2=36.44$, df 2, $P<.001$) to have a difficulty affording food. Only 2.5% of respondents with an income over 185% of poverty reported a problem with this risk factor compared to 24.6% of the individuals below 125% of the poverty level.

Similarly, difficulty buying food and educational level demonstrated the same pattern as income level. Respondents with lower education were more apt ($x^2=31.99$, df 2, $P<.001$) to report problems with food purchasing than the higher educated respondents. This was demonstrated in Table 9 where 2.5% of the college educated reported a problem with this risk factor as opposed to 30% of the respondents with the lowest education, particularly those with less than a high school education.

The probability of problems with this risk factor was higher ($x^2=7.13$, df 1, $P<.01$) among non-whites with 22.2% answering "yes" to this question compared to 6.1% of whites. Finally, households with one or three or more persons were
more prone ($x^2=8.80$, df 2, $P<.05$) to food purchasing problems than two-person households.

*Usually eat meals alone.*

Chi square analysis indicated that 64.5% of respondents over 85 years of age consumed meals alone compared to 11.5% in the 60 to 64 age group. As age increased, respondents were more likely ($x^2=55.77$, df 3, $P<.001$) to dine alone. An association between this risk factor was also found with living arrangements. Respondents who lived alone were much more likely to dine alone ($x^2=283.75$, df 2, $P<.001$) and it occurred with 83.0% of this group compared to 3.4% to 3.5% of the larger household sizes.

The relationship between income and eating alone was consistent with the same pattern that has evolved with the other risk factors. In other words, respondents in the lowest income group were more apt ($x^2=39.50$, df 2, $P<.001$) to eat alone than the higher income groups. Almost half (47.4%) of the respondents in the lowest income groups ate alone as opposed to 15.1% of the highest income group.

*Three or more prescribed or over-the-counter drugs per day.*

Chi square analysis indicated a significant relationship ($x^2=10.17$, df 3, $P<.05$) between age and use of multiple medications. In this sample, the highest use of medications was found in respondents who are 75 years of age or older and it was also more likely ($x^2=5.88$, df 1, $P<.05$) to occur with
females than with males. Of the females, 34.1% of them answered "yes" to this question compared to 22.1% of the males. No significant relationships were found between this risk factor and race, education, household size or income. However, in this sample, more multiple medication use tended to occur among respondents who were white, higher educated or in one-person households.

Involuntary weight loss or gain of ten pounds in six months.

The demographics most associated with involuntary weight loss or gain included income, race, education and gender. Again, the pattern of increased risk with lower income and lower educated respondents applied as well to this risk factor. Chi square analysis revealed that lower income respondents were more likely ($x^2=19.89, \, \text{df} \, 2, \, P<.001$) to encounter this problem than higher income individuals. In the lower income (less than 125% of poverty) group, 33.3% answered "yes" to this question, while an affirmative response was given by 10.1% of the higher income group.

As educational level decreased, the prevalence of this risk factor increased ($x^2=7.93, \, \text{df} \, 2, \, P<.05$). Of the lowest educated respondents, 26.7% of them encountered this problem as opposed to 9.8% of the college educated respondents. Although involuntary weight loss or gain was found in 12.9% of the whites, a higher percentage (38.9%) was seen in non-whites ($x^2=9.69, \, \text{df} \, 1, \, P<.01$). Finally, chi square analysis
indicated females were more prone \( (x^2 = 6.19, \text{df} \ 1, \ P < .05) \) to this risk factor than males and it occurred with 16.6\% of females compared to 7.4\% of the males.

**Difficulty with shopping and/or cooking.**

Chi square analysis indicated an association between difficulty with shopping and cooking and gender, age, education and income. Females were more likely \( (x^2 = 8.55, \text{df} \ 1, \ P < .01) \) to experience this risk factor than males. In the sample, 12.7\% of the females reported a problem with shopping or cooking compared with 3.3\% of the males. As age increased, respondents were more inclined \( (x^2 = 28.4, \text{df} \ 3, \ P < .001) \) to have difficulty with this risk factor. Of the 85 and older respondents, 35.5\% answered "yes" to this question versus 4.1\% of the 60 to 64 age group.

Again, respondents with progressively lower education and/or income were more susceptible \( (x^2 = 22.19, \text{df} \ 2, \ P < .001) \) to a problem with shopping or cooking. Although 5.9\% of the college educated respondents reported a problem with shopping and cooking, a higher percentage (33.3\%) was found in the lower educated participants. Similarly, as income decreased, the prevalence \( (x^2 = 28.48, \text{df} \ 2, \ P < .001) \) of this risk factor increased. The frequency of "yes" responses increased from 5\% of the respondents in the highest income group to 28.1\% of the respondents in the lowest income group.
Association Between the Risk Factors and the High and Moderate Nutritional Risk Groups

Table 10 revealed a number of interesting findings between each risk factor and the risk score category of the respondents who answered "yes" to the risk factor. Data was ranked to indicate which risk factors were most associated with high and moderate risk and provided some illuminating and helpful information, especially for future program planning.

First, the risk factors of not having enough money to buy food, consuming less than two meals per day, difficulty with shopping and cooking, and tooth or mouth problems affecting food intake were most associated with the high nutritional risk group. Of this group, 92.9% did not have enough money to buy food, 85.7% ate less than two meals per day, 67.4% had difficulty with shopping and 57.6% had tooth or mouth problems.

Secondly, the risk factors of taking multiple medications, having an illness that affected food intake, eating most meals alone and consuming few fruits, vegetables or milk products were most associated with the moderate nutritional risk group. Although greater than three drinks per day had a high association with moderate risk, it was not found to be statistically associated with nutritional risk in this study. However, the data may not represent the true consumption of alcohol in this population as previously discussed. Of the moderate risk group, 55.3% were taking
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>N</th>
<th>DF</th>
<th>X^2</th>
<th>% Risk Score</th>
<th>High Risk</th>
<th>Mod. Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>low</td>
<td>moderate</td>
<td>high</td>
</tr>
<tr>
<td>Illness</td>
<td>187</td>
<td>2</td>
<td>131.02***</td>
<td>19.9</td>
<td>49.5</td>
<td>30.6</td>
</tr>
<tr>
<td>&lt;2 meals/day</td>
<td>14</td>
<td>2</td>
<td>54.17**</td>
<td>-</td>
<td>14.3</td>
<td>85.7</td>
</tr>
<tr>
<td>Few fruits, veg., milk</td>
<td>148</td>
<td>2</td>
<td>110.16***</td>
<td>20.0</td>
<td>42.8</td>
<td>37.2</td>
</tr>
<tr>
<td>≥3 alcohol drinks</td>
<td>17</td>
<td>2</td>
<td>5.55</td>
<td>23.5</td>
<td>47.1</td>
<td>29.4</td>
</tr>
<tr>
<td>Tooth/mouth problems</td>
<td>34</td>
<td>2</td>
<td>49.26**</td>
<td>15.2</td>
<td>27.3</td>
<td>57.6</td>
</tr>
<tr>
<td>Not enough money</td>
<td>29</td>
<td>2</td>
<td>135.15***</td>
<td>-</td>
<td>7.1</td>
<td>92.9</td>
</tr>
<tr>
<td>Usually eat alone</td>
<td>105</td>
<td>2</td>
<td>47.95***</td>
<td>21.4</td>
<td>49.5</td>
<td>29.1</td>
</tr>
<tr>
<td>Multiple medications</td>
<td>132</td>
<td>2</td>
<td>83.11***</td>
<td>17.4</td>
<td>55.3</td>
<td>27.3</td>
</tr>
<tr>
<td>10 lb weight change</td>
<td>60</td>
<td>2</td>
<td>78.07***</td>
<td>8.3</td>
<td>41.7</td>
<td>50.0</td>
</tr>
<tr>
<td>Difficulty shop/cook</td>
<td>43</td>
<td>2</td>
<td>100.47***</td>
<td>7.0</td>
<td>25.6</td>
<td>67.4</td>
</tr>
</tbody>
</table>

Note: *p < .05  **p < .01  ***p < .001
multiple medications, 49.5% usually ate meals alone and had an illness that affected food intake and 42.8% consumed few fruits, vegetables or milk products.

**Introduction to Discussion**

In this portion of the chapter, the findings of the study are discussed. Data analysis revealed some important relationships between the risk factors, risk score and demographic characteristics of the sample. Of particular importance to the meaning of the data are the demographic characteristics of the high risk population and the potential interrelationships among the risk factors and demographic variables. As previously discussed, the physical and psychosocial effects of aging combined with lifestyle habits are interrelated and cumulatively may increase nutritional risk. For example, multiple nutritional risk factors may result from financial constraints as seen in the high nutritional risk group.

The risk factors that were found to be most associated with nutritional risk are discussed and compared to other studies that have utilized the Checklist. Data analysis has provided an understanding of the relative importance of each risk factor in relation to demographic characteristics of the sample and in their contribution to nutritional risk among older adults. Finally, the implications to the larger
population of the findings for nutritional screening and nutritional intervention are presented.

**Demographics**

The demographic profile of the sample indicated the majority of respondents were female. A comparison of 1990 census data for Monroe County to this study in Figure 7 indicates the study sample had 12% more females than the census data. This study may have had a higher percentage of women because less women traditionally work outside the home than men which may have resulted in more women answering the phone, particularly in households where the male spouse has not retired.

However, the age of the respondents was quite representative of the census data as displayed in Figure 8. A slightly lower percentage of the 75 and older age group and a higher percentage of the 60 to 64 age group in the study sample compared to the census data may have been due to the exclusion of institutionalized older adults in this study. The distribution of race was also reflective of the census as seen in Figure 9.

The census data indicated 95% of the 60 and older age group are white while the study sample was 96% white. The 1% difference may indicate less non-whites have phones or a higher amount of them were included in the incomplete survey group (due to refusals, no answers, disconnected numbers,
Figure 7. Gender of Study Sample Compared to 1990 Census Data

Study Sample

1990 Census

Male
Female

%
moved from household or unlisted). The majority of the non-white sample was African Americans (3%) compared to 4% of African Americans in the census.

Another similarity to the census data was found with the number of respondents at the poverty level (less than 100%) as seen in Figure 10. In the study sample, 5.1% of the respondents were under 100% of the poverty level versus 6.7% of the census data. However, the census data was grouped for individuals over the age of 65 which may have accounted for the increased poverty. In addition, the slightly lower poverty level in the study sample may be due to the possibility of less phone usage among lower socioeconomic groups. However, it does not appear to be a significant bias for this study.

Association Between the Nutritional Risk Score and the Demographics of the Sample

As seen in Table 6, the correlation coefficients revealed a strong association between low socioeconomic status, low educational attainment and non-whites with increased nutritional risk. These findings were consistent with other studies, particularly the strong association between income and nutritional status (Chernoff, 1991; Krondl et al., 1982 Lehmann, 1989; ADA, 1987a; and Ryan & Bower, 1989). Since income was the demographic variable most associated with risk, the null hypothesis was rejected. Although the
relationship between nutritional status and educational level was not as widely discussed in the literature as income. Lehmann’s (1989) review of the literature and several other articles indicated it was associated with increased nutritional risk (Davies, 1990; Zheng & Rosenberg, 1989).

Of particular concern is the interrelationship between income, education and race which was strongly associated with high nutritional risk. This association (P<.01), as seen in Figure 11, reveals a higher percentage of nonwhites (46.7%) had an income below 125% of the poverty level as opposed to whites (15%). In addition, a significant relationship (P<.001) was found between educational attainment and nonwhites with a much higher percentage of non-whites (38.9%) with an education less than high school compared to whites (5.6%). This data indicates the interrelationship among these demographic variables and highlights the increased risk level of low income non-whites.

Living arrangement was also correlated with nutritional risk indicating people who live alone are at higher nutritional risk. As previously mentioned, the relationship between living alone and nutritional status was controversial and inconsistent in the literature. Davis et al. (1990) and Ryan & Bower (1989) had found a relationship between living alone and caloric intake but not between living alone and poorer food choices. The criteria used for analysis may account for the discrepancy between this study and the
Figure 11. Income Status and Educational Attainment by Race

![Bar Chart]

Percentage of Sample in each Race

- < 125%: 15.0 Non White, 46.7 White
- > 185%: 33.3 Non White, 70.1 White
- K - 8: 5.6 Non White, 38.9 White
- College: 22.2 Non White, 48.8 White

Poverty Level vs. Education
findings from the other studies. They looked specifically at inadequate nutrient intake while the checklist estimated existing or potential nutritional problems.

As seen in Table 9, people who live alone are more likely to eat meals alone (P<.001) and to have difficulty affording food (P<.05). In accordance with the literature, this study found people who live alone are more likely to have lower incomes which may affect food availability. Since most of these respondents were at moderate risk, as seen in Table 10, nutrition screening may help to identify individuals who are socially isolated and to encourage them to participate in programs, such as senior nutrition programs, that provide social interaction as well as a nutritious meal.

The literature review indicated a lack of consensus among researchers regarding the effect of living alone on nutritional intake. However, this study found a significant relationship (P<.01) between consumption of fruits and vegetables and living alone. This finding may indicate a lack of variety due to financial constraints or lack of motivation to eat alone. Of the one-person households in the sample, 32.1% and 38.4% had only one serving of fruit and vegetables, respectively. In two-person homes, 16.0% and 24.1% of the respondents consumed one serving of fruits and vegetables, respectively. In addition, more people who live alone have no servings of fruit and vegetables compared to two-person households. Data analysis also revealed there are more whites
in one person households and more non-whites in households with three people.

It is interesting to note that a statistical association was not found between nutritional risk and age. However, Figure 12 demonstrates that there were fewer adults 75 and older in the low risk group and more in the moderate risk group compared to adults under 75 years of age. In the high risk group, there was a relatively even distribution of ages. which may indicate the heterogeneity of older adults. The literature consistently discussed the physiologic and psychosocial diversity found in this population. Therefore, the distribution of high risk among all age groups may reinforce the premise that chronological age cannot be used as a determinant of health status.

Although a statistical relationship was not found between gender and nutritional risk, Table 7 shows that females (3.3) had a higher mean risk score than males (2.8) and that more females (17.7%) received a high risk score than males (10.7%). The implication of this finding may be that the needs and circumstances of moderate and high risk females may require special attention.

The results of the T-Tests, which tested the null hypothesis that there was no difference among the demographic variables and their influence on risk, are presented in Table 11. These findings were consistent with correlational and chi square findings that a difference among the demographic
Table 11

Relationhip Between Demographic Subgroups and Risk Score using Group T-Tests

<table>
<thead>
<tr>
<th>Demographics</th>
<th>T value</th>
<th>DF</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White &amp; Non-whites</td>
<td>-4.96</td>
<td>425</td>
<td>.000***</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-8a &amp; Hsb</td>
<td>3.98</td>
<td>222</td>
<td>.000***</td>
</tr>
<tr>
<td>K-8 &amp; College</td>
<td>6.11</td>
<td>230</td>
<td>.000***</td>
</tr>
<tr>
<td>HS &amp; College</td>
<td>2.93</td>
<td>396</td>
<td>.004**</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;125% &amp; &lt;185%</td>
<td>2.76</td>
<td>108</td>
<td>.007**</td>
</tr>
<tr>
<td>&lt;125% &amp; &gt;185%</td>
<td>8.09</td>
<td>293</td>
<td>.000***</td>
</tr>
<tr>
<td>&lt;185% &amp; &gt;185%</td>
<td>3.63</td>
<td>289</td>
<td>.000***</td>
</tr>
<tr>
<td>Living Arrangements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 &amp; 2 people</td>
<td>4.28</td>
<td>365</td>
<td>.000***</td>
</tr>
<tr>
<td>1 &amp; 3 or more people</td>
<td>1.15</td>
<td>165</td>
<td>.253</td>
</tr>
<tr>
<td>2 &amp; 3 or more people</td>
<td>-2.01</td>
<td>312</td>
<td>.045*</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.12</td>
<td>425</td>
<td>.908</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-64 &amp; 65-74</td>
<td>-0.46</td>
<td>299</td>
<td>.647</td>
</tr>
<tr>
<td>60-64 &amp; 75-84</td>
<td>-1.31</td>
<td>213</td>
<td>.191</td>
</tr>
<tr>
<td>60-64 &amp; 85+</td>
<td>-1.60</td>
<td>150</td>
<td>.111</td>
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<tr>
<td>65-74 &amp; 75-84</td>
<td>-0.87</td>
<td>272</td>
<td>.383</td>
</tr>
<tr>
<td>65-74 &amp; 85+</td>
<td>-1.22</td>
<td>209</td>
<td>.224</td>
</tr>
<tr>
<td>75-84 &amp; 85+</td>
<td>-0.69</td>
<td>123</td>
<td>.493</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male &amp; Female</td>
<td>-1.52</td>
<td>425</td>
<td>.129</td>
</tr>
</tbody>
</table>

Note: *p < .05   **p < .01   ***p < .001

a Kindergarten thru 8th grade
b High School
variables does exist. For example, the T-test indicated non-whites are more apt ($P < .001$) to be at nutritional risk than whites. In addition, the lowest educated respondents were more likely ($P < .001$) to show nutritional risk than the higher educated respondents. Less of a difference, although still significant ($P < .01$), was found between high school and college educated respondents.

A similar relationship was found with income levels. The greatest difference ($P < .001$) was found between the lowest and highest income levels. In addition, the most significant difference ($P < .001$) was found between one and two person households. A difference was found between households with two or three or more individuals, but no difference was found between households with one and three or more individuals. This concurred with previous tests that one and three person households demonstrated higher nutritional risk.

**Risk factors Most Associated with the Risk Score**

As previously discussed, the top four risk factors most associated with high risk in this sample included not having enough money to buy food, consuming less than 2 meals per day, tooth or mouth problems affecting food intake and difficulty with grocery shopping and food preparation. The implication of these findings is that financial constraints may be the barrier to good nutritional status and that older adults in the high risk group may benefit primarily from affordable community health and social service programs. Programs that
provide financial assistance with dental care, food and shopping and affordable meals that allow for social interaction may be of particular value to the high risk group. Since high nutritional risk was found primarily in non-whites, individuals with lower education and/or income and in households with one or three or more individuals, programs should be targeted to older adults with these characteristics.

In addition, nutrition education may help to encourage older adults to consume regular meals and help find creative ways to prepare food (for example, cooking with less salt and fat). Since high nutritional risk was found among non-whites (see Table 9) more than whites, it is important to develop culturally specific programs that will be more adaptable to their background (for example, adapting recipes for foods commonly used by a particular race).

Moderate nutritional risk was most associated with taking multiple medications, illness affecting intake, consuming meals alone and few fruits, vegetables and milk products. These findings suggest that nutrition education and counselling on the nutrition management of certain diseases, potential drug-nutrient interactions and basic good nutrition may be of particular value to the moderate risk group. Therefore, it is imperative that medical nutrition therapy be included in basic health benefit packages and that physicians provide referrals as indicated to qualified nutrition professionals. In addition, adequate funding for programs,
such as Congregate Meals and Meals-on-Wheels, is necessary to provide meals and socialization for older adults.

In this study, the moderate risk group included both whites (33.7%) and non-whites (38.9%) and respondents at all income and educational levels. However, this risk category occurred more often in the older age groups (75 and older), at lower income levels and in one-person households. This finding indicates it is important to provide nutrition counselling when indicated and offer meal-programs to all older adults, particularly for the oldest age groups.

**Comparison of Risk Factors and Scores Among Various Surveys**

According to A. Coleman (Personal communication, June 1994) at the NSI Headquarters, no other Checklist study has been completed (that they are aware of) that has used a probability sample besides this study. Another researcher is attempting to do a small (about 70) probability sample using the Checklist but the study has not been completed. Coleman was interested in receiving the results of this study and has requested a copy of them. A number of Congregate Meal site programs have administered the survey which utilized relatively large convenience samples.

In Table 12, demographic data of the study sample was compared to available data from several congregate meal samples. The Nebraska and Washington Checklist studies included very large samples at congregate meal sites statewide while the Monroe County, N.Y. and Orange County, CA.
Table 12

Demographic Characteristics of Various Checklist Surveys

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Probability Sample</th>
<th>Convenience Samples (Congregate Meal Programs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monroe County, NY</td>
<td>Monroe County, NY (N=666)</td>
</tr>
<tr>
<td>Study Sample</td>
<td>(N=430)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>72%</td>
<td>72%</td>
</tr>
<tr>
<td>75+ years of age</td>
<td>29%</td>
<td>50%</td>
</tr>
<tr>
<td>White</td>
<td>96%</td>
<td>89%</td>
</tr>
<tr>
<td>Living alone</td>
<td>26%</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: 

a Respondents were 60 years of age or older

b Respondents were 55 years of age or older
Congregate meal site checklist surveys were administered only in these counties.

As seen in Table 12, the majority of respondents in all the surveys were females. Interestingly, the percentage of females (72%) were the same in the Monroe County study sample and congregate survey which may indicate more females attend the programs or they may be more willing to complete the survey. As expected, the congregate meal surveys had a higher percentage (50% to 58%) of respondents in the 75 and older age group than the study sample (29%) since retired older individuals were probably more likely to attend senior nutrition programs.

The study sample had a higher percentage of whites compared to the Monroe County congregate meal site survey which may attract a higher proportion of non-whites. Comparative data for living arrangement and income was available only from the Washington state Survey and educational information was not available from any of the survey publications. As expected with an older sample, the Washington State survey had a higher percentage (53%) of respondents who lived alone than the study sample (26%). Income data will not be compared since only one survey provided income data (Washington State) and the criteria used to assess income was not available.

Table 13 presents the frequency of "yes" responses among the surveys. Interestingly, the frequency of responses to
Table 13
Comparison of "Yes" Responses to Risk Factors Among Various Surveys

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>% Study Sample</th>
<th>% Monroe County</th>
<th>% Washington</th>
<th>% Orange County</th>
<th>% Nebraska</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness</td>
<td>43.5</td>
<td>34.6</td>
<td>24.3</td>
<td>33.7</td>
<td>25.9</td>
</tr>
<tr>
<td>&lt;2 meals/day</td>
<td>3.3</td>
<td>7.1</td>
<td>11.4</td>
<td>10.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Few fruits, vegetables, milk</td>
<td>34.4</td>
<td>17.7</td>
<td>22.9</td>
<td>47.7</td>
<td>15.7</td>
</tr>
<tr>
<td>&gt;3 alcohol drinks/day</td>
<td>4.0</td>
<td>-</td>
<td>2.5</td>
<td>3.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Tooth/mouth problems</td>
<td>7.9</td>
<td>8.1</td>
<td>9.8</td>
<td>13.7</td>
<td>6.3</td>
</tr>
<tr>
<td>Not enough money</td>
<td>6.7</td>
<td>6.7</td>
<td>10.6</td>
<td>7.8</td>
<td>4.8</td>
</tr>
<tr>
<td>Usually eat alone</td>
<td>24.4</td>
<td>45.1</td>
<td>40.5</td>
<td>41.7</td>
<td>28.7</td>
</tr>
<tr>
<td>≥3 medications</td>
<td>30.7</td>
<td>36.1</td>
<td>36.5</td>
<td>37.7</td>
<td>31.8</td>
</tr>
<tr>
<td>10 lb weight loss</td>
<td>14.0</td>
<td>15.9</td>
<td>12.3</td>
<td>16.7</td>
<td>11.2</td>
</tr>
<tr>
<td>Difficulty with shop/cook</td>
<td>10.0</td>
<td>8.5</td>
<td>14.6</td>
<td>21.9</td>
<td>7.8</td>
</tr>
</tbody>
</table>
illness affecting food intake was highest among the study sample. Since this study had a larger proportion of 60 to 74 year olds than the congregate meal surveys, this may indicate again that the prevalence of illness does not correlate with age and that it varies widely among a heterogeneous population. In addition, the percentage of respondents who had three or more drinks per day was highest (4.0%) among the study sample although the Orange County Congregate survey was not far behind at 3.7%. According to Chernoff (1991), approximately 32% of people over the age of 65 regularly drink and 6% of them are considered "heavy" drinkers (p.470). Thus, the lower than expected alcohol use among all the surveys may be due to reluctance to admit to drinking three or more drinks per day.

A lower percentage of the study sample consumed less than two meals per day (3.3%), usually ate alone (24.4%) or need to take three or more medications per day (30.7%) compared to the other surveys. The discrepancy may be due in part to the age difference between the study sample and the congregate meal samples. In this study, increased age was associated with multiple drugs use (P<.05) and eating alone (P<.001). Low income levels and non-whites were associated with eating less than two meals per day in the study sample. Since none of the other surveys had a higher proportion of non-whites, it is possible that these respondents had a lower income than the study sample.
In Table 14, the distribution of high risk scores among the various survey's are displayed. The lowest percentage of high risk older adults was found in the study sample. Again, a number of variables may be contributing to the higher percentages in the other surveys. Although income data was not available, it is possible the Orange County respondents had a higher percentage of poverty since they had the highest percentage of risk (29.8%).

The lack of association between age alone and risk is emphasized in Table 15 which provides a comparison of mean risk scores between the study sample and Washington State sample. Although the present study indicated a trend toward increased moderate risk with age, the highest mean risk level (4.2) was found in the 60 to 64 age group and the 65 to 74 (3.25) age group of the Washington survey. Because the Washington State survey was administered at congregate meal sites which tend to attract older non-working adults, it is possible that inability to work due to health problems in the younger group may account for part of the discrepancy. Both samples showed a significant increase in risk among non-whites and a slight increase in risk among females.

Relationship Between the Risk Factors, Demographics and Risk Score

In the last section of this chapter, the interrelationships between the risk factors, demographics and risk score will be summarized. The nutritional problems and
Table 14
Percent Distribution of High Risk Scores Among Various Surveys

<table>
<thead>
<tr>
<th>Survey</th>
<th>% at Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Sample</td>
<td>15.7</td>
</tr>
<tr>
<td>Monroe County Congregate</td>
<td>17.5</td>
</tr>
<tr>
<td>Orange County Congregate</td>
<td>29.8</td>
</tr>
<tr>
<td>Washington Congregate</td>
<td>20.6</td>
</tr>
</tbody>
</table>
Table 15
Comparison of Mean (±SD) Risk Scores

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Study Sample</th>
<th>Washington State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65</td>
<td>2.93 ± 2.87</td>
<td>4.24 ± 3.89</td>
</tr>
<tr>
<td>65-74</td>
<td>3.09 ± 3.29</td>
<td>3.25 ± 3.50</td>
</tr>
<tr>
<td>75-84</td>
<td>3.45 ± 2.91</td>
<td>3.03 ± 3.14</td>
</tr>
<tr>
<td>85+</td>
<td>3.87 ± 3.16</td>
<td>3.12 ± 3.05</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>3.03 ± 2.92</td>
<td>2.88 ± 3.09</td>
</tr>
<tr>
<td>Non-White</td>
<td>6.61 ± 4.59</td>
<td>5.59 ± 3.92</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.82 ± 2.48</td>
<td>3.20 ± 3.51</td>
</tr>
<tr>
<td>Female</td>
<td>3.32 ± 3.29</td>
<td>3.30 ± 3.33</td>
</tr>
</tbody>
</table>
relationship among the variables that are identified can be utilized in the development of nutrition screening and intervention programs.

**Illness affecting food intake**

Although this was the most prevalent risk factor among the sample, the findings are consistent with the incidence of nutrition-related diseases and conditions commonly seen in older adults. The importance of good nutrition in the prevention and treatment of certain diseases was frequently discussed in the literature. For example, if an older individual does not receive appropriate assistance with the nutritional management of cancer, the side effects of medications, such as nausea and vomiting, may increase the persons risk of malnutrition. Since this risk factor was so common in this sample, it should reinforce the need to include nutritional screening, nutrition intervention and third party reimbursement for nutrition services in health care programs for older adults.

Chi square analysis revealed significant relationships between illness affecting food intake and non-whites and living arrangements (see Table 8). Although whites still had a high percentage (42.6%) of illness, the non-whites had a higher percentage (66.7%). As previously discussed, the leading causes of death among the black population are diabetes mellitus, heart disease and stroke. The implication
of these findings indicate the need to provide culturally-specific programs for nutrition management of disease and health promotion/disease prevention that are designed to meet the needs and lifestyle of this population.

For example, Rebovich et al. (1990) developed a program for older black adults that included one hour of nutrition education and one hour of exercise conducted by dietetics and physiology students under faculty supervision. The clients received pre- and post-nutritional assessment (including laboratory values and anthropometrics) and culturally specific food practices, identified from diet histories, were incorporated into the intervention strategies. The meetings were held in a church which are "primary institutions among black elderly" (Rebovich et al., 1990, p.310C).

The completion rate was 82% and the clients reported that they enjoyed the program and learned new information and felt they would change their eating habits and exercise regularly. Rebovich et al. (1990) recommended that an effort should be made to conduct "outreach to medically underserved areas" and to offer it several times during the year (P.310C).

Chi square analysis also indicated that more respondents in households with three or more people (primarily) are more likely to have an illness that affects food intake. A possible explanation for the higher prevalence in this group may be that some older adult are being cared for by family.
Interestingly, less illness affecting intake was found in the older age groups compared to the younger age groups although this was not statistically significant. However, it may reflect once again the physiological diversity found in the older adult population.

Inadequate consumption of fruits, vegetables and milk products

As seen in Table 10, inadequate consumption of fruits, vegetables or milk products was most common with the moderate and high risk group indicating a significant number of older adults may benefit from nutrition education. Chi square analysis indicated non-whites, low educational attainment and low socioeconomic status was associated with this risk factor.

Data from NHANES I showed 50% of older adults with an income below the poverty level had an intake below 2/3 of the RDA on a number of vitamins. "The percentage of people with vitamin intakes below 2/3 of the RDA is reportedly substantial and is largely determined by economic and social status" (Zheng & Rosenberg, 1989, P.58).

A significant relationship was not found between living alone and inadequate consumption of fruits, vegetables and milk products. However, data provided by question 14 through 16 on the questionnaire provided further information on the number of servings of fruits, vegetables and milk products consumed by the respondents. For example, people who live alone were more likely (P<.01) to eat less fruit and vegetables. This finding may correlate with Davies (1990) who
found that socially isolated people had a diet with limited variety.

In addition, chi square analysis found a significant relationship (P<.01) between gender and servings of vegetables. Males are more likely to have no or 1 serving of vegetables while females are more apt to have 2 or 3 servings. Although no significant differences were found between age and fruit, vegetable and milk consumption, all ages tend to have limited amounts of milk products as seen in Figure 13.

This finding, which was also frequently discussed in the literature, may indicate the need to educate all older adults on the importance of adequate servings of these food groups, particularly milk products. Although respondents were not formally asked why they limited milk products, a number of them stated they were trying to cut down on fat and cholesterol. This indicated that some older adults may be limiting milk products rather than substituting lower fat choices such as skim milk.

Although a statistical relationship was not found between race and this risk factor, more non-whites tend to have no servings of fruit, vegetables and milk products than whites. Lower educated respondents were more apt to eat less fruit (P<.01), vegetables (P<.001) and milk (P<.01). Respondents in the lower income groups tended to eat less fruit (P<.01), vegetables (P<.05) and milk (P<.01) than the higher income group.
Figure 13. Servings of Milk by Age Group
Intake of less than two meals per day

Chi square analysis (see Table 10) revealed an inadequate intake of meals to be a common problem among the high risk group in particular. This finding indicated this risk factor was not a major concern among the lower risk groups and seemed to be associated primarily with low income respondents and non-whites. Routine nutrition screening and intervention may help to identify these individuals before they become malnourished. Intervention strategies that provide food assistance, such as food stamps, or encouragement to attend senior nutrition programs may be invaluable for this group. In this study, none of the low income non-white respondents had attended a senior nutrition program.

Intake of three or more drinks per day

Despite the low percentage of respondents who reported having three or more drinks per day, it was distributed among the low, moderate (primarily) and high risk groups. In particular, this study found an association between males and this risk factor. Nutrition screening may help to identify alcohol abusers and initiate rehabilitation and counseling on the dangers of excessive drinking. Alcohol may decrease food intake by displacing other nutrients and by suppressing appetite which can result in nutrient deficiencies. Early intervention may help to influence an older person to limit alcohol and to prevent potential effects of alcohol on the
body, such as cirrhosis, pancreatitis and gastritis which can further aggravate nutritional problems.

**Tooth or mouth problems affecting intake**

Tooth or mouth problems were reported by a relatively low number of respondents, but it appeared to be a significant problem for 57.6% of the high risk individuals. Since this risk factor was common among high risk respondents, an expected association between race, income and education resulted. The underlying problem seems to be financial constraints which may be preventing an older, primarily non-white, adult from obtaining dental care.

Surprisingly, this research did not find a statistical relationship between tooth and mouth problems and age. This finding may also reinforce another theme that has developed in this paper regarding the physiologic diversity found in the older adult population. Through nutrition screening, an older individual who has been identified with tooth and mouth problems can be directed to appropriate and affordable services.

**Lack of money to buy food**

The strong association between income and nutritional risk has been emphasized throughout this paper and in the literature review. Although a low percentage (6.7%) of the respondents reported a lack of money to buy food, it was extremely prevalent (92.9%) among the high risk group. Similar results were found in the Orange County congregate
meal survey. In this survey, 7.8% of the respondents reported difficulty with food purchasing and 70.2% of them were at moderate or high risk. An unexpected finding in this study was that only 24.6% of the respondents in the lowest income groups reported difficulty with food purchasing. However, this researcher also recalls a number of respondents who hesitated before saying "no" when asked about this risk factor so this may not be a true percentage. Possible explanations for this finding may be many people in this group were already receiving assistance or they are able to purchase food, but the quality and quantity may be questionable.

Of course, lack of income is not an easy problem to solve particularly in the clinical setting, but nutrition screening may help to direct an at-risk individual towards community-based services that can provide financial or food assistance. For example, with some encouragement and guidance, some older adults may decide to attend a senior nutrition program or apply for food stamps who otherwise may have not considered it.

As expected, the demographic variables that have regularly been associated with low income levels in this study, non-whites and low educational attainment were significant for this risk factor. In addition, respondents who lived alone or with more than three people were more likely (P<.001) to have difficulty affording food than individuals in households with two people. This finding was
not surprising since data analysis revealed a tendency for income to decrease as age increased.

**Usually eat meals alone**

This study found a relatively large number of respondents who reported eating meals alone with the majority of them at moderate risk. As expected, age and living arrangement were associated with this risk factor. More of the older respondents have probably lost spouses compared to the younger participants. People who live alone may have less opportunity to dine with others even if they are attending congregate meals programs regularly. However, some interaction may be better than none at all and nutrition screening can help to identify those individuals who may benefit from senior nutrition programs and other social activities.

Income was also associated with this risk factor and may be due in part to inability to afford social activities. This researcher recalls one respondent who lived alone and wanted to interact more with people, but she could not afford to participate in the activities with her friends. Nutrition intervention may convince an older adult, such as this respondent, to attend a senior nutrition program and meet new friends. The literature has discussed the potential physical, psychological and social benefits of interacting with other people. Despite limited evidence, many people would probably agree that social interaction is important and may help to encourage an older individual to eat regular nutritious meals.
Three or more prescription or over-the-counter drugs per day

The finding from this study that 31% of the sample was taking multiple medications was consistent with the literature. Chi square analysis found the highest use of medications among the 75 and older age group and females. This finding may indicate a need to pay special attention to females in the older age groups, particularly since they tend to have a relatively lower dietary intake. With increased medication, the risk of side effects increases which may affect appetite and result in anorexia or obesity, changes in taste, diarrhea and other problems that can affect nutritional status.

Involuntary weight loss or gain of ten pounds in six months

Although involuntary weight loss or gain was not as prevalent a risk factor as some of the others, it was more common among the moderate and high risk respondents. Again, income status may be an underlying problem here since low income may prevent an older adult from consuming adequate meals. In addition, females and non-whites were more likely to report a problem with involuntary weight loss or gain. These findings may indicate a need to monitor weight status closely with older individuals who fit the demographic characteristics.

Difficulty with shopping or cooking

Similarly, difficulty with shopping and cooking was not a common problem in general, although the majority (67.4%) of
the high risk group reported a problem with this risk factor. In particular, chi square analysis found an association between difficulty with shopping and cooking, women and increasing age. Only 4.0% of the 60 to 64 year olds reported a problem compared to 35.5% of the 85 and older age group.

These findings indicate that disability significantly contributes to nutritional risk as age increases which was consistent with the literature (Wahlqvist & Kouris, 1990; White et al., 1991). This author recalls one respondent who had difficulty shopping due to a disability and she did not have any help. Because the respondent shopped infrequently, she was not able to have a constant supply of fresh fruits, vegetables and dairy products and purchased more canned goods.

Routine nutrition screening and intervention may help to direct an at-risk individual such as this to the appropriate services. If shopping services are not widely available, this may be an area that needs further program development. Because low income and educational levels were also associated with this risk factor, it is also important that shopping services be affordable. Interestingly, of the non-whites who reported a problem with shopping and cooking, all of them were receiving help. Therefore, the individuals who may be receiving the least help are low income white females in all age groups.
Chapter 5

CONCLUSION

Summary

Differences between High and Moderate Nutritional Risk

In this study, a larger than expected number of respondents were at high nutritional risk. These respondents were more likely to experience risk factors that are probably a result of or aggravated by low income which was consistent with the literature. For example, over 90% of the high risk group stated they did not have enough money to buy food and 86% ate less than two meals per day. For future program planning, it is important to note the high risk respondents were more likely to be non-white, in the lowest income and educational levels and to live alone or with three or more people.

Difficulty with shopping and cooking was another risk factor common to this group and it was found more frequently among respondents who were female, 85 years of age or older and in the lowest income levels. Although a statistical relationship was not found, lack of assistance with shopping and cooking occurred more frequently with respondents who were female, white, in the lowest income groups and highest age groups and in one and two-person households. This study found more African Americans than whites were receiving help with shopping and cooking. It is possible more females reported
problems with this risk factor since, traditionally, they perform these duties more frequently than men and tend to outlive men.

In contrast, the data revealed that respondents in the moderate risk group were more likely to have risk factors that were related to disease, medications and inadequate diet. A higher frequency of eating alone and consuming few fruits, vegetables or milk products was found in this group. This data reinforces the need for adequate funding for programs, such as congregate meals, which provide nutritious meals, nutrition education and socialization. Demographic data indicates older adults in all age, race and income groups could benefit from these programs, and particularly low income individuals who are 75 years of age or older and in one-person households.

Throughout this report, the importance of nutritional management of certain diseases and potential drug-nutrient interactions has been emphasized and it is well documented in the literature. Of the 43% of the study sample who reported an illness that affected dietary intake, 34% of them were found to be at moderate nutritional risk. This data indicates the need to include medical nutrition therapy in health benefits so that costly health problems can be prevented or reduced and to improve the quality of life for older adults.

The lack third party reimbursement for nutrition services has been identified as the major barrier to routine nutrition
screening in Hartp's survey of over 750 health professionals. As previously discussed, 80% of these professionals support inclusion of nutrition screening and treatment in basic benefits packages. The literature reported that up to 85% of the older adult population has health problems that could benefit from nutrition intervention. If medical nutrition services are not included in basic health packages, many older adults will simply not be able to afford nutrition intervention. Without proper nutrition management of certain diseases, such as heart disease or diabetes mellitus, increased morbidity, expensive complications and surgical procedures may result.

As Rush (1993) emphasized, the effectiveness of nutrition screening and identification of individuals at risk will be questionable if appropriate intervention programs and services are not available. A collaborative effort between physicians, nutrition professionals and care givers is mandatory in order to establish screening and intervention programs. Examples of how this has been accomplished are provided in the NSI booklet, "Implementing Nutrition Screening and Intervention Strategies". Helpful information on how to incorporate nutrition screening in the community, acute care, ambulatory and long-term care setting is included in the booklet.

Frequency of "Yes" Responses to Nutrition Risk Factors

The frequency of "yes" responses to the risk factors provides interesting data on which factors were most common
among the study sample. Although responses from respondents included all risk score categories (low, moderate and high), the demographic data highlights with whom these factors are most likely to be found. It is important to note that some risk factors that were found to be low among the entire sample were strongly associated with the high risk group. For example, not having enough money to buy food or eating less than two meals per day was found in 7% and 3%, respectively, in the study sample versus 93% and 86% in the high risk group. These findings reinforce what has been discussed in the literature— that low socioeconomic status is highly correlated with nutritional risk.

Illness affecting intake was the most prevalent risk factor (43% of sample) followed by eating few fruits, vegetables and milk products (34%), taking three or more medications per day (31%), and usually eating meals alone (24%):

**Illness affecting food intake**

This risk factor was distributed among all age, race and income groups and educational levels. However, it was significantly associated with race and household size—illness tended to occur more frequently in non-whites and it was seen more in households with three or more people. The incidence of illness in one and two-person households was relatively similar, and it was not correlated with age. This data again reinforces the importance of reimbursable medical nutrition
therapy since heart disease, diabetes mellitus and stroke are the leading causes of death in African Americans.

**Eat few fruits, vegetables or milk products**

Respondents who were African American, in lower income and educational groups or lived alone were more likely to answer "yes" to this risk factor. It was a relatively common risk factor among both the moderate and high risk groups indicating the need to provide nutrition education not only to older adults, but to individuals of all ages. For example, certain lifelong nutritional habits can contribute to some of the nutritional problems found in older adults. This study found an alarming number (20% to 26%) of the sample were not consuming any milk products. Individuals who do not consume adequate servings of milk products, and particularly if this habit begins in childhood, may be at a higher risk for osteoporosis and bone fractures later in life. Nutrition education can help to convey the importance of substituting lower fat milk products for individuals who are concerned about their fat intake. Promoting good nutrition in children and young adults may impact their health and well-being later in life.

**Greater than three medications per day**

Multiple medication use was found in 31% of the sample, it was more likely to occur among females and it generally increased with age. It was found among all races and income levels and highlights the importance of including counselling
for potential drug-nutrient interactions by qualified health professionals.

**Usually eat alone**

As expected, eating meals alone was more apt to happen as age increased, income decreased and in one-person households. Although the effect of living alone on dietary intake was controversial in the literature, it seemed most researchers agreed social interaction has a positive effect on nutritional intake and supported congregate meal programs. The screening process may help to identify these individuals, encourage them to attend nutrition programs and decrease their risk of poor nutritional status.

**Significance**

As previously discussed, this research represents the only completed Checklist survey that has used a probability sample to date. These findings have provided important insight into the factors that may be contributing to nutritional risk in the older adult population. In addition, demographic data provided an understanding of where to target nutrition programs. Correlation and chi square analysis showed that individuals with low income and education levels, who are non-white and live in households with one or three or more people are more prone to high nutritional risk. Age was not correlated with nutritional risk, although it was significantly associated with eating meals alone and
difficulty with shopping and cooking. The different risk factors that were found to be common within each group (moderate risk, high risk individuals and the entire sample) helped to define which combination of risk factors contribute most to risk. Although this study has provided a general idea of which risk factors require further attention, any nutrition intervention must address each older adults particular needs and circumstances.

The issues highlighted from this study are being discussed with members of the Older Adult Nutrition Coalition which consists of nutrition professionals interested in improving nutrition programs. Meetings are being held to identify goals, objectives and action plans for various issues and to incorporate them into nutrition-related programs. For example, inadequate income was a common problem with the high risk group and low income seniors may avoid applying for food stamps due to the perceived hassle. A potential action identified by the committee is to work with the Department of Social Services to make the process easier. Another example is the falling participation in congregate meals programs with the goal to increase promotion of the program. In addition, the committee will be discussing ways to promote nutrition screening with physicians.

Limitations
Several possible limitations have been identified:
1. The sample contained 12% more women compared to the 1990 census which may result in a slight gender bias. However, age and race of the study respondents were representative of the Census.

2. Several statements in the Checklist were confusing for some respondents and may have affected the response to the statements.

3. The value of the Checklist has been questioned in the literature, but it seems to be generally recognized as an effective screening tool.

Recommendations

1. First and foremost, medical nutrition therapy (for all individuals) and nutrition screening for older adults must be included in basic health benefit packages so patients will be more likely to pursue nutrition intervention when indicated. Most health professional believe and cost benefit studies have shown that health care dollars can be saved by appropriate and timely nutrition intervention. Cost/benefit documentation must become a priority for nutrition professionals to provide evidence that nutrition services save health care dollars and should be presented to health care administrators and insurance companies. Local dietetic associations can assist with the development of cost/benefit studies and provide grassroots support. The American Dietetic Association is actively promoting the inclusion of medical nutrition therapy
in basic health care, but support from nutrition professionals and other health professionals, especially physicians, is vital.

2. Provide adequate funding for and marketing of nutrition programs, such as congregate meals, meals-on-wheels, food stamps and shopping services. In addition, the application process must be convenient and simple so that it will not be perceived as a "hassle". The Older Adult Coalition is now discussing the possibility of providing information for physicians to give their patients when nutrition risk is identified.

3. In order to gain a more comprehensive understanding of the nutritional problems and requirements of older adults, further research must be conducted. This research will help to identify nutrition services that will most effectively meet the needs of this population. In particular, more data is needed in the following areas as recommended by the Surgeon General (USDHHS, 1988):
   a. Nutrient and energy requirements
   b. Effects of deficiencies and excesses of nutrients on longevity and morbidity.
   c. Interrelationships between the environment, lifestyle habits and nutritional status.
   d. Education methods and programs designs that are shown to promote adequate dietary intake.
e. Effective programs designed to identify older adults at nutritional risk and to monitor nutritional status over time.

The surgeon General also recommends the development of alternative educational methods that consider different life-styles, cultural backgrounds and learning styles and vision and hearing problems of high risk older adults. Since many of these individuals are from low socioeconomic backgrounds, discussion groups at housing projects or churches may be most effective (Ryan & Bower, 1989). Older adults in the high risk groups may benefit most from programs that offer financial assistance with food and dental work, affordable meals and guidance with food shopping. For example, supermarket tours for low income older adults may help them to plan more nutritious meals within their budget.

4. Davies and Knutson (1991) also offered some recommendations for nutrition professionals which are quite similar to what the Older Adult Nutrition Coalition is doing with this study.

   a. Identify risk factors within the community and target groups and individuals who are at high nutritional risk.

   b. Establish appropriate priorities to meet the needs of older adults (medical, public health, nutrition or social services).
c. Define indicators of nutritional risk and develop a tool to assess them.

d. Provide simple techniques for assessment, reporting, implementation and reassessment.

e. Involve the media to educate the public.
REFERENCES CITED


*Nutrition Reviews, 50*(12), 421.


*Clinics in Laboratory Medicine, 13*(2), 433-453.


*Journal of the American Dietetic Association, 80*, 523-529.


*Medical Clinics of North America, 73*(6), 1531-1550.


APPENDIX A

Determine Your Nutritional Health Checklist
The Warning Signs of poor nutritional health are often overlooked. Use this checklist to find out if you or someone you know is at nutritional risk.

Read the statements below. Circle the number in the yes column for those that apply to you or someone you know. For each yes answer, score the number in the box. Total your nutritional score.

DETERMINE YOUR NUTRITIONAL HEALTH

YES

1. I have an illness or condition that made me change the kind and/or amount of food I eat.
2. I eat fewer than 2 meals per day.
3. I eat few fruits or vegetables, or milk products.
4. I have 3 or more drinks of beer, liquor or wine almost every day.
5. I have tooth or mouth problems that make it hard for me to eat.
6. I don’t always have enough money to buy the food I need.
7. I eat alone most of the time.
8. I take 3 or more different prescribed or over-the-counter drugs a day.
9. Without wanting to, I have lost or gained 10 pounds in the last 6 months.
10. I am not always physically able to shop, cook and/or feed myself.

TOTAL

Total Your Nutritional Score. If it’s 0-2 Good! Recheck your nutritional score in 6 months.

3-5 You are at moderate nutritional risk. See what can be done to improve your eating habits and lifestyle. Your office on aging, senior nutrition program, senior citizens center or health department can help. Recheck your nutritional score in 3 months.

6 or more You are at high nutritional risk. Bring this checklist the next time you see your doctor, dietitian or other qualified health or social service professional. Talk with them about any problems you may have. Ask for help to improve your nutritional health.

These materials developed and distributed by the Nutrition Screening Initiative, a project of:

AMERICAN ACADEMY OF FAMILY PHYSICIANS

THE AMERICAN DIETETIC ASSOCIATION

* NATIONAL COUNCIL ON THE AGING, INC.

Remember that warning signs suggest risk, but do not represent diagnosis of any condition. Turn the page to learn more about the Warning Signs of poor nutritional health.
APPENDIX B

Screen I
**Level 1 Screen**

**Body Weight**

Measure height to the nearest inch and weight to the nearest pound. Record the values below and mark them on the Body Mass Index (BMI) scale to the right. Then use a straight edge (ruler) to connect the two points and circle the spot where this straight line crosses the center line (body mass index). Record the number below.

Healthy older adults should have a BMI between 24 and 27.

Height (in): _____________
Weight (lbs): _____________
Body Mass Index: ___________ (number from center column)

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 <24
☐ Body mass index >27

For the remaining sections, please ask the individual which of the statements (if any) is true for him or her and place a check by each that applies.

**Eating Habits**

☐ Does not have enough food to eat each day
☐ Usually eats alone
☐ Does not eat anything on one or more days each month
☐ Has poor appetite
☐ Is on a special diet
☐ Eats vegetables two or fewer times daily
☐ Eats milk or milk products once or not at all daily
☐ Eats fruit or drinks fruit juice once or not at all daily
☐ Eats breads, cereals, pasta, rice, or other grains five or fewer times daily
☐ Has difficulty chewing or swallowing
☐ Has more than one alcoholic drink per day (if woman); more than two drinks per day (if man)
☐ Has pain in mouth, teeth, or gums
A physician should be contacted if the individual has gained or lost 10 pounds unexpectedly or without intending to during the past 6 months. A physician should also be notified if the individual's body mass index is above 27 or below 24.

Living Environment
- Lives on an income of less than $6000 per year (per individual in the household)
- Lives alone
- Is housebound
- Is concerned about home security
- Lives in a home with inadequate heating or cooling
- Does not have a stove and/or refrigerator
- Is unable or prefers not to spend money on food (<$25-30 per person spent on food each week)

Functional Status
Usually or always needs assistance with (check each that apply):
- Bathing
- Dressing
- Grooming
- Toileting
- Eating
- Walking or moving about
- Traveling (outside the home)
- Preparing food
- Shopping for food or other necessities

If you have checked one or more statements on this screen, the individual you have interviewed may be at risk for poor nutritional status. Please refer this individual to the appropriate health care or social service professional in your area. For example, a dietitian should be contacted for problems with selecting, preparing, or eating a healthy diet, or a dentist if the individual experiences pain or difficulty when chewing or swallowing.

Those individuals whose income, lifestyle, or functional status may endanger their nutritional and overall health should be referred to available community services: home-delivered meals, congregate meal programs, transportation services, counseling services (alcohol abuse, depression, bereavement, etc.), home health care agencies, day care programs, etc.

Please repeat this screen at least once each year—sooner if the individual has a major change in his or her health, income, immediate family (e.g., spouse dies), or functional status.

These materials developed by the Nutrition Screening Initiative.
APPENDIX C

Screen II
Level II Screen

Complete the following screen by interviewing the patient directly and/or by referring to the patient chart. If you do not routinely perform all of the described tests or ask all of the listed questions, please consider including them but do not be concerned if the entire screen is not completed. Please try to conduct a minimal screen on as many older patients as possible, and please try to collect serial measurements, which are extremely valuable in monitoring nutritional status. Please refer to the manual for additional information.

Anthropometrics

Measure height to the nearest inch and weight to the nearest pound. Record the values below and mark them on the Body Mass Index (BMI) scale to the right. Then use a straight edge (paper, ruler) to connect the two points and circle the spot where this straight line crosses the center line (body mass index). Record the number below; healthy older adults should have a BMI between 24 and 27; check the appropriate box to flag an abnormally high or low value.

Height (in): ____________
Weight (lbs): ____________
Body Mass Index (weight/height²): ____________

Please place a check by any statement regarding BMI and recent weight loss that is true for the patient.

☐ Body mass index <24
☐ Body mass index >27
☐ Has lost or gained 10 pounds (or more) of body weight in the past 6 months

Record the measurement of mid-arm circumference to the nearest 0.1 centimeter and of triceps skinfold to the nearest 2 millimeters.

Mid-Arm Circumference (cm): ____________
Triceps Skinfold (mm): ____________
Mid-Arm Muscle Circumference (cm): ____________

Refer to the table and check any abnormal values:

☐ Triceps skinfold <10th percentile
☐ Triceps skinfold >95th percentile

Note: mid-arm circumference (cm) - [0.314 x triceps skinfold (mm)] = mid-arm muscle circumference (cm)

For the remaining sections, please place a check by any statements that are true for the patient.

Laboratory Data

☐ Serum albumin below 3.5 g/dl
☐ Serum cholesterol below 160 mg/dl
☐ Serum cholesterol above 240 mg/dl

Drug Use

☐ Three or more prescription drugs, OTC medications, and/or vitamin/mineral supplements daily
Clinical Features

Presence of (check each that apply):

- Problems with mouth, teeth, or gums
- Difficulty chewing
- Difficulty swallowing
- Angular stomatitis
- Glossitis
- History of bone pain
- History of bone fractures
- Skin changes (dry, loose, nonspecific lesions, edema)

Eating Habits

- Does not have enough food to eat each day
- Usually eats alone
- Does not eat anything on one or more days each month
- Has poor appetite
- Is on a special diet
- Eats vegetables two or fewer times daily
- Eats milk or milk products once or not at all daily
- Eats fruit or drinks fruit juice once or not at all daily
- Eats breads, cereals, pasta, rice, or other grains five or fewer times daily
- Has more than one alcoholic drink per day (if woman); more than two drinks per day (if man)

Living Environment

- Lives on an income of less than $6000 per year (per individual in the household)
- Lives alone
- Is housebound
- Is concerned about home security

These materials developed by the Nutrition Screening Initiative.
APPENDIX D

Systematic Approach to Screening
SCHEMATIC- A PRACTICAL APPROACH TO NUTRITIONAL SCREENING

CHECKLIST
Completed by older person or caregiver

INCREASED RISK OF POOR NUTRITIONAL STATUS

SCREEN I
(Basic Nutrition Screen)
Completed by a social service or health care professional

Weight Change
Underweight

Refer to Physician

No nutritional problem but:
Functionally dependent
Poor socioeconomic circumstance

Consider Community Social Service & Health Programs

SCREEN II
(Includes Lab Work)
Completed by a health care professional in medical setting

Inadequate or inappropriate diet

Refer to Dietitian or Community Nutrition Program

IDENTIFY COMMON NUTRITIONAL PROBLEMS

Weight loss or underweight
Protein energy malnutrition
Osteoporosis
Vitamin D deficiency
Obesity
Hypercholesterolemia

Institute appropriate therapy/management
APPENDIX E

Questionnaire
Hello, my name is ___________ and I'm calling for the Monroe County Health Department. Recently, a letter was sent to your home informing you of a telephone nutrition study of Monroe County residents aged 60 or older and that you would be receiving a phone call. May I speak with someone aged 60 or older in the household?

Would you be willing to complete a confidential survey about your dietary habits which will take approximately 7 minutes? The information you provide is important because it will help local decision makers to better understand the nutritional needs of older adults.

The first section is from a national survey designed to learn about your nutrition. Please answer yes or no to the following statements.

1. I have an illness or condition that made me change the kind and/or amount of food I eat. (Score)
   1. Yes 2
   2. No 0

2. I eat fewer than 2 meals per day.
   1. Yes 3
   2. No 0

3. I eat few fruits or vegetables, or milk products.
   1. Yes 2
   2. No 0

4. I have 3 or more drinks of beer, liquor or wine almost every day.
   1. Yes 2
   2. No 0

5. I have tooth or mouth problems that make it hard for me to eat.
   1. Yes 2
   2. No 0

6. I don't always have enough money to buy the food I need.
   1. Yes 4
   2. No 0

7. I eat alone most of the time.
   1. Yes 1
   2. No 0
8. I take 3 or more different prescribed or over-the-counter drugs a day.
   1. Yes 1
   2. No 0

9. Without wanting to, I have lost or gained 10 pounds in the last 6 months.
   1. Yes 2
   2. No 0

10. I am not always physically able to shop, cook and/or feed myself.
    (Go to ques. 11) 1. Yes 2
    (Go to ques. 14) 2. No 0

11. Are you physically able to cook your own meals?
    1. Yes
    2. No

    If No:
    11. A. Does someone regularly prepare your meals at home?
        1. Yes
        2. No

12. Are you physically able to feed yourself?
    1. Yes
    2. No

    If No:
    12. A. Does someone regularly help to feed you?
        1. Yes
        2. No

13. Are you physically able to grocery shop?
    1. Yes
    2. No

    If No:
    13. A. Does someone regularly help you with grocery shopping?
        1. Yes
        2. No
14. On average, how many servings of fruit, including fruit juices, do you consume in a day?
   1. 1
   2. 2
   3. 3 or more
   4. none

15. On average, how many servings of vegetables, including vegetable juices, so you consume in a day?
   1. 1
   2. 2
   3. 3 or more
   4. none

16. On average, how many servings of milk and milk products, such as cheese and yogurt, do you consume in a day?
   1. 1
   2. 2
   3. 3 or more
   4. none

17. In the past month, have you gone to a senior center, adult day care, soup kitchen or other community program for a meal?
   1. Yes
   2. No

If Yes:
17. A. Have you had a meal at a senior center?
   1. Yes
   2. No
17. B. Have you had a meal at an adult day care program?
   1. Yes
   2. No

17. C. Have you had a meal at a soup kitchen?
   1. Yes
   2. No

17. D. How many days a week do you go to such programs for a meal?
   1. 1
   2. 2
   3. 3
   4. 4
   5. 5
   6. 6
   7. 7

18. Do you currently have meals delivered to your home?
   1. Yes
   2. No
   If Yes:

18. A. Who provides you with the most meals?
   1. Meals on wheels (program of Visiting Nurse Service)
   2. Club 24 "Helping Hands for Seniors"
   3. Family
   4. Friends/Neighbor
   5. Church
   6. Other ____________________
18B. How many days a week do you receive these meals?
1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7

18 C. If you receive meals on the weekend, which days are they delivered?
1. Saturday only
2. Sunday only
3. Both Saturday and Sunday

(Interviewer, circle the number next to answer or fill in the blank as indicated)

Since this study is anonymous, we are analyzing the data with general information, such as your age and educational level which I would like to ask you about now. This information will give us an understanding of the nutritional health of different kinds of people.

19. What is your Zip code? ____________________________

20. What is your Gender
1. Male
2. Female

21. What is your birthdate ____________________________

22. What is your race?
1. White
2. African American
3. Asian
4. American Indian
5. Alaskan Native
6. Other____________________

23. Are you of Hispanic origin?
1. Yes
2. No
24. What was the last year of school you completed?
1. Elementary (grades K-3)
2. Middle (grades 4-8)
3. High (grades 9-12) or GED
4. Some college
5. Undergraduate degree
6. Graduate or doctoral degree

25. How many people live in your household including yourself?
1. 1
2. 2
3. 3
4. 4
5. 5 or more

How many people does your combined income support? Please include retirement and social security funds and let me know when I've reached your income range.

26.

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<td>2. ≤ 100% of poverty</td>
<td>≤ 568, ≤ 6810</td>
<td>3. ≤ 125% of poverty</td>
<td>≤ 710, ≤ 8512</td>
<td>4. &lt;185% of poverty</td>
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<td>5. ≥ 185% of poverty</td>
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<td>2. ≤ 100% of poverty</td>
<td>≤ 964, ≤ 11,570</td>
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<td>≤ 1205, ≤ 14,463</td>
<td>4. &lt;185% of poverty</td>
<td>&lt; 1784, &lt; 21,405</td>
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Although I can't offer nutrition advice, if you'd like to find out about nutrition programs and services in Monroe County, please call The Office for the Aging between 9 AM and 2 PM Monday through Friday at 274-8181. This completes the survey. Thank you for your time and willingness to provide this information. Good-bye.
APPENDIX F

Poverty Guidelines
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<th>1992 Poverty Guidelines</th>
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<th>Annually</th>
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<td>2. ≤ 100% of poverty</td>
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<td>≥ 2884, 34,614</td>
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Poverty threshold for a family of 7 = 21,090, 8 = 23,470.
APPENDIX G

Survey Notification Letter
July 20, 1993

Dear Monroe County Resident:

You are one of over 600 people who has been randomly selected to participate in a Monroe County Health Department study of nutrition among adults aged 60 and older. Within the next month, a surveyor will contact you by phone and ask you to complete an anonymous nutrition survey which takes about seven minutes. The surveyor does not know your name or address. The only information she has is your phone number.

I'd like to ask you to participate in the survey. The information you provide, will help us identify the nutrition needs of our community. We will then be able to determine how to meet the needs.

Good nutrition plays an important role in preventing diseases and helps with recovery when an illness does strike. Those who are not well nourished tend to have to have longer hospital stays, and more health problems.

I hope that you will participate in this study and provide us with information that will be valuable to our community.

If you have any questions about the study, feel free to contact me at 274-8422.

Thank you.

Sincerely,

Anne Kern

Anne Kern, RD
Coordinator, Monroe County Nutrition Watch
APPENDIX H

RIT Approval of Study
TO: (Principal Investigator)  Susan Best and Ed Stockham

FROM: RIT Institutional Review Board

DATE:  6/2/93

Subject: "Nutrition Risk Assessment of Non-institutionalized Elderly in Monroe County"
(Project Title)

The Board has taken the following action on the above project request:

____ Exempt

X  Approved as Type I. Informed consent required for Types II, III, IV.

____ Deferred. Please submit following additional information or assurances promptly so Board can act on your request. Do not seek informed consent or involve human subjects until approved by Board.

____ Disapproved or suspended. You are free to resubmit with revisions, and to request a hearing with the Board.

Supporting Statement or Additional Requirements

Approval is premised on the modification of the proposal indicated in your memo of May 25, 1993. In particular, no individuals name will be reported to the Health Department.

If project is approved, you may proceed as described with the understanding that you will promptly report to the Board proposed modifications, unanticipated risks, or actual injury to human subjects. If the project extends more than 12 months and continues to involve the active participation of human subjects, it must be resubmitted to the Board within 12 months of the above date. If the approved project is RIT-initiated and involves the cooperation of subjects in other institutions, a statement from those institutions indicating appropriate review and approval relative to risk to human subjects must be received by the RIT Institutional Review Board prior to the participation of subjects in those institutions.

Inquiries about DHHS regulations or the RIT policy and procedures may be directed to any member of the Board.

John M. Waud
John M. Waud, Ph.D., Chairman
Institutional Review Board

cc: IRB Members