Nutritional Status, Eating Habits, and Nutrition Attitudes of Older Adults Relocating into a Personal Care Home

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Abstract

Relocation to a personal care home is a stressful experience and may occur at a traumatic moment in life. The effects of relocation to a PCH on nutritional status are unknown, yet under-nutrition is common among PCH residents. **Objectives:** To explore the effect of relocating to a PCH on the nutritional status, eating habits, and nutrition attitudes of adults aged 60 years and older. **Methods:** Fourteen Caucasian older adults (F = 57%) with a mean age of 83 years (SD = 9.79) consented to participate. Sixty-four percent of participants experienced inter-institutional relocation. Anthropometric, biochemical, clinical and dietary information was collected at Time Points A (2-3 months following relocation) and B (6-7 months following relocation) through face-to-face interviews, medical chart reviews and communications with nursing staff. **Results:** At Time B, cognitive function declined ($z = -2.185$, $p < .05$) and the number of medications prescribed increased ($z = -2.00$, $p < .05$). Levels of 25-hydroxyvitamin D were insufficient among 83% of participants at both time points. Mean serum albumin was 34.4 ± 7.2 g/L at Time B and the prevalence of nutritional risk increased from 57% to 77%. Dietary intake was inadequate according to Canada's Food Guide recommendations. Nutrition attitudes did not change. **Implications & Conclusions:** Six months following relocation, nutritional risk was more prevalent, with early evidence of possible protein-energy malnutrition. Nutritional inadequacies may result if dietary intakes do not improve. A collaborative approach is needed to assess environmental, psychosocial and nutritional factors

that contribute to poor dietary intake and will assist in the development of an intervention program.

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Dedication

This thesis is dedicated to the study participants. The people I interviewed all donated their time and experience in the hope that this research would help to make personal care homes better places to live for future generations of older adults.

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List of Abbreviations

ADL	Activities of Daily Living
BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
CFG	Canada's Food Guide
DRI	Dietary Reference Intake
EAR	Estimated Average Requirement
FFM	Fat Free Mass
FM	Fat Mass
GDS	Geriatric Depression Scale
GED	General Education Diploma
LTC	Long Term Care
MHCH	Mean Corpuscular Hemoglobin Concentration
MDS	Minimum Data Set
MMSE	Mini-Mental State Exam
MNA	Mini-Nutritional Assessment
MNA-SF	Mini-Nutritional Assessment Short Form
NHANES-III	Third National Health and Nutrition Examination Study
NHRS	Nutrition, Health and Relocation Survey
NHRS:IS	Nutrition, Health and Relocation Survey: Initial Screen
PCH	Personal Care Home
RSS	Relocation Stress Syndrome
SCREEN ©	Seniors in the Community: Risk Evaluation of Eating and Nutrition
SPSS	Statistical Package for the Social Sciences
TIBC	Total Iron Binding Capacity
WRHA	Winnipeg Regional Health Authority

CHAPTER ONE: INTRODUCTION

Study Rationale

Older adults are a rapidly growing segment of the population. As the number and proportion of older adults grow, it is to be expected that demand for personal care home (PCH) services will rise concurrently. Within Canada, the age group comprised of adults 80 years and older is the fastest growing segment of the population (Statistics Canada, 2007). This demographic also makes up the largest proportion of adults living in PCHs in the Winnipeg Regional Health Authority (WRHA) (Lamont, L., personal communication, July 7, 2008).

In later life, adults may relocate several times, each time to progressively more supportive housing. These moves occur for a number of reasons and often at difficult moments in an individual's life, such as after the death of a spouse or in response to declining functional ability. Thus, relocation, which is already a stressful event for any adult, becomes more so when the move is being made to a PCH. However, little is known about the effect of relocation to a PCH upon nutritional status. Previous studies have noted that relocated PCH residents experience an increase in falls, cognitive decline, and increases in salivary cortisol, depression, and functional dependency (Capezuti, Boltz, Renz, Hoffman, & Norman, 2006; Castle, 2004; Gallagher & Walker, 1990; Hodgson, Freedman, Granger, & Erno, 2004; Spasoff et al., 1978). These poor outcomes have the potential to reduce dietary intake, which could lead to further deterioration of overall health status.

Among Canadian PCH residents, the prevalence of undernutrition, the most common form of malnutrition among this population, ranges from 37-45% (Carrier, Ouellet, & West, 2007; Keller, 1993). The consequences of malnutrition can be dire. Inadequate vitamin status is linked to visual impairment, dementia, and certain types of cancer. Unintentional weight loss, an indicator of malnutrition, is associated with increased morbidity and mortality among PCH residents (Allard et al., 2004; Sullivan et al., 2002; Sullivan, Johnson, Bopp, & Roberson, 2004). As such, it is important to determine if relocation to a PCH results in any negative consequences to dietary intakes and nutritional status that could further impair the quality of life of residents.

As no previous studies have examined the impact of relocation on nutritional health, this study investigated the effect of relocation on the nutritional status, eating habits, and eating attitudes of older adults (individuals 60 years of age and older) who had recently moved into a PCH. The results of this exploratory pilot study may be used to develop a comprehensive study including a larger sample size comprised of residents residing in both urban and rural PCHs. The findings from this study and any future studies will begin to fill the gap in the literature existing in the area of relocation and nutritional status. Furthermore, the findings may be used practically, to assist in the development of intervention strategies to aid older adults in adapting to their new environment in order to maintain or improve their nutritional well-being. Health professionals may also utilize these strategies to encourage, support, and assist older adults in

developing their own adaptive mechanisms that will ultimately enhance their quality of life following relocation.

Objective

The objective of this study is to investigate the effect relocating to a personal care home on the nutritional status, nutrition attitudes, and eating habits of older adults.

Research Questions

Health and nutritional status are closely intertwined. Residents of PCHs, due to their poor health status, are frequently at risk of malnutrition and the serious health consequences that entails. This area of study leads to the following research questions:

1. What are the characteristics of newly admitted PCH residents with respect to:

    Cognitive status

    Depression

    Skin integrity

    Nutritional status

    Functional ability

    Nutrition attitudes and beliefs

    Quality of life, health, and lifestyle

    Eating habits

2. Do the above characteristics change six months after residents relocate to a PCH?

3. Is gender, age or nutritional status (when assessed with the MNA-SF) associated with changes in the above characteristics?

4. What are the characteristics of PCH residents six months post-relocation with respect to food service and adjustment to the new home?

These questions have not previously been addressed in the literature, making this study unique.

Summary

In this Chapter, a background to the importance of this study was presented. Chapter Two will provide further validation of the underlying principles guiding this project through a detailed literature review. As no information exists regarding the impact of relocation on nutritional status in PCHs, I have reviewed the following closely related fields to build a strong foundation for future work in this area: demographic trends, the physiological impact of age on nutrition needs, cognitive changes, geriatric depression, nutritional risk and malnutrition, health outcomes related to undernutrition, PCH dining service, relocation, and relocation stress syndrome (RSS). Chapter Three will present an overview of the methodology used in this study, including study design, participant selection, data collection techniques and statistical analysis. Chapter Four will feature the study results and Chapter Five will offer a discussion of the results presented by summarizing the major research findings and implications, as well as discussing the strengths and limitations of this project, and offering suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

Introduction

Due to declining birth rates and increasing longevity, the number and proportion of adults aged 65 years and older is expected to increase substantially across the globe in the twenty first century (Bond, Peace, Dittmann-Kohli, & Westerhof, 2007; World Health Organization, 2007). In Manitoba, the percentage of provincial residents over the age of 65 reached 14.1% in the 2006 census, which is higher than the national average of 13.7% (Statistics Canada, 2007). This growth is expected to accelerate in 2011, when the first baby boomers reach 65 years of age (Statistics Canada, 2007).

Increasing age is associated with increased likelihood of personal care home (PCH) residency as, within Manitoba, 5.6% of adults aged 65 and over reside in a PCH, while 23.9% of adults aged 85 and over reside in a PCH (Centre on Aging, 2005). Moving to a PCH is traumatic and can be accompanied by varying degrees of stress, which in turn cause physiologic changes (Jackson, Swanson, Hicks, Prokop, & Laughlin, 2000a) that may impact nutritional status. Furthermore, age-associated changes in nutritional needs result in the requirement that older adults consume a diet that contains fewer calories, but more nutrients, than the diet of a younger person. Maintaining a nutrient dense diet is a challenge for many older adults, but when combined with the physical vulnerability of frail older adults moving into PCHs, who are experiencing a considerable life change, it may become even more challenging. If the recently

relocated individual has difficulty adjusting to the new environment and develops anxiety, depression, changes in eating habits, or gastrointestinal disturbances, which are all symptoms of relocation stress syndrome (RSS), then that individual may experience a decline in nutritional status that could lead to further poor health outcomes.

Using the search engines PubMed, Ageline and CINAHL, no previous studies examining the impact of relocation on nutritional status were found. This review will instead examine the related literature on aging, nutritional risk, malnutrition, and their potential health outcomes, as well as PCH dining, institutional relocation, and relocation stress syndrome. This review will clarify the rationale behind our exploration of the effect of relocating to a PCH on the eating habits, nutrition attitudes and nutritional status of older adults (individuals 60 years of age and older).

Demographics

Since the industrial revolution, life expectancy has nearly doubled in Western countries from roughly 45 to 80 years and still shows no sign of slowing its rate of growth (Bond et al., 2007). As a consequence of increasing life expectancy and a concurrent decline in birth rates, both the number and the proportion of older adults are increasing and are expected to continue to increase throughout the 21st century (Bond et al., 2007). Globally, there were 600 million people aged 60 and over in the year 2000; by the year 2025, the number of older adults will double and by the year 2050, it is expected to more than triple (World Health Organization, 2007). As indicated by 2006 Census data, 13.7% of the

Canadian population is over age 65 (up from 13.0% in 2001) and the number of people aged 80 and over has reached a record-setting 1.2 million (Statistics Canada, 2007). Within 25 years, the number of Canadian centenarians is predicted to triple, ultimately growing to more than 14,000 individuals (Statistics Canada, 2007).

Within Manitoba, the number of adults aged 65 and over has reached 14.1% of the population (Statistics Canada, 2007). According to the Centre on Aging at the University of Manitoba and based on data from the 2001 Census, 5.6% of Manitobans older than 65 years of age reside in a PCH. PCH residency becomes notably more common with increasing age, as 23.9% of Manitobans aged 85 years and older reside in a PCH (Centre on Aging, 2005). Within the WRHA from 2004 to 2007, 11.1% of PCH residents were under 75 years of age, 29.2% were between the ages of 75 and 84, 25.4% were between the ages of 85 and 89, and 34.3% of residents were 90 years and older (Lamont, L., personal communication, July 7, 2008).

In Canada and internationally, women have a higher average life expectancy than men. Canadian women born in 2004 can expect to survive until 83 years of age, while men can expect to survive until 78 years of age (World Health Organization, 2008). The consequences of higher life expectancy among women are shown in data from the 2006 Census and presented in the updated Manitoba Fact Book on Aging (McCrimmon, 2008). There are more older women than there are older men: in 2006 there were 219 women for every 100 men aged 85 and older. Women are also more likely to be widowed: 53.8% of women

between the ages of 75 and 84 are widowed, compared to 17.3% of men in the same age group. Additionally, women aged 75 and older are more than twice as likely to live alone as men in the same age group. Given women's predominance in this age group, it can also be surmised that women make up the majority of PCH residents.

Between 2001 and 2006, 17.8% of older Manitobans reported changing residences. The incidence of relocation was similar among both women and men. However, the Census did not collect information regarding the types of residences to which older adults relocated, and it remains unknown how many of these individuals relocated to more supportive forms of housing.

Nutritional Needs of Older Adults

While not all people physically age at the same rate, throughout the lifespan changes are continuously occurring that gradually result in the phenotypes associated with age. In addition to visible signs of aging, there are metabolic and physiologic changes that result in altered nutrient needs among older adults. This was formally recognized in 1997 when the Institute of Medicine began publishing revised dietary reference intakes (DRIs) that included specific recommendations for older adults and was reinforced in 2007, when Health Canada released the revised Canada's Food Guide (CFG) with specific recommendations for adults over the age of fifty.

The caloric needs of older adults are lower due to reductions in energy expenditure and loss of muscle tone (sarcopenia) (American Dietetic Association, 2000; American Dietetic Association, 2005b), but in healthy older adults, calories

should be ingested from fat, carbohydrate and protein in the same proportions (25-30%, 45-65% and 10-15%, respectively) as in younger adults (Harris, 2004). Because caloric needs are lower, while nutrient needs generally remain the same or increase (*e.g.,* vitamin D), older adults need to consume low-calorie, nutrient dense foods such as whole grains, fruits and vegetables, and low-fat meat and dairy products in order to maintain a positive nutritional status.

A low-calorie, nutrient dense diet may be difficult for older adults to maintain for many reasons. Firstly, aging can result in functional limitations that affect the ability of older adults to buy groceries and prepare food, such as difficulty carrying heavy shopping bags or reduced mobility. Additionally, declining senses of sight, smell and taste may affect mealtime enjoyment and cause a reduction in appetite. Furthermore, declining oral health, including tooth loss and xerostomia (dry mouth), is common among older adults in long term care (LTC) facilities (Wyatt, 2002) and impairs the ability to chew and swallow food.

Although older adults may face challenges related to obtaining, preparing and eating food, achieving not only a low-calorie, but also a nutrient dense diet is important because aging also presents physiological changes that affect vitamin and mineral needs. For example, older adults have a reduced ability to absorb calcium, are exposed less frequently to sunlight and lose up to 60% of their ability to synthesize active vitamin D, all of which affect calcium homeostasis and bone health (Harris, 2004; Nieves, 2003; Wigg, Prest, Slobodian, Need, & Cleland, 2006). In addition, vitamin B_{12} deficiency is common among older adults:

it occurs in 30 – 40% of institutionalized older adults and is often due to gastrointestinal changes that impair absorption of the vitamin (Andres et al., 2004). One such change is an increase in stomach pH, known as atrophic gastritis, which results in impaired cleavage of protein-bound vitamin B_{12}, a necessary step prior to absorption of the vitamin. Reduction in the amount of intrinsic factor, a carrier protein for unbound vitamin B_{12} secreted by parietal cells and required for transfer across the intestinal membrane, also impairs vitamin B_{12} absorption. A further example of a physiologic change affecting nutritional needs is particular to women. After menopause, women do not require as much iron as they did when they were still menstruating regularly (Harris, 2004). These examples of physiologic changes demonstrate a need for careful diet planning, as the energy and micronutrient needs of older adults are not the same as those of younger adults.

Cognitive Status of Older Adults

While there appears to be a relationship between nutritional status and cognition, that relationship is not clear. Quadri et al. (2004) examined the association between homocysteine, folate, and vitamin B_{12} in individuals with mild cognitive impairment who had a Clinical Dementia Rating of 0.5 or a clinical diagnosis of either Alzheimer's disease or vascular dementia. In the final adjusted model, their data suggests a strong association between high levels of plasma homocysteine and both vascular dementia (OR 4.3, CI 1.3, 14.7, p = .018) and Alzheimer's disease (OR 3.7, CI 1.1, 11.2, p = .044), as well as an association between low levels of serum folate and the presence of a Clinical

Dementia Rating of 0.5 (OR 3.1, CI 1.2, 8.1, p = .007), Alzheimer's disease (OR 3.5, CI 1.1, 11.2, p = .087), and dementia (OR 3.8, CI 1.3, 11.2, p = .018), but no associations between vitamin B_{12} status and cognitive impairment. However, using the Standardized Mini-Mental State Exam (SMMSE), Paulionis, Kane and Meckling (2005) found no association between B vitamin status (B_{12}, B_6, folate, and niacin) and cognitive status.

Regardless of this ongoing debate within the literature, it has been shown that the presence of nutritional risk among individuals with cognitive impairment leads to increased likelihood of death (OR 1.6, 95% CI: 1.1, 2.2) (Keller & Ostbye, 2000). Another study found no difference in the prevalence of nutritional risk (determined using the Mini-Nutritional Assessment [MNA]), between older adults without dementia, with possible early dementia, or with dementia (Quinn, Johnson, Andress, & McGinnis, 2003).

Geriatric Depression

Definitions of depression and what constitutes an older adult vary, but prevalence estimates indicate that depression is common late in life. In the United States, depression ranges from 8-20% among healthy, community dwelling older adults and up to 50% among residents of long-term care facilities (Adamek & Slater, 2008). Wallace (2008) offers a more conservative estimate of the prevalence of depression in American nursing homes, stating that 15-25% of residents are affected by depression.

Secondary analysis of data from the Canadian Study of Health and Aging has indicated that the prevalence of both major and minor forms of depression

among older adults may be lower than the 12% average indicated in previously published data (Ostbye et al., 2005). Among adults aged 65 and older, the prevalence of both major and minor depression was 6.6% in the study population. Contrary to previously published data, residents of institutions did not demonstrate a higher prevalence of depression (OR 1.7, CI 0.9-3.1). Consistent with other publications were the findings that women exhibited a higher likelihood of depression than did men and that the incidence of depression is inversely associated with age.

Also consistent with other publications, but inconsistent with the study's other finding that the prevalence of depression is not higher among the institutionalized, was the finding that those with greater health problems were more likely to be depressed. Participants who felt that their health limited their activities "a great deal" exhibited an increased risk of depression (OR 21.5, CI 5.4-85.0) when compared to those who responded "not at all". This inconsistency may be due to the exclusion of cases where responses to questions regarding depression were not reported or labelled "don't know", because participants with severe dementia are less likely to respond to questions and are more likely to live in institutions than in the community. Therefore, a higher number of cases where people were experiencing depression may have been excluded from the institutionalized group than in the community-dwelling comparison group.

There are gaps in the literature regarding the relationship between mental health and eating behaviours (Polivy & Herman, 2005). What is known is that the

relationship is bi-directional. For example, negative emotions may lead individuals to overeat high-fat and/or high-sugar foods, yet eating sweet or salty comfort foods may improve mood. Conversely, eating well may improve positive mood and positive mood may lead to eating well. The majority of the literature in this area has focused on eating disorders or intentional weight loss and mental state. Clarification on the relationship between unintentional weight loss and mental state, as well as the effect of emotional stress on dietary intake in different people (why do some people reduce their dietary intake when stressed while others do not?), is required. Of relevance to this literature review is the consistent finding that widowhood, common among older adults and women in particular, may confer potentially negative effects on dietary intakes through increased feelings of depression and loneliness (Payette & Shatenstein, 2005).

Nutritional Risk

Although the concept of nutritional risk is not clearly defined, it can be described as the risk factors that lead to nutritional problems (Keller, 2006). Among community-dwelling older adults, the prevalence of nutritional risk is estimated at 47% among Prince Edward Islanders (MacLellan & Van Til, 1998), 68.7% in South-West Ontario (with 44.4% being at high nutritional risk) (Keller & McKenzie, 2003), and at 9% and 16% nationally among community-dwelling and institutionalized participants of the Canadian Study of Health and Aging, respectively (Shatenstein, Kergoat, & Nadon, 2001). The large variability in prevalence is due to differences in nutrition risk criteria and assessment tools.

Within institutions, the widely used Minimum Data Set (MDS) 2.0 has several trigger variables that may indicate nutritional risk. The presence of any of the following should initiate a referral of the resident concerned to a dietitian: weight loss, change in taste perception, leaving 25% or more of meals uneaten, a diet prescription for parenteral feeding, texture modification, syringe feeding or a therapeutic diet, or the presence of pressure ulcers. Bowman and Keller (2005) examined the validity of these MDS 2.0 items as identifiers of nutritional risk and found that the trigger for diet prescription (parenteral, enteral, texture modification or syringe diet [t = -4.249, p = .000]), as well as supplement use (t = -2.862, p = .005) and swallowing difficulty (t = -2.013, p = .046) were significantly associated with nutritional risk rating when residents were assessed by a dietitian using the Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN ©) tool. Body Mass Index (BMI) is not part of the MDS, but can be calculated from MDS data and a BMI of 24 kg/m^2 or less was also associated with nutritional risk (t = -3.845 and t = -3.751, respectively, p < .001).

In addition, Keller and McKenzie (2003) used principal components analysis to determine that 44% of the variance among community-dwelling older adults considered to be at nutritional risk can be ascribed to four patterns: low food intake, characterized by inadequate consumption of food groups and skipping meals; poor appetite, characterized by the use of meal supplements or replacements; physical and external challenges, characterized by chewing and swallowing difficulties, restricted diets or financial concerns; and instrumental activity challenges, characterized by physical difficulty in cooking and shopping.

A different study conducted by Shatenstein, Kergoat and Nadon (2001) found that reported loss of interest in life (β = 0.53, CI 0.30, 0.93, *p* = .027) and increased frailty, expressed as weight loss (β = 1.25, CI 1.01, 1.54, *p* = .036) were predictors for risk of undernutrition among institutionalized older adults.

Malnutrition

Malnutrition is typically described by one of the following situations: (1) undernutrition due to inadequate energy or protein intake, (2) overnutrition due to excessive energy intake, (3) deficiencies of specific nutrients or (4) nutrient imbalances (Keller, 1993). Among older adults residing in PCHs, malnutrition is most likely to be due to an inadequate dietary intake of energy, protein, or of specific nutrients. Although PCHs make an effort to offer pleasant and appealing meals and dining facilities, malnutrition is not unusual among PCH and LTC residents (American Dietetic Association, 2005b). In a 1993 study involving a LTC hospital in Canada, Keller concluded that the rate of undernutrition, including mild, moderate, and severe cases, was 45.5% and could be considered high, but not unusual in this type of setting. A more recent study, conducted by Carrier, Ouellet and West (2007) in New Brunswick, determined that 37.4% of nursing home residents participating in the study were at risk of malnutrition.

Lengyel, Whiting, and Zello (2008) found a number of nutrient inadequacies among residents of Saskatchewan LTC facilities who were receiving a regular, non-therapeutic diet. Nutrient inadequacies were estimated based on observed dietary intakes. More than half of female study participants consumed inadequate amounts of the following nutrients to meet the EAR: Folate

(based on pre-fortification levels; 97%), magnesium (100%), zinc (77%), vitamin E (97%), and vitamin B_6 (81%). More than half of male study participants consumed inadequate amounts of folate (based on pre-fortification levels, 94%), magnesium (88%), zinc (82%), vitamin E (71%), vitamin B_6 (59%) and vitamin C (59%) to meet the EAR for these nutrients. In addition, 26% of female participants and 6% of male participants consumed inadequate amounts of vitamin B_{12} to meet the EAR. There are no EARs for dietary fibre, calcium, or vitamin D, but mean intakes of these nutrients were found to be below adequate intake levels among male and female participants.

These findings are supported by studies completed in other countries. A study of older adults in the United Kingdom found that 21% of institutionalized residents were at medium or high risk of undernutrition and that the risk of undernutrition was higher among adults aged 85 years and older compared to adults aged 65 to 75 years old (OR 2.64, CI 1.30, 5.33) (Margetts, Thompson, Elia, & Jackson, 2003). In the United States, Crogan, Shultz, Adams, and Massey (2001) claimed that malnutrition affects up to 85% of LTC residents in some PCHs and the American Dietetic Association (2005a, p.1955) stated that "as many as 65% of residents experience unintended weight loss and undernutriton". Variation among research studies in the reported prevalence of malnutrition in institutions can be ascribed to differences in methodology and diagnostic criteria, as there is no universally accepted standard.

Pervasive malnutrition among LTC residents has led to several enquiries. Among these, Wendland, Greenwood, Weinberg, and Young (2003) concluded

that a typical 28-day menu cycle from a highly rated LTC facility that is based on traditional resources such as CFG or the United States Department of Agriculture's Food Guide Pyramid will undoubtedly result in malnutrition among residents because they do not provide sufficient amounts of vitamin E, pantothenic acid, calcium, zinc, copper, manganese or dietary fibre. If meals are only partially consumed, as is more typical among residents, the number and severity of deficiencies would increase. This conclusion is based on the nutrient content of the unrestricted and lactose-free diets, which was calculated using a dietary software program that included all in-house recipes and determined the nutrient composition of these diets using the Canadian Nutrient File.

Many factors contribute to malnutrition. Physiologic changes result in reduced appetites among older adults and if the diet is not sufficiently nutrient dense, may further result in unmet micronutrient needs and subsequent deficiencies (American Dietetic Association, 2005b; Harris, 2004). In addition to physiologic changes, declining intakes may be attributed to loneliness, depression, impaired functional capacity, staffing shortages at mealtimes, and state of health, including medication use and diagnoses of certain illnesses and conditions such as diabetes and dysphagia (Constans, 2003; Cowan, Roberts, Fitzpatrick, While, & Baldwin, 2004). Using a multiple linear regression model, Keller (1993) found a significant association between undernutrition and the following nutrition and/or feeding-related variables: dysphagia ($\beta = 0.158$, $p = .01$), slow eating ($\beta = 0.175$, $p = .005$), poor protein intake ($\beta = 0.252$, $p = .0001$), poor

appetite (β = 0.229, *p* = .001), poor position for eating (β = 0.150, *p* = .05), and the presence of a feeding tube (β = 0.180, *p* = .005).

Consequences of Malnutrition

Micronutrient analysis and weight loss are key diagnostic tools for malnutrition because they indicate that the diet may be deficient in energy and/or poor in specific nutrients (neither tool precludes the existence of a metabolic disorder). Potential micronutrient deficiencies are of serious concern because they are increasingly linked to disease states commonly associated with aging: Low serum levels of vitamins C, A and E are associated with the incidence of age-related cataract (Chylack et al., 2002; Jacques et al., 2001; Leske et al., 1998; Simon & Hudes, 1999); Thiamine and folate deficiency may be associated with the onset of Alzheimer's disease (Blass, Gleason, Brush, DiPonte, & Thaler, 1988; La Rue et al., 1997; Quadri et al., 2004); and insufficient vitamin D, calcium and phytoestrogens are associated with the incidence of colorectal cancer (Cotterchio et al., 2006; Martinez, 2005; Wu, Willett, Fuchs, Colditz, & Giovannucci, 2002).

Furthermore, Crogan and Pasvogel (2003) demonstrated that protein-energy malnutrition, present in 44.4% of study participants who had resided in a nursing home for six months, was associated with poorer quality of life. Participants residing in a nursing home for six months who had protein-energy malnutrition had difficulty eating (*r* = -.26, *p* = .037) as well as a lower sense of psychosocial well-being related to involvement in personal activities (*r* = .28, *p*

= .028) and facility life (r = .32, p = .011) and in personal relationships with roommates (r = .34, p = .008) and other residents (r = .49, p = .006).

Weight loss is a frequent diagnostic criterion for malnutrition among older adults (Allard et al., 2004; Keller, 1993; Margetts et al., 2003) and has been correlated with morbidity (Allard et al., 2004; Sullivan et al., 2002; Sullivan et al., 2004). In an examination of nutrition risk factors and survival among Ontario residents of LTC facilities, Allard et al. (2004) found that a body mass index (BMI) of ≥ 26 was associated with significantly lower mortality (p < .001) than a BMI of < 26 in univariate analysis, although this association did not retain statistical significance in the final model.

In an analysis of data from the Geriatric Anorexia Nutrition Registry, Sullivan et al. (2002) found that continued weight loss over a six month period resulted in a mortality rate nearly double that of individuals who were able to halt their weight loss and/or gain weight over the same period. The adjusted relative risk of mortality for those who lost weight was 1.95 (95% CI 1.43 – 2.66). In a subsequent study on monthly weight fluctuations, Sullivan et al. (2004) determined that a resident with a weight loss of ≥ 5% of body weight within a one month period had a relative risk of mortality 10.6 times greater (95% CI 3.2 – 35.5) than that of an individual who gained weight within the same time frame.

Dining in Personal Care Homes

It is becoming apparent that PCH administrators can alter residents' risk of malnutrition by adjusting meal offerings and the dining environment. Using logistic regression to examine nursing home food services and risk of

malnutrition in New Brunswick, Carrier, West and Ouellet (2007) found that the following items were associated with risk of malnutrition: menu cycle length (β = -2.162, *p* = .003), difficulty manipulating dishes, lids and packages (β = 0.285, *p* = .009), a bulk food delivery system (β = 1.329, *p* = .036), resident satisfaction with food quality (β = 0.253, *p* = .044), and porcelain dishes (β = -0.345, *p* = .052). Additionally, Bernstein et al. (2002) have noted that high dietary variety is associated with higher energy and nutrient intakes (β = 20.5, *p* < .001).

Dining and diet planning in PCHs should be given high priority in order to maintain the nutritional status of residents. Diet planning and dining receive considerable attention in the literature devoted to PCHs, in part because food and eating are important components of the quality of life of residents. In 2005 (a), the American Dietetic Association published a position paper stating that "Nutrition care in long-term settings must meet two goals: maintenance of health and promotion of quality of life" and advocated for liberalization of residents' diet prescriptions. There is little potential for harm in this advice, as PCHs are already required to provide meals that meet Health Canada's guidelines to receive accreditation. Moreover, liberalized diets have the potential to improve the quality of life of PCH residents by offering them more independence in their meal selections and in increasing their diet variety, thereby increasing their pleasure in eating (Welsh, 2005; Yen, 2005).

Indeed, many PCHs put significant effort into improving the dining experiences and quality of life of residents. Measures taken include making small adjustments such as offering seasonally appropriate foods, making sure

the layout of the dining room and table height are correct to ensure comfort and mobility for residents in wheelchairs and walkers, and using decorative elements in table setting such as centrepieces, tablecloths and napkins, and playing age appropriate music during mealtimes (Speroff, Davis, Dehr, & Larkins, 2005). More extreme measures taken by several PCHs in North Carolina included redesigning dining rooms to look more like homes by including murals and fireplaces as special touches, or to look more like restaurants by having themes portrayed in the décor and in the meal offerings (Pfeiffer et al., 2005). More ambient dining facilities have the potential to improve the nutritional status of residents by encouraging socialization and consequently increasing caloric intake among residents (American Dietetic Association, 2005b), but these changes are recent and their impact should be assessed through future research.

Relocation

Older adults may relocate for a number of reasons, such as a change in health status, loss of a spouse, or declining functional or cognitive ability (Johnson & Tripp-Reimer, 2001). A review of relocation among ethnic elders suggests that older adults move an average of three times in their final decades of life and that moves are gradually made to more supportive housing as their need for care increases (Johnson & Tripp-Reimer, 2001). Institutional relocations may be made under many circumstances; they may be made from home to institution, from one institution to another (inter-institutional relocation), or within the same institution (intra-institutional relocation) and may involve different degrees of environmental change. These relocations may be temporary

or permanent, occur individually or *en masse*, be the first move or one of many, and may occur suddenly or be planned (Tickle, 1993).There are no apparent differences in health outcomes or in adaptation between residents who experience inter-institution or home to institution moves (Gass, Gaustad, Oberst, & Hughes, 1992; Tickle, 1993).

Modifiers of adaptation post-relocation include physiological and genetic factors, such as activities of daily living (ADL) status, medical condition, and sensory abilities. They include psychological factors, such as mental status and self-esteem; and environmental and administrative factors, such as preparation prior to relocation, caring staff and the ability to retain possessions. Modifiers of adaptation also include social support factors, including friends, family and peer support, as well as person-environment interactions, which could include the degree of resident involvement in decision making (Tickle, 1993).

One study found that residents who relocated involuntarily due to a nursing home closure did not experience any changes to physical or mental health within a three month follow-up period. However, residents did experience an increase in falls: 76.9% of residents fell following relocation compared to 51.2% who fell prior to relocation (p = .0001) (Capezuti et al., 2006). In a study examining the effect of relocation, LTC residents who moved to a newly built facility were compared to residents who had not yet moved. The investigators found that the stress hormone cortisol was elevated in salivary samples one week following relocation (p = .005), but that it had declined significantly at four weeks following relocation (p = .03), indicating that the stress imposed by

relocation eases within four weeks of a move (Hodgson et al., 2004). Although this is true for their study population, it is not generalizable to individuals relocating to a PCH from home or another institution because the residents in this study were moving to a new facility under the same management and relocated with the knowledge that they would be able to maintain relationships with staff and other residents, retain their possessions, and were well-prepared for the move by staff.

In another study examining the psychological outcomes of intra-institutional relocation, the authors found that relocated residents were 23% more likely to demonstrate cognitive decline ($p \leq .01$), 29% more likely to demonstrate signs of depression ($p \leq .05$), and 33% more likely to show a decline in social engagement ($p \leq .01$) than non-relocated residents (Castle, 2004). A further study involving a LTC facility undergoing extensive renovations examined four groups of participants: one group that volunteered to relocate temporarily to another facility and who were well-prepared for the move by staff, two groups of involuntarily internally transferred residents and a control group that experienced no relocations or transfers. All three experimental groups were subject to crowding in their temporary placements, but the externally transferred group benefited through improvement in measured physical, emotional and behavioural outcomes, perhaps because they moved voluntarily, were prepared by staff for the move and knew that the move was only temporary. In contrast, the groups of internally transferred residents experienced an increase in falls during the eight month renovation period: 55 and 72 per hundred residents fell in the two

internally transferred groups compared to 7 and 19 per hundred residents in the externally transferred and control groups. Mortality rates were also higher, although the difference was not statistically significant, among all the relocated groups than in the control group over the fourteen month study (Gallagher & Walker, 1990).

An older study of individual relocation and health outcomes conducted in Ontario found that after one month in a new environment (foster home, home for the aged, nursing home, chronic care hospital or a psychiatric hospital) older residents were less likely to report having a fair or poor appetite (not significant), but experienced an increase in dependency in ADL from an average of 3.4 dependent activities to an average of 4.1 dependent activities ($p < .05$) (Spasoff et al., 1978). At the one year follow-up, changes in health status included an increase in self-reported fair or poor appetite among residents (not significant) and a slight increase in dependency in ADL (not significant). The only significant change one year following admission was a decline in cognitive function from 91.6 at the one month point to 85.6 at the one year point, measured by participants' ability to complete Raven's Progressive Matrices ($p < .01$).

In the early 1980's, Borup was one of the first investigators to study the effect of relocation on variables other than mortality. In 1980, Borup, Gallego and Heffernan published a paper examining the effect of inter-institutional relocation on health in 326 older adults. The findings did not show any significant differences between pre and post relocation self-reported health status, although the authors did find a significant difference in functional ability. Relocated adults

showed a stable level of functioning (difference of -0.14), while the control group experienced a decrease in functional ability (difference of 2.63) ($F = 5.20$, $p = .023$). Furthermore, gender differences were noted: non-relocated men experienced much greater functional decline (difference of 6.56) than did non-relocated women (difference of 0.95) ($F = 4.00$, $p = .047$). Noting that relocated men and women fared similarly, maintaining the same level of functioning, the authors concluded that relocating has a positive effect on those who relocate, but that the effect is much greater in men (Borup, Gallego, & Heffernan, 1980). In a follow up study looking at the degree of environmental changes experienced by relocated older adults using the same data set, Borup did not note any significant differences in pre- and post-relocation health, functioning or mortality rates between groups who experienced either radical change, moderate change or no change in environment following relocation (Borup, 1982).

Relocation Stress Syndrome

In 1992, the North American Nursing Diagnosis Association introduced RSS as a nursing diagnosis. RSS is defined as a physiologic and/or psychosocial disturbance occurring as a result of moving from one environment to another (Jackson, Swanson, Hicks, Prokop, & Laughlin, 2000a). In addition to major characteristics such as anxiety, depression, apprehension, loneliness and increased confusion which nearly always occur, changes in eating habits, gastrointestinal disturbances and weight change occur in 50 to 70% of cases (Jackson, Swanson, Hicks, Prokop, & Laughlin, 2000b). It is likely that these factors would lead to a decline in nutritional status and contribute to malnutrition.

Despite the potential severity of RSS, it is important to note that not all new PCH residents suffer to the same extent, or at all. Residents who have greater involvement in the decision to relocate and who receive family support are less likely to display symptoms of RSS (Talerico, 2004). However, relocating to a PCH is more likely to be viewed negatively by older adults because it often occurs at a traumatic time in an individual's life. Trauma may involve the loss of a spouse or a family member, a decline in health and/or a hospital stay for a serious illness, or dependency for three or more activities of daily living (ADL) (Talerico, 2004).

An important theme derived from a phenomenological study examining residents' perceptions of relocation was lack of choice. Residents who had relocated willingly had done so because they felt there was no reasonable alternative (Nay, 1995). The perception that some older adults relocate voluntarily may need to be reinterpreted as fulfilling their desire to make the best of things. Other themes that emerged from the interviews were a sense of loss, which for women meant loss of home and possessions, while for men it meant loss of work, a sense of being a burden on family and the feeling that there was no future and nothing to look forward to as a nursing home resident (Nay, 1995). These themes emerged during interviews assessing residents' perceptions of relocation from the time the decision to relocate was made up to admission into a facility. The investigation did not include further interviews regarding adaptation to daily life within a PCH.

RSS is generally described by three stages: pre-institutionalisation, transitional and post-institutionalisation, each of which is associated with different characteristics (Talerico, 2004; Melrose, 2004). In the pre-institutionalisation phase, an individual may be feeling overwhelmed due to the logistics of selling their home and packing their belongings. In the transitional phase, feelings of helplessness and abandonment come to the fore. Subsequently, in the post-institutionalisation phase, new residents struggle to find their place in their new environment and to maintain links with friends and family who live outside of the institution (Jackson, Swanson, Hicks, Prokop, & Laughlin, 2000b; Talerico, 2004; Melrose, 2004). Symptoms of RSS can occur during any or all of the aforementioned stages.

Rossen and Knafl (2003) describe three transition styles based on 31 community-dwelling women moving into congregate living facilities: full, partial, and minimal integration. They found that fewer than 50% of the women experienced full integration following relocation, but that these women voluntarily relocated, perceived themselves to be socially competent, had a sense of community and were satisfied with their new home. Women who did not experience full integration may have moved involuntarily, were uncertain about whether they could handle the demands of their new home and were less socially involved.

Conclusion

In a review of the literature on older adult's experiences with residential care placement, Lee, Woo and Mackenzie (2002) concluded that there was a

lack of literature on the experiences of older adults as they make their day-to-day adjustment. There is also a dearth of information regarding the relationship between geriatric depression and dietary patterns, as well as regarding the effect of relocation upon nutritional status. This study will add to the literature in these areas by examining the effect of moving on the eating habits, nutrition attitudes and nutritional status of older adults. This area of study will become increasingly important as the population ages and the need for PCH and other supportive housing options grows.

CHAPTER THREE: METHODS

Design

As the first study examining the effect of relocation to a PCH on nutritional status, this pilot study was exploratory in nature and was intended to assess both the feasibility of and the need for conducting a future longitudinal study in urban and rural Manitoba using these methods and research questions. Selected participants were assessed during two face-to-face interviews. The investigator was trained in standardized interviewing techniques involving older adults and the Personal Health Information Act guidelines by the supervisor.

This study took place in two phases with continuous enrolment for eleven months. The first phase consisted of (a) recruitment and obtaining informed consent from participants; and (b) an initial interview, diet record and blood draw. The second phase occurred four months after the first interview (*i.e.*, six to seven months following relocation) and consisted of a second interview, diet record and blood draw.

The research questions addressed in this study were developed in an effort to determine what, if any, effect relocation to a PCH has on the nutritional status, eating habits and nutrition attitudes of older adults. The research questions are as follows.

1. What are the characteristics of newly admitted PCH residents with respect to:

    Cognitive status

    Depression

    Skin integrity

Nutritional status

Functional ability

Nutrition attitudes and beliefs

Quality of life, health, and lifestyle

Eating habits

2. Do the above characteristics change six months after residents relocate to a PCH?

3. Is gender, age or nutritional status (when assessed with the MNA-SF) associated with changes in the above characteristics?

4. What are the characteristics of PCH residents six months post-relocation with respect to food service and adjustment to the new home?

Study Population

The researcher attempted to recruit twenty residents from two Winnipeg PCHs: one, a 140 bed PCH and the second, a LTC facility with 168 beds designated for personal care. Residents were eligible to participate in the study if they met the following criteria: (1) 60 years of age and older; (2) cognitively able to answer questions as determined by key informants of the facility; (3) resided in the facility for a minimum of two and a maximum of three months; and (4) were not receiving parenteral nutrition. Enrollment began in June 2007 and continued until April 2008. Potential participants were identified by key informants of the facilities: unit managers, dietetic representatives and admissions staff. They were then approached by the key informant and given a letter explaining the study. The key informant spoke to potential participants and asked if they would

be willing to speak to the researcher. If a positive answer was obtained, the name and room number of the individual was forwarded to the researcher. Upon receipt of contact information, the investigator visited the potential participant in their unit to obtain informed consent (Appendix A) and to answer questions about study procedures.

Of the twenty-eight potential participants identified by the facilities, three did not meet the inclusion criteria and seven declined to participate. Of the remaining eighteen individuals, four participants withdrew from the study prior to the first interview and one participant passed away after completing phase one. In total, fourteen participants completed phase one and thirteen participants completed phase two of the study.

Ethical approval for the use of human subjects was obtained from the University of Manitoba and the participating research sites.

Data Collection Procedures

Participants were interviewed in their rooms or in a quiet room provided by the PCH, such as a sunroom. Interviews were conducted at the participants' convenience in the mornings to avoid any confounding effect that may be attributable to sundowning, a phenomenon that is associated with increased agitation and confusion occurring late in the afternoon, often among individuals with dementia (Burney-Puckett, 1996). Interviews took forty-five minutes to one hour to complete.

Age, gender and time were independent variables. Dependent variables included cognitive function, skin integrity, depression, functional ability, nutritional

status (BMI, BIA, MNA-SF, biochemical indices, and dietary intake), quality of life, health, and lifestyle, nutrition attitudes and beliefs, eating habits, and attitudes towards relocation.

Participants were administered Folstein, Folstein & McHugh's (1975) Mini-Mental State Exam [(MMSE) Appendix B], using Molloy et al.'s (1991) guidelines for use and scoring. Standardization of the MMSE has been shown to reduce intra-rater and inter-rater variability (Molloy et al., 1991). The MMSE was administered prior to the commencement of the first research phase to ensure that participants met the inclusion criteria. The highest score possible is 30, with 20 being the cut-off for inclusion in the study, based on classification of scores of 20 to 23 as indicative of mild impairment, and scores of 24 or higher indicating very mild or no cognitive impairment (Zec et al., 1992). The MMSE was administered again at the commencement of phase two to assess change in cognitive function.

For both phases, the following information was collected by the investigator to assess changes in nutritional status and dietary intake after relocation into the PCH.

Measures of nutritional status

Anthropometrics

Height and body weight were obtained from participant's medical charts. Height was recorded upon admission as self-reported. In instances where a participant's height was not recorded in their medical chart, the participant was asked to provide their height. When height was provided in Imperial units it was

converted to metric units using the formula height (inches) divided by 2.5. Weight for the interview month was obtained in kilograms. Body composition was measured using a bioelectrical impedance analyzer [(BIA) Quantum II, RJL Systems, Clinton Township, MI, USA] for all participants without a pacemaker or automatic defibrillator. Skin was cleaned using 70% isopropyl alcohol and four adhesive electrodes (3M Health Care, St. Paul, MN, USA) were placed on the right wrist and ankle with the participant lying in a supine position. Resistance and reactance were measured with 425 μA at a frequency of 50 Khz.

Fat free mass (FFM) and fat mass (FM) were calculated using the general population equation derived from the third National Health and Nutrition Examination Survey (NHANES-III), the default equation provided with the RJL Body Composition Management Software (version 2.0). The NHANES-III equation is appropriate for adults between the ages of 18 and 94 years of age. Several equations developed for specific use in older adults have also been published. From among these, the Göteborg equation, developed as part of the Nordic Research on Ageing study was selected for comparison (Dey & Bosaeus, 2003). Dey and Bosaeus (2003) compared this equation to two others that were also developed from older populations as well as a third developed from the general population inclusive of older adults, using total body water and total body potassium as a reference. Compared to total body potassium, both equations derived from populations of older adults underestimated FFM in men and women, while the equation derived from the general population underestimated FFM only in women. The Göteborg equation was selected as a comparison for the

NHANES-III equation provided by RJL Systems because it alone did not underestimate FFM in participants of either gender.

The BIA system measures body composition, specifically fat and fat-free mass. It is a non-invasive, inexpensive, and portable method appropriate for older adults without pacemakers or automatic implantable cardiac defibrillators residing in PCHs. BIA and skinfold thickness measures demonstrate similar agreement with dual-energy X-ray absorptiometry, but BIA shows stronger R^2 values in linear regression and smaller standard deviation than measures of skinfold thickness in older Finnish women (Haapala et al., 2002).

Biochemical indices

Hematological and biochemical testing was completed in order to provide markers of nutritional status. Complete blood counts, electrolytes (blood urea nitrogen, serum creatinine, sodium, potassium, chloride), albumin, total protein, iron, total iron binding capacity (TIBC), lipoprotein profile, vitamin D, and vitamin B_{12} were examined. Blood draws were completed by phlebotomists from the participating facilities within one week of the first interview. Analysis of electrolytes, total protein, and albumin were completed in the PCH laboratory. Analysis of iron, TIBC, % iron saturation, lipid profiles, and vitamin B_{12} were completed at St. Boniface General Hospital. Complete blood counts were completed at Misericordia Health Centre and 25-hydroxyvitamin D testing was completed at Health Sciences Centre. The results were faxed to the researchers and to the participants' PCH for inclusion in their medical charts. Reference values are provided in Appendix C (Diagnostic Services of Manitoba, 2007).

Mini-Nutritional Assessment – Short Form

The original Mini-Nutritional Assessment was developed in the early 1990's to detect three levels of nourishment among older adults: the well-nourished, those at risk of malnutrition and those with clear signs of malnutrition (Bauer, Kaiser, Anthony, Guigoz, & Sieber, 2008). The short form of this tool, the Mini-Nutritional Assessment-Short Form [(MNA-SF) Appendix D], was developed by Rubenstein, Harker, Salva, Guigoz, and Vellas (2001) from the original and was validated for use with the same population of older adults. Correlation between the two assessment tools is excellent (Pearson's r = .969) (Bauer, Anthony, Guigoz, and Sieber, 2008). The MNA-SF is a practical screening tool that divides patients into two categories: normal nutrition and possible malnutrition.

Participants may receive a maximum score of 14 points in six categories (BMI, weight loss, stress or acute disease, mobility, psychological problems and food intake), with a score of less than 12 indicating that participants are at risk of malnutrition and need further assessment. The MNA, together with the MNA-SF, is considered the best available malnutrition screening tool for use among institutionalized older adults (Hudgens & Langkamp-Henken, 2004). No study has been done to compare the MNA or its short form when it is completed by a patient or by a nurse. However, Bauer, Kaiser, Anthony, Guigoz and Sieber (2008), claim that unpublished data shows little difference in score based on who completed the assessment. During both phases, the MNA-SF was completed by a nurse or health-care aide with detailed knowledge of the resident.

Dietary intake

Food consumed at breakfast, lunch, and dinner was visually estimated for three consecutive weekdays during the week of each interview. The individual food items remaining on the resident's tray were visually estimated as plate waste and consumption was recorded in standard imperial measurements. Shatenstein, Claveau and Ferland (2001) concluded that well-trained monitors can use visual observation to accurately estimate dietary intakes of older PCH residents with cognitive impairment. All participants had limitations, whether physical and/or cognitive, thus the researcher and trained assistants recorded dietary intake for all participants.

Participants were also solicited during interviews and at meals to provide detailed information on snacking as well as any information regarding foods eaten that were obtained from outside the PCH during the three-day period. In instances where the dining tray was not collected by the researcher (*e.g.,* when staff removed the tray prior to the researcher's arrival), the following day's equivalent meal was substituted for dietary analysis. This data was compared to the WRHA Nutrition and Food Services' "Comparison of Nutrition and Food Services' Standard Diet to Eating Well With Canada's Food Guide" to determine the participants' daily intakes of the four food groups, as well as daily intakes of: fibre-rich foods (foods with ≥ 2 g fibre per serving), calcium and vitamin D-rich foods (≥ 165 mg calcium per serving and/or ≥ 25 IU vitamin D per serving), servings of fruit and vegetables obtained from juice, and the number of daily servings of dark orange and dark green vegetables (Bobrowski & Gislason,

2007). The number of servings consumed from each food group was averaged over each three day period and participants were classified as meeting or exceeding CFG recommendations (≥ 100%); consuming 75-99%, 50-74%, 25-49%, or less than 25% of the recommended number of servings for each food group (Health Canada, 2007).

For analysis, meal trays, including food and fluids, were assessed by the researcher and research assistants as 0%, 25%, 50%, 75% or 100% consumed. This type of whole-tray assessment has been shown to be largely inaccurate when completed by nursing assistants (Castellanos & Andrews, 2002), but has been included to complement the assessment of food group consumption and to aid in evaluating change in eating habits.

Measures of health status

Medical charts were accessed to obtain information about current and chronic diseases, number and type of medications prescribed, and diet order for each participant. In addition, the following validated tools were administered: Braden Risk Assessment for Pressure Ulcers (Appendix E), 5-Item Geriatric Depression Scale [(GDS) Appendix F], and Katz Index of Activities of Daily Living [(ADL) Appendix G]. The Braden scale and Katz ADL were completed by a nurse or a health care aide who had detailed knowledge of the participants' health, eating habits, and functional abilities. More detailed information on each of these assessments is provided in the subsequent paragraphs.

Skin integrity

The Braden Risk Assessment for Pressure Ulcers was used as an indicator of protein status. Reduced mobility, malnutrition, dehydration, incontinence, and circulatory problems are risk factors for pressure sores (Edlich et al., 2004; Gallo, Fulmer, Paveza, & Reichel, 2000), which range in prevalence from 3% to 30% in developed countries (Pancorbo-Hidalgo, Garcia-Fernandez, Lopez-Medina, & Alvarez-Nieto, 2006). In 1989, the U.S. National Pressure Ulcer Advisory Panel reported the prevalence of pressure ulcers among home care recipients as 7% to 12%, among hospitalized patients as 3% to 14%, and among newly admitted long-term care residents as 15 to 25% (Edlich et al., 2004). Pressure sores are more likely to occur among individuals with serum albumin levels below 3.5 g/dL (Edlich et al., 2004). In addition to being a risk factor for pressure ulcers, the presence of malnutrition may also exacerbate the condition, because it results in impaired wound healing (Edlich et al., 2004).

The Braden Scale is the most studied assessment tool for pressure ulcers and has been validated in many settings (Pancorbo-Hidalgo et al., 2006). It shows high inter-rater reliability (Pearson's *r* .83 – .99), with acceptable ranges for specificity and sensitivity (*Sp*: 100% - 26%, *Se*: 100% - 38.9%) (Pancorbo-Hidalgo et al., 2006). The Braden Scale comprises six subsections (sensory perception, moisture, activity, mobility, nutrition, and friction and shear) and each subsection has a maximum score of four points (three points for friction and shear), leading to a best score of 23 points. Individuals scoring 16 or less are considered at risk of developing pressure ulcers (Edlich et al., 2004).

Due to the high cost of caring for individuals with pressure ulcers and the high prevalence rates of pressure ulcers among residents of institutions, the Braden Scale for Risk Assessment of Pressure Ulcers is completed on a monthly basis for residents of both the PCHs involved in this study. The assessment takes approximately ten minutes to complete, but requires that the assessors have training in nursing in order to complete a full physical evaluation of the patient. Therefore, the completed assessment was obtained from participants' medical charts for the month of the interview.

Depression

The Geriatric Depression Scale was selected as the depression screening tool because it is recommended for clinical use by the Institute of Medicine and is appropriate for older adults with mild or no cognitive impairment (Gallo et al., 2000). The 5-Item GDS (Hoyl et al., 1999) has been validated against the gold standard, Clinical Psychiatric Diagnosis of Depression, with higher sensitivity, specificity, accuracy, positive predictive value and negative predictive value than the 15-Item GDS (*Se:* 0.97 compared to 0.94, *Sp:* 0.85 compared to 0.82, accuracy 0.90 compared to 0.88, *PPv:* 0.85 compared to 0.82, *NPv:* 0.97, compared to 0.94) in a community-dwelling population of frail male veterans. In 2003, the 5-Item GDS performed comparably to the 15-Item GDS when compared to the Clinical Diagnosis of Depression among outpatients, hospitalized patients and nursing home residents, of whom two-thirds were female (Rinaldi et al., 2003).

The 5-Item GDS consists of five yes or no questions about mood. Each question is equally weighted, with a maximum score of five points. Individuals receiving scores of zero to one are categorized as not depressed, while those who obtain a score of two or higher are considered depressed. This screening test was administered to participants by the researcher during the interview.

Functional ability

The Katz Index of ADL, originally published in 1963, was developed specifically for institutionalized older adults and chronically ill individuals who had a stroke or hip fracture (McDowell & Newell, 1996). It assesses independence in bathing, dressing, toileting, transferring, continence, and feeding, giving one point for each activity that the individual is able to complete independently. Thus, a score of six indicates complete independence and a score of zero indicates total dependence. Functional assessment is an important component of a nutritional assessment because malnutrition is a potential consequence of impaired function (Mitchell & Chernoff, 1999).

The Katz Index of ADL was selected because it was purposefully developed for this population. It is highly recommended and widely used within gerontological nursing (Wallace & Shelkey, 2007), however few reports have been published regarding its validity and reliability. The most popular alternative to this assessment, the Barthel Index, has been similarly understudied (Hartigan, 2007). Brorsson and Asberg (1984) concluded that the Katz ADL assessment was reliable when used in short-term care. Sonn and Asberg (1991) found that internal consistency and the coefficient of scalability of this assessment were

acceptable in a study of community-dwelling Swedish older adults. No studies examining its use in long term care were found in the PubMed or CINAHL search engines.

Measures of other variables

The NHRS:IS and NHRS collect information about the following: quality of life, health and lifestyle, nutrition attitudes and beliefs, eating habits, and attitudes towards relocation. The NHRS:IS (Appendix H) was administered during the first interview in phase one and the NHRS (Appendix I) was administered during the second interview in phase two. The NHRS:IS collects information regarding eating habits and diet, attitudes and beliefs regarding food and nutrition, as well as information about general health and demographics. The follow-up NHRS repeats the same questions regarding eating habits, diet, general health, and nutrition attitudes and beliefs. It also includes an extensive section examining PCH residents' food and dining experiences and a small section devoted to questions exploring the attitudes of participants towards their new homes. The final section addressing relocation attitudes comes from unpublished work by Dr. Eileen Rossen at the University of North Carolina Greensboro (used with the permission of the author).

Both surveys were previously developed by the Supervisor, Dr. Lengyel, and were based on previous work examining the nutrition knowledge, attitudes and beliefs of caregivers (Verrall, Berenbaum, Chad, Nanson, & Zello, 2000), and further developed using focus group interviews with recently relocated older adults and the Supervisor's past experience exploring the nutritional needs of

older adults. The surveys were tested with a subsequent pilot group to look for problems with word choice and sentence structure, but have not been previously tested for reliability or validity (unpublished work by Dr. Lengyel). These surveys were administered to participants by the researcher, Ms. Sitter, during the interviews and took approximately thirty minutes each to complete.

Statistical Analysis

Data from the surveys were compiled and statistically analyzed using the Statistical Package for Social Sciences (SPSS) release #16.0 for Windows (SPSS Inc., Chicago, IL). A *p*-value ≤ .05 was used to signify statistical differences between all comparisons. Descriptive statistics [*i.e.,* means, standard deviations, and ranges] were used to identify participant characteristics. The non-parametric Wilcoxon Signed Rank Test was used to look for changes in variables between phases one and two. Spearman's rho was used to look for correlations between independent and dependent variables. Paired T-tests were used to assess changes in biochemical indices. Internal consistency of the NHRS and NHRS:IS was looked at using Cronbach's alpha. The Göteborg FFM prediction equation is $11.78 + 0.499 \times (\text{height}^2/\text{resistance}) + 0.134 \times \text{weight} + 3.449 \times \text{sex}$, where height is measured in centimeters, weight is measured in kilograms and male sex is assigned a value of one and female sex is assigned a value of zero (Dey and Bosaeus, 2003).

CHAPTER FOUR: RESULTS

Study Population

Of the fourteen participants, 57% were female and 43% were male. The majority of participants were in the oldest-old age category (85 years and older), with a mean age of 83.0 ± 9.8 years. Table 4.1 presents the general characteristics of participants. Most participants experienced inter-institutional relocation, were widowed, and had completed high school. Women were more likely to be obese. The average income of the study participants is not presented, as 10 of the 14 participants responded “unknown” when asked about their annual income. Study participants were recruited in approximately even numbers from the two participating PCHs and the responses show that most study participants (64%) had relocated into their PCH from another LTC facility.

Table 4.1 Participant Characteristics

Variable	Women 64[a] (9)[b]	Men 36 (5)	Total 100 (14)
Age (years)			
Young old (60 – 74)	11 (1)	20 (1)	14 (2)
Middle old (75 – 84)	33 (3)	20 (1)	29 (4)
Oldest old (85+)	56 (5)	60 (3)	57 (8)
PCH			
1	44 (4)	40 (2)	43 (6)
2	56 (5)	60 (3)	57 (8)
Type of move			
Inter-institutional	67 (6)	60 (3)	64 (9)
Intra-institutional	11 (1)	20 (1)	14 (2)
Home to institution	22 (2)	20 (1)	21 (3)
Initial BMI			
Normal (18 - 24.9)	33 (3)	60 (3)	43 (6)
Overweight (25 - 29.9)	22 (2)	40 (2)	29 (4)
Obese (30+)	44 (4)	0	29 (4)
Marital status			
Never married	11 (1)	20 (1)	14 (2)
Married	22 (2)	40 (2)	29 (4)
Widowed	67 (6)	40 (2)	57 (8)

Continued on the next page

Variable	Women 64[a] (9)[b]	Men 36 (5)	Total 100 (14)
Education			
Grade 9 or less	33 (3)	20 (1)	29 (4)
Some high school	11 (1)	20 (1)	14 (2)
High school/Equivalent	33 (3)	0	21 (3)
Trade school or community college	11 (1)	0	7 (1)
Some university	11 (1)	20 (1)	14 (2)
University degree	0	0	0 (0)
Graduate or professional degree	0	40 (2)	14 (2)
Income adequacy			
Yes	44 (4)	40 (2)	43 (6)
No	56 (6)	40 (2)	50 (7)
Unknown	0	20 (1)	7 (1)

[a] Expressed as a percentage
[b] Number of participants

Table 4.2 presents health status measures completed during phases one and two as well as results from the MNA-SF. Scores were assessed for differences between Time A and Time B using the non-parametric Wilcoxon Signed Rank test. This test revealed a statistically significant reduction in participants' MMSE scores at Time B, $z = -2.18$, $p < .05$ with a moderate effect size ($r = .42$). No other statistically significant changes were revealed through this analysis, however small, non-significant changes were observed. Higher levels of depression and decreases in functional ability and nutritional status were noted, while risk of pressure sore development slightly decreased. The prevalence of possible malnutrition, indicated by a MNA-SF score of < 12, increased from 57% at Time A to 77% at Time B.

Table 4.2 Participant Health Status Measures at Time A[a] and Time B[b]

Measure	Women		Men		Total	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
MMSE[c]	28.0 ± 2.1	26.3 ± 1.5	25.6 ± 4.3	21.8 ± 8.8	27.2 ± 3.1	24.6 ± 5.7[*]
5-Item GDS[d]	1.8 ± 1.8	2.0 ± 1.8	2.0 ± 1.7	2.4 ± 2.3	1.9 ± 1.7	2.2 ± 1.9
Braden[e]	17.8 ± 3.1	18.1 ±3.2	20.0 ± 0.7	19.8 ± 1.1	18.6 ± 2.7	18.8 ± 2.7
Katz ADL[f]	2.7 ± 1.9	2.6 ± 1.6	2.0 ±0.7	1.4 ± 0.9	2.4 ±1.6	2.2 ± 1.5
MNA-SF[g]	10.4 ± 1.8	10.1 ± 1.5	12 ± 1.2	9 ± 3.2	11 ± 1.8	9.7 ± 2.3

[a] 2-3 months post-relocation
[b] 6-7 months post-relocation
[c] Mini-Mental State Exam, highest possible score = 30
[d] 5-Item Geriatric Depression Scale, highest possible score = 5
[e] Braden Risk Assessment for Pressure Ulcers, highest possible score = 23
[f] Katz Index of Activities of Daily Living, highest possible score = 6
[g] Mini-Nutritional Assessment-Short Form, highest possible score = 14
[*] $p < .05$ for the difference between Time A and B

Anthropometric data is reported in Table 4.3. An average weight loss of 3.2 kg was observed between Times A and B among both men and women, although on average women lost more weight than men: 3.5 kg versus 2.3 kg, respectively (not statistically significant). The observed weight loss resulted in an average reduction of approximately one point in BMI between Time points A and B.

Table 4.4 presents body composition data. Four participants used a pacemaker or a defibrillator and were excluded from the bioelectrical impedance analysis. Measurement error occurred on three occasions (once at Time A and twice at Time B) and those cases were also excluded, leaving nine cases available for analysis at Time A and eight at Time B. No statistically significant differences were observed between Times A and B. The RJL systems software (NHANES-III equation) and the Göteborg equation produced values for Time A that differed by 1.3 kg in estimation of fat free mass and by 0.8 kg in estimation of fat mass. Values for Time B were nearly identical, differing by 0.6 kg in estimation of fat free mass and by 0.2 kg in estimation of fat mass. As a percentage of body weight, fat mass was higher among women than among men at Times A and B.

Table 4.3 Anthropometric Characteristics

Characteristic	Women Mean ± SD (Range)		Men Mean ± SD (Range)		Total Mean ± SD (Range)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Age (years)	83.4 ± 8.1 (68-97)	n/a	82.0 ± 13 (60-96)	n/a	83.0 ± 9.8 (60-97)	n/a
Weight (kg)	81.4 ± 29.1 (49.4-127.8)	77.9 ± 25.0 (49.3-122.8)	77.8 ± 7.8 (64.4-84.4)	75.5 ± 10.7 (59.9-88.6)	80.2 ± 23.3 (49.4-127.8)	77.0 ± 20.1 (49.3-122.8)
BMI (kg/m^2)	30.3 ± 9.6 (18.6-45.8)	29.4 ± 8.7 (18.6-44.0)	24.4 ± 2.1 (21.5-27.2)	23.7 ± 2.6 (20.0-26.5)	28.2 ± 8.2 (18.6-45.8)	27.2 ± 7.4 (18.6-44.0)

Table 4.4 Participant Body Composition

Body Composition	Women Mean ± SD (Range)		Men Mean ± SD (Range)		Total Mean ± SD (Range)	
	Time A (n=6)	Time B (n=6)	Time A (n=3)	Time B (n=2)	Time A (N=9)	Time B (N=8)
Body Composition: NHANES-III equation, RJL Systems software						
FFM (kg)	49.4 ± 11.8 (36.5-71.0)	47.1 ± 7.5 (33.9-56.5)	57.3 ± 8.3 (48.2-64.4)	55.7 ± 9.5 (48.9-62.4)	52.0 ± 11 (36.5-71.0)	49.3 ± 8.3 (33.9-62.4)
FFM (%)	63.6 ± 12.2 (48.4-82.1)	65.1 ± 9.7 (50.0-76.7)	75.1 ± 1.1 (74.2-76.3)	76.1 ± 8 (70.4-81.7)	67.5 ± 11.3 (48.4-82.1)	67.8 ± 10.1 (50.0-81.7)
FM (kg)	31.4 ± 18.0 (10.7-54.5)	27 ± 13.8 (15.4-51.5)	18.9 ± 2.4 (16.2-20.6)	18.6 ± 10.7 (11-26.2)	27.2 ± 15.6 (10.7-54.5)	24.9 ± 13 (11.0-51.5)
FM (%)	36.4 ± 12.2 (17.9-51.6)	34.9 ± 9.7 (23.3-50.0)	24.9 ± 1.1 (23.7-25.8)	24 ± 8 (18.3-29.6)	32.5 ± 11.3 (17.9-51.6)	32.2 ± 10.1 (18.3-50.0)

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Body Composition	Women Mean ± SD (Range)		Men Mean ± SD (Range)		Total Mean ± SD (Range)	
	Time A (n=6)	Time B (n=6)	Time A (n=3)	Time B (n=2)	Time A (N=9)	Time B (N=8)
Body Composition: Göteborg Equation						
FFM (kg)	48.1 ± 9.5 (37.5-65.6)	47.9 ± 7.6 (33.6-56.0)	56.2 ± 6.3 (49.3-61.6)	55.0 ± 6.2 (50.6-59.3)	50.8 ± 9.1 (37.5-65.6)	49.6 ± 7.6 (33.6-59.3)
FFM (%)	63.2 ± 13.5 (47.8-82.5)	65.5 ± 9.6 (49.3-76.1)	73.9 ± 2.4 (72.1-76.6)	75.7 ± 12.4 (66.9-84.5)	66.7 ± 12.0 (47.8-82.5)	68.0 ± 10.5 (49.3-84.5)
FM (kg)	32.0 ± 19.9 (10.5-59.9)	26.9 ± 14.0 (15.7-52.2)	20.1 ± 4.3 (15.1-22.8)	19.3 ± 14.1 (9.3-29.3)	28.0 ± 17 (10.5-59.9)	25.0 ± 13.5 (9.3-52.2)
FM (%)	36.9 ± 13.5 (17.5-52.2)	34.6 ± 9.6 (23.9-50.7)	26.1 ± 2.4 (23.4-27.9)	24.3 ± 12.4 (15.5-33.1)	33.3 ± 12.0 (17.5-52.2)	32.0 ± 10.5 (15.5-50.7)

Results of the analysis of participant medication and supplement use are presented in Figure 4.1. Participants used an average of 8.9 medications and 2.2 supplements at Time A. Increases in prescription medication use to 9.9 medications and in supplement use to 2.7 supplements were observed at Time B. The increase in supplement use occurred due to an increase in prescribed vitamin D, calcium carbonate and vitamin B_{12}, which may have occurred due to physician revision of the biochemical results placed in patients' files following testing done at Time A. Medication adjustments were typically made to pain medication and to bowel control medication. Use of the Wilcoxon Signed Rank Test indicated a statistically significant increase in the average number of medications prescribed at Time B, $z = -2.00$, $p < .05$ with a moderate effect size ($r = .39$). No statistically significant difference in the number of supplements prescribed was observed.

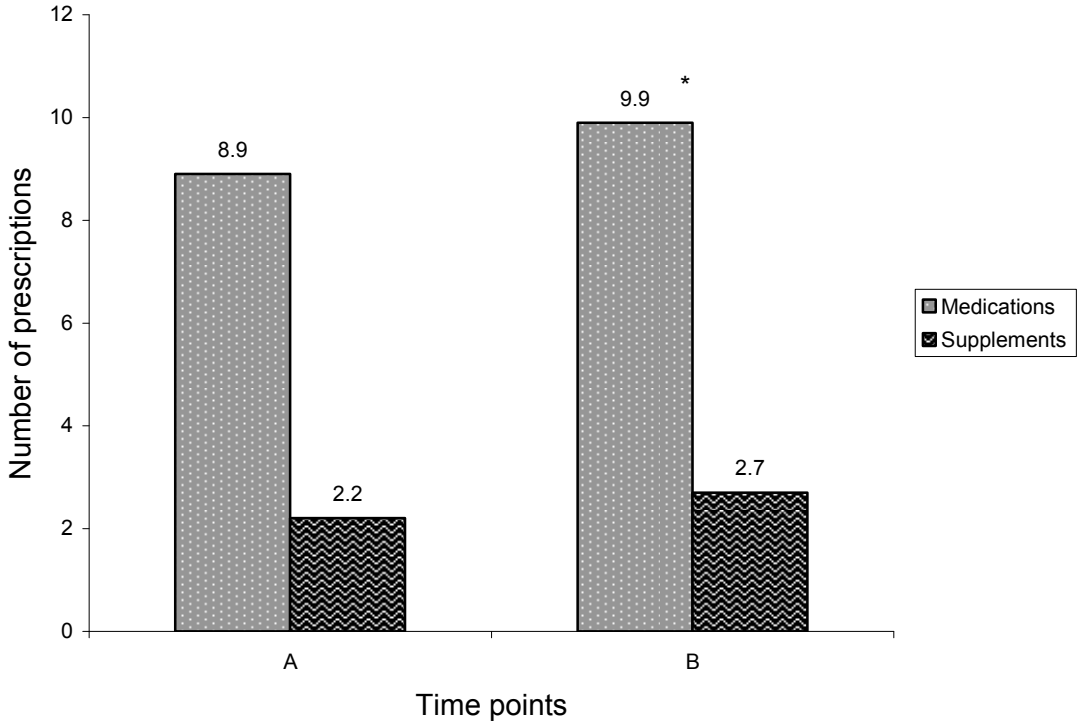

Figure 4.1 Medication and Supplement Use at Time Points A and B

* $p < .05$

Diagnoses did not change between Times A and B. Major diagnoses that may affect the nutritional status of study participants are presented in Table 4.5. Participants presented an average of 5.54 ± 1.98 major diagnoses. Depression and/or anxiety as well as arthritis are the most common diagnoses, affecting 62% of study participants. They are followed by congestive heart failure and hypertension, which each affect 43% of participants. Among women, arthritis affects 100% of participants, while depression and/or anxiety is the second most common diagnosis, affecting 63% of participants. Osteoporosis, hypertension, depression and/or anxiety, congestive heart failure, and anemia each affect 60% of male participants. Cancer (active or by history) and neurological disease, each affecting 40% of male participants, are the second most common diagnoses among male participants.

Table 4.5 Major Diagnoses That May Affect the Nutritional Status of Participants

Diagnosis	Women 62[a] (8)[b]	Men 38 (5)	Total 100 (13)
Anemia	13 (1)	60 (3)	31 (4)
Arthritis	100 (8)	0 (0)	62 (8)
Cancer (active or by history)	13 (1)	40 (2)	23 (3)
Congestive Heart Failure	38 (3)	60 (3)	43 (6)
Coronary Artery Disease	38 (3)	0 (0)	23 (3)
Cerebrovascular Accident	13 (1)	20 (1)	15 (2)
Dementia	0 (0)	20 (1)	8 (1)
Depression and/or Anxiety	63 (5)	60 (3)	62 (8)
Diabetes	13 (1)	20 (1)	15 (2)
Dysphagia	13 (1)	20 (1)	15 (2)
Gastrointestinal Disease	38 (3)	20 (1)	31 (4)
Hypertension	38 (3)	60 (3)	43 (6)
Hypothyroidism	25 (2)	20 (1)	23 (3)
Neurological Disease	25 (2)	40 (2)	31 (4)
Osteoporosis	25 (2)	60 (3)	38 (5)
Pain	25 (2)	20 (1)	23 (3)
Poor vision	25 (2)	20 (1)	23 (3)

[a] Expressed as a percentage
[b] Number of participants

Nutrition, Health, and Relocation Survey and Initial Screen Responses

General information about participants' eating habits and diet type, collected in the initial screen and the follow-up survey, is presented in Table 4.6. Most participants (Time A: 71%; Time B: 54%) were prescribed the standard LTC diet. The standard LTC diet meets or exceeds CFG recommendations for all food groups and provides 1550 to 2000 calories and 2200 ml of fluids daily (Winnipeg Regional Health Authority, 2008). All food items are compliant with this diet type, because it is intended for LTC residents who do not have special dietary considerations. More than half of participants were using supplements at Time A and Time B, the most common being a calcium-containing multivitamin. Nearly all participants ate meals or snacks three or more times per day and all could feed themselves without help, although assistance was required to open food packages. Eighty-five percent of participants ate meals in the dining room at least once per day. Participants also ate more often in the company of others following relocation: 35% at alone three or more times per day at Time A compared to 16% who did so at Time B. Participants expressed similar levels of satisfaction with their eating habits at Time A and at Time B. No statistically significant differences in responses were observed between Time points A and B.

Table 4.6 Participant Responses Regarding Eating Habits at Time Points A[a] and B[b]

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Are you on a specific diet?						
Yes	22 (2)	38 (3)	40 (2)	40 (2)	29 (4)	39 (5)
No	78 (7)	63 (5)	60 (3)	60 (3)	71 (10)	62 (8)
What is your diet?						
LTC	78 (7)	63 (5)	60 (3)	40 (2)	71 (10)	54 (7)
Texture modified	0	0	40 (2)	40 (2)	14 (2)	15 (2)
Therapeutic	22 (2)	38 (3)	20 (1)	20 (1)	21 (3)	31 (4)
Do you use any supplements?						
Yes	67 (6)	75 (6)	40 (2)	40 (2)	57 (8)	62 (8)
No/don’t know	33 (3)	25 (2)	60 (3)	60 (3)	43 (6)	39 (5)

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Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
If yes, which?						
None	33 (3)	25 (2)	60 (3)	40 (2)	43 (6)	31 (4)
Multivitamin	33 (3)	25 (2)	20 (1)	20 (1)	29 (4)	23 (3)
Calcium	11 (1)	13 (1)	0	0	7 (1)	8 (1)
Liquid Supplement	22 (2)	25 (1)	20 (1)	20 (1)	21 (3)	23 (3)
Don't know	0	13 (1)	0	20 (1)	0	15 (2)
How many times did/do you eat per day?						
Twice	0	0	20 (1)	0	7 (1)	0
Three times	44 (4)	25 (2)	20 (1)	20 (1)	36 (5)	23 (3)
Four times	44 (4)	50 (4)	20 (1)	60 (3)	36 (5)	54 (7)
Five times	11 (1)	13 (1)	20 (1)	20 (1)	14 (2)	15 (2)

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Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Six or more times	0	13 (1)	0	0	0	8 (1)
No response	0	0	20 (1)	0	7 (1)	0
Before you moved here, could you feed yourself without help?						
Yes	100 (9)	n/a	100 (5)	n/a	100 (14)	n/a
How often did/do you go a day without eating?						
Sometimes	11 (1)	13 (1)	20 (1)	20 (1)	14 (2)	15 (2)
Usually	0	0	20 (1)	0	7 (1)	0
Never	89 (8)	88 (7)	40 (2)	80 (4)	71 (10)	85 (11)
No response	0	0	20 (1)	0	7 (1)	0

Continued on the next page

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
How many times per day do you eat in the dining room?						
Never	n/a	25 (2)	n/a	0	n/a	15 (2)
Once	n/a	0	n/a	20 (1)	n/a	8 (1)
Twice	n/a	13 (1)	n/a	20 (1)	n/a	15 (2)
Three times	n/a	63 (5)	n/a	20 (1)	n/a	62 (8)
How many times per day did/do you eat alone?						
Never	44 (4)	13 (1)	20 (1)	60 (3)	36 (4)	31 (4)
Once	11 (1)	38 (3)	40 (2)	40 (2)	21 (3)	39 (5)
Twice	0	25 (2)	20 (1)	0	7 (1)	15 (2)
Three times	22 (2)	13 (1)	0	0	14 (2)	8 (1)

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Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Four times	22 (2)	13 (1)	0	0	14 (2)	8 (1)
Six or more times	0	0	20 (1)	0	7 (1)	0
How satisfied are you with your eating habits?						
Very dissatisfied	11 (1)	0	0	0	7 (1)	0
Moderately Dissatisfied	11 (1)	13 (1)	0	20 (1)	7 (1)	15 (2)
Slightly dissatisfied	0	13 (1)	20 (1)	20 (1)	7 (1)	15 (2)
Slightly satisfied	11 (1)	0	0	0	7 (1)	0
Moderately satisfied	44 (4)	63 (5)	20 (1)	40 (2)	36 (5)	54 (7)
Very satisfied	22 (2)	13 (1)	40 (2)	20 (1)	29 (4)	15 (2)
No response	0	0	20 (1)	0	7 (1)	0

[a] 2-3 months post-relocation
[b] 6-7 months post-relocation

Overall, participants held strong positive beliefs and attitudes towards nutrition at both time points (Table 4.7). The Wilcoxon Signed Rank Test did not reveal any statistically significant changes in participant-held beliefs and attitudes between Times A and B. Opinions were divided among participants regarding the importance of vitamin supplements. At Time B, 50% of participants expressed strong disagreement, disagreement, or neutrality towards the statement "I think I need vitamin pills to be sure I am getting adequate nutrition." Participants expressed unanimous agreement towards the statement "I believe that eating a good diet helps prevent disease in myself."

Results about quality of life, health, and lifestyle are provided in Table 4.8. Although most participants (Time A: 70%, Time B: 79%) rated their own health as good or excellent compared to others their age, many (Time A: 35%, Time B: 54%) expressed dissatisfaction with their health. Responses regarding life satisfaction were similar to those for health satisfaction. However, participants reported greater satisfaction with their social relationships at Time A than at Time B (not statistically significant). Approximately 70% of participants were confined to a chair or a bed for most of the day due to health constraints, however when asked to report on their activity levels, 44% of participants at Time A and 54% of participants at Time B said they were "somewhat active", "active" or "very active" compared to others their age. No statistically significant differences in responses were observed between Time points A and B.

Table 4.7 Participant Responses Regarding Nutrition Beliefs and Attitudes at Time Points A[a] and B[b]

Question	Women Mean ± SD		Men Mean ± SD		Total Mean ± SD	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
People of all ages should be concerned about eating healthy diets						
Agree	67 (6)	38 (3)	20 (1)	0	50 (7)	23 (3)
Strongly agree	33 (3)	63 (5)	80 (4)	100 (5)	50 (7)	77 (10)
I believe that eating a good diet helps prevent disease in myself						
Agree	56 (5)	63 (5)	40 (2)	40 (2)	50 (7)	54 (7)
Strongly agree	44 (4)	38 (3)	60 (3)	60 (3)	50 (7)	46 (6)

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Question	Women Mean ± SD		Men Mean ± SD		Total Mean ± SD	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
I think I am more likely to become sick when I am not eating well						
Neutral	11 (1)	0	40 (2)	0	21 (3)	0
Agree	44 (4)	63 (5)	20 (1)	100 (5)	36 (5)	77 (10)
Strongly agree	44 (4)	38 (3)	40 (2)	0	43 (6)	23 (3)
Food is a large part of my life, therefore eating a healthy diet is important						
Disagree	0	13 (1)	0	0	0	8 (1)
Agree	78 (7)	75 (6)	40 (2)	40 (2)	64 (9)	62 (8)
Strongly agree	22 (2)	13 (1)	60 (3)	60 (3)	36 (5)	31 (4)

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Question	Women Mean ± SD		Men Mean ± SD		Total Mean ± SD	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Of all the factors that influence my health, nutrition is the most important						
Strongly disagree	11 (1)	0	0	0	7 (1)	0
Disagree	0	13 (1)	20 (1)	0	7 (1)	8 (1)
Neutral	33 (3)	13 (1)	0	0	21 (3)	8 (1)
Agree	44 (4)	38 (3)	60 (3)	60 (3)	50 (7)	46 (6)
Strongly agree	11 (1)	38 (3)	20 (1)	40 (2)	14 (2)	39 (5)
I think I should eat a greater variety of foods						
Disagree	22 (2)	50 (4)	0	0	14 (2)	31 (4)
Neutral	11 (1)	13 (1)	0	0	7 (1)	8 (1)
Agree	44 (4)	38 (3)	60 (3)	60 (3)	50 (7)	46 (6)

Continued on the next page

Question	Women Mean ± SD		Men Mean ± SD		Total Mean ± SD	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Strongly agree	22 (2)	0	40 (2)	40 (2)	29 (4)	15 (2)
I think I need vitamin pills to ensure I am getting adequate nutrition						
Strongly disagree	0	0	20 (1)	20 (1)	7 (1)	8 (1)
Disagree	22 (2)	25 (2)	0	20 (1)	14 (2)	23 (3)
Neutral	11 (1)	13 (1)	20 (1)	20 (1)	14 (2)	15 (2)
Agree	44 (4)	25 (2)	60 (3)	0	50 (7)	15 (2)
Strongly agree	22 (2)	38 (3)	0	40 (2)	14 (2)	39 (5)
A change in my diet does not affect my health						
Strongly disagree	22 (2)	0	20 (1)	0	21 (3)	0
Disagree	22 (2)	38 (3)	20 (1)	40 (2)	21 (3)	39 (5)

Continued on the next page

Question	Women Mean ± SD		Men Mean ± SD		Total Mean ± SD	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Neutral	11 (1)	25 (2)	20 (1)	20 (1)	14 (2)	23 (3)
Agree	44 (4)	38 (3)	40 (2)	40 (2)	43 (6)	39 (5)

[a] 2-3 months post-relocation
[b] 6-7 months post-relocation

Table 4.8 Participant Responses Regarding Quality of Life, Health, and Lifestyle at Time Points A[a] and B[b]

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Compared to others your age, how would you rate your health?						
Fair	11 (1)	25 (2)	40 (2)	40 (2)	21 (3)	31 (4)
Good	89 (8)	63 (5)	60 (3)	60 (3)	79 (11)	62 (8)
Excellent	0	13 (1)	0	0	0	8 (1)
How satisfied are you with your health?						
Very dissatisfied	11 (1)	0	0	40 (2)	7 (1)	15 (2)
Moderately dissatisfied	11 (1)	50 (4)	20 (1)	0	14 (2)	31 (4)
Slightly dissatisfied	22 (2)	13 (1)	0	0	14 (2)	8 (1)
Slightly satisfied	11 (1)	13 (1)	0	0	7 (1)	8 (1)

Continued on the next page

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Moderately satisfied	33 (3)	25 (2)	60 (3)	40 (2)	43 (6)	31 (4)
Very satisfied	11 (1)	0	20 (1)	20 (1)	14 (2)	8 (1)
How satisfied are you with life in general?						
Very dissatisfied	11 (1)	13 (1)	0	20 (1)	7 (1)	15 (2)
Moderately dissatisfied	22 (2)	50 (4)	20 (1)	20 (1)	21 (3)	39 (5)
Slightly satisfied	11 (1)	0	0	0	7 (1)	0
Moderately satisfied	22 (2)	38 (3)	80 (4)	60 (3)	43 (6)	46 (6)
Very satisfied	33 (3)	0	0	0	21 (3)	0
How satisfied are you with your social relationships?						
Very dissatisfied	11 (1)	0	0	0	7 (1)	0
Moderately dissatisfied	11 (1)	13 (1)	20 (1)	0	14 (2)	8 (1)

Continued on the next page

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
Slightly dissatisfied	0	25 (2)	0	40 (2)	0	31 (4)
Slightly satisfied	11 (1)	0	20 (1)	0	14 (2)	0
Moderately satisfied	44 (4)	25 (2)	40 (2)	40 (2)	43 (6)	31 (4)
Very satisfied	22 (2)	38 (3)	20 (1)	0	21 (3)	23 (3)
No answer	0	0	0	20 (1)	0	8 (1)
Do you have a close friend with whom you can discuss almost anything?						
Yes	44 (4)	63 (5)	40 (2)	40 (2)	43 (6)	54 (7)
No	56 (5)	38 (3)	60 (3)	60 (3)	57 (8)	46 (6)
Compared to others your age, how active are you?						
Not at all active	44 (4)	38 (3)	20 (1)	20 (1)	36 (5)	31 (4)

Continued on the next page

Question	Women % (n)		Men % (n)		Total % (N)	
	Time A (n = 9)	Time B (n = 8)	Time A (n = 5)	Time B (n = 5)	Time A (N = 14)	Time B (N = 13)
A little active	0	0	40 (2)	40 (2)	14 (2)	15 (2)
Somewhat active	11 (1)	0	40 (2)	20 (1)	21 (3)	8 (1)
Active	22 (2)	63 (5)	0	20 (1)	14 (2)	46 (6)
Very active	11 (1)	0	0	0	7 (1)	0
No answer	11 (1)	0	0	0	7 (1)	0
Are you currently in a chair or bed for most of the day because of your health?						
Yes	67 (6)	63 (5)	80 (4)	80 (4)	71 (10)	69 (9)
No	33 (3)	38 (3)	20 (1)	20 (1)	29 (4)	31 (4)

[a] 2-3 months post-relocation
[b] 6-7 months post-relocation

Tables 4.9 and 4.10 report participants' responses regarding their relocation experiences collected in the NRHS. Table 4.9 presents responses to questions focusing on food and dining experiences, while Table 4.10 presents participants attitudes towards relocation. As these questions are not a part of the NHRS:IS, the information provided is descriptive in nature rather than comparative.

The responses presented in Table 4.9 indicate that a large majority of participants enjoyed eating with other people, were happy with how the seating in the dining room is handled at mealtimes, and liked the times that meals are served. Sixty-nine percent of participants agreed or strongly agreed with the statement "The foods that are offered here are different from what I ate before I moved" and 46% of participants disagreed or strongly disagreed with the statements "I am eating a more nutritious diet since I moved here" and "I am offered a selection of foods to choose from at mealtimes." Most participants (69% and 54%, respectively) agreed with the statements "I miss eating the foods that I used to eat" and "I miss preparing meals for myself." Men were more likely to agree with the statements "My dining experiences here are just as I expected" (60% of men agreed compared to 13% of women) and "Overall, I am satisfied with the meals served here" (60% of men agreed compared to 38% of women).

The responses presented in Table 4.10 indicate that a sizeable minority, ranging from 15-30% of participants, expressed dissatisfaction with their new home, while 46% of respondents strongly disagreed, disagreed, or were neutral in response to the statement "I am happy living in my new home." However,

when asked to respond to the statements “I find my new home comfortable” and “My new home is nice”, 85% of participants agreed with those statements, indicating that they are satisfied with the physical space provided to them.

Table 4.9 Participant Responses Regarding Food and Dining Experiences

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
I enjoy eating with other people.			
Disagree	13 (1)	0	8 (1)
Agree	75 (6)	60 (3)	69 (9)
Strongly agree	13 (1)	40 (2)	23 (3)
Choosing where and with whom I eat are important to me.			
Disagree	13 (1)	0	8 (1)
Neutral	13 (1)	20 (1)	15 (2)
Agree	63 (5)	80 (4)	69 (9)
Strongly agree	13 (1)	0	8 (1)
I like the times that the meals are served.			
Disagree	0	40 (2)	15 (2)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Neutral	13 (1)	0	8 (1)
Agree	75 (6)	60 (3)	69 (9)
Strongly agree	13 (1)	0	8 (1)
I am happy with how the seating in the dining room is handled at mealtimes.			
Disagree	13 (1)	0	8 (1)
Neutral	25 (2)	20 (1)	23 (3)
Agree	63 (5)	80 (4)	69 (9)
Eating in the dining room is mostly a pleasant social experience.			
Disagree	13 (1)	0	8 (1)
Neutral	25 (2)	20 (1)	23 (3)
Agree	63 (5)	80 (4)	69 (9)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
The foods that are offered here are different from what I ate before I moved.			
Disagree	0	60 (3)	23 (3)
Neutral	13 (1)	0	8 (1)
Agree	50 (4)	40 (2)	46 (6)
Strongly agree	38 (3)	0	23 (3)
I like having meals prepared for me.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	0	20 (1)	8 (1)
Neutral	25 (2)	0	15 (2)
Agree	63 (5)	60 (3)	62 (8)
Strongly agree	0	20 (1)	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
The service the dietary staff provides adds to my mealtime enjoyment.			
Neutral	38 (3)	20 (1)	31 (4)
Agree	38 (3)	80 (4)	54 (7)
Strongly agree	25 (2)	0	15 (2)
I miss eating the foods that I used to eat.			
Disagree	25 (2)	40 (2)	31 (4)
Agree	25 (2)	20 (1)	23 (3)
Strongly agree	50 (4)	40 (2)	46 (6)
Before I moved here, I prepared meals for myself.			
Strongly disagree	0	40 (2)	15 (2)
Disagree	13 (1)	0	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Neutral	0	20 (1)	8 (1)
Agree	38 (3)	40 (2)	39 (5)
Strongly agree	38 (3)	0	23 (3)
No response	13 (1)	0	8 (1)
It is important that I have good conversation at mealtimes.			
Disagree	13 (1)	20 (1)	15 (2)
Neutral	38 (3)	20 (1)	31 (4)
Agree	38 (3)	60 (3)	46 (6)
Strongly agree	13 (1)	0	8 (1)
I miss preparing meals for myself.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	13 (1)	80 (4)	39 (5)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Agree	50 (4)	0	31 (4)
Strongly agree	25 (2)	20 (1)	23 (3)
Overall, I am satisfied with my dining experiences.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	13 (1)	20 (1)	15 (2)
Neutral	25 (2)	20 (1)	23 (3)
Agree	50 (4)	60 (3)	54 (7)
I feel at home here.			
Strongly disagree	25 (2)	0	15 (2)
Disagree	13 (1)	20 (1)	15 (2)
Neutral	25 (2)	20 (1)	23 (3)
Agree	38 (3)	60 (3)	46 (6)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
I am satisfied with the variety of foods served here.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	25 (2)	20 (1)	23 (3)
Neutral	25 (2)	20 (1)	23 (3)
Agree	38 (3)	60 (3)	46 (6)
Overall, I am satisfied with the meals served here.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	13 (1)	20 (1)	15 (2)
Neutral	38 (3)	20 (1)	31 (4)
Agree	38 (3)	60 (3)	46 (6)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
I enjoy the types of foods that are given to me here.			
Disagree	38 (3)	40 (2)	39 (5)
Neutral	38 (3)	0	23 (3)
Agree	25 (2)	60 (3)	39 (5)
I am offered a selection of foods to choose from at mealtimes.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	38 (3)	80 (4)	54 (7)
Agree	38 (3)	0	23 (3)
Strongly agree	13 (1)	20 (1)	15 (2)
My social experiences here are just as I expected them to be.			
Strongly disagree	13 (1)	0	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Disagree	13 (1)	40 (2)	23 (3)
Neutral	38 (3)	20 (1)	31 (4)
Agree	38 (3)	40 (2)	39 (5)
I am eating a more nutritious diet since I moved here.			
Disagree	63 (5)	20 (1)	46 (6)
Neutral	13 (1)	40 (2)	23 (3)
Agree	25 (2)	40 (2)	31 (4)
My appetite has improved since I moved here.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	50 (4)	40 (2)	46 (6)
Neutral	25 (2)	0	15 (2)
Agree	13 (1)	40 (2)	23 (3)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Strongly agree	0	20 (1)	8 (1)
My dining experiences here are just as I expected.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	13 (1)	20 (1)	15 (2)
Neutral	63 (5)	20 (1)	46 (6)
Agree	13 (1)	60 (3)	31 (4)

Table 4.10 Participants' Attitudes Towards Relocation

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
I find my new home comfortable.			
Disagree	0	20 (1)	8 (1)
Neutral	13 (1)	0	8 (1)
Agree	88 (7)	80 (4)	85 (11)
My new home is nice.			
Disagree	13 (1)	20 (1)	15 (2)
Agree	88 (7)	80 (4)	85 (11)
I find my move was valuable to me.			
Disagree	13 (1)	0	8 (1)
Neutral	13 (1)	20 (1)	15 (2)
Agree	63 (5)	80 (4)	69 (9)
Strongly agree	13 (1)	0	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
The people around me at my new home are friendly.			
Disagree	13 (1)	0	8 (1)
Neutral	0	20 (1)	8 (1)
Agree	50 (4)	80 (4)	62 (8)
Strongly agree	25 (2)	0	15 (2)
No response	13 (1)	0	8 (1)
Living in my new home is interesting.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	25 (2)	0	15 (2)
Agree	38 (3)	100 (5)	62 (8)
Strongly agree	13 (1)	0	8 (1)
No response	13 (1)	0	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Living in my new home is beneficial.			
Disagree	25 (2)	20 (1)	23 (3)
Neutral	0	40 (2)	15 (2)
Agree	63 (5)	40 (2)	54 (7)
Strongly agree	13 (1)	0	8 (1)
I find living in my new home pleasant.			
Disagree	38 (3)	20 (1)	31 (4)
Neutral	13 (1)	0	8 (1)
Agree	50 (4)	60 (3)	54 (7)
Strongly agree	0	20 (1)	8 (1)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
Life in my new home is good.			
Disagree	25 (2)	40 (2)	31 (4)
Neutral	13 (1)	0	8 (1)
Agree	63 (5)	60 (3)	62 (8)
My living conditions are satisfying to me.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	13 (1)	0	8 (1)
Neutral	13 (1)	40 (2)	23 (3)
Agree	63 (5)	60 (3)	62 (8)

Continued on the next page

Statement	Women % (n) (n = 8)	Men % (n) (n = 5)	Total % (N) (N = 13)
I am happy living in my new home.			
Strongly disagree	13 (1)	0	8 (1)
Disagree	25 (2)	20 (1)	23 (3)
Neutral	25 (2)	0	15 (2)
Agree	25 (2)	60 (3)	39 (5)
Strongly agree	0	20 (1)	8 (1)
No response	13 (1)	0	8 (1)

Biochemical Data

The results of biochemical analyses are presented in Table 4.11. Reference ranges for biochemical indices are reported in Appendix D. Among the total population, paired T-tests revealed a statistically significant reduction in serum iron levels $t = 2.229$, $df = 11$, $p < .05$ with a large effect size ($r = .31$), as well as in mean corpuscular hemoglobin concentration $t = 5.113$, $df = 12$, $p < .001$ with a large effect size ($r = .69$). No other statistically significant changes in biochemical indices were revealed among the total population.

When men's data was examined separately, iron ($t = 4.103$, $df = 4$, $p < .05$), percent iron saturation ($t = 6.236$, $df = 4$, $p < .005$), and mean corpuscular hemoglobin concentration ($t = 2.998$, $df = 4$, $p < .05$) declined from Time A to Time B. Among women, neither iron ($t = .430$, $df = 6$, $p > .5$) nor percent iron saturation ($t = -.162$, $df = 6$, $p > .5$) declined. However, mean corpuscular hemoglobin concentration ($t = 4.011$, $df = 7$, $p = .005$) declined among women. Additionally, increases in creatinine ($t = -3.263$, $df = 7$, $p < .05$) and chloride ($t = -2.876$, $df = 7$, $p < .05$) levels were observed among women, but not among men.

Averages for all biochemical indices, including albumin and vitamin B_{12}, were within laboratory norms except for vitamin D. Vitamin D results are presented in Table 4.11 and in Figure 4.1. Vitamin D status is considered optimal if serum 25-hydroxyvitamin D is between 75 and 250 nmol/L, insufficient if it is between 25 and 75 nmol/L and deficient when it is below 25 nmol/L. 25-Hydroxyvitaim D was an average of 55.0 nmol/L at Time A and 58.5 nmol/L at

Time B. No differences in vitamin D status were observed between participants who were tested in different seasons (data not shown).

Table 4.11 Biochemical Data for Participants at Time A[a] and Time B[b]

Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
Protein status						
Iron (µmol/L)	12.2 ± 7.2 (8)	12.2 ± 6.0 (8)	17.3 ± 2.4 (5)	12.2 ± 4.2 (5)*	14.2 ± 6.2 (13)	12.2 ± 5.2 (13)*
TIBC[c] (µmol/L)	56.3 ± 8.2 (8)	58.2 ± 11.5 (8)	44.9 ± 6.2 (5)	45.2 ± 4.6 (5)	51.9 ± 9.2 (13)	53.2 ± 11.3 (13)
% Iron Saturation (%)	21.4 ± 10.9 (8)	22.9 ± 10.6 (8)	39.6 ± 10.4 (5)	28.0 ± 12 (5)*	28.4 ± 13.8 (13)	24.8 ± 10.9 (13)
Total Protein (g/L)	63.9 ± 8.2 (7)	66.1 ± 4.0 (8)	63.0 ± 4.8 (5)	59.8 ± 6.0 (5)	63.5 ± 6.7 (12)	63.7 ± 5.6 (13)
Albumin (g/L)	35.3 ± 5.3 (6)	33.0 ± 8.6 (7)	39.5 ± 3.7 (4)	36.4 ± 4.6 (5)	37.0 ± 5 (10)	34.4 ± 7.2 (12)
Vitamin B_{12} (pmol/L)	418.8 ± 229.0 (9)	565.0 ± 307 (8)	461.2 ± 272.5 (5)	451.4 ± 276.7 (5)	433.9 ± 235.8 (14)	521.3 ± 289.5 (13)

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Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
Lipoprotein profile						
Cholesterol (mmol/L)	4.8 ± 1.4 (8)	5 ± 0.8 (7)	3.8 ± 0.8 (5)	3.6 ± 0.6 (5)	4.4 ± 1.3 (13)	4.4 ± 1.0 (12)
Triglycerides (mmol/L)	2.1 ± 1.1 (8)	2.3 ± 1.4 (7)	1.2 ± 0.7 (5)	1.0 ± 0.6 (5)	1.8 ± 1.1 (13)	1.8 ± 1.2 (12)
HDL Cholesterol (mmol/L)	1.3 ± 0.5 (8)	1.3 ± 0.3 (7)	1.3 ± 0.3 (5)	1.2 ± 0.2 (5)	1.3 ± 0.4 (13)	1.2 ± 0.3 (12)
LDL Cholesterol (mmol/L)	2.5 ± 1.2 (8)	2.8 ± 0.8 (6)	1.9 ± 0.6 (5)	1.9 ± 0.5 (5)	2.3 ± 1.0 (13)	2.4 ± 0.8 (11)
Cholesterol : HDL ratio	4.0 ± 1.7 (8)	3.8 ± 1 (6)	3.0 ± 0.9 (5)	3.1 ± 0.9 (5)	3.6 ± 1.5 (13)	3.5 ± 1 (11)

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Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
LDL : HDL ratio	2.1 ± 1.3 (8)	2.1 ± 0.7 (6)	1.5 ± 0.6 (5)	1.7 ± 0.7 (5)	1.9 ± 1.1 (13)	1.9 ± 0.7 (11)
Complete blood count						
WBC ($x10^9$/L)	7 ± 2.0 (9)	6.6 ± 2.6 (8)	6.8 ± 1.9 (5)	7.3 ± 1.0 (5)	6.9 ± 1.9 (14)	6.9 ± 2.1 (13)
RBC ($x10^{12}$/L)	4.2 ± 0.5 (9)	4.2 ± 0.6 (8)	4 ± 0.6 (5)	4 ± 0.7 (5)	4.1 ± 0.5 (14)	4.1 ± 0.7 (13)
Hemoglobin (g/L)	127.8 ± 18.1 (9)	125.9 ± 19.6 (8)	130.2 ± 12.5 (5)	128.8 ± 17.3 (5)	128.6 ± 15.8 (14)	127.0 ± 18.1 (13)
Hematocrit (L^{-1})	0.4 ± 0.0 (9)	0.4 ± 0.1 (8)	0.4 ± 0.0 (5)	0.4 ± 0.0 (5)	0.4 ± 0.0 (14)	0.4 ± 0.0 (13)
MCV[d] (fL)	93.7 ± 7.1 (9)	95.6 ± 5.4 (8)	95.7 ± 7.5 (5)	99.5 ± 7.3 (5)	94.4 ± 7.0 (14)	97.1 ± 6.2 (13)

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Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
MCH[e] (pg)	30.3 ± 2.9 (9)	30.2 ± 2.1 (8)	32.9 ± 2.5 (5)	32.9 ± 2.4 (5)	31.2 ± 2.9 (14)	31.2 ± 2.5 (13)
MCHC[f] (g/L)	322.8 ± 13.6 (9)	315.9 ± 11.5 (8)*	343.6 ± 6.8 (5)	331.0 ± 14.6 (5)*	330.2 ± 15.3 (14)	321.7 ± 14.4 (13)*
RDW[g] (%)	15 ± 2.5 (9)	14 ± 1.1 (8)	13.7 ± 1.1 (5)	13.5 ± 1.1 (5)	14.5 ± 2.16 (14)	13.8 ± 1.1 (13)
Platelets ($x10^9$/L)	244.9 ± 30.9 (9)	232.1 ± 20.1 (8)	198.6 ± 57.2 (5)	201.0 ± 28.9 (5)	228.4 ± 46.1 (14)	220.1 ± 40.5 (13)
MPV[h] (fL)	10.7 ± 1.1 (9)	10.9 ± 1.2 (8)	10.7 ± 1.3 (5)	10.4 ± 1.2 (5)	10.7 ± 1.1 (14)	10.7 ± 1.2 (13)
Neutrophils ($x10^9$/L)	4.4 ± 1.3 (9)	4.1 ± 1.6 (8)	4.3 ± 1.5 (5)	5 ± 0.7 (5)	4.3 ± 1.3 (14)	4.4 ± 1.4 (13)
Lymphocytes ($x10^9$/L)	1.8 ± 1.1 (9)	1.7 ± 1 (8)	1.6 ± 0.5 (5)	1.4 ± 0.2 (5)	1.7 ± 0.9 (14)	1.6 ± 0.8 (13)

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Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
Monocytes ($x10^9$/L)	0.6 ± 0.1 (9)	0.6 ± 0.2 (8)	0.7 ± 0.2 (5)	0.7 ± 0.2 (5)	0.6 ± 0.2 (14)	0.6 ± 0.2 (13)
Eosinophils ($x10^9$/L)	0.2 ± 0.1 (8)	0.2 ± 0.1 (8)	0.2 ± 0.1 (5)	0.2 ± 0.0 (5)	0.2 ± 0.1 (13)	0.2 ± 0.1 (13)
Electrolytes						
Urea (mmol/L)	6.5 ± 1.5 (9)	6.7 ± 1.2 (8)	6.3 ± 2.3 (4)	7.7 ± 4.5 (4)	6.4 ± 1.7 (13)	7.0 ± 2.6 (12)
Creatinine (µmol/L)	71.8 ± 31.9 (9)	76.9 ± 38.4 (8)*	70.8 ± 16.2 (4)	71.4 ± 25 (5)	71.5 ± 27.2 (13)	74.8 ± 32.8 (13)
Sodium (mmol/L)	139.0 ± 3.5 (9)	139.6 ± 2 (8)	137.2 ± 6.1 (5)	136.2 ± 3.6 (5)	138.4 ± 4.4 (14)	138.3 ± 3.1 (13)
Potassium (mmol/L)	4.2 ± 0.4 (9)	4.4 ± 0.4 (8)	4.2 ± 0.1 (5)	4.2 ± 0.4 (5)	4.2 ± 0.3 (14)	4.4 ± 0.4 (13)

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Biochemical index	Women Mean ± SD (n)		Men Mean ± SD (n)		Total Mean ± SD (N)	
	Time A	Time B	Time A	Time B	Time A	Time B
Chloride (mmol/L)	101.7 ± 3.2 (9)	102.8 ± 3.7 (8)*	102.8 ± 4.6 (5)	101.8 ± 2.9 (5)	102.1 ± 3.6 (14)	102.4 ± 3.3 (13)
Vitamin D						
25-Hydroxy-vitamin D (nmol/L)	51.7 ± 26.1 (7)	55.5 ± 31.7 (6)	59.6 ± 25.6 (5)	62.0 ± 16.5 (5)	55.0 ± 25.0 (12)	58.5 ± 24.9 (11)

[a] 2-3 months post-relocation
[b] 6-7 months post-relocation
[c] Total Iron Binding Capacity
[d] Mean Corpuscular Volume
[e] Mean Corpuscular Hemoglobin
[f] Mean Corpuscular Hemoglobin Concentration
[g] Red Cell Distribution Width
[h] Mean Platelet Volume
* $p < .05$ between Time A and Time B

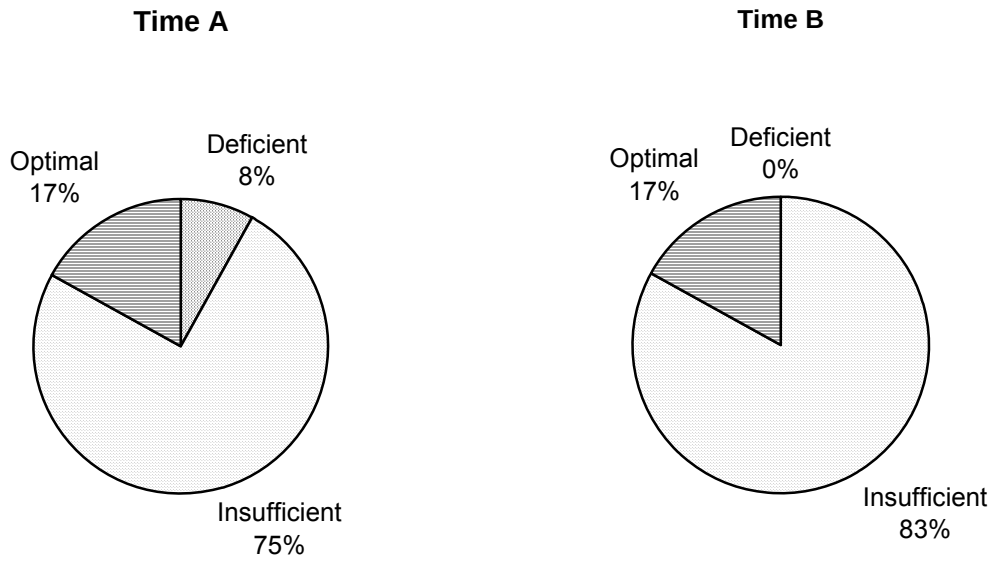

Figure 4.2 Vitamin D Status at Time Points A (N = 12) and B (N = 12).

Deficient < 25 nmol/L, Insufficient 25 – 75 nmol/L, Optimal 75 – 250 nmol/L

Correlations

Relationships between gender, age, nutritional status and other variables were revealed by Spearman rank order correlation (Table 4.12). MNA-SF at Time B had a moderate, positive relationship with weight change. Age and BMI had a moderate, negative relationship at Times A and B, while the other relationships reached statistical significance ($p \leq .05$) at A or B, but not at both Times.

Table 4.12 Correlated Variables

Variable 1	Variable 2	Time A (N=14) Spearman's rho, p	Time B (N=13) Spearman's rho, p
Age	Body mass index	-.534, .049	-.666, .013
Age	MMSE score	-.660, .010	-.435, .137
Mobility	Self-rated activity	.642, .013	.489, .090
Continence (Katz)	Nutrition (Braden)	-.589, .027	.000, 1.000
Sodium	Vitamin D	-.596, .041	-.252, .455
Total protein	Albumin	.656, .039	.327, .299
MNA-SF score	Mobility	.193, .508	.632, .020
MNA-SF score B	Weight change	n/a	.644, .017
Gender	TIBC	.508, .076	.592, .033
Gender	MCHC	-.759, .002	-.549, .052

Dietary Intake

Three-day average food group consumption is presented in Figure 4.2. Few participants met or exceeded the number of daily food group servings recommended for older adults by CFG, with the exception of the milk and alternatives group at Time A. During phase one, 50% of participants met or exceeded the number of daily servings recommended for milk and alternatives. During phase two, the percentage of participants meeting or exceeding daily serving recommendations dropped to just over 20%. The percentage of participants consuming ≥ 100% of the recommended servings of meat and alternatives increased at Time B, while the percentage of participants consuming ≥ 100% of recommended fruit and vegetable servings remained constant at 8% of study participants. Approximately half of the study population consumed less than 50% of the number of daily recommended servings for all food groups at both time points.

Snacking was reported at Time A by 36% of participants and by 46% of participants at Time B. Participants who reported snacking reported an average of 0.76 snacks per day at Time A and 0.94 snacks per day at Time B. Snacks eaten (*e.g.,* cookies, muffins, juice, sandwiches etc.) were often those supplied by the PCH. Two participants regularly snacked on foods purchased outside of the PCH. These snacks were primarily comprised of cookies, cheddar cheese and crackers, microwave popcorn, and fresh fruits and vegetables.

During the three-day diet records, two participants obtained meals from outside of the facility. Staff confirmed that this eating behaviour was typical for

these participants. They ate take-out Chinese food, canned and instant soups and instant macaroni and cheese.

CFG (2007) recommends consumption of one serving of a dark orange vegetable and one serving of a dark green vegetable daily. Diet records were reviewed to assess compliance with this recommendation among study participants, with only one participant meeting the recommendation to eat a daily serving of a dark green vegetable. None of the participants met the recommendation to eat a daily serving of a dark orange vegetable. On average, participants consumed 0.26 daily servings of dark green and 0.17 daily servings of dark orange vegetables at Time A. At Time B, participants consumed a daily average of 0.21 servings of dark green and 0.08 servings of dark orange vegetables.

Dietary intake of foods considered sources of fibre remained steady at both time points. Participants consumed an average of 3.79 servings of foods considered sources of fibre at A and 3.69 servings at Time B. This indicates that participants are not meeting the DRI for fibre. Participants consumed an average of one serving of fruit juice daily (Time A: 0.98, Time B: 1.22) and 2 servings of calcium-rich foods daily (Time A: 2.00, Time B: 2.44).

Breakfast is the main meal of the day. On average, participants consumed over 80% of the breakfast meal. Consumption of the lunch meal was the lowest at A and B (74% and 69%, respectively), while about three-quarters of the dinner meal was consumed at both time points.

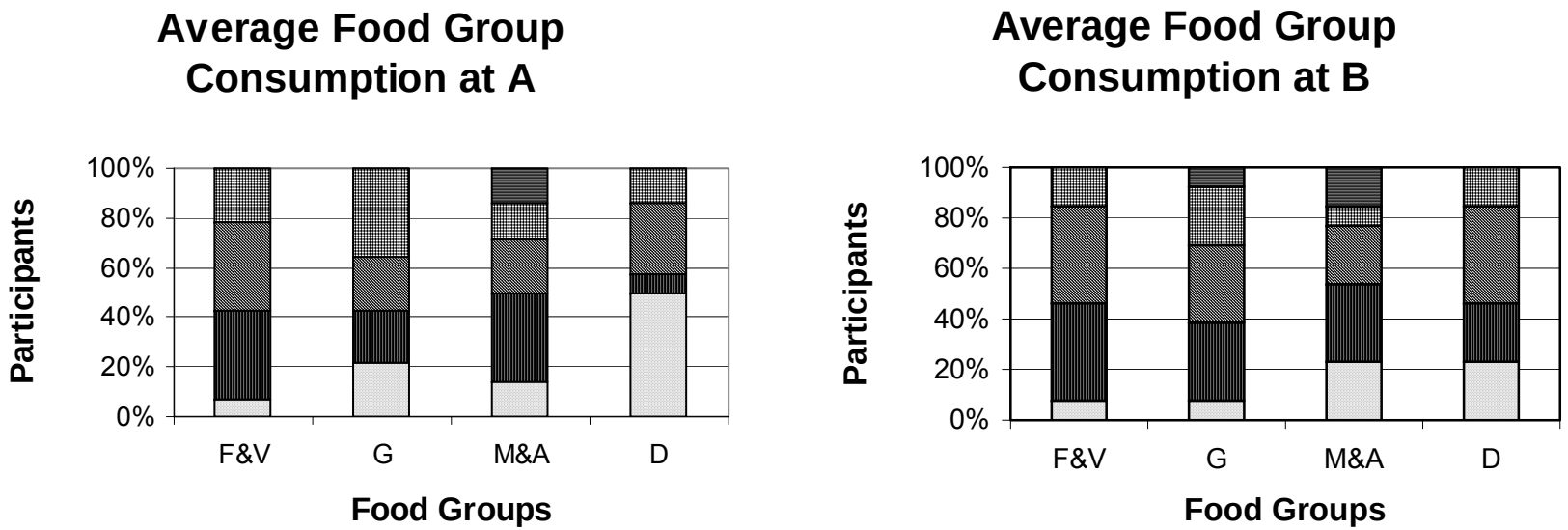

Figure 4.3 Participant Food Group Consumption Compared to Canada's Food Guide (2007) Recommendations. Food groups: F&V (fruit and vegetables), G (grains), M&A (meat and alternatives), D (milk and alternatives). ≥ 100% of CFG recommendation consumed is represented by dots, 75-99% of CFG recommendation consumed is represented by horizontal stripes, 50-74% of CFG recommendation consumed is represented by diagonal stripes, 25-49% of CFG recommendation consumed is represented by checkers, and < 25% of CFG recommendation consumed is represented by vertical stripes.

Nutrition, Health, and Relocation Initial Screen and Survey Reliability

Internal consistency has not been previously reported for the Nutrition, Health, and Relocation Initial Screen or Survey. The data obtained from this study's sample was used to determine the internal consistency of several sections within the two instruments. In the beliefs and attitudes section of the NHRS:IS, the Cronbach alpha coefficient was .417. The Cronbach alpha coefficient for the beliefs and attitudes section of the NHRS was .329. This section addresses two issues, beliefs and attitudes, and contains eight questions.

After the deletion of one inappropriate question, number 25 "Before I moved here I prepared foods for myself", the Cronbach alpha coefficient for the food and dining experiences section of the NHRS was .892. In the final section, which dealt with issues related to relocation, the Cronbach alpha coefficient was .748. No items were deleted from the final section.

CHAPTER FIVE: DISCUSSION

Summary and Integration of Results

This section will present a summary of the results and address them in the context of the research questions presented in Chapter Three.

Research Question One: What are the characteristics of newly admitted PCH residents with respect to cognitive status, depression, skin integrity, nutritional status, functional status, nutrition attitudes and beliefs, quality of life, health and lifestyles, and eating habits?

Measures of health status

The measures used to assess health status were the SMMSE, the 5-Item GDS, the Braden Risk Assessment for Pressure Ulcers, and the Katz Index of ADL. Upon investigation it was found that study participants demonstrated high cognitive function and were not clinically depressed or at risk of developing pressure sores. Initially, participants demonstrated considerable functional disability, typically retaining the ability to feed themselves and maintain control of bladder and bowel function, while requiring assistance with bathing, dressing, toileting and transferring.

Medical charts were reviewed for information on medications and diagnoses. Polypharmacy was evident, with participants prescribed an average of 8.9 medications. Participants presented an average of 5.5 major diagnoses.

Measures of nutritional status

Nutritional status was measured using the MNA-SF, anthropometrics, biochemical indices, and through observed dietary intake. MNA-SF scores indicated that participants were at risk of malnutrition and that further investigation into their nutritional status is warranted. The average BMI for the entire group was in the overweight category (25 to 29.9), but men had a lower average BMI than did women. The average BMI among men was within the normal weight category (< 24.9), while the average BMI among women was in the obese category (> 29.9). As Allard et al. (2004) demonstrated, a BMI above 26 kg/m^2 may be protective among older persons against risk of mortality. Bowman and Keller (2005) demonstrated that a BMI of ≤ 24 kg/m^2 was associated with the increased presence of nutritional risk. Therefore, this data shows that male participants may be at higher nutritional risk than female participants, due to their lower BMI.

Initial biochemical indices for study participants do not offer strong evidence of nutritional risk when compared to the reference values for adults used by Diagnostic Services of Manitoba (2007). When men and women are considered together, the major indicators of nutritional status (iron, TIBC, total protein, albumin, and vitamin B_{12}) that were included in this investigation were within reference ranges. When considered separately, the average values among men fell below normal values for TIBC, red blood cell count and hemoglobin status. The average values among women were above the norm for triglycerides and red cell distribution width. Among all participants, average

values for electrolytes, complete blood cell counts and lipoprotein profiles were within reference ranges, except for those indices noted above.

The one index of concern was vitamin D status. Average 25-hydroxyvitamin D levels for all participants were, at 55.0 nmol/L, insufficient (but not deficient), according to Diagnostic Services of Manitoba (2007) and a recent review of vitamin D deficiency (Holick, 2007). When considered separately, mean serum 25-hydroxyvitamin D levels were insufficient for men and women.

Analysis of the results from the three-day diet record completed two months post-relocation shed light onto the eating habits of study participants. Forty to sixty percent of participants did not consume enough food to meet half of CFG daily serving recommendations (*i.e.*, roughly half of participants consumed fewer than 3.5 servings of fruits and vegetables, 3 servings of grain products, 1.5 servings of milk and alternatives, and less than 1 serving of meat and alternatives daily.) The finding that participants did not meet CFG recommendations to consume one dark green and dark orange vegetable daily is consistent with the finding that participants did not consume sufficient servings of fruits and vegetables. Because few of the participants consumed enough servings of the four food groups to meet CFG recommendations, they may be at risk for nutrient and caloric deficiencies.

Measures of other variables

The NHRS:IS collected information related to the eating habits and diet, quality of life, health and lifestyles, nutrition attitudes and beliefs, demographics, and general health. Information collected regarding general health has been reported previously in the measures of health status subsection. All of the participants were Caucasian and most were female and/or widowed. Few knew what their annual income was, but most felt that it was inadequate to meet their needs. Most participants completed high school, and one-third completed additional training following high school.

Prior to relocating, 86% of participants claimed to eat three or more times per day and 35% ate three or more meals per day alone. Twenty-one percent of participants were initially prescribed a therapeutic diet, with 78% on a standard LTC diet. Additionally, 14% of participants' diets were subject to texture modification to enable easier chewing and swallowing. Most participants (71%) expressed satisfaction with their current eating habits.

Overall, responses to statements about nutrition attitudes and beliefs were strongly positive. Participants demonstrated an understanding of the importance of nutrition and healthy diets and of the link between diet and health. Participants expressed unanimous agreement with the statements "People of all ages should be concerned about eating healthy diets," "I believe that eating a good diet helps prevent disease in myself," and "Food is a large part of my life, therefore eating a healthy diet is important." A minority of participants expressed disagreement or neutrality in response to the following three statements: "Of all the factors that

influence my health, nutrition is the most important," "I think I need vitamin pills to ensure I am getting adequate nutrition," and "I think I should eat a greater variety of foods." As the interviews were not recorded for qualitative analysis, there is no verbatim transcript of participants' comments on these statements. However, research notes indicate that participants who disagreed with the above statements felt that nutrition was important in influencing their health, but probably not the most important factor in doing so, and that they were already provided with a sufficient variety of foods at mealtimes.

When asked about quality of life, health, and lifestyle, 79% of participants rated their health as "good." In a subsequent question, 35% expressed dissatisfaction with their health, indicating that some participants felt that their health was good compared to that of their peers, but were not personally satisfied with their health status. A smaller percentage of participants were dissatisfied with life in general and with social relationships. When asked if they were currently in a chair or a bed for most of the day because of their health, 71% of participants responded "yes". However, when asked how active they were compared to others their age, 42% of participants indicated that they were "somewhat active," "active," or "very active," demonstrating a possible dichotomy between the way participants perceived themselves and their actual physical limitations.

Conclusion

This sample of newly admitted PCH residents can be described as being cognitively intact, as not suffering from depression or at risk of developing pressure sores, but with limited functional ability. They have several major diagnoses that could affect their nutritional status and use multiple prescription medications. They are at risk of malnutrition and men may be at higher risk than women due to their lower BMI. Participants see themselves as being healthier and more active than their peers and have positive nutrition attitudes and beliefs.

Research Question Two: Do the Characteristics Investigated at Time A Change Six Months Post-Relocation?

Measures of health status

At follow-up, a statistically significant decline in cognitive function was observed among study participants. Other health status measures exhibited small, but not statistically significant variations. However, there is practical significance attached to the small change in the average 5-Item GDS score, which increased from 1.9 to 2.2, thereby rising above the 2.0 threshold that is indicative of clinical depression. This would suggest that feelings of depression among study participants became strong enough to merit treatment by a physician. Small changes in the scores of assessments that examined functional ability and pressure sore risk did not result in any different practical implications. A statistically significant increase in the number of medications prescribed to participants at Time B was observed and can be accounted for by changes in pain and bowel control medication. No change was observed to major diagnoses.

Measures of nutritional status

Nutritional status, as measured by the MNA-SF, declined (not statistically significant) and participants lost an average of 3.2 kg in the four months separating phases one and two. On average, women lost 1.2 kg more weight than men did. However, average BMI for women was in the protective overweight category (25 to 29.9), while that for men declined further within the normal weight category (18 to 24.9). FFM (kg) also declined between the two points, more when calculated using the NHANES-III equation (average decline among all participants was 2.7 kg) than when using the Göteborg equation (average decline among all participants was 1.2 kg). However, although FFM decreased with weight, % FFM did not change between Time A and B. Decline in FFM raises concern about the potential role of sarcopenia and protein-energy malnutrition among study participants.

Biochemical data continued to provide weak evidence of nutritional risk when participants' results are compared to Diagnostic Services of Manitoba (2007) reference ranges. Average values among all participants for iron, TIBC, total protein, albumin, and vitamin B_{12}, the major indicators of nutritional status assessed, were within the reference ranges for adults used by Diagnostic Services of Manitoba (2007). However, mean serum albumin at Time B was 34.4 g/L, below the 35 g/L cut-off level that indicates potential chronic protein energy malnutrition among older adults (Mitchell & Chernoff, 1999). Statistically significant declines were observed for iron and MCHC, although values remained within the reference ranges used by Diagnostic Services of Manitoba (2007).

When men and women are considered separately, average values among men fell below the norm for total protein, which may be another indication that men are at higher nutritional risk than women. Average values among men continued to be below normal for TIBC, red blood cell count and hemoglobin. Average values among men rose above normal for urea.

The average values among women continued to be above the norm for triglycerides, but average red cell distribution width values decreased to within normal ranges. The average value for mean corpuscular hemoglobin concentration declined to levels below the normal range. The average value for serum albumin also declined among women from 35.3 ± 5.3 g/L to 33.0 ± 8.6 g/L (not statistically significant) and at Time B was within the reference range for adults used by Diagnostic Services of Manitoba (2007), but below the 35 g/L cut-off that is indicative of potential chronic protein energy malnutrition among older adults (Mitchell & Chernoff, 1999).

Finally, vitamin D status remained a concern, with serum 25-hydroxyvitamin D levels increasing from 55.0 nmol/L to 58.5 nmol/L, but remaining within the range of insufficiency.

Dietary intake did not change significantly between Time A and Time B. Forty to sixty percent of participants continued to consume less than half of the daily servings recommended by CFG for each of the four food groups. The number of participants meeting or exceeding CFG serving recommendations for grain products and for milk and alternatives decreased at Time B. The number of

participants meeting or exceeding CFG serving recommendations for meat and alternatives increased at Time B from 14% to 21%.

Measures of other variables

The NHRS repeated questions related to eating habits and diet, quality of life, health, and lifestyles, nutrition attitudes and beliefs and general health. General health information has been reported in the measures of health status subsection. Differences in responses to questions assessing eating habits also did not attain statistical significance. The number of participants prescribed a therapeutic diet increased from 21% to 31% and all participants reported eating three or more times per day, as compared to 86% of participants reporting the same at Time A. Participants also ate more frequently in the company of others; 70% of participants ate in the company of others (in the dining room or elsewhere) at least twice a day at Time B compared to 57% at Time A.

When responding to statements about nutrition attitudes and beliefs, participants expressed similar levels of agreement with responses provided in the Initial Screen. No statistically significant differences were noted between responses from Time A to Time B, although a larger minority (31%) disagreed with the statement “I think I should eat a greater variety of foods” than previously (14%).

Responses to quality of life, health and lifestyle statements also did not show a statistically significant change. Participants were somewhat less satisfied with their health, with 54% expressing dissatisfaction at Time B compared to 35% at Time A. They were also more dissatisfied with life in general, as 54% of

participants indicated dissatisfaction at Time B compared to 28% at Time A, as well as being more dissatisfied with their social relationships: 39% claimed to be dissatisfied at Time B compared to 21% at Time A.

Conclusion

Most participant characteristics did not change significantly between Time A and Time B. Cognitive status declined significantly between Time A and B. A small increase in average depression scores, while not statistically significant, has practical significance since study participants may be described as clinically depressed at Time B, but not at Time A. A statistically significant increase in prescription medication use was observed.

Concerns regarding the nutritional status of study participants at Time A were justified, as markers of nutritional status worsened with time: participants scored lower on the MNA-SF, lost weight and FFM, and continued to consume insufficient amounts of food to maintain nutritional status. Biochemical indices remained within reference ranges (except for vitamin D), but mean serum albumin declined below a point considered a cut-off for adequate protein status by gerontologists. There was also biochemical evidence to indicate that male participants may be at higher nutritional risk than female participants.

The decline in satisfaction with health, life, and social relationships among participants was not statistically significant, but may be related to the increase in depression scores.

Research Question Three: Is Gender, Age, or Nutritional Status (MNA-SF score) Associated with Changes in Measured Characteristics?

Several statistically significant associations of moderate strength were revealed. Age was negatively correlated to BMI at both time points. MNA-SF scores at Time B were positively correlated with weight change. Other variables were significantly correlated with each other at one, but not both, points in time. For example, gender was positively correlated at with TIBC at Time B ($p < .05$), but not at Time A ($p = .08$) and gender was negatively correlated with MCHC at Time A ($p < .005$), but not at Time B ($p = .052$). These examples approach significance at Time A and Time B, respectively, and lack of significance may be due to sampling. In other instances where significance is reached at one time point, but not the other, such as in the relationship between continence (Katz) and nutrition (Braden) where the p-value at Time A is .027 versus 1.0 at Time B, the probability difference is so vast that no confidence can be attributed to the relationship.

Research Question Four: What are the Characteristics of PCH Residents at Six Months Post-relocation with Respect to Food and Dining Experiences and to Relocation Adjustment?

In addition to repeating questions related to eating habits and diet, quality of life, health and lifestyles, nutrition attitudes and beliefs, and general health (reported under the subheading research question two), the NHRS introduced questions examining participants' experiences with food and dining as well as

their attitudes towards relocation. Participants expressed high levels of agreement (85%) with positive statements describing the physical environment: it was agreed that the new home was both nice and comfortable. Participants also expressed high levels (≥ 70%) of agreement regarding the social context of their new homes: the people are friendly and living in the new home is interesting. Fewer than 50% of total participants (but 80% of male participants) agreed or strongly agreed with the statement "I am happy living in my new home."

Participants expressed low levels of agreement (≤ 40%) with statements regarding matching the reality of social and dining experiences with the expectations that they had had of these things prior to relocating. Comments made by participants regarding these questions indicated that many did not know what to expect of the social and dining experiences within the PCH setting. Participants also expressed low levels of agreement (≤ 40%) with positive statements regarding food and food service: having a selection of foods to choose from at mealtimes, eating a more nutritious diet since moving, and enjoying the types of foods served. Other statements received responses indicating moderate levels of agreement (40-65%).

Explanation and Integration of Findings with Existing Research

Sample population

The gender and age of the participants in this sample are consistent with expectations based on demographic trends. The oldest old formed the largest proportion of participants, consistent with both personal communication with Lori Lamont, Executive Director of the WRHA's Personal Care Home Program for the

WRHA, and with local expectations set forth in the Manitoba Fact Book on Aging (Centre on Aging, 2005). The ratio of males to females (3:4) participating in the study was higher than the ratio of males to females in the 85 and older age group expected based on data from the 2006 Census (1:2), but is not inconsistent with gender expectations since the study included a number of participants from the young old and middle old age groups, where the gender imbalance is not as pronounced.

Nutritional risk

Participants can be described as at nutritional risk based on MNA-SF scores, due to weight loss, and based on evidence provided through diet records. The prevalence of possible malnutrition, indicated by MNA-SF < 12, was 57% at Time A and rose to 77% at Time B. The prevalence of possible malnutrition among this population is higher than the prevalence rates reported by other Canadian studies among community dwelling older adults (47 – 68.7%) as well as among institutionalized older adults (34.7 – 45.5%) (Carrier, Ouellet, and West, 2007; Keller, 1993; Keller & McKenzie, 2003; MacLellan & Van Til, 1998). The high prevalence of possible malnutrition within this population is more consistent with Crogan, Shultz, Adams, and Massey's (2001) claim that protein energy malnutrition affects up to 85% of residents in some American PCHs. A review of the nutritional situation of nursing home residents in Western countries found that the prevalence of malnutrition and the risk of malnutrition together (assessed with the MNA) ranged from 30 to 90% (Pauly, Stehle, & Volkert, 2007).

The high prevalence of possible malnutrition observed among study participants may be due in part to the age of study participants. Margetts, Thompson, Elia, and Jackson (2003) demonstrated that undernutrition is two and a half times more common in adults aged 85 years and older than among adults aged 65 to 75 years old. The average age of participants in this study was 83.0 years.

Bioelectrical impedance analysis

Body composition data are consistent with the expectation that men have higher amounts of FFM than women. As little reference data exists for older adults, it is difficult to compare the body composition results of this population with other populations of older adults in long-term care. However, when the results for this sample are compared to results from the NHANES-III study for the male and female population aged 80 to 89 years (RJL Systems, 2008), the results are similar.

On average, the participants of this study weigh more than those of the NHANES-III study, but the percentage of body weight comprised of FFM (76.1 ± 8 and 75.6 ± 6.1 among men and 65.1 ± 9.7 and 65.0 ± 6.9 among women in this study at Time B and the NHANES-III study, respectively) and FM (24 ± 8 and 24.4 ± 6.1 among men and 34.9 ± 9.7 and 35.0 ± 6.9 among women in this study at Time B and the NHANES-III study, respectively) were almost identical among the participants of both studies. The results from the NHANES-III equation provided with the manufacturer's software were used in this comparison, but the results from the Göteborg equation were also similar.

Biochemical indices

The presence of malnutrition was not confirmed by biochemical analysis of nutrition status indicators, which were all within Diagnostic Services of Manitoba reference ranges for adults. It may be that participants are at risk of malnutrition, but are not yet malnourished. Biochemical analyses in this study looked at the specific nutrients albumin, total protein, iron, vitamin B_{12} and vitamin D. It was revealed that albumin, a marker of protein status, was within normal ranges for healthy older adults, but may be considered low in at-risk older adults, especially at Time B. Total protein was in the lower end of the reference range at Time A and Time B. Iron levels were within the reference range for men and women, but TIBC, from which serum transferrin levels can be estimated (Mitchell & Cheronoff, 1999), was below the reference range in men at Times A and B. Participant levels for total protein and albumin are comparable to levels for hospitalized older adults in Spain (Esteban Perez, Fernandez-Ballart, & Salas-Salvado, 2000). These results indicate that participants should be encouraged to increase protein intake, as they may be at risk for protein energy malnutrition. Examining markers of protein status at a future time point may provide evidence of protein energy malnutrition.

Results show that vitamin B_{12} status was adequate among study participants. This is surprising, as other studies have indicated that as a result of physiologic changes associated with age, vitamin B_{12} is a nutrient of concern among older adults, due to inadequate dietary intake (lengyel, Whiting, & Zello, 2008) and/or to physiologic changes associated with aging (Andres et al., 2004).

Vitamin D status

It was expected that vitamin D status would be below what is considered sufficient, because older adults have reduced ability to synthesize vitamin D from sunlight and to absorb the vitamin across intestinal barriers. The observed prevalence of sub-optimal vitamin D status (83%) is comparable to rates observed (79%) among LTC residents in Toronto (Liu et al., 1997). Lack of seasonal variability in vitamin D status was observed and is likely due to mobility restrictions that prevented PCH residents from going outdoors to spend time in the sun. However, the observed lack of seasonal variability is inconsistent with findings from a study of seasonal vitamin D status conducted in Toronto area LTC facilities (Liu et al., 1997). This may be related to higher levels of functional ability among the Toronto cohort.

The consequences of insufficient vitamin D status may be severe. Insufficient 25-hydroxyvitamin D leads to reduced ability to absorb calcium and phosphorous, leading to poor bone health, osteoporosis, and increased risk of bone fracture (Holick, 2007). Insufficient 25-hydroxyvitamin D is also associated with muscle weakness, which results in increased risk of falls, and a 30 to 50% increased risk of colon, prostate, and breast cancer (Holick, 2007).

The CFG (2007) recommends a vitamin D supplement of 400 IU daily for adults older than 50 years, but reviews of vitamin D research suggest that a supplement of 800 IU is necessary to reduce the risk of falls and cancer and to improve bone health (Holick, 2007; Lister, 2008; Whiting, 2008). Several organizations, including the United States Department of Agriculture, the

Canadian Dermatology Association, the Canadian Cancer Society, and the National Osteoporosis Foundation recommend vitamin D supplements of 1000 IU daily (Whiting, 2008).

It was unexpected that participants receiving a daily vitamin D supplement would have insufficient levels of 25-hydroxyvitamin D: 50% of participants received supplements at Time A and 77% at Time B. The type of vitamin D supplement and the dose received by each participant is unknown. The type of vitamin D, vitamin D_2 or D_3, is relevant, as vitamin D_2 is approximately 30% as effective as vitamin D_3 in maintaining serum 25-hydroxyvitamin D levels (Holick, 2007). Thus, it is recommended that individuals using vitamin D_2 supplements receive three times the dose recommended for vitamin D_3 supplement users (*e.g.,* 3000 IU vitamin D_2 or 1000 IU vitamin D_3).

Medication use affects vitamin D metabolism. Glucocorticoids and anticonvulsants speed the catabolism of 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D, the active form of the vitamin, to the inactive metabolite, calcitroic acid (Holick, 2007; Institute of Medicine, 1997). Within this study, 38% of participants were prescribed these types of medications. Thus, medication use may partially contribute to insufficient vitamin D status. Holick (2007) recommends that individuals using these medications take 50,000 IU of vitamin D_2 weekly, biweekly, or monthly to maintain vitamin D status.

Food and dining experiences

Dietary intakes were low overall and are consistent with participants' responses to questions addressing food. Fifty-four percent of participants

disagreed with the statement “My appetite has improved since I moved here.” No other questions were asked regarding appetite that might help evaluate appetite prior to relocation. Other questions regarding food, such as “I am satisfied with the variety of foods served here,” “I enjoy the types of foods that are given to me here,” and “Overall, I am satisfied with the meals served here,” also exhibited low (< 50%) levels of agreement.

In an examination of food service satisfaction among 205 older adults residing in LTC facilities in Saskatoon, Saskatchewan, Lengyel, Smith, Whiting, and Zello (2004) observed higher (> 70%) levels of satisfaction in response to similar items (“Do you like the types of foods that are served?”, “Is there a wide assortment of foods served to you?”, and “Are you satisfied with the meals that you receive?”) Satisfaction among participants of the Lengyel, Smith, Whiting, and Zello (2004) study may be higher as a consequence of differences in survey assessment. The NHRS offers respondents a five point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) to select responses from and may be more sensitive to subtle differences in opinion than the survey administered by Lengyel, Smith, Whiting, and Zello (2004), which offers respondents a three point Likert scale (yes, sometimes, no).

Satisfaction may also be linked to the length of time respondents resided in the participating facility. This study examined the opinions of recently relocated residents, whereas Lengyel, Smith, Whiting, and Zello (2004) examined the opinions of cognitively non-impaired older adults who resided in the participating facility for two months or longer.

Dietary intake

LTC diet planning is based on the nutritional needs of older adults and is consistent with CFG standards. However, Wendland, Greenwood, Weinberg and Young (2003) have shown that this may not be sufficient to ensure a nutritionally adequate diet even if participants fully consumed every meal. By examining dietary intake and analyzing the nutrient composition of menu items, Lengyel, Whiting, and Zello (2008) observed that the prevalence of certain nutrient inadequacies (protein, folate, magnesium, zinc, and vitamins E, C and B_6) ranged from 40 – 100%. Results from the above two studies indicate that the participants of this study, who did not fully consume meals or meet CFG recommendations, may develop nutrient inadequacies.

Implications of Findings

Low dietary intake and participant consumption of less than half of CFG serving recommendations for each of the four food groups indicate that participants may be, or may become, deficient in specific nutrients. Consistent under-eating may also result in energy deficiency and further weight loss, leading to increased risk of morbidity and mortality (Sullivan et al., 2002; Sullivan et al., 2004).

PCHs may be able to improve food intakes by offering new residents and their families a structured orientation to the PCH including nutrition and food services. Food intake may also be improved by making changes to the PCH eating environment, such as making it a more welcoming space, using music and

table decorations or by encouraging conversation and socialization among residents at mealtimes.

Further improvements in food and nutrient intake may occur by making changes to food services. Such changes may be difficult due to the sophistication of the food service delivery system, the impossibility of providing everyone with food that is the same as what they used to eat at home, and the varying expectations residents hold regarding the dining facilities and meals. Little research examining the impact of food service on dietary intake exists. Carrier, West and Ouellet (2007) have found that longer menu cycles, easy to manipulate dishes, and packaging, and serving food on porcelain dishes improve dietary intakes. Diet variety has also been associated with energy and nutrient intake (Bernstein et al., 2002). Increasing the menu cycle from 21 days to 28 days could increase diet variety and improve dietary intake. Further investigations may reveal other aspects of food service that may improve food consumption.

Currently, best practice among food service providers in LTC is to develop a standard diet based on CFG recommendations. However, Wendland, Greenwood, Weinberg, and Young (2003) have shown that a 28-day menu cycle based on CFG does not provide adequate amounts of many micro-nutrients needed by older adults. Furthermore, Lengyel, Whiting, and Zello (2008) demonstrated that older residents of LTC facilities do not consume sufficient amounts of the meals provided to prevent potential nutrient deficiencies. Additionally, analysis of observed dietary intake among participants of this study

shows that participants are consuming less than half of CFG recommendations for each of the food groups. Given the evidence provided by these studies, it may be necessary to enhance the nutrient content of diets provided to older adults in PCHs.

Menu planning should reflect the risk of malnutrition exhibited by older adults residing in PCHs. Meal enhancement, supplementation, and oral liquid nutrition supplements may be practical strategies to improve dietary intake among PCH residents. Meal enhancement involves increasing the nutrient content of menu items and may be possible as contracts are negotiated with food suppliers. For example, cream soups and hot cereal are provided to many residents on a regular basis and the addition of skim milk powder to these items would increase their nutrient and caloric density without increasing the quantity of food provided. A second example could involve requesting that food providers add pea meal protein to casserole dishes, thereby increasing the protein content of an item without increasing the overall quantity of food provided.

Supplementation with 100 000 IU of vitamin D_3 every three months has been proven effective in a LTC setting (Wigg et al., 2006). Participants' 25-hydroxyvitamin D status rose from 36.4 ± 12.6 nmol/L to 124 ± 27.9 nmol/L within six months and remained at desirable levels throughout the two year study period, without any evidence of toxicity. Since vitamin D is rare in food and vitamin D insufficiency is common among PCH residents, a mandatory supplementation regime similar to that presented above may be the most practical solution to improving vitamin D status.

Participants in this study expressed disagreement (64%) with the statement “I am offered a selection of foods to choose from at mealtimes”, yet it is known that allowing residents independence in their meal selections has the potential to improve quality of life (Welsh, 2005; Yen, 2005). Currently, in both facilities, residents do have some autonomy in making menu decisions. However, as one participant stated, they have to select the menu so far in advance that it is difficult to remember what they chose. Another resident commented that she found it very difficult to make menu selections ahead of time, as she really did not know what she would want to eat next week, or next fortnight. Given the quality of today’s information systems, it may be possible to devise a method that would decrease the period of time between when a resident makes menu selections and when that particular menu is served.

Limitations

Lack of significant differences between dependent variables at Time points A and B may be due to the small sample size and/or the use of less powerful statistical tests. Participant recruitment was challenging due to timing: enrollment began in June 2007, as the summer months have been noted by PCH staff as a time when few deaths occur among residents, making new admissions rare at this time of year. Also negatively affecting recruitment was the observation by PCH staff that older adults are provided with increased support at home and are thus able to live for longer periods of time within the community or in other forms of supportive housing before relocating to a PCH. As a result, residents are being admitted in poorer health than ever before, which often

disqualifies them for a study that stipulates cognitive function as a condition of enrollment.

Due to the small sample size, it was not possible to compare groups of participants based on gender or age. A larger sample size would have made further analyses possible as well as increased the ability of the non-parametric test, Wilcoxon Signed Rank Test, to detect statistical significance between the points of comparison.

Additionally, although the 5-Item GDS and the MNA-SF have been well validated, they may be less sensitive than the original forms of the assessments and therefore, less responsive to subtle differences in mood and nutritional status. This is almost certainly the case with the Katz Index of Activities of Daily Living, which has previously been criticized for its lack of sensitivity in detecting subtle changes (Wallace and Shelkey, 2007). However, the primary alternative to the Katz assessment, the Barthel Index, has also been criticized for lack of sensitivity.

Consistency in identifying correlations at both time points may be due to the small sample size. Several relationships between variables were shown to be moderately correlated and significant at Time A or B, but not quite significant (p from .05 to .1) at the alternate time. These relationships include age and MMSE score, mobility and self-rated activity, gender and total iron binding capacity, and gender and mean corpuscular hemoglobin concentration.

The study design was limited in its ability to identify trends in the variables examined. Additional points of measurement would provide the information

necessary to determine if the observed changes in variables noted at Time B are part of a trend towards decreased nutritional status.

Future Directions

Further investigation of the effect of relocation into a PCH on the nutritional status of older adults should be planned to clarify the changes that occur as new residents adapt to their environment. A longitudinal study that recruits a larger sample and has additional measurement points is needed to confirm the finding that nutritional risk increases following relocation and the finding that men are at higher nutritional risk than women. A study involving a larger sample would also be able to determine if relocation affects health status measures and clarify the relationship between these measures and nutritional status. Such a study should also include additional follow-up of biochemical markers of nutritional status to determine if clinical changes confirm the presence of malnutrition following relocation.

The results of this investigation and future investigations could be used to develop and study the effect of an intervention program on the nutritional status of recently relocated PCH residents. Examples of such an intervention include having a dietary aide or registered dietitian spend time with a new resident to determine food likes and dislikes as well as to explain the menu selection process, a meal enhancement program, dietary supplementation, or group activities involving many residents that encourage socialization and eating. Involving future PCH residents in PCH activities prior to relocating may reduce

anxiety related to relocation and may help set expectations of dining and food service, but may not always be a feasible strategy.

This investigation included cognitively functioning PCH residents, however the majority of PCH residents exhibit some level of cognitive impairment. The inclusion of mildly and moderately impaired residents in future studies could shed additional light on the impact of relocation on nutritional status. Results obtained from this type of study could be used to develop interventions to target PCH residents with varying levels of cognitive impairment.

Additionally, researchers could investigate the effect of modifiers of adaptation following relocation on nutritional status. Tickle (1993) is clear that there are many modifiers that affect the ability of individuals to adapt following relocation. These modifiers include physiological and genetic factors, psychological, environmental and administrative factors, social support factors and person-environment interactions. This study was not designed to examine the impact of residents' perceptions of their relocation experience upon nutritional status, but that would present a future direction for this area of research.

Nay (1995) presented a qualitative study examining residents' perceptions of relocation that revealed that residents felt they lacked choice in relocating to a PCH. Residents who relocated willingly did not truly want to relocate, but felt that there was no viable alternative to dwelling in a PCH. This study did not follow-up with newly admitted PCH residents, but a future study could follow-up with this work by examining newly admitted residents' motivations for relocating as well as their perceptions of the experience and attempt to correlate motivation and

perception with nutritional status. A potential hypothesis would be that residents who relocate willingly adapt more quickly and do not experience a decline in nutritional status. The null hypothesis would be the reverse: those residents who do not relocate willingly take longer to adapt and experience a decline in nutritional status. This area of research would also add to the body of literature examining the relationship between depression and dietary intake.

Summary

Initially, participants had a high level of cognitive functioning, low risk of developing pressure sores, and were not depressed, but were functionally impaired, diagnosed with several major conditions, and using multiple medications. At the follow-up interview six months post-relocation, participants exhibited a decline in cognitive status, an increase in medication use, and exhibited signs of depression.

At Time A, 57% of participants had an MNA-SF score below 12, indicating possible malnutrition and 83% of participants had sub-optimal 25-hydroxyvitamin D. Other biochemical indices were within reference ranges. At Time B, the prevalence of MNA-SF scores below 12 increased to 77% and participants lost an average of 3.2 kg. Vitamin D status did not change. Other biochemical indices remained within reference ranges, although albumin declined below the threshold for possible protein energy malnutrition among older adults. Iron and mean corpuscular hemoglobin also declined. Dietary intake was poor at both time points.

Markers of nutritional status were related to age (BMI) and to weight change (MNA-SF at Time B), but not to other measures of health status. Gender was related to TIBC and to MCHC. Participants exhibited higher levels of satisfaction with physical and social aspects of their new environment and lower levels of satisfaction with food and food service.

Eating habits and nutrition attitudes did not change six months after relocation, however a decline in nutritional status was observed. A longitudinal study with additional points of measurement is needed to determine if the observed decline in nutritional status is part of a trend or if nutritional status shows any improvement in the long term. The results from this study may be used to guide LTC practice and to develop an intervention aimed at improving the nutritional status of newly relocated PCH residents.

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Appendix A: Consent Form

Consent Form

My name is Melissa and I am a student in the Department of Human Nutritional Sciences at the University of Manitoba. I am doing a study looking at the effects of moving on the eating habits and nutritional status of older adults who have recently moved into a personal care home (PCH).

The purpose of this study is:

To look at the effect of moving on eating habits, lifestyle changes, nutrition attitudes and nutritional status of older adults (those 65 years and older) who have recently moved into a PCH

The benefits of this study will be:

1) To understand the effect of moving on the nutritional health of older adults.
2) To provide information necessary for health professionals to develop strategies aimed at helping older adults cope with their transition and to improve their quality of life.

You will be asked to complete two interviews looking at your eating habits, health and height, weight and body fat measurements. We will also do two blood tests. There is no risk to you and the care you receive will not be affected by your decision.

To take part in this study, I understand and agree with the following sentences:

1) I give my permission to be interviewed.
2) I will take the following tests and questionnaires:
    - Nutrition Relocation and Health Survey: Initial Screen
    - Nutrition Relocation and Health Survey
    - Mini-Mental State Exam
    - Mini-Nutrition Assessment
    - Braden Risk Assessment for Pressure Ulcers

- 5 Item Geriatric Depression Scale
- 2 blood samples
- Bioelectrical Impedance Analysis
- Weight and Height measurements

3) I will allow researchers to access my medical charts to obtain information about my current and chronic diseases, the number and types of medications prescribed to me and my diet order.
4) I have been able to ask any questions I want about the study, which have been answered to my satisfaction.
5) My name will not be connected to my answers and my name will be kept private.
6) I do not have to answer all of the questions asked. I may withdraw consent and end the interview at anytime, without any problems. If I do not want to participate, it will not affect my care or the services that I receive here.
7) Each interview will last 45-60 minutes.
8) A copy of the main findings of the study will be given to me after it is completed.

If you have any questions about this project, please contact the researchers:

Melissa Sitter
M.Sc. Candidate
University of Manitoba
Dept. of Human Nutritional Sciences

General Office Human Ecology Bldg
Winnipeg, MB, R3T 2N2
Home: (XXX) XXX-XXXX
Email: XXXX

Christina O. Lengyel, Ph.D., R.D.
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University of Manitoba
Dept. of Human Nutritional Sciences
405 Human Ecology Bldg
Winnipeg, MB, R3T 2N2
Office: (XXX) XXX-XXXX
Email: XXXX

This study has been approved by the University of Manitoba Human Ethics Research Board. If you have any questions about your rights as a participant in this survey you may contact:

The Human Ethics Secretariat
Office: (204) 474-7122
Email: Margaret_Bowman@umanitoba.ca

I accept the contents of this consent form and have received a copy to keep.

Printed Name of Participant

Signature of Participant Date

Signature of Interviewer Date

Signature of Project Coordinator Date

Appendix B: Mini-Mental State Exam

Mini Mental State Exam

Section 1 – Orientation

/5

( ) What year is this?
( ) What season is this?
( ) What month is this?
( ) What day of the week is this?
( ) What is today's date?

/5

( ) What country are we in?
( ) What province are we in?
( ) What city are we in?
( ) What is the name of this building?
( ) What room is this?

Section 2 – Registration, calculation and short term memory

/3

"I am going to name three objects. After I have said all three objects, I want you to repeat them. Remember what they are, because I am going to ask you to name them again in a few minutes"

( ) Book
( ) Pen
( ) Watch

/5

( ) Spell the word *world* backwards

/3

"Name the three objects I mentioned earlier."

( ) Book
( ) Pen
( ) Watch

Section 3 – Language

/9

( ) What is this (show pencil)?
( ) What is this (show wristwatch)?
( ) Repeat after me “No ifs, ands or buts”
( ) “Please pick up this paper in your dominant hand,
( ) fold it in half and
( ) place it on the table”
( ) Read this sign and do as it says (Close your eyes)
( ) Write a sentence
( ) Copy this design

SCORE: ___/___.

Adjusted score: ___/ 30 .

Comments:

Appendix C: Reference Ranges for Biochemical Indices (Diagnostic Services of Manitoba, 2007)

Biochemical Index	Women	Men
Protein status		
Iron (µmol/L)	7.0-27.0	7.0-27.0
TIBC[a] (µmol/L)	47-80	47-72
% Iron Saturation (%)	14-50	14-50
Total Protein (g/L)	60-80	60-80
Albumin (g/L)	33-45	33-45
Vitamin B_{12} (pmol/L)	>180	>180
Lipoprotein profile		
Cholesterol (mmol/L)	<5.2	<5.2
Triglycerides (mmol/L)	<1.7	<1.7
HDL Cholesterol (mmol/L)	>1.1	>1.0
LDL Cholesterol (mmol/L)	<3.4	<3.4
Cholesterol/HDL	<4.5	<4.5
LDL/HDL	<3.5	<3.5
Complete blood count		
WBC ($x10^9$/L)	4.5-11	4.5-11
RBC ($x10^{12}$/L)	3.8-5.2	4.4-5.9

Biochemical Index	Women	Men
Hemoglobin (g/L)	120-160	140-180
Hematocrit (1/L)	0.35-0.47	0.4-0.52
MCV[b] (fL)	80-98	80-98
MCH[c] (pg)	26-34	26-34
MCHC[d] (g/L)	320-365	320-365
RDW[e] (%)	11.4-14.4	11.4-14.4
Platelets ($x10^9$/L)	140-440	140-440
MPV (fL)	9.4-12.4	9.4-12.4
Neutrophils ($x10^9$/L)	1.8-5.4	1.8-5.4
Lymphocytes ($x10^9$/L)	1.3-3.2	1.3-3.2
Monocytes ($x10^9$/L)	0.3-0.8	0.3-0.8
Eosinophils ($x10^9$/L)	0.0-0.4	0.0-0.4
Electrolytes		
Urea (mmol/L)	2.8-7.1	2.8-7.1
Creatinine (µmol/L)	35-97	44-106
Sodium (mmol/L)	135-147	135-147
Potassium (mmol/L)	3.5-5.0	3.5-5.0
Chloride (mmol/L)	97-106	97-106

Biochemical Index	Women	Men
Vitamin D		
25-Hydroxyvitamin D (nmol/L)	75-250	75-250

[a] Total Iron Binding Protein
[b] Mean Corpuscular Volume
[c] Mean Corpuscular Hemoglobin
[d] Mean Corpuscular Hemoglobin Concentration
[e] Red cell Distribution Width

Appendix D: Mini-Nutritional Assessment – Short Form

Mini Nutrition Assessment – Short Form

A. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
   0 = severe loss of appetite
   1 = moderate loss of appetite
   2 = no loss of appetite

B. Weight loss during last three months
   0 = weight loss greater than 3 kg (6.6 lbs)
   1 = does not know
   2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
   3 = no weight loss

C. Mobility
   0 = bed or chair bound
   1 = able to get out of bed/chair but does not go out
   2 = goes out

D. Has suffered psychological stress or acute disease in the past three months
   0 = yes
   2 = no

E. Neuropsychological problems
   0 = severe dementia or depression
   1 = mild dementia
   2 = no psychological problems

F. Body Mass Index (BMI) (weight in kg) / (height in m)^2
   0 = BMI less than 19
   1 = BMI 19 to less than 21
   2 = BMI 21 to less than 23
   3 = BMI 23 or greater

Screen score (subtotal max. 14 points)
   12 points or greater: Normal – no need for further assessment
   11 points or below: Possible malnutrition – continue assessment

Appendix E: Braden Risk Assessment for Pressure Ulcers

					Score
Sensory perception	1. *Completely limited* a. Unresponsive to painful stimuli due to diminished level of consciousness or sedation OR b. Limited ability to feel pain over most of body surface.	2. *Very limited* a. Responds only to painful stimuli. Cannon communicate discomfort except by moaning or restlessness OR b. Has a sensory impairment that limits the ability to feel pain or discomfort over ½ of body.	3. *Slightly limited* a. Responds to verbal commands but cannot always communicate discomfort or need to be turned OR b. Has some sensory impairment that limits ability to feel pain or discomfort in 1 or 2 extremities.	4. *No impairment* Responds to verbal commands. Has no sensory deficit that would limit ability to feel or voice pain or discomfort.	
Moisture	1. *Constantly moist* Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. *Moist* Skin is often but not always moist. Linen must be changed at least once a shift.	3. *Occasionally moist* Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. *Rarely moist* Skin is usually dry; linen requires changing only at routine intervals.	
Activity	1. *Bedfast* Confined to bed.	2. *Chairfast* Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. *Walks occasionally* Walks occasionally during day but for very short distances, with or without assistance.	4. *Walks frequently* Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.	
Mobility	1. *Completely immobile* Does not make even slight changes in body or extremity position without assistance.	2. *Very limited* Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently	3. *Slightly limited* Makes frequent though slight changes in body or extremity position independently	4. *No limitations* Makes major and frequent changes in position without assistance.	
Nutrition	1. *Very poor* a. Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein per day. Takes fluids poorly. Does not take a liquid dietary supplement OR b. Takes nothing by mouth and/or is maintained on clear liquids or intravenously for more than 5 days.	2. *Probably inadequate* a. Rarely eats a complete meal and generally eats only ½ of any food offered. Protein intake includes only 3 servings per day. Occasionally will take a liquid diet supplement OR b. Receives less than optimum amount of liquid or tube feeding.	3. *Adequate* a. Eats over ½ of most meals. Eats a total of 4 servings of protein each day. Occasionally will refuse a meal, but will usually take a supplement if offered OR b. Is on a tube feeding or total parenteral nutrition regimen.	4. *Excellent* Eats most of every meal. Never refuses a meal. Usually eats 4 or more servings of protein per day. Occasionally eats between meals. Does not require supplementation.	

Friction and shear	1. *Problem* Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction.	2. *Potential problem* Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. *No apparent problem* Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.		

Score: _____

Appendix F: 5-Item Geriatric Depression Scale

Five Item Geriatric Depression Scale (GDS)

1. Are you basically satisfied with your life?	Yes	No
2. Do you often get bored?	Yes	No
3. Do you often feel helpless?	Yes	No
4. Do you prefer to stay in your room rather than going out and doing new things?	Yes	No
5. Do you feel pretty worthless the way you are now?	Yes	No

Appendix G: Katz Index of Activities of Daily Living

Activities	**Independence: (1 point)** No supervision, direction or personal assistance.	**Dependence: (0 points)** With supervision, direction, personal assistance or total care.
Bathing Points ☐	**(1 point)** Bathes self completely or needs help in bathing only a single part of the body such as the back, genital area or disabled extremity.	**(0 points)** Needs help with bathing more than one part of the body, getting in or out of the tub or shower. Requires total bathing.
Dressing Points ☐	**(1 point)** Gets clothes from closets and drawers and puts on clothes and outer garments complete with fasteners. May have help tying shoes.	**(0 points)** Needs help with dressing self or needs to be completely dressed.
Toileting Points ☐	**(1 point)** Goes to toilet, gets on and off, arranges clothes, cleans genital area without help.	**(0 points)** Needs help transferring to the toilet, cleaning self or uses bedpan or commode.
Transfer Points ☐	**(1 point)** Moves in and out of bed or chair unassisted. Mechanical transferring aides are acceptable.	**(0 points)** Needs help moving from bed to chair or requires a complete transfer.
Continence Points ☐	**(1 point)** Exercises complete self control over urination and defecation.	**(0 points)** is partially or totally incontinent of bowel or bladder.
Feeding Points ☐	**(1 point)** Gets food from plate into mouth without help. Preparation of food may be done by another person.	**(0 points)** Needs partial or total help with feeding or requires parenteral feeding.

TOTAL POINTS = _____ 6 = highly independent, 0 = very dependent

Appendix H: Nutrition, Health, and Relocation Survey: Initial Screen

Instructions for the Interviewer: Please ask the questions and the responses provided below for each participant. Write the response on the blank lines provided for each question and/or circle the selected response.

Interviewer please read the following to the participant: *I will be asking you questions about your eating behaviors and lifestyle experiences **prior to** moving into this long term care facility. There are no right or wrong answers to any of the questions. Please answer the questions as best as you can.*

Nutrition Information

1a. List the foods and the amounts you **typically** ate for breakfast, lunch, supper, and snacks (foods between meals).

Time of Meals	Description of Food and Beverages	Amount (Use any of the following units:cups, fl.oz, grams, tbsp, tsp, oz)
Breakfast		
Morning Snack		
Lunch		
Afternoon Snack		
Supper		
Evening Snack		

Time of Meals	Description of Food and Beverages	Amount (Use any of the following units:cups, fl.oz, grams, tbsp, tsp, oz)
Other (Give times)		

1b) Who usually prepared your meals prior to relocation?

01) Yourself **02)** Spouse or partner **03)** Other family member
04) Meal delivery program **05)** Other:_____.

2. Are you on a specific diet prescribed by your family physician?

01) Yes **02)** No

If yes, please list: _____

3a. Are you currently taking any nutrition supplements (e.g., vitamins, minerals, herbs)?

01) Yes **02)** No

3b. If yes, what supplements are you taking?

4. Before you moved here (the facility), how many times (including meals and snacks) did you usually eat per day?

01) 0 **02)** 1 **03)** 2 **04)** 3 **05)** 4 **06)** 5 **07)** 6 and up

5. Before you moved here, could you feed yourself without help?

01) Yes **02)** No

6. Before you moved here (the facility), how often did you go a full day without eating?

01) Sometimes **02)** Usually **03)** Never

7. Before you moved here, how many times per day did you eat alone?

01) 0 **02)** 1 **03)** 2 **04)** 3 **05)** 4 **06)** 5 **07)** 6 and up

8. How satisfied are you with your current eating habits?

01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

Interviewer please read the following to the participant: I will read some statements to you. Please use the choices provided to respond to statements 9 to 16.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
01	02	03	04	05

9. Of all of the factors that influence my health, nutrition is the most important. ☐

10. People of all ages should be concerned about eating healthy diets. ☐

11. I think I am more likely to become sick when I am not eating well. ☐

12. I think I need vitamin pills to ensure I am getting adequate nutrition. ☐

13. I believe that eating a good diet helps prevent disease in myself. ☐

14. A change in my diet does not affect my health. ☐

15. Food is a large part of my life, therefore eating a healthy diet is important. ☐

16. I think I should eat a greater variety of foods. ☐

Quality of Life, Health, and Lifestyle

17. Comparing yourself to others your age, how would you rate your health?

01) Poor **02)** Fair **03)** Good **04)** Excellent

18. How satisfied are you with your health?

01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

19. How satisfied are you with life in general?

01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

20. How satisfied are you with your social relationships?

01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

21. Do you have a very close friend with whom you can discuss almost anything?

01) Yes **02)** No

22. Compared to other men and women your age, how physically active are you?

01) Not at All Active
02) A Little Active
03) Somewhat Active
04) Active
05) Very Active

23. Are you currently in a chair or bed for most or all of the day because of your health?

01) Yes **02)** No

Demographic Section

1. How old are you? (Age on last birthday) _____

2. Height _____ Weight _____

3. Are you male or female?
01) Male **02)** Female

4. Which race best represents you?
01) Caucasian
02) Black
03) Asian
04) First Nations/Inuit/Metis
55) Other_____

5. What is your present marital status?
01) Married
02) Separated
03) Divorced
04) Widowed
05) Never married
06) Living with your partner
55) Other_____

6. What is the highest grade of school that you completed?
01) Grade School (grade 9 or less)
02) Some High School
03) High School/GED
04) Trade School or Community College
05) Some University
06) University Degree
07) Some Graduate School
08) Graduate or Professional Degree
55) Other_____

7. a) What was your estimated total household income before taxes last year?

01) Under $5,000
02) $5,000 to $9,999
03) $10,000 to $14,999
04) $15,000 to $19,999
05) $20,000 to $29,999
06) $30,000 to $39,999
07) $40,000 to $49,999
08) $50,000 to $59,999
09) $60,000 to $74,999
10) $75,000 to $99,999
11) $100, 000 or more
12) Unknown

7. b) Do you feel that your income is adequate to meet your needs?

01) Yes **02)** No

8. Do you currently have any of the following conditions? (Mark all the boxes that apply to you.)

01) Arthritis/rheumatism
02) Cancer
03) Chewing/Mouth Problems
04) Chronic Appetite Loss
05) Diabetes
06) Eye Problems
07) Food Allergies
08) Hearing Problems
09) Heart Disease
10) High Blood Pressure
11) High Cholesterol
12) Lactose Intolerance
13) Memory Loss or Confusion
14) Osteoporosis
15) Stroke
16) Swallowing Problems
17) Taste Problems
18) Parkinson's Disease
19) Multiple Sclerosis
20) None
55) Other: _____

Thank you for your participation.

Appendix I: Nutrition, Health, and Relocation Survey

Instructions for the Interviewer: Please ask the questions and the responses provided below for each participant. Write the response on the blank lines provided for each question and/or circle the selected response.

Interviewer please read the following to the participant: *I will be asking you questions about your eating behaviors and lifestyle experiences since you have been living in this long term care facility. There are no right or wrong answers to any of the questions. Please answer the questions as best as you can.*

Nutrition Information Height _____ Weight _____

1. List the foods and the amounts you **typically** eat for breakfast, lunch, supper, and snacks (foods between meals).

Time of Meals	Description of Food and Beverages	Amount (Use any of the following units:cups, fl.oz, grams, tbsp, tsp, oz)
Breakfast		
Morning Snack		
Lunch		
Afternoon Snack		
Supper		
Evening Snack		

Time of Meals	Description of Food and Beverages	Amount (Use any of the following units:cups, fl.oz, grams, tbsp, tsp, oz)
Other (Give times)		

2. Are you on a specific diet prescribed by your family physician?
01) Yes **02)** No

If yes, please list: _____

3a. Are you currently taking any nutrition supplements (e.g., vitamins, minerals, herbs)?
01) Yes **02)** No

3b. If yes, what supplements are you taking?

4. How many times do you usually eat (including meals and snacks) per day?
01) 0 **02)** 1 **03)** 2 **04)** 3 **05)** 4 **06)** 5 **07)** 6 and up

5. How often do you go a full day without eating?
01) Sometimes **02)** Usually **03)** Never

6. How many times per day do you eat in the dining room?
01) 0 **02)** 1 **03)** 2 **04)** 3

7. How many times per day do you eat alone?
01) 0 **02)** 1 **03)** 2 **04)** 3 **05)** 4 **06)** 5 **07)** 6 and up

8. How satisfied are you with your current eating habits?
01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

Interviewer please read the following to the participant: I will read some statements to you. Please use the choices provided to respond to statements 9 to 38.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
01	02	03	04	05

9. Of all of the factors that influence my health, nutrition is the most important. ☐
10. People of all ages should be concerned about eating healthy diets. ☐
11. I think I am more likely to become sick when I am not eating well. ☐
12. I think I need vitamin pills to ensure I am getting adequate nutrition. ☐
13. I believe that eating a good diet helps prevent disease in myself. ☐
14. A change in my diet does not affect my health. ☐
15. Food is a large part of my life; therefore eating a healthy diet is important. ☐
16. I think I should eat a greater variety of foods. ☐

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
01	02	03	04	05

17. I enjoy eating with other people. ☐
18. I feel at home here. ☐
19. I am happy with how the seating in the dining room is handled at mealtimes. ☐
20. I am satisfied with the variety of foods served here. ☐
21. Choosing where and whom I eat with are important to me. ☐
22. I like the times that the meals are served. ☐
23. It is important that I have good conversations at mealtimes. ☐
24. Eating in the dining room is mostly a pleasant social experience. ☐

25. Before I moved here, I prepared meals for myself. ☐
26. The foods that are offered here are different from what I ate before I moved. ☐
27. I enjoy the types of foods that are given to me here. ☐
28. I am eating a more nutritious diet since I moved here. ☐
29. I am offered a selection of foods to choose from at mealtimes. ☐
30. My appetite has improved since I moved here. ☐
31. I like having meals prepared for me. ☐
32. The service the dietary staff provides adds to my mealtime enjoyment. ☐
33. I miss eating the foods that I used to eat. ☐
34. I miss preparing meals for myself. ☐
35. My dining experiences here are just as I expected. ☐
36. My social experiences here are just as I expected them to be. ☐
37. Overall, I am satisfied with the meals served here. ☐
38. Overall, I am satisfied with my dining experiences (includes food, dietary services, and the eating environment). ☐

Quality of Life, Health, and Lifestyle

39. Comparing yourself to others your age, how would you rate your health?

01) Poor **02)** Fair **03)** Good **04)** Excellent

40. How satisfied are you with your health?
01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

41. How satisfied are you with life in general?
01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

42. How satisfied are you with your social relationships?

01) Very Dissatisfied
02) Moderately Dissatisfied
03) Slightly Dissatisfied
04) Slightly Satisfied
05) Moderately Satisfied
06) Very Satisfied

43. Do you have a very close friend with whom you can discuss almost anything?

01) Yes **02)** No

44. Compared to other men and women your age, how physically active are you?

01) Not at All Active
02) A Little Active
03) Somewhat Active
04) Active
05) Very Active

45. Are you currently in a chair or bed for most or all of the day because of your health?

01) Yes **02)** No

46. Have you had any changes to your health since you moved here? Yes No

If yes, please explain._____
_____
_____
_____
_____

Interviewer please read the following to the participant: Here is a series of statements that reflects various opinions you may have about your new home. Each statement has five possible responses. I will read each statement to you. Please use the choices provided to respond to statements 47 through 56.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	0	3	4

47. Living in my new home is beneficial……._____
48. I find living in my new home pleasant……_____
49. Life in my new home is good. …….._____
50. I find my new home comfortable……_____
51. I find my move was valuable to me……..…._____
52. My living conditions are satisfying to me……_____
53. My new home is nice……_____
54. I am happy living in my new home……_____
55. Living in my new home is interesting……_____
56. The people around me at my new home are friendly……._____

Thank you very much for your participation.