

AN OSTEOPOROSIS INTERVENTION PROGRAM FOR CHINESE WOMEN—
KNOWLEDGE, SELF-EFFICACY, AND INTENTION

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By
Zhi Jin Xu, MA, MS
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Dissertation Advisory Committee Chair:
Grace Xueqing Ma, Public Health, Temple University

Dissertation Committee Members:
Jay Segal, Public Health, Temple University
Joseph DuCette, Psychological Studies in Education, Temple University
Carolyn Fang, Fox Chase Cancer Center

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ABSTRACT

Title: An Osteoporosis Intervention Program for Chinese Women—
Knowledge, Self-Efficacy, and Intention

Candidate's Name: Zhi Jin Xu

Degree: Doctor of Philosophy

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Doctoral Advisory Committee Chair: Grace Xueqin Ma, Ph.D.

Osteoporosis is a disease of the bone and skeletal system which weakens bone structure and results in fractures. The disease has caused a heavy economic burden in the U.S., especially among Americans over the age of 50. According to The Surgeon General's report on bone health in 2004 (U.S. Department of Health and Human Service (USDHHS), 2004), an estimated 10 million Americans over age 50 have osteoporosis, and another 34 million have osteopenia and are at risk of osteoporosis. The projected cost directly associated with osteoporosis is \$34.0 billion in 2005 and will rise to more than \$41.4 billion in 2025 (Vanness & Tosteson, 2005). Osteoporosis also results in serious and often devastating health problems for affected individuals (Riggs & Melton, 1995) because of the fractures it causes. Riggs and Melton (1995) estimated that each year 1.5 million people suffer an osteoporosis-related fracture.

Unlike genetic risk factors that can be nearly impossible to modify, living on a calcium-rich diet is a lifestyle choice. Effective intervention programs can be useful tools to educate people to adopt a calcium-rich diet. Studies have shown that a calcium-rich diet can increase bone mineral density and intervention programs can facilitate the process of the lifestyle change (Wong, Lau, E.M., Lau, W.W., & Lynn,

2004; Lv & Brown, 2011). However, effective intervention programs against osteoporosis are limited for minorities, and specifically, for elderly Chinese women. The prevalence of osteoporosis in Chinese women is high but the knowledge level is low (Babbar et al., 2006; Lau, Woo, Leung, Swaminathan, & Leung, 1992), which provides an opportunity for intervention. A community-based intervention program was designed based on the modified health belief model (HBM). Its content was specifically tailored to the cultural background and the characteristics of the Chinese women living in the Greater Philadelphia area, based on the findings from previous studies. The intervention program was implemented and its effectiveness was evaluated in a 2-group quasi-experimental study.

The study recruited eight (8) Chinese community organizations and assigned them to receive either the intervention program or the control program according to the timing of their agreement to participate and the balance of total participants recruited for each study group at the time. A total of 102 Chinese women were enrolled from the three (3) organizations that were assigned to the Intervention Group and 90 from the five (5) organizations that were assigned to the Control Group. Participants in the Intervention Group received a 30-minute education session delivered in Chinese (Mandarin). The education focused on the Health Belief Model constructs in the context of osteoporosis intervention. It provided information about osteoporosis, including the functions of the bones, prevalence and risk factors. It highlighted participants' susceptibility to osteoporosis, the consequences and severity of the disease, and targeted messages to increase self-efficacy and decrease barriers. The contents were tailored to the study population. The osteoporosis education was

delivered in plain language to suit the population's low educational level and used examples relevant to their cultural background. Participants in the Control Group watched a 30-minute video about liver functions and hepatitis B transmission and prevention.

The study tested three (3) primary hypotheses that, compared with the Control Group, the Intervention Group at post-intervention would have 1) a higher knowledge level of osteoporosis, 2) a higher self-efficacy for adopting a calcium-rich diet, and 3) a higher intention level to consume more calcium-rich food items. The data were collected at three time points: baseline, post-intervention, and three months after the intervention. The scores of knowledge level and self-efficacy were analyzed by mixed linear regression models with adjustment of the baseline variables and accounted for the correlations among the participants from the same site. The intention stage was analyzed by a multinomial logistic regression model with adjustment of baseline intention stage and the baseline variables.

The results for the study were consistent with all three primary hypotheses. The intervention program increased the knowledge level of osteoporosis and perceived self-efficacy in the Intervention Group. At post-intervention, the differences between the two study groups was 0.17 (95% CI: 0.02, 0.32; p-value<0.037) for the knowledge scores, and 0.34 (95% CI: 0.12, 0.56; p-value<0.001) for the self-efficacy scores. The results also suggested that the intervention program moved the participants in the Intervention Group to higher intention stages. The odds ratio (Intervention/Control Group) of being at a higher intention stage was 3.29 (95% CI: 1.23, 8.82; p-value=0.016). The study showed that the community-based and culturally tailored

intervention program designed for the elderly Chinese women was effective. It increased the osteoporosis knowledge level and self-efficacy for adopting a calcium-rich diet and moved participants to a higher intention stage of consuming more calcium-rich food items. Additionally, the study showed that more than 50% of the participants had low bone mass.

In conclusion, this intervention program reached a hard-to-reach population of elderly Chinese women and provided public health professionals a useful tool to work with. The high prevalence of low bone mass in this population provided the public health agencies useful information to aid their decisions on resource allocation.

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DEFINITION OF TERMS

Knowledge level

A participant's level of knowledge about osteoporosis

Perceived susceptibility

A participant's belief regarding her chance of getting the condition being studied

Perceived severity

A participant's belief of the seriousness of the condition and its consequences

Perceived barriers

A participant's belief about the cost of taking the action, both tangible and psychological

Self-efficacy

A participant's confidence in her ability to take the action

Intention stage

A progressive series of six stages measuring a participant's behavior intention

Number of calcium-rich food items consumed

Total number of calcium-rich food items participants consumed as they indicated on the food frequency questionnaire

Calcium intake

Total grams of calcium amount consumed. It is measured by the quantity of food and the calcium content in the food. The food quantity is measured by the number of portions consumed in a period of time and portion size.

CHAPTER 1

INTRODUCTION

Statement of the Problem

Studies revealed a high prevalence of osteoporosis among older Chinese women, which presents a serious public health problem (Babbar et al., 2006; Lynn, Lau, & Leung, 2005; Wu et al., 2004). The reasons for the high prevalence of osteoporosis among older Chinese women are complex. Some are due to genetic factors, for example, older age, female gender, and small-framed body type. The genetic risk factors are difficult to alter. Others are associated with lifestyle and behavioral choices, which are modifiable. This dissertation study focused on one such modifiable risk factor, namely, inadequate calcium intake in these Chinese women. Studies have shown that the awareness level of osteoporosis among Chinese women was low and calcium intake was inadequate, which provided an opportunity for intervention.

Although a few studies aimed at increasing calcium intake in Chinese women (e.g., Babbar et al., 2006; Tussing & Chapman-Novakofski, 2005), many of them lack a concurrent control group in the study design, which made it difficult to determine whether the observed effects were attributable to the changes in the milieu where the study population lived, or to the intervention program, or to a mixture of both. This study is a quasi-experimental study with a concurrent control group. The inclusion of such a control group minimized the effects that confounding factors might have caused and provided a foundation to assess the intervention effects with more scientific confidence.

Purpose of the Study

The main purpose of this study was to evaluate the effectiveness of an intervention program for Chinese women living in the Greater Philadelphia area. The intervention program was designed based on the constructs of the Health Belief Model (Rosenstock, Strecher, & Becker, M., 1988) and tailored to the cultural and education background of the target population. The effects of the intervention program were evaluated in a quasi-experimental, 2-group parallel comparison study.

Additionally, this study measured the bone mineral density and estimated the prevalence of osteoporosis in this population of Chinese women. The estimate could provide useful information for public health agencies in their resource allocation.

Significance of the Study

The study is important for three reasons. First, the study could potentially establish an efficacious intervention program. Because the program is tailored to the elderly Chinese women, the success of the intervention program could provide a useful tool for the intervention against osteoporosis for the community health professionals who work with this population. Second, the study design included a concurrent control group that added scientific rigor to the study. With the concurrent control group in the study, we could make a more convincing statement whether the effects of intervention program are caused by the intervention or by the changes in the environment where the target groups live. Third, the BMD data obtained from this minority population may provide useful information for public health agencies in their resource allocation decisions.

Specific Aim and Hypotheses

To evaluate the efficacy of the proposed intervention program, the study has the following hypotheses.

Primary hypotheses:

- (1) The knowledge level of osteoporosis is higher in the Intervention Group than that in the Control Group at post-intervention.
- (2) The self-efficacy for adopting a calcium-rich diet is higher in the Intervention Group than that in the Control Group at post-intervention.
- (3) The intention to consume more calcium-rich food items is increased in the Intervention Group compared with the Control Group at post-intervention.

Secondary hypothesis:

The participants in the Intervention Group consume more calcium-rich food items compared to the participants in the Control Group three months after intervention.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Overview of Osteoporosis

The bones that make up the skeleton system are a vital part of our body. They consist of crystals of mineral, mostly calcium and phosphorus, bound to a protein matrix. The bones serve two essential functions that often compete with each other. On the one hand, they provide support and protect our body and enable us to perform physical activities. In order to perform this function well, bones need sufficient calcium and phosphorus to maintain its strength. On the other hand, bones also serve as a reservoir of essential minerals for the body, particularly calcium and phosphorus. When calcium and phosphorus are in short supply in the body, the body takes them out from the bones to other organs to serve vital functions (USDHHS, 2004). Thus, the calcium and phosphorus in the bones are constantly changing. At the same time, bones are undergoing a continuing process of breaking down old bones and forming new ones. Under normal circumstances, this change produces a net increase of bone mass during the earlier years of our lives. However, during later years of life this change results in a net decrease in bone mass. When the bone mass decreases, the body is at risk of osteoporosis, a bone disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased risk of fractures of the hip, spine and wrist (National Institutes of Health (NIH), 2012).

Currently, osteoporosis is mainly diagnosed by bone mineral density (BMD). BMD measures grams of mineral per area or volume of bones at some specific body sites, most commonly at the sites of femur bone, hip, and spine. It is commonly reported as a T-score, which compares an individual's bone mineral density with the mean bone density of a reference population, for example, healthy young adult women. The World Health Organization defines osteoporosis when a T-score is less than -2.5, which means the bone density is 2.5 standard deviations (SD) below the mean of the reference population, and osteopenia is a T-score of between -1.0 to -2.5 (Nelson, Helfand, Woolf, & Allan, 2002).

The prevalence of osteoporosis and osteopenia is high in the U.S. According to the surgeon general's report on bone health in 2004 (USDHHS, 2004), 10 million Americans over age 50 have osteoporosis and another 34 million have osteopenia. As the American population is getting older, the prevalence of the diseases tends to increase. The projected prevalence in 2020 is 14 million for osteoporosis and 48 million for osteopenia (USDHHS, 2004). These high figures alone call for intervention against the disease. Unfortunately, the actual prevalence of the disease is likely to be higher than these projected figures. Because osteoporosis is largely asymptomatic until a bone fracture occurs and the bone mass is not regularly measured, osteoporosis and osteopenia are often not diagnosed. Many people who have the disease are not aware that they have the disease, as was reported in the study of National Osteoporosis Risk Assessment (NORA; Siris et al., 2001) and a NHANES study (Preaemer, Furner, & Rice, 1999; cited in USDHHS, 2004). NORA was a randomized clinical trial that enrolled more than 200,000 postmenopausal women aged 50 or above. These women had not previously

been diagnosed with osteoporosis or osteopenia at the study enrollment. Yet the study found that nearly 40% of these women had osteopenia and more than 7% had osteoporosis. Similar high proportions of undiagnosed osteoporosis and osteopenia were found in the NHANES study. In that study, the prevalence of osteoporosis per 100 persons by self-reporting was 11.1 but the actual prevalence by the BMD measurement was 26.1, more than twice as high.

The significant negative impact of osteoporosis in the United States and in the world has been well documented. The most serious consequence of the disease is bone fracture. Fractures of the spine can lead to deformity, immobility, and even an impaired pulmonary system. Fractures at other sites reduce the quality of life and have serious economical consequences. Osteoporosis can become a severe economic burden with continued aging of the American population if no corrective measures are taken. Direct osteoporosis-related cost, which does not include the cost associated with loss of productivity, is \$41.4 billion in 2025 (Vanness & Tosteson, 2005). It is projected that if the current condition persists, by the year 2020 one in two Americans over the age of 50 will have or be at risk of osteoporosis (USDHHS, 2004). However, the costs and prevalence of osteoporosis can be reduced if the awareness of osteoporosis is increased and effective interventions take place.

Prevalence of Osteoporosis in Chinese Women

Osteoporosis is also a major health problem in Chinese women. Although estimations vary, a high prevalence of osteoporosis among Chinese women was reported by many studies (Babbar et al., 2006; Lynn, Lau, & Leung, 2005; Wu et al., 2004).

Babbar et al. (2006) reported that 55% of Chinese women (mean age=63.0) in New York City had osteoporosis (T-score<-2.5) and an additional 38% had osteopenia (T-score between -1.0 to -2.5). This high prevalence was consistent with those found in a study by Lynn, Lau and Leung (2005) on Chinese women over 40 in Hong Kong and with those reported by Wu et al., (2004) on Chinese women over 50 in mainland China. The proportion of osteoporosis were 49% at the lumbar site of the spine and 19% at the total hip area from the findings reported by Lynn, Lau and Leung (2005), and were more than 32% at different sites of the spine and 19% at the total hip area from the findings by Wu et al. (2004).

Typically, a person reaches his/her peak bone mass around age 30 to 40 and then loses about 0.5% or more of bone mass every year after the age of 40 (Kohrt et al., 2004). Studies have shown that the prevalence of osteoporosis in women starts to rise substantially after the age of 50 and doubles after the age of 60. The prevalence of osteoporosis among Caucasian women was found to be less than 1% before the age of 49 but rose sharply to 14.8% between the age of 50 to 59, and continued to rise to 21.6%, 38.5%, and 70% at ages of 60 to 69, 70 to 79 and 80 and above, respectively (WHO, 2003). A similar pattern was observed in Chinese women. Liao et al. (2002) measured 2,702 females by dual-energy x-ray absorptomertry (DEXA). And they found that the prevalence of osteoporosis was less than 5% before the age of 50, but increased sharply to 23.9% in women aged 50 to 59, then more than doubled to 56.3% in women aged 60 to 69, and eventually leveled off at 71.8% and 83.2% at ages of 70 to 79 and 80 and above, respectively. The sharp increase of osteoporosis prevalence at the age of 50 and its doubling at the age of 60 suggest two time points where intervention programs may be

most effective. In summary, the high prevalence of osteoporosis in Chinese women suggested public health needs for effective intervention programs in this minority population.

Modifiable Risk Factors of Osteoporosis—Calcium Intake

Osteoporosis is a complicated disease. Many factors involved in the process of achieving an optimal bone mass early in life and preserving bone mass late in life. Some of these factors are of lifestyle and behavioral choices. These modifiable risk factors are the targets of potential interventions.

Nutritional factors, especially calcium and vitamin D, play crucial roles in achieving a peak bone mass and maintaining a healthy bone structure throughout the whole life span. Because the living bone system continues to undergo bone resorption (i.e., breaking down the bones) and formation (i.e. building new bones), an adequate calcium supply from either diet or supplement is critically important. Increasing calcium and vitamin D intake has been shown to increase BMD (Chapuy et al. 2002; Shea et al, 2002; Tang et al. 2007). Chapuy et al. (2002) studied the effects of increased intake of calcium and vitamin D in an elderly population with a mean age of 85.2 years. They found that the BMD in the femoral neck bone increased 0.29% annually in the group that treated with calcium and vitamin D. Although the increase may seem small but it was meaningful when it was compared with a decrease of 2.36% annually in the placebo group. Additionally, the same study also showed that increased BMD resulted in fewer bone fractures. Specifically, the incidence of hip fractures was 6.9% in the study participants who took calcium and vitamin D and 11.1% among those who took the

placebo. A positive treatment effect of calcium supplement alone and in combination with vitamin D regarding BMD were also reported in most studies as shown in the two large meta-analyses studies, i.e., Shea et al. (2002) and Tang et al. (2007). Tang et al. (2007) identified 29 randomized trials from searching all publications on calcium and vitamin D from January, 1966 to January, 2007. Of the 24 studies that reported bone mineral density outcome, all except one (1) study showed a positive treatment effect of calcium. The overall treatment effects (Intervention Group - Control Group) regarding BMD change were 1.19% (95% CI: 0.76 to 1.61, $p < 0.001$) at the spine and 0.54% (95% CI: 0.35 to 0.73, $p < 0.001$) at the hip. Of the 17 studies that reported fracture outcome, all showed a reduced risk in the treatment group although a statistical significance was achieved only in four of these studies. The overall reduction of the fracture risk did not reach statistical significance. The estimated relative risk of fracture from the meta-analysis was 0.88 (95% CI: 0.83, 0.95).

The reasons why the risk reduction of fracture in some studies failed to reach statistical significance may be complex. One reason could be because the risk reduction was too small to be detected by the limited total number of participants with bone fractures in these studies. For example, the largest study in Tang et al. (2007) was a large-scale, randomized, double-blind, placebo-controlled study. It was a sub-study (Jackson et al., 2006) within the well-documented Women's Health Initiative. The study enrolled a total of more than 38,000 postmenopausal women and followed them for an average of seven years. However, despite the large number of participants in the study there were only about 4,260 women, about 11% of the total, reported fracture outcomes. The observed risks of total fracture were low, about 1.64% to 1.70%. However, it is worth

noting that the fracture risks in the group treated with calcium and vitamin D were lower compared with the placebo group. And there were reductions in the risk of fractures, especially in the hip and the spine. For example, the estimated relative reductions in fracture risk were 12% in the hip and 10% in the clinical vertebral. Judged by their 95% confidence intervals reported these reductions were approaching the statistical significance. Furthermore, as stated in a report by the Institute of Medicine (IOM) “BMD is a reliable predictor for fracture risk later in life” (IOM, 2010), the increases in the BMD may offer long-term benefits of reducing the risk of fracture.

Similarly, studies showed that an increased calcium intake was beneficial in older Chinese women. Lau et al. (1992) randomized 50 Chinese women with ages between 62 to 92 years in Hong Kong to four study groups: calcium supplement, exercise, calcium supplement plus exercise, and placebo. Although the numbers in each group were small, this study showed that compared with the placebo group women in the two calcium supplement groups had a much smaller decrease of BMD in the spine and femoral neck, and an increase of BMD in Ward’s triangle and intertrochanteric area.

This study focused on the dietary calcium intake because increasing of dietary calcium is considered safer than increasing of supplement calcium. The safety and efficacy of supplement calcium have been controversial. Recently, there are reports that suggest the supplement calcium may actually have caused harm. The findings from the Women’s Health Initiative study suggested that the supplement calcium may have increased the risk of kidney stone (Wallace et al., 2011) in postmenopausal women. Interestingly, the same study found that dietary calcium may have decreased the risk of kidney stone. In the same issue of British Medical Journal that republished the Wallace

study, Fauve (2011) in his editorial “the risk of kidney stone formation: the form of calcium matters” pointed out that the dietary calcium binds to dietary oxalate in the intestinal lumen to prevent absorptions of both calcium and oxalate, thereby decreases urine calcium oxalate super-saturation and the kidney stone formation. He further pointed out that “optimal calcium intake can be achieved while minimizing kidney stone risk by the use of dietary calcium sources and the avoidance of calcium supplements”. Other studies suggested the supplement calcium may have increased the risk of cardiovascular diseases (Bolland, Grey, Avenell, Gamble, & Reid, 2011; Li, Kaaks, Linseisen, & Rohrmann, 2012). Given the controversies surrounding the supplement calcium, a decision was made to promote the increase of dietary calcium intake only to avoid any potential health risks that may be associated with the supplement calcium.

Calcium Intake in Chinese Women

The daily calcium intake was low in Chinese women, well below the amount of 1200 mg/day for women over 50 years of age as recommended by the U.S. dietary guidance (IOM, 2010). Lau et al. (1992) found that daily intake of dietary calcium intake was around 250 mg/day in Hong Kong Chinese women between the age of 62 and 92 year, less than 20% of the recommended amount. Wong et al. (2004) indicated that even after they experienced osteoporosis fractures, the 187 Chinese women in their study still had about only half of the recommended daily calcium intake. Tseng and Hernandez (2005) used a food frequency questionnaire (FFQ) and a 24-hour recall to capture the nutrients intake in U.S. Chinese women from Philadelphia, PA. They found that the median daily intake of calcium was 591 gm/day by the 24-hour recall and 620 mg/day by

the FFQ. Similar low dietary calcium intakes were reported by Babbar et al. (2006) in elderly Chinese women in New York City, NY; by Lv and Brown (2011) in a group of Chinese mothers of students who were attending weekend Chinese schools in Philadelphia, PA. The median total calcium intake was around 644 mg/day in the study by Babbar et al. (2006) and 319 to 394 mg/day in the study Lv and Brown (2011). The low daily calcium intake revealed by these studies underscores the public health needs for effective intervention programs to increase the calcium intake.

Theoretical Base for the Osteoporosis Intervention Program

This design of the intervention program was based on the Health Belief Model (HBM) (Rosenstock, Strecher, & Becker, 1988). The HBM model was initially developed to explain simple health behaviors such as participating in tuberculosis screening. The origin of the HBM can be traced back to a study conducted by Hochbaum in 1952 (Rosenstock, 1974). The objective of the study was to identify factors that influenced the decision to obtain a chest X-ray for the early tuberculosis detection (Hochbaum, 1958). The study found a clear relationship between a person's behavior toward the chest X-ray and his beliefs, mainly perceived susceptibility and perceived benefit, toward tuberculosis. The proportion of obtaining an X-ray was about 82% among those who believed that they were susceptible to the disease and that an earlier detection was beneficial. This participating rate was nearly four times as high as the proportion among the persons who did not hold these beliefs which was 21%. Another significant finding was that the level of fear towards the disease played an important role in a person's action. The proportion of persons who obtained an X-ray was the highest among

those whose fear level was in the 'mid-range'. The study found that a fear level either too high or too low impeded a person's action of obtaining a chest X-ray.

During the years between 1950s and 60s, more health behaviors such as the detection of cervical cancer, immunization against flu were studied and the health belief model matured along the way (Rosenstock, 1974). As Rosenstock stated in 1974, the HBM initially included the concepts of perceived susceptibility, severity, benefit, barrier, and cue to action (Rosenstock, 1974). As the model was later extended to apply to healthy life-style changes, behaviors that require persisted efforts and more sophisticated skills, it became clear that the persons need to feel competent about performing the health behaviors before they can take actions. Therefore, Rostenstock, Strecher, and Becker proposed to add perceive self-efficacy to the model (1988).

The HBM provides guidance about how to motivate individuals to change their behaviors. The model indicates that behavior change is the result of a cognitive process that evaluates perceived susceptibility and severity of the health problem, benefits and barriers to the behavior change, and self-efficacy for performing the change. In general, it is accepted that people will take action to change their behavior in order to avoid a condition if they believe that: 1) they are susceptible to the condition and the condition has serious consequences; 2) believe that the benefit of the action outweighs the barriers to taking the actions; and 3) they have the confidence in their ability to take the action (Glanz, Rimer, & Lewis, 2002). The HBM has been used extensively in the design of various interventions. In their book "Health Behavior and Health Education" (2003), Glanz, Rimer and Lewis proved many examples of HBM being used in the intervencion programs to boost the use of mammogram for early breast cancer detection or to promote

proventive behaviors against AIDS. The HBM also has been used in many osteoporosis intervention programs (Babbar et al, 2006; Blalock, Norton, Patel, & Dooly, 2005; Doheny, Sedlak, Estok, Zeller, 2007; Kim, Horan, Gendler, & Patel, 1991).

The HBM is uniquely suitable for use as a theoretical framework for developing an intervention program against osteoporosis for elderly Chinese women. Because studies found that many elderly Chinese women do not realize that they are at risk or fully understand the consequences of the disease, an intervention program aimed at raising the knowledge level and improving self-efficacy could be efficacious.

Educational Intervention Programs for Osteoporosis

Educational intervention programs can be effective in increasing the knowledge level of osteoporosis and self-efficacy for adopting a calcium-rich diet, thereby resulting in an increase of their dietary calcium intake among Chinese women. For example, dietary counseling, even in short duration, significantly increased the daily intake of dietary calcium (Wong et al., 2004). In the study by Wong et al., Chinese women in Hong Kong were randomized to either an intervention group or a control group. Participants in the intervention group received a 45-minute one-on-one dietary counseling session regarding the importance of calcium and protein as well as sources of calcium in the Chinese diet at the initial visit, and two 15-minute reinforcement counseling sessions at month 1 and month 4. At the month 4 follow-up visit, the dietary calcium intake in the intervention group had an increase of 129.1 mg/day whereas the increase in the control group was only 51.2 mg/day, a difference of 77.8 mg a day, which is statistically significant.

Brecher et al. (2002) studied the effects of knowledge of osteoporosis, belief about osteoporosis and exercise, perceived susceptibility, and osteoporosis self-efficacy on dietary calcium intake and exercise activity. The study enrolled women between the ages of 25 to 75 years, 58 of them randomized to the intervention group and 52 of them to the control group. At the beginning of the study, all women received the background questionnaires through mail. After the subjects returned background questionnaires, they were randomized to either the intervention or control group. Women in the intervention group were given a 3-part educational program, which included a medical presentation of risk factors of osteoporosis, dietary counseling, and an interactive exercise demonstration. They then completed the follow-up questionnaires at the end of the program; participants in the control group did not receive the educational program. They completed follow-up questionnaires two weeks after the enrollment. Both groups completed the questionnaires again at three months follow-up time. The study showed that this modest 3-part education program, which lasted three hours, increased knowledge scores and maintained this increase three months later. Although the intervention did not increase calcium-intake, the study showed that more women in the intervention program than in the control group reported an intention to do so immediately after the intervention program and 83% of them reported that they had increased calcium intake three months later compared to 58% of participants in the control group who reported doing so. These studies suggested that intervention programs may be effective in increasing the knowledge level, which may potentially lead to increased calcium intake.

CHAPTER 3

METHODOLOGY

Study Design

The study was a quasi-experiment with two study groups, an Intervention and Control Groups. Eight (8) Chinese community organizations in the Greater Philadelphia area were recruited to participate in the study. To reduce any potential bias, the study group assignment was not pre-determined for each organization. Instead, the assignment was based on the timing of an organization's agreement to participate and the balance of the total participants recruited in each study group at the time. This random nature of the study group assignment was designed to prevent the investigators from assigning favorable organizations to the Intervention Group and consequently introducing bias to the comparisons between the two study groups. The inclusion of a concurrent control group in this manner minimized the effects that potential confounding factors may introduce and provided a foundation to assess the intervention effects with more scientific confidence.

Population and Study Sample

The targeted population of this study was Chinese American women who were at least 50 years of age and were living in the Greater Philadelphia area. Studies had shown that the calcium intake in this population of elder women was inadequate (Babbar et al. 2006; Lv & Brown, 2011; Tseng and Hernandez, 2005) and increasing intake of calcium

can reduce the bone losses or even increase the bone masses in elderly women (Chapuy et al., 2002; Lau, Woo, Leung, Swaminathan & Leung, 1992).

All study participants were recruited from community-based organizations who are partners of the Center for Asian Health, Temple University. The inclusion criteria for the study were as follows:

1. Age 50 or older
2. Self-identified Chinese ethnicity
3. Able to attend the workshop
4. Able to understand either Chinese (Mandarin or Cantonese) or English
5. Able to complete questionnaires by themselves or with help from study staff

Study recruitment was achieved through the assistance from the organization's management. All participants from the same organization were assigned to the same study condition because they tend to participate in the same activities and interact with each other. Participants in the Intervention Group received an osteoporosis education presentation and those in the Control Group watched a video about hepatitis B. Approximately, 200 women were recruited.

Study Procedures

An outline of the study procedures is schematically presented in Figure 1. At the beginning of the study but before any education sessions, participants completed a baseline assessment including demographic and socioeconomic information, knowledge about osteoporosis, and measurement of HBM constructs. Upon completion of the baseline assessment, the participants from the intervention organizations were assigned to

the Intervention Group condition to receive an osteoporosis education presentation; the participants from the control organizations were assigned to the Control Group condition. They watched an educational video about hepatitis B infection and vaccination against the infection. At the end of the workshops, participants completed the post-intervention questionnaires.

About three months after the workshops, participants in both study groups completed follow up assessment. Data collection for both groups occurred at the organization sites. After completing all assessments, the Control Group participants received the same osteoporosis education that the Intervention Group received, and had their BMD measured.

The protocol and questionnaires for the study were reviewed and approved by the Institutional Review Board (IRB), Temple University. The informed consents were obtained from all participants. The IRB approval letter is provided in Appendix G and a sample of the informed consent form is provided in Appendix H.

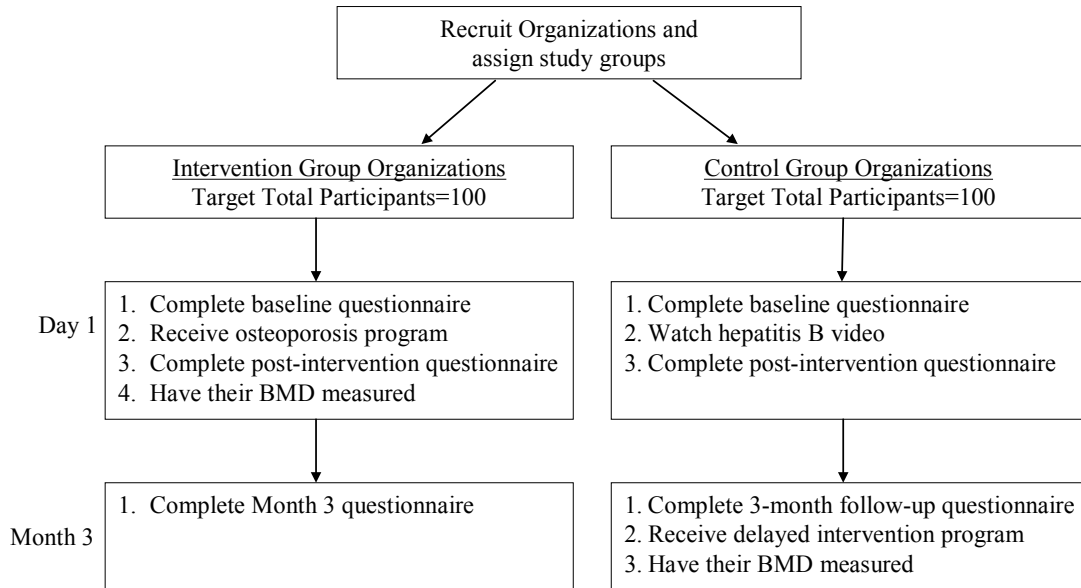


Figure 1. Study procedure flow chart

Description of the Intervention Program

The intervention was a 30-minute education presentation conducted at the organization site. The presentation consisted of the components of the knowledge level and HMB constructs.

1. To increase the knowledge level, we:
 - a. explained the functions of the bone to support and protect the body, and to serve as an reservoir for calcium and phosphorus; and when the intake of calcium is low, the bone releases calcium to support vital body functions;

- b. showed photos of osteoporotic and healthy bones, and explained that the structurally weakened bones lose their ability to support and protect the body;
 - c. explained how the bone structure can be damaged just like a house can be damaged by termites;
 - d. explained how osteoporosis is diagnosed and what T-scores mean.
2. To increase perceived susceptibility, we:
- a. explained the risk factors of osteoporosis: advanced age, being of Asian race, small body frame, inadequate calcium intake, and lack of exercise;
 - b. showed prevalence by age, pointed out that the risk of osteoporosis is 6 out of 10 for Chinese women between the age of 60 to 69, 7 out of 10 between the age of 70 to 79, and 8 out of 10 for age 80 and above.
3. To increase perceived severity, we:
- a. showed consequences of osteoporosis such as bone fracture, loss of mobility and deformity;
 - b. explained that osteoporosis causes severe kyphosis (i.e. hunchback).
4. To increase perceived self-efficacy, we:
- a. showed an example of food label on a milk bottle,
 - b. explained where to look for calcium content on the food labels,
 - c. provided a list of food items with high calcium content,
 - d. showed recipes of several traditional Chinese dishes with calcium-rich ingredients.

The presentation slides are provided in Appendix F.

Description of the Control Program

The participants in the Control Group watched a hepatitis B video that consisted of the following video clips:

- a public announcement for hepatitis B testing and vaccination from a well-known Chinese scientist, David Ho, who was *Time* magazine's Person of the Year for 1991 for his contributions to the HIV treatment;
- a personal experience of hepatitis B infection leading to liver cancer by a Chinese movie star Jin Sumei;
- an education video about liver functions and hepatitis B transmission;
- a public health education video about an Asian woman asking her doctor about the hepatitis B test and what the results mean for her;
- a video about the vaccination against hepatitis B infection.

The hepatitis B video was used for the Control Group because it did not relate to osteoporosis yet offered valuable information about a disease that had a high prevalence among Chinese.

Description of Questionnaires

The data were collected at three (3) time points, baseline, post-intervention, and Month 3 after the intervention. The definitions of the time points are provided in Table 1. To ease the burden on the study participants, not all components of the questionnaire were administered at all time points. A summary of the questionnaire components administered at each time point is provided in Table 2. The baseline and post-intervention

questionnaires were administered before and after the workshops, respectively. The Month 3 questionnaires were collected from the participants at about three months follow-up at the organization site.

The details of the questionnaire are provided in this section. The questionnaires were developed first in English, and then translated into Chinese. The Chinese version was then back-translated to English to ensure the accuracy of the translations. The Chinese version was then used in the study. The Chinese version of the questionnaires is provided in Appendix D and the English version in Appendix E.

Most of the questionnaires were adopted from Blalock, Norton, Patel, and Dooley (2005). The items were modified based on the considerations of study population's age, cultural background and educational level. After a pilot testing in a focus group, the items were further modified for better clarity and easier understanding. See details in Section Pilot Testing of the Questionnaires for Face Validity.

Table 1. Definition of Time Points During the Study

Time Point Name	Description
Baseline	Before the intervention/control session
Post-Intervention	At the end of the intervention/control session
Month 3 After the Intervention	About 3 months after the intervention/control session

Table 2. Summary of Questionnaire Components Administered at Each Time Point

Components Of The Questionnaire	Baseline	Post-Intervention	Month 3 After the Intervention
Demographic And Baseline Characteristics	Yes	No	No
Baseline Osteoporosis Information	Yes	No	No
Knowledge Level Of Osteoporosis	Yes	Yes	No
Intention To Consume More Calcium-Rich Food Items	Yes	Yes	Yes
Perceived Self-Efficacy	Yes	Yes	Yes
Perceived Susceptibility	Yes	Yes	No
Perceived Severity	Yes	Yes	No
Perceived Barriers	Yes	Yes	No
Food Frequency Questionnaire (FFQ)	Yes	No	Yes

Baseline Characteristics Information

Demographic and socioeconomic information collected at baseline were age, weight, years lived in the U.S., educational level, employment status, income level, English proficiency, and internet use. The health behavior and osteoporosis-related information collected were whether or not participants lost height in the last five years, when their last general health check-ups were, whether or not they were currently taking vitamins or calcium supplement.

Knowledge Level of Osteoporosis

The knowledge level of osteoporosis was measured at baseline, post-intervention and Month 3 after the intervention, using 12 questionnaire items as shown in Table 3, along with the correct responses to the items. The possible responses to the items were "1=Agree", "2=Disagree", and "3=Don't Know". The knowledge score was calculated as the total number of correctly answered items divided by the total number of items that

were responded to. The items to which a participant did not respond were excluded from the score calculation. The score ranged from 0 to 1, 0 when none of the items were responded to correctly and 1 when all items were answered correctly. If a participant did not respond to any items, her score was set to missing.

Table 3. Correct Responses for the 12 Knowledge Items

Questionnaire Item	Correct Response (1=Agree, 2=Disagree)
• Bone cancer can be caused by osteoporosis.	2
• Bone fractures can be caused by osteoporosis.	1
• Sardine is rich in calcium.	1
• Bachoy is rich in calcium.	1
• Osteoporosis is caused by a virus.	2
• Osteoporosis can be diagnosed by a bone mineral density Test.	1
• Being overweight will increase my chance of getting osteoporosis.	2
• Getting enough Vitamin D will decrease my chance of getting osteoporosis.	1
• Eating red meat will decrease my chance of getting osteoporosis.	2
• Taking estrogen after menopause will decrease my chance of getting osteoporosis.	1
• Wearing properly fitting shoes will decrease my chance of getting osteoporosis.	2
• Walking will decrease my chance of getting osteoporosis.	1

For measurements of perceived self-efficacy for adopting a calcium-rich diet, perceived severity of osteoporosis, and perceived barriers to increasing calcium intake, the possible responses to the questionnaire items were "Agree", "Disagree", and "Don't Know". A score for an overall measurement was calculated as the total number of

"Agree" responses divided by the total items that a participant responded to. The score ranged from 0 to 1, 0 when a participant did not agree with any of the items she responded to and 1 when she agreed to all items she responded to. The items to which a participant did not respond were excluded from the score calculation. If a participant did not respond to any items, her score was set to missing. Additional details specific to each measurement are provided as follows.

Self-Efficacy for Adopting a Calcium-Rich Diet

Self-efficacy for adopting a calcium-rich diet was measured at baseline and post-intervention by the following five questionnaire items.

1. I can find calcium contents from food labels.
2. I know which food items are high in calcium content.
3. Consuming calcium-rich food is not difficult.
4. I know how to select appropriate food to increase my calcium intake.
5. I can eat calcium-rich food on a regular basis.

Intentions to Consume More Calcium-Rich Food Items

The intention to consume more calcium-rich food items was measured at baseline, post-intervention, and Month 3 after the intervention by asking participants to select one of the following statements that most closely resembled their current thinking:

1. I have never seriously thought about consuming more calcium-rich food items.
2. I have thought about consuming more calcium-rich food items but decided against it.
3. I am thinking about trying to consume more calcium-rich food items.
4. I will consume more calcium-rich food items next month.
5. I will consume more calcium-rich food items next week.

6. I am currently doing things to consume more calcium-rich food items.

Perceived Severity of Osteoporosis

The perceived severity of osteoporosis was measured at baseline and post-intervention by the following five questionnaire items: (1) The thought of getting osteoporosis scares me; and if I get osteoporosis (2) my whole life will change; (3) I will not be able to walk around; (4) I will lose height; and (5) I will not be able to do house work.

Perceived Barriers to Increasing Calcium Intake

The perceived barriers to increasing calcium intake were measured at baseline and post-intervention by the following seven questionnaire items:

1. I don't know which food items are high in calcium;
2. My neighborhood grocery stores do not carry calcium-rich food items that I like;
3. I don't know how to cook calcium-rich food item;
4. I don't like the taste of calcium-rich food items;
5. My family members don't like the taste of calcium-rich food items;
6. Calcium-rich food costs too much;
7. Calcium-rich food items contain too much fat.

Perceived Susceptibility to Osteoporosis

The perceived susceptibility to osteoporosis was measured at baseline and post-intervention by 2 questionnaire items, "I am concerned that I may get osteoporosis" and "It is very likely that I will get osteoporosis". The choices for the responses were "Agree", "Disagree", and "Don't Know".

Calcium-Rich Food Item

The number of calcium-rich food items consumed was measured by a modified food frequency questionnaire (FFQ) based on the one used by Tseng and Hernandez (2005) in Chinese women living in Philadelphia, PA, which was the target population for this study. As pointed out by Tseng and Hernandez, the 24-hour recall is considered a more accurate measurement to capture the food consumption. Compared with the 24-hour recall, the FFQ is less costly and easier to use. In their study, the FFQ captured most of the commonly consumed foods and major nutrient source that the 24-hour recall method captured, especially regarding the calcium intake. The FFQ captured 94% of the total calcium intake as measured by the 24-hour recall. The FFQ used by Tseng and Hernandez contained 88 items that measured not only the dietary calcium intake but also other nutrients such as fat, cholesterol, carbohydrate, protein, fiber, folic acid, or iron. We selected from their FFQ the 23 food items that have a calcium content >50 mg per 100 gm of food weight for the FFQ used in this study. The modified FFQ was administered at two time points: baseline and Month 3 after the intervention.

Bone Mineral Density Measurement

As an incentive to encourage study participation and also a means to assess the bone mineral density (BMD) in the study population, we measured participants' BMDs. The BMD measurement was taken by Sahara Clinical Bone Sonometer (Hologic, Bedford, MA) at the calcaneus (heel bone) site at baseline for the Intervention Group and at Month 3 after the intervention for the Control Group. The three months difference in the measurement times for the two groups was not expected to make any meaningful differences because studies had shown that the BMD measurements at peripheral skeletal

sites were not changed even in people who were on osteoporosis medications that changed their BMD at the spinal site at least 4% per year (Miller, 2002). T-scores were recorded directly from the device with the reference database of young normal Caucasian females provided by the manufacturer.

It is well established that BMD readings from peripheral devices, which the Sahara device belongs to, are higher than the readings from the clinical gold standard of central dual-energy x-ray absorptiometry (DEXA) machines, and consequently underestimate the prevalence of osteoporosis. We did not intend to use the BMD reading from Sahara for clinical diagnosis of osteoporosis or osteopenia. Instead, we used it as an incentive to encourage the participation in the study and to collect information about the bone mass in this population. We encouraged participants to consult with their family doctors and to have their BMD measured by a clinical diagnostic machine if their BMD reading was below -1.0, which was the level to be interpreted as 'low bone mass and at increased risk of fracture' as recommended in the Sahara's user manual (Hologic, 2000). Additionally, we used a T-score of -2.0 from the device for osteoporosis based on the risk of a hip fracture it is associated with. The risk of a hip fracture in women with T-score < -2.0 from a peripheral device was found to be the same in women with a T-score < -2.5 from a DEXA machine (Miller, 2002).

Pilot Testing of the Questionnaires for Face Validity

The questionnaires were pilot tested in a focus group of four Chinese women who were similar to the study population regarding age and education level. The objective of the pilot testing was to evaluate whether or not the questionnaire items were understood

easily and correctly. The following wording and question items were modified according to the findings of the pilot test.

1. Pilot participants had difficulty of deciding between "Strongly Agree" and "Agree". At the discussion session following the pilot test they commented that they could not decide which of the two they should select as their responses. A similar difficulty was observed between "Strongly Disagree" and "Disagree". Additionally, they thought the five choices were too many and confusing. Consequently, the original 5-point Likert scale from strongly agree to strongly disagree was modified to a 3-point response scale (Agree, Disagree, and Don't Know) for ease of use in this elderly population.
2. The wording "Osteoporosis may result in hip fractures" was changed to "Osteoporosis may result in bone fractures". The Chinese translation of hip is more difficult for the general population to understand. (“骨质疏松症可能造成髋部骨折” to “骨质疏松症可能造成骨折”)
3. The wording “Do you currently have health insurance?” was changed to “Do you currently have medical insurance?” because the term commonly used among this population is “medical insurance”. (“您目前有健康保险吗?” to “您目前有医疗保险吗?”)
4. The questionnaire items of “It is possible that I may get osteoporosis” and “It is likely that I may get osteoporosis” were completely correlated with the questionnaire item “I am concerned about getting osteoporosis” The four participants complained that these questions were too similar. So “It is possible that I may get osteoporosis” was removed from the questionnaire.

5. Questionnaire item “Swimming will decrease my chance of getting osteoporosis” was removed because swimming is not a weight-bearing exercise and it is not clear whether or not swimming will decrease one's chance of getting osteoporosis.
6. Responses to “What is your annual household income?” were reformatted from Arabic numbers to Chinese words, i.e., Less than \$10,000; \$10,000-\$20,000; \$20,000-\$30,000; \$30,000-\$40,000 and Above \$40,000 to ①少于一万; ②一万至两万; ③一万至三万; ④三万至四万; ⑤多于四万)

Reliability of the Questionnaires

The reliability of the questionnaire items in this study was evaluated by the test-retest method. A total of 14 participants, who were similar to the study population but did not participate in the study, were recruited for the test-retest assessment. The same questionnaires were administered two times with a month interval between them. The agreements between the responses to the same questionnaire item collected at the two time points were assessed by Pearson's correlation for continuous variables and by Cohen's kappa statistic for categorical variables. A kappa statistic from 0.21 to 0.40 indicates the strength of agreement is fair, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial, and 0.81 to 1.00 almost perfect (Landis & Koch, 1977). Additionally, the kappa statistic is zero or misleadingly low when the responses from the two time points are in a full or near full agreement but are not at least in a 2 by 2 dimension. These agreement situations occurred in this study for questionnaire items asking for whether or not the participants were taking HRT or having health insurance, for items about timing of last health check-up, and for items about participants' responses to two statements, *I Won't Be Able to*

Walk Around If I Get osteoporosis and I Won't Be Able to Do House Work If I Get Osteoporosis. For these variables, although the kappa statistics were not calculated, the high agreements were evident from the distributions of the responses at the two time points.

A summary of the agreements is provided in Table 4. Overall, the agreements between the responses at the two time points were high, especially for baseline characteristic variables. Complete agreements were observed in responses to variables for age, years lived in the U.S., marital status, education level, employment status, internet use, whether the testers were taking HRT or had their BMD measured before the current study. Additionally, the correlation of weight collected between the two time points was 0.86 (95% CI: 0.59, 0.95). For other demographic categorical variables that were not in complete agreement, the kappa statistics were all >0.4 except for one, an indication of better than moderate agreements. The only exception was for the questionnaire item asking whether or not there were family members who had osteoporosis. The kappa (κ) was 0.18 (95% CI: -0.38, 0.71). Although the kappa estimate was low for this questionnaire item, there were 71.4% (10 out of 14) participants who gave consistent responses and only four (4) changed their responses between the two time points. So the agreement for this questionnaire item was better than the kappa statistic suggested. The agreements for the 12 questionnaire items measuring the knowledge of osteoporosis were also good. They were >0.4 for 10 of them. The only two questionnaire items with low kappa statistics were “Eating Red Meat Will Decrease My Chance of Getting Osteoporosis” ($\kappa=0.30$), and “Wearing Properly Fitted Shoes Will Decrease My Chance of Getting osteoporosis” ($\kappa=0.24$). Similar observations were made regarding the

agreements with questionnaire items for perceived self-efficacy and perceived barriers. The agreements for the two perceived susceptibility were good, $\kappa=0.59$ for “I am Concerned That I may Get Osteoporosis”, and $\kappa=0.67$ for “It Is Very Likely That I Will Get Osteoporosis”.

The agreements for the perceived severity questionnaire items were somewhat lower. Near full agreement was observed for responses to two questionnaire items, “I Won’t Be Able to Walk Around If I Get Osteoporosis” and “I Won’t Be Able To Do House Work If I Get Osteoporosis”. But the agreements for the other three items were low: $\kappa=0.20$ for “It Scares Me To Think That I May Get osteoporosis”, $\kappa=0.26$ for “My Whole Life Will Change If I Get Osteoporosis”, $\kappa=0.21$ for “I Will Loss Height If I Get Osteoporosis”.

Table 4. Summary of Test-Retest Reliability of Questionnaire Responses

Questionnaire Item	Response At Time 1	Response At Time 2	Correlation/Kappa[1] (95% CI)
Baseline Characteristic Variables			
	Mean (SD)	Mean (SD)	
Age	61 (12.3)	62 (12.7)	1.00 (1.00, 1.00)[2]
Weight	118 (10.7)	116 (11.7)	0.86 (0.59, 0.95)
Years Lived in the U.S.	20 (10.4)	20 (10.0)	1.00 (0.99, 1.00)
Marital Status	n (%)	n (%)	
Married	10 (71.4)	9 (64.3)	1.00 (1.00, 1.00)
Divorced/Separated	1 (7.1)	1 (7.1)	
Widower	3 (21.4)	3 (21.4)	
No Response	0	1 (7.1)	
Education level			
<Elementary School	2 (14.3)	2 (14.3)	1.00 (1.00, 1.00)
<High School Graduate	1 (7.1)	1 (7.1)	
University	2 (14.3)	2 (14.3)	
Graduate and Above	9 (64.3)	9 (64.3)	
Employment Status			
Employed	10 (71.4)	10 (71.4)	1.00 (1.00, 1.00)
Retired	2 (14.3)	2 (14.3)	
Homemaker	2 (14.3)	2 (14.3)	
Income Level			
<\$10K	4 (28.6)	2 (15.4)	0.79 (0.48, 1.00)
\$10K to \$20K	0	1 (7.7)	
>\$40K	10 (71.4)	10 (76.9)	
English Proficiency			
	3 (21.4)	3 (23.1)	0.70 (0.34, 1.00)
Not Well	1 (7.1)	2 (15.4)	
Well	10 (71.4)	8 (61.5)	
Internet Use			
No	4 (28.6)	4 (28.6)	1.00 (1.00, 1.00)
Yes	10 (71.4)	10 (71.4)	
Reduced Height			
Yes	2 (14.3)	1 (7.1)	0.63 (-0.02, 1.00)
No	12 (85.7)	12 (85.7)	
No Response	0	1 (7.1)	
Taking Vitamin/Calcium			
Yes	12 (85.7)	8 (57.1)	0.45 (-0.00, 0.91)
No	2 (14.3)	5 (35.7)	
No Response	0	1 (7.1)	
Taking HRT			
Yes	0	0	Full Match
No	14 (100.0)	14 (100.0)	
Had Osteoporosis			
Yes	6 (42.9)	4 (28.6)	0.70 (0.32, 1.00)
No	8 (57.1)	10 (71.4)	

Table 4. (Continued)

Questionnaire Item	Response At Time 1	Response At Time 2	Correlation/Kappa[1] (95% CI)
Osteoporosis in Family			
Yes	2 (14.3)	4 (28.6)	0.18 (-0.36, 0.71)
No	12 (85.7)	10 (71.4)	
BMD Measured			
Yes	6 (42.9)	6 (42.9)	1.00 (1.00, 1.00)
No	8 (57.1)	8 (57.1)	
Osteoporosis medication			
Yes	3 (21.4)	2 (14.3)	0.76 (0.32, 1.00)
No	11 (78.6)	12 (85.7)	
Last Health Check-Up			
<12 Months	13 (92.9)	13 (92.9)	Near Full Match
>1 Year	0	1 (7.1)	
No Response	1 (7.1)	0	
Health Insurance			
Yes	13 (92.9)	14 (100.0)	Near Full Match
No	1 (7.1)	0	
Knowledge Of Osteoporosis			
Bone Cancer Can Be Caused By Osteoporosis.			
Disagree	11 (78.6)	11 (78.6)	1.00 (1.00, 1.00)
Don't Know	3 (21.4)	3 (21.4)	
Bone Fractures Can Be Caused By Osteoporosis.			
Agree	12 (85.7)	12 (85.7)	0.44 (-0.18, 1.00)
Disagree	1 (7.1)	0	
Don't Know	1 (7.1)	2 (14.3)	
Sardine Is Rich In Calcium.			
Agree	7 (50.0)	10 (71.4)	0.57 (0.18, 0.96)
Disagree	7 (50.0)	4 (28.6)	
Bachoy Is Rich In Calcium.			
Agree	1 (7.1)	2 (14.3)	0.75 (0.46, 1.00)
Disagree	7 (50.0)	8 (57.1)	
Don't Know	6 (42.9)	4 (28.6)	
Osteoporosis Is Caused By A Virus.			
Disagree	10 (71.4)	11 (78.6)	0.43 (-0.10, 0.96)
Don't Know	4 (28.6)	3 (21.4)	
Osteoporosis Can Be Diagnosed By A Bone Mineral Density Test.			
Agree	13 (92.9)	12 (85.7)	0.63 (-0.02, 1.00)
Don't Know	1 (7.1)	2 (14.3)	

Table 4. (Continued)

Questionnaire Item	Response At Time 1	Response At Time 2	Correlation/Kappa[1] (95% CI)
Being Overweight Will Increase My Chance of Getting Osteoporosis.			
Agree	3 (21.4)	3 (21.4)	0.67 (0.36, 0.99)
Disagree	7 (50.0)	5 (35.7)	
Don't Know	4 (28.6)	6 (42.9)	
Getting Enough Vitamin D Will Decrease My Chance Of Getting Osteoporosis.			
Agree	12 (85.7)	12 (85.7)	1.00 (1.00, 1.00)
Don't Know	2 (14.3)	2 (14.3)	
Eating Red Meat Will Decrease My Chance Of Getting Osteoporosis.			
Agree	2 (14.3)	2 (14.3)	0.30 (-0.09, 0.69)
Disagree	9 (64.3)	6 (42.9)	
Don't Know	3 (21.4)	6 (42.9)	
Taking Estrogen After Menopause Will Decrease my Chance Of Getting Osteoporosis.			
Agree	7 (50.0)	6 (42.9)	0.75 (0.47, 1.00)
Disagree	0	2 (14.3)	
Don't Know	7 (50.0)	6 (42.9)	
Wearing Properly Fitted Shoes Will Decrease my Chance Of Getting osteoporosis.			
Agree	2 (14.3)	1 (7.7)	0.24 (-0.07, 0.56)
Disagree	7 (50.0)	11 (84.6)	
Don't Know	5 (35.7)	1 (7.7)	
Walking Will Decrease My Chance Of Getting Osteoporosis.			
Agree	10 (71.4)	7 (53.8)	0.59 (0.22, 0.95)
Disagree	2 (14.3)	2 (15.4)	
Don't Know	2 (14.3)	4 (30.8)	
Efficacy of Adopting A Calcium-Rich Diet			
I Can Find Calcium Content By Reading Food Labels.			
Agree	12 (85.7)	12 (85.7)	0.44 (-0.18, 1.00)
Disagree	1 (7.1)	0	
Don't Know	1 (7.1)	2 (14.3)	
I Know Which Food Items Are High In Calcium Content.			
Agree	9 (64.3)	9 (64.3)	0.41 (-0.05, 0.87)
Disagree	1 (7.1)	0	
Don't Know	4 (28.6)	5 (35.7)	
Consuming Calcium-Rich Food Is Not Difficult.			
Agree	12 (85.7)	13 (92.9)	0.64 (0.01, 1.00)
Disagree	1 (7.1)	0	
Don't Know	1 (7.1)	1 (7.1)	
I Know How To Select Appropriate Food To Increase My Calcium Intake.			
Agree	9 (64.3)	10 (71.4)	0.27 (-0.10, 0.64)
Disagree	3 (21.4)	2 (14.3)	
Don't Know	2 (14.3)	2 (14.3)	
I Can Eat Calcium-Rich Food On A Regular Basis.			
Agree	11 (78.6)	12 (85.7)	0.55 (0.14, 0.96)
Disagree	2 (14.3)	0	
Don't Know	1 (7.1)	2 (14.3)	

Table 4. (Continued)

Questionnaire Item	Response At Time 1 n (%)	Response At Time 2 n (%)	Correlation/Kappa[1] (95% CI)
Intention to Consume More Calcium-Rich Food Items.			
Never Thought About It	1 (7.1)	1 (7.7)	0.30 (0.02, 0.58)
Decided Against It	1 (7.1)	0	
Thinking About It	4 (28.6)	8 (61.5)	
Doing So Currently	8 (57.1)	4 (30.8)	
I Am Concerned That I May Get Osteoporosis.			
Agree	10 (71.4)	8 (57.1)	0.59 (0.24, 0.94)
Disagree	1 (7.1)	2 (14.3)	
Don't Know	3 (21.4)	4 (28.6)	
It Is Very Likely That I Will Get Osteoporosis.			
Agree	7 (50.0)	6 (42.9)	0.67 (0.35, 0.98)
Disagree	2 (14.3)	4 (28.6)	
Don't Know	5 (35.7)	4 (28.6)	
Perceived Susceptibility			
It Scares Me To Think That I May Get Osteoporosis.			
Agree	2 (14.3)	3 (21.4)	0.20 (-0.31, 0.71)
Disagree	12 (85.7)	10 (71.4)	
Don't Know	0	1 (7.1)	
My Whole Life Will Change If I Get Osteoporosis.			
Agree	2 (15.4)	5 (35.7)	0.26 (-0.09, 0.61)
Disagree	8 (61.5)	7 (50.0)	
Don't Know	3 (23.1)	2 (14.3)	
Perceived Severity			
I Won't Be Able To Walk Around If I Get osteoporosis.			
Disagree	14 (100.0)	12 (85.7)	Near Full Match
Don't Know	0	1 (7.1)	
No Response	0	1 (7.1)	
I Will Loss height If I Get Osteoporosis.			
Agree	9 (69.2)	12 (85.7)	0.21 (-0.28, 0.71)
Disagree	3 (23.1)	1 (7.1)	
Don't Know	1 (7.7)	1 (7.1)	
I Won't Be Able To Do House Work If I Get Osteoporosis.			
Agree	1 (7.1)	0	Near Full Match
Disagree	13 (92.9)	13 (92.9)	
Don't Know	0	1 (7.1)	
I Don't Know Which Food Items Are High In Calcium.			
Agree	Agree	6 (46.2)	0.71 (0.38, 1.00)
Disagree	Disagree	6 (46.2)	
Don't Know	Don't Know	1 (7.7)	

Table 4. (Continued)

Questionnaire Item	Response At Time 1	Response At Time 2	Correlation/Kappa[1] (95% CI)
Perceived Barriers of Adopting A Calcium-Rich Diet			
Stores Don't Carry Calcium-Rich Food Items That I Like.			
Agree	2 (14.3)	0	0.32 (-0.23, 0.87)
Disagree	11 (78.6)	12 (85.7)	
Don't Know	1 (7.1)	2 (14.3)	
I Don't Know How To Cook Calcium-Rich Food Items.			
Agree	4 (28.6)	4 (28.6)	0.47 (0.11, 0.83)
Disagree	4 (28.6)	6 (42.9)	
Don't Know	6 (42.9)	4 (28.6)	
I Don't Like The Taste Of Calcium-Rich Food.			
Agree	0	1 (7.1)	0.41 (-0.05, 0.87)
Disagree	9 (64.3)	9 (64.3)	
Don't Know	5 (35.7)	4 (28.6)	
My Family Members Don't Like The Taste Of Calcium-Rich Food.			
Agree	0	0	0.55 (0.11, 0.99)
Disagree	8 (57.1)	9 (64.3)	
Don't Know	6 (42.9)	5 (35.7)	
Calcium-Rich Food Cost Too Much.			
Agree	0	0	0.43 (-0.10, 0.96)
Disagree	10 (71.4)	11 (78.6)	
Don't Know	4 (28.6)	3 (21.4)	
Calcium-Rich Food Contain Too Much Fat.			
Agree	0	1 (7.1)	0.59 (0.11, 1.00)
Disagree	11 (78.6)	11 (78.6)	
Don't Know	3 (21.4)	2 (14.3)	
[1] Reliability of test-retest is measured by Pearson's correlation for continuous variables (age, weight, and years living in the U.S), and by Cohen's Kappa for categorical variables.			
[2] The responses at Time 1 and Time 2 were matched except for one missing age at Time 2.			

Statistical Analysis Plan

The details of the analysis methods are provided in this section. A summary of the methods used to assess the primary and secondary hypothesis is provided in Table 5.

Table 5. Summary of Key Analysis Methods

Hypothesis	Endpoint	Analysis Method	Key Features
Primary: The Intervention Group would have a higher knowledge level of osteoporosis at post-intervention.	Knowledge score=(correct responses/total responses)	Mixed linear regression	<ul style="list-style-type: none"> • Response variable=response score at post-intervention • Explanatory variable=group assignment, baseline score, and significant baseline variables • Correlation among the participants from the same site was modeled.
Primary: The Intervention Group would have a higher self-efficacy for adopting a calcium-rich diet at post-intervention.	Efficacy score=(correct responses/total responses)	Mixed linear regression	Similar to the method for knowledge score
Primary: The Intervention Group would have higher intention to consume calcium-rich food item at post-intervention.	The intention stage a participant was at	Generalized linear regression	<ul style="list-style-type: none"> • Response variable=intention stage • Explanatory variables=group assignment, baseline intention stage and significant baseline variables • Distribution=multinomial • Link=logit
Secondary: The Intervention Groups would consume more calcium-rich food items at Month 3 after the intervention.	Number of calcium-rich food items	Mixed linear regression	Similar to the method for knowledge score

Baseline Characteristics

For baseline characteristics variables that were continuous, such as age, weight and years lived in the U.S., means and their 95% confidence intervals were provided. Additionally, group differences were assessed by a t-test. For categorical variables, such as marital status or employment status, number and percentage for each category were tabulated and group differences were evaluated by Pearson's χ^2 test.

Primary Hypotheses Regarding Effects of Intervention Program at Post-Intervention

The three primary hypotheses for this study were that, compared with the Control Group, the Intervention Group at post-intervention would have: 1) a higher knowledge level of osteoporosis; 2) a higher self-efficacy for consuming more calcium-rich food items; and 3) a higher intention stage to consume more calcium-rich food items (see Section Research Aim and Hypotheses for detail). The methods to test the three primary hypotheses are described in this section.

Knowledge Level of Osteoporosis

The knowledge levels of osteoporosis were measured by 12 questions as described in Section Description of Questionnaires. Briefly, a knowledge score was the total number of correct responses divided by the total number of items that a participant responded to. The score ranged from 0 to 1, 0 when a participant had zero correct response to any items and 1 when a participant responded to all items correctly. The mean and 95% confidence interval were provided by study group and time point.

Additionally, mixed linear regression models were used to estimate the group difference. The associations between the knowledge score and individual baseline

variables were evaluated one at a time at the presence of study group and baseline knowledge score. The difference between the two study groups were estimated by a mixed linear regression model adjusting for baseline knowledge score, baseline variables that were found not to be the same between the two study groups or were found to be significantly associated with post-intervention knowledge. Since the participants were recruited from the organizations and were not randomized individually, the participants from the same organization may be correlated and not independent observation units. Therefore, the mixed model also included the organization as a random variable to account for the correlations.

The knowledge level was also evaluated regarding each component questionnaire item. The proportions of participants with correct responses were provided by study group and time point for each individual items. The difference between the two study groups regarding a questionnaire item was estimated by hierarchical logistic regression models.

Self-Efficacy for Adopting a Calcium-Rich Diet

The five items used to measure perceived self-efficacy for adopting a calcium-rich diet were listed in section Descriptions of Questionnaires. The endpoint for hypothesis evaluation was the efficacy score. The analysis methods for the self-efficacy score were similar to those used to analyze the knowledge score.

Intention to Consume More Calcium-Rich Food Items

The intentions of consuming more calcium-rich food items were measured by six statements corresponding to six progressive stages of intention (see Section Descriptions

of Questionnaires for detail). The distribution of intention stages was tabulated by study group. The two study groups were compared by a Cochran-Mantel-Haenszel χ^2 statistics that tests whether the two study groups had the same mean stage score. Additionally, a generalized linear model with a multinomial distribution and a cumulative logit link was used to compare the two study groups with adjustment to baseline intention, baseline variables that were found not to be the same between the two study groups, and the baseline variables that were found to be significantly associated with post-intervention knowledge. The odds ratio (Intervention Group/Control Group) for being at a higher stage was provided to assess the magnitude of the difference between the two study groups.

Secondary Hypothesis Regarding Intervention Effects at Month 3 After the Intervention

The secondary hypothesis for this study was that the participants in the Intervention Group consumed more calcium-rich food items than did the participants in the Control Group at Month 3 after the intervention. The total number of food items was used to compare the two study groups by the same mixed linear regress model used for knowledge score analysis.

Statistical Methods for Other Endpoints

Perceived Susceptibility

The perceived susceptibility was measured by asking the participants to respond to the two statements: 1) I am concerned about getting osteoporosis; 2) It is very likely that I will get osteoporosis. The possible response choices were “Agree”, “Disagree”, and “Don't Know”. The effect of intervention program was evaluated for each statement

separately. First, a Pearson's χ^2 was used to test the significance of the association between study group and the responses at post-intervention. Then the associations between the post-intervention response to the statement and the individual baseline variables were assessed using hierarchical logistic models. The dependent variable for the models was the response to the statement, dichotomized as Agree or Disagree/Don't Know. The exploratory variables were responses to the statement at baseline, study group, and one individual baseline variable added to the models. After the significant baseline variables were identified, the effects of intervention program were evaluated further by odds ratios (Intervention Group/Control Group) using hierarchical logistic models in three conditions: 1) no adjustment, 2) adjusting for baseline response to the statement alone, and 3) adjusting for baseline response to the statement and significant baseline variable identified as well as the baseline variables that were found to be different between the study groups.

Perceived Severity

The intervention effects regarding perceived severity were evaluated by the same methods used for the knowledge scores.

Perceived Barriers

The methods used to analyze perceived barriers were the same as those used for the knowledge scores and self-efficacy scores.

Power

The study was designed to have an adequate power to detect a meaningful increase of the knowledge level of osteoporosis by the intervention program. The sample

size of 100 participants in each study group would have a power of 80% to detect a 20% increase of knowledge score in the Intervention Group at the 2-sided alpha level of 5%. For example, if the mean knowledge score at post-intervention was 0.6 in the Intervention Group and 0.5 in the Control Group, the study design would have an 80% of power to detect that difference between the two groups. The calculation assumed that the standard deviation of the knowledge scores was 0.25.

CHAPTER 4

RESULTS

Characteristics of the Study Population

A total of eight (8) community-based organizations were recruited. The first organization was enrolled on 19-Sep-2011 and the last on 29-Apr-2012. The assignment of each organization to a study group was not fixed but random, in the sense that the assignment was based on the timing of the organization's consent to participate and the total participants already enrolled in each study group.

A summary table of the eight organizations is provided below in Table 6. Three organizations were assigned to the Intervention Group and five to the Control Group. A total of 192 Chinese women who were at least 50 years of age were recruited from these organizations, 102 from the three organizations assigned to Intervention Group and another 90 from other five organizations assigned to the Control Group. The total number of participants was different for each organization. The first organization recruited was the largest with 70 participants. The two recruited last were the smallest, with six and seven participants respectively. The proportions of participants reached for the Month 3 follow up were comparable: 74.5% in the Intervention Group and 73.3% in the Control Group.

Table 6. Summary of Organizations and Participants in the Study

Study Group	Organization ID	Description	Dated Recruited	Number of Participants	
				Pre- and Post- Intervention	Month 3 Follow Up (%)
Intervention	1000	Senior Center	09/17/2011	70	52 (74.3%)
	3000	Chinese Church	10/30/2011	14	14 (100%)
	6000	Senior Housing	1/11/2012	18	10 (55.6%)
Total				102	76 (74.5%)
Control	2000	Senior Housing	09/29/2011	36	29 (80.6%)
	4000	Sunday Chinese School	12/04/2011	25	19 (76.0%)
	5000	Community Center	12/15/2011	16	10 (62.5%)
	7000	Chinese Church	3/25/2012	6	3 (50.0%)
	8000	Buddhist Church	4/29/2012	7	5 (71.4%)
Total				90	66 (73.3%)

Baseline Demographics

Summaries of the baseline information of the study participants are provided in Table 7 for variables related to demographic and socioeconomic background information, and in Table 8 for variables related to osteoporosis background information and general health information. The tables show that the participants in this study had the baseline characteristics as we anticipated in this population based on previous studies conducted in similar communities (Ma, 2009). Specifically, the English proficiency was low, 86% of

participants in the Intervention Group and 89% of participants in the Control Group viewed their English proficient “Not Well at All” or “Not Well”; the education level was low, 49% in the Intervention Group and 77% in the Control Group had no more than high school education; the income level was low, 51% in the Intervention Group and 68% in the Control Group had less than \$10,000 annual income.

Additionally, the two tables show that the two study groups were similar regarding most but not all baseline characteristics. For demographic variables (Table 7) the participants in the two study groups were comparable ($p\text{-value}>0.05$) regarding age, body weight, years lived in the US, marital status, employment status, income level, and English Proficiency; but were somewhat different regarding education level ($p\text{-value}=0.001$) and internet use (<0.001). For osteoporosis background (Table 8) the participants in the two study groups were comparable ($p\text{-value}>0.05$) regarding whether they had lost height in the past five years, were currently taking vitamin or calcium supplements, were taking hormone replacement therapy, had been told by their doctors of having had osteoporosis, or were currently taking medication to treat osteoporosis; but were somewhat different regarding whether they had a family member who had osteoporosis ($p\text{-value}=0.008$) and had their bone mineral density (BMD) measured ($p\text{-value}=0.004$). For general health information (Table 8), the participants in the two study groups were comparable regarding their last health check-up ($p\text{-value}=0.541$) but were different regarding their health insurance status ($p\text{-value}=0.04$).

It appears that the Intervention Group had a higher education level and used the internet more often. The Intervention Group also had higher proportions of participants with a family member with osteoporosis, with the BMD measured before the study, and

having health insurance. These differences between the two study groups at baseline could potentially confound the evaluation of the intervention effects. However, differences between study groups are common in observational studies. The differences were anticipated at the design phase of the study and the analysis methods were planned accordingly. The statistical analysis plan was designed to include sensitivity analyses to evaluate the intervention effect adjusting for baseline parameters that were found to be different between the study groups. In executing these statistical models, categories for baseline variables with very low number of participants were combined with their adjacent categories so the models could converge and make estimates. Specifically, the category of “ ≥ 3 years” for last health check-up was combined with the category of “ ≥ 1 year”; the categories of “Never Married”, “Divorced/Separated”, and “widowed” were combined into one category of “Not Married”; the category of “Graduate And Above” was combined with “University”; the category of “Unemployed” was combined with “Retired”; the category of “Very Well” for English proficiency was combined with “Well”; and finally, the four levels of Income level $\geq \$10,000$ were combined.

Table 7. Summary of Baseline Variables Related to Demographics and Socioeconomics by Study Group

	Intervention Group (N=102)		Control Group (N=90)		P-Value
	n	Mean (95% CI)	n	Mean (95% CI)	
Age	101	70.1 (68.3, 71.9)	89	69.4 (67.6, 71.2)	0.563
Weight	98	125.6 (121.9, 129.4)	86	125.3 (119.7, 130.8)	0.926
Years Lived in US	100	13.2 (11.3, 15.2)	88	15.6 (12.9, 18.2)	0.164
Marital Status	n	Proportion (%)	n	Proportion (%)	P-Value
Total	102		90		0.360
Married	66	64.7	50	55.6	
Never Married	1	1.0	5	5.6	
Divorced/Separated	6	5.9	6	6.7	
Widower	26	25.5	27	30.0	
No Response	3	2.9	2	2.2	
Education Level					
Total	102		90		0.001
<Elementary School	21	20.6	27	30.0	
<High School Graduate	15	14.7	22	24.4	
High School	14	13.7	20	22.2	
University	46	45.1	15	16.7	
Graduate and above	3	2.9	1	1.1	
No Response	3	2.9	5	5.6	
Employment Status					
Total	102		90		0.982
Employed	12	11.8	10	11.1	
Unemployed	3	2.9	2	2.2	
Retired	54	52.9	47	52.2	
Homemaker	25	24.5	25	27.8	
No Response	8	7.8	6	6.7	
Income Level					
Total	102		90		0.051
<\$10K	52	51.0	61	67.8	
\$10K to \$20K	14	13.7	6	6.7	
\$20K to \$30K	1	1.0	0	0.0	
\$30K to \$40K	2	2.0	0	0.0	
>\$40K	7	6.9	1	1.1	
No Response	26	25.5	22	24.4	
English Proficiency					
Total	102		90		0.062
Not Well	46	45.1	47	52.2	
Well	42	41.2	33	36.7	
Very Well	10	9.8	2	2.2	
No Response	1	1.0	0	0.0	
	3	2.9	8	8.9	
Internet Use					
Total	102		90		<0.001
No	76	74.5	77	85.6	
Yes	24	23.5	5	5.6	
No Response	2	2.0	8	8.9	

N=Participants in each study Group. n=Participants with indicated responses.

Table 8. Summary of Baseline Health and Osteoporosis Information by Study Group

	Intervention Group		Control Group		P-Value
	N	Proportion (%)	N	Proportion (%)	
Reduced Height					
Total	102		90		0.687
Yes	41	40.2	33	36.7	
No	55	53.9	49	54.4	
No Response	6	5.9	8	8.9	
Taking Vitamin/Calcium					
Total	102		90		0.348
Yes	78	76.5	62	68.9	
No	21	20.6	22	24.4	
No Response	3	2.9	6	6.7	
Taking HRT					
Total	102		90		0.406
Yes	6	5.9	2	2.2	
No	89	87.3	80	88.9	
No Response	7	6.9	8	8.9	
Had Osteoporosis					
Total	102		90		0.577
Yes	54	52.9	42	46.7	
No	47	46.1	46	51.1	
No Response	1	1.0	2	2.2	
Osteoporosis in Family					
Total	102		90		0.008
Yes	35	34.3	14	15.6	
No	60	58.8	64	71.1	
No Response	7	6.9	12	13.3	
BMD Measured					
Total	102		90		0.004
Yes	61	59.8	32	35.6	
No	38	37.3	54	60.0	
No Response	3	2.9	4	4.4	
Osteoporosis Medication					
Total	102		90		0.508
Yes	43	42.2	31	34.4	
No	56	54.9	55	61.1	
No Response	3	2.9	4	4.4	
Last Health Check-Up					
Total	102		90		0.541
Never	6	5.9	10	11.1	
<12 Months	63	61.8	48	53.3	
>1 Year	22	21.6	18	20.0	
>3 Years	5	4.9	7	7.8	
No Response	6	5.9	7	7.8	
Health Insurance					
Total	102		90		0.007
Yes	82	80.4	55	61.1	
No	16	15.7	23	25.6	
No Response	4	3.9	12	13.3	

HRT = Hormone replacement therapy BMD = Bone mineral density
Smoking status at baseline was also collected. None of the participants smoked.

Summary of Bone Mineral Density by T-Score

The distributions of the T-scores by study group are provided in Figure 2. The figure shows that the T-score distributions for the two study groups were largely overlapped, suggesting no significant difference between the two groups, although the mean T-score in the Intervention Group [-1.3, (95%CI: -1.5, -1.1)] was slightly lower when compared with the Control Group [-1.0, (95% CI: -1.3, -0.60)].

The proportions of participants with low bone density and osteoporosis were high (Table 9). Overall, 59% (95% CI: 0.50, 0.68) of the study participants had low bone mass (T-score<-1.0) and 24% (95% CI: 0.17, 0.33) had osteoporosis (T-score<-2.0). Consistent with the observation regarding the T-score, the proportions of participants with low bone mass and osteoporosis in the Intervention Group were somewhat higher, although not significant, when compared with the Control Group. The proportions in the Intervention Group and the Control Group were 66% (95% CI: 54%, 76%) and 48% (95% CI: 33%, 63%) for low bone mass, and 28% (95% CI: 18%, 39%) vs. 19% (95% CI: 9%, 33%) for osteoporosis, respectively.

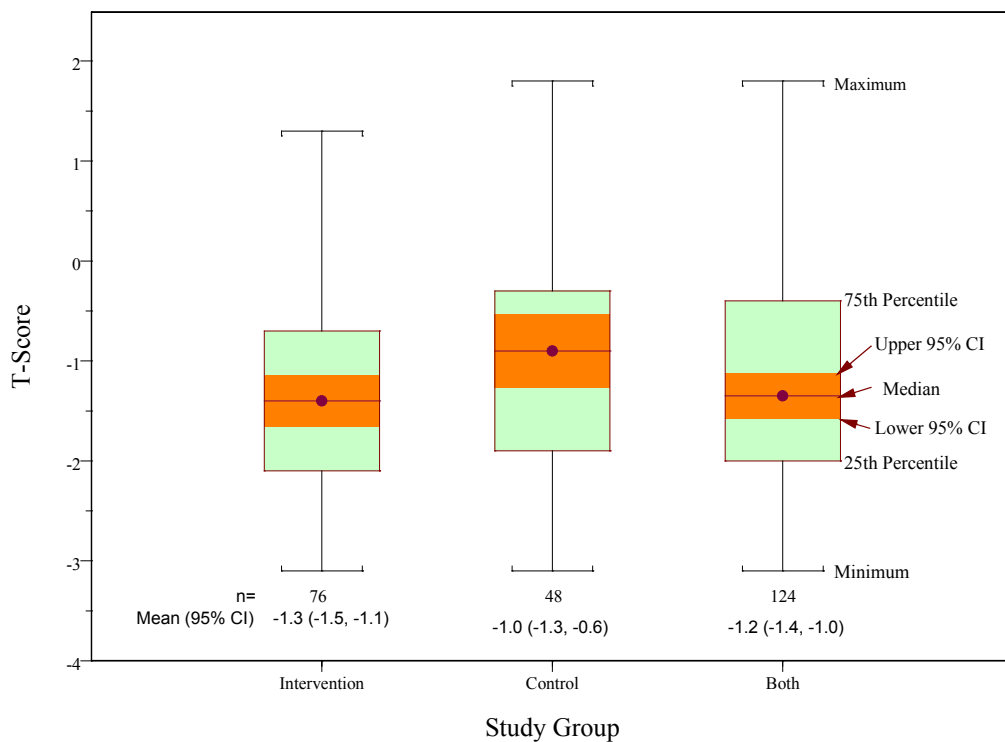


Figure 2. Summary of T-Scores by Study Group

Table 9. Proportions of Low Bone Mass and Osteoporosis by Study Group

	Intervention Group		Control Group		Both Groups	
	s/n	Proportion (95% CI)	s/n	Proportion (95% CI)	s/n	Proportion (95% CI)
Low Bone Mass (T<-1.0)	50/76	66% (54%, 76%)	23/48	48% (33%, 63%)	73/124	59% (50%, 68%)
Osteoporosis (T<-2.0)	21/76	28% (18%, 39%)	9/48	19% (9%, 33%)	30/124	24% (17%, 33%)

The BMD was measure by Sahara Clinical Bone Sonometer the calcaneus (heel bone) site.
n = Number of participants with BMD score.
s = Number of participants with the condition.
CI = 95% confidence interval.

Evaluation of the Intervention Effects at Post-Intervention

As stated in the section Specific Aims And Hypotheses, the three primary hypotheses used to evaluate the efficacy of the intervention program were:

- (1) The knowledge level of osteoporosis is higher in the Intervention Group than that in the Control Group at post-intervention.
- (2) The self-efficacy for adopting a calcium-rich diet is higher in the Intervention Group than that in the Control Group at post-intervention.
- (3) The intention to consume more calcium-rich food items is increased in the Intervention Group compared with the Control Group at post-intervention.

This section describes the results regarding the three primary hypotheses, and the results regarding other endpoints that were measured at post-intervention.

Knowledge Level of Osteoporosis

The knowledge level of osteoporosis was measured by an osteoporosis knowledge score that was composed of 12 individual knowledge items. Refer to Section Description of Questionnaires for more details. The knowledge score served as a proxy measure for an overall knowledge level about osteoporosis. It was calculated as the total number of correct responses divided by the total number of items that a participant responded to. The score ranged from 0 to 1, 0 when a participant had no correct response to any items and 1 when a participant responded to all items correctly. If a participant did not respond to an item, this item was not contributed to the score calculation. If a participant did not respond to any of the 12 items, her score was set to missing.

A summary of knowledge scores by study group and time is provided in Figure 3. The observed knowledge scores in the Intervention Groups were 0.45 (95% CI: 0.41, 0.50) at baseline and 0.63 (95% CI: 0.58, 0.67) at post-intervention, whereas scores in the Control Group were 0.41 (95% CI: 0.36, 0.46) at baseline and 0.46 (95% CI: 0.42, 0.51) at post-intervention. The analyses presented in Table 10 show that the Intervention Group had a mean knowledge score that was similar to that in the Control Group at baseline (p-value=0.515) but was higher than that in the Control Group at post-intervention (p-value<0.05). The estimated difference (Intervention Group - Control Group) was 0.21 (95% CI: 0.03, 0.39; p-value=0.034) not adjusted; 0.17 (95% CI: 0.05, 0.29; p-value=0.019) adjusted for baseline score; and 0.17 (95% CI: 0.02, 0.32; p-value=0.037) adjusted for baseline knowledge score and baseline characteristic variables. All three estimates showed that the Intervention Group had a higher knowledge score at post-intervention.

Associations between the post-intervention knowledge scores and individual baseline characteristic variables were explored using mixed linear regression models. The model's dependent variable was the post-intervention knowledge score; the explanatory variables were baseline knowledge score, study group and one additional baseline variable as indicated in Table 11. The organization was modeled as a random-effect with compound symmetry as the covariance structure. The results indicated that the study group was a significant variable for post-intervention knowledge score. The baseline-adjusted post-intervention knowledge score in the Intervention Group's was 0.17 (95% CI: 0.05, 0.29; p-value=0.019) higher than the score in the Control Group, supporting the claim that the intervention program had increased knowledge scores. Additional variables

identified as significant to the post-intervention knowledge score were baseline knowledge score (p-value<0.001) and baseline efficacy score (p-value=0.005) although the influences were small. The post-intervention knowledge score increased 0.05 for each one tenth increase of baseline knowledge scores and 0.01 for each one tenth increase of baseline efficacy scores.

After the significant baseline variables were identified, the effects of the intervention program regarding knowledge scores were evaluated further, adjusting for these significant variables and the five baseline characteristic variables that were not the same for the two study groups, which were the variables for family member with osteoporosis, having had BMD measure before, education level, health insurance, and internet use. The results of this sensitive analysis are provided in Table 10. As stated above, the Intervention Group had higher knowledge scores than did the Control Group at post-intervention.

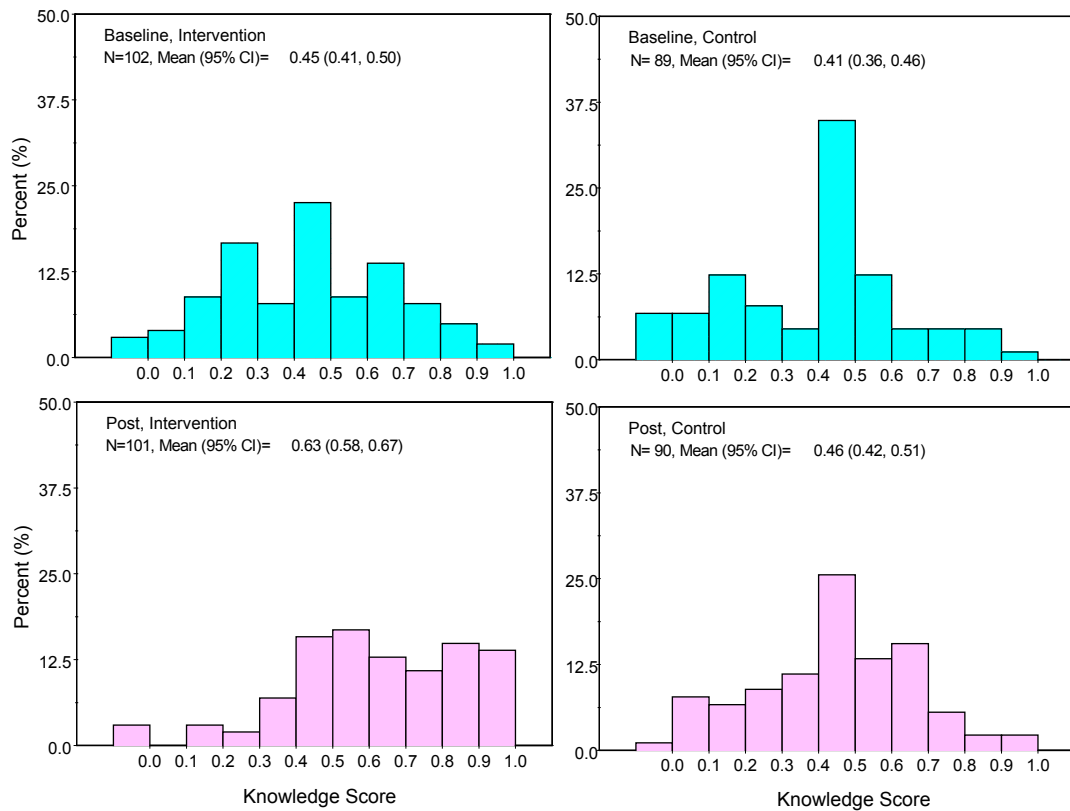


Figure 3. Distributions of Overall Knowledge Scores by Study Group and Time

Table 10. Analysis of Intervention Effects Regarding Post-Intervention Knowledge Scores

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Difference	P-value
		n	Mean (95% CI)	n	Mean (95% CI)		
No Adjustment	Baseline	102	0.45 (0.01, 0.89)	89	0.41 (0.33, 0.49)	0.04 (-0.47, 0.55)	0.515
	Post-Intervention	101	0.65 (0.50, 0.79)	90	0.44 (0.33, 0.55)	0.21 (0.03, 0.39)	0.034
Baseline Score	Post-Intervention	101	0.63 (0.53, 0.73)	89	0.46 (0.39, 0.54)	0.17 (0.05, 0.29)	0.019
Baseline Score, Significant Baseline Variables	Post-Intervention	85	0.60 (0.51, 0.69)	64	0.43 (0.35, 0.51)	0.17 (0.02, 0.32)	0.037

Difference is Intervention Group minus Control Group.
Significant baseline characteristics variables are variables for having family member with osteoporosis, having BMD measured before, education level, health insurance status, internet usage, baseline efficacy score, and baseline severity score.
CI=Confidence interval. N=Number of participants. n=Number of participants contributed to the analysis.

Table 11. Analysis of Associations Between Post-Intervention Knowledge Scores and Baseline Variables

Variable	Parameter (95% CI)	P-value
Study Group	0.17 (0.05. 0.29)	0.019
Baseline Knowledge Score	0.05 (0.04. 0.06)	<.001
Baseline Efficacy Score	0.01 (0.00. 0.02)	0.005
Baseline Severity Score	-0.01 (-0.02. 0.00)	0.055
Baseline Barrier Score	-0.01 (-0.02. 0.00)	0.158
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	-0.07 (-0.15. 0.02)	0.123
Thinking About It	-0.04 (-0.15. 0.08)	0.536
Will Do So Next Month	-0.02 (-0.09. 0.04)	0.470
Will Do So Next Week	0.05 (-0.12. 0.22)	0.569
Doing So Currently	0.05 (-0.12. 0.22)	0.529
Baseline Being Concerned or Not	-0.05 (-0.11. 0.01)	0.101
Baseline Response to How likely (Agree/Other)	-0.03 (-0.08. 0.03)	0.392
Age	-0.00 (-0.00. 0.00)	0.802
Weight	0.00 (-0.00. 0.00)	0.708
Reduced Height (Yes/No)	0.02 (-0.03. 0.08)	0.448
BMD Measured (Yes/No)	0.01 (-0.05. 0.06)	0.843
Taking Osteoporosis Medication (Yes/No)	-0.00 (-0.06. 0.06)	0.953
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.07 (-0.04. 0.18)	0.206
>1 Year	0.01 (-0.06. 0.07)	0.845
Taking Vitamin/Calcium (Yes/No)	-0.05 (-0.11. 0.02)	0.155
Taking HRT (Yes/No)	-0.01 (-0.14. 0.13)	0.907
Had Osteoporosis (Yes/No)	-0.01 (-0.07. 0.04)	0.680
Osteoporosis in Family (Yes/No)	-0.01 (-0.08. 0.05)	0.699
Years Lived in US	-0.00 (-0.00. 0.00)	0.527
Marital Status (Reference=Widow)	-0.01 (-0.07. 0.04)	0.654
Education Level (Reference=<Elementary School)		
<High School Graduate	-0.01 (-0.09. 0.07)	0.786
High School	0.02 (-0.07. 0.11)	0.688
University and Above	0.01 (-0.08. 0.09)	0.891
Employment Status (Reference=Homemaker)		
Employed	0.04 (-0.07. 0.14)	0.479
Unemployed/Retired	0.02 (-0.04. 0.09)	0.517
Income Level (At Least 10K/Below 10K)	0.04 (-0.04. 0.12)	0.311
Health Insurance (Have/Not Have)	0.04 (-0.03. 0.11)	0.239
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.05 (-0.08. 0.18)	0.459
Not Well	0.00 (-0.06. 0.06)	0.908
Internet Use (Yes/No)	0.02 (-0.06. 0.11)	0.573

P-values are the statistical significance for testing no difference, i.e. the parameter being 0.
In addition to the indicated variable, all models included the variables for baseline knowledge score and study group.
CI=Confidence interval. HRT=Hormone Replacement Therapy.

In addition to the overall knowledge level, the intervention effect was also evaluated regarding the 12 items that constituted the overall knowledge score individually. The summaries (Table 12) show that the proportions of participants with correct responses in the Intervention Group increased from baseline to post-intervention for all individual items except one. The increases in the Intervention Group are summarized below:

Percentage Points Increase in the Intervention Group	Questionnaire Item Name
≥ 25	• Bone cancer can be caused by osteoporosis.
	• Sardine is rich in calcium.
	• Bachoy is rich in calcium.
	• Getting enough vitamin D will decrease my chance of getting osteoporosis.
≥ 20	• Walking will decreased my chance of getting osteoporosis.
≥ 10	• Being overweight will increase my chance of getting osteoporosis.
	• Taking estrogen after menopause will decrease my chance of getting osteoporosis.
	• Wearing properly fitted shoes will decrease my chance of getting osteoporosis.
≥ 5	• Osteoporosis can be diagnosed by a bone mineral density test.
< 5	• Bone fractures can be caused by osteoporosis.
	• Osteoporosis is caused by a virus.
	• Eating red meat will decrease my chance of getting osteoporosis.

In contrast, the changes in the Control Group were not consistent and small in magnitude. Of note, the proportions of correct responses regarding the two calcium-rich food items increased more than 25 percentage points in the Intervention Group, from 56.6% to 81.8% for sardine and from 27.3% to 68.0% for bachoy, whereas the increases in the Control Group were much smaller, from 45.3% to 48.8% for sardine and from 17.4% to 31.0% for bachoy. The differential increases between the two study groups could be attributable to the intervention program because the program specifically pointed out that these two food items are high in calcium. Also of interest is the high proportion of participants who at baseline already knew that osteoporosis could cause bone fracture, and that the BMD test could diagnose osteoporosis. There were 88.2% of the participants in the Intervention Group and 81.8% in the Control Group who already knew that osteoporosis could cause bone fractures; 83.5% in the Intervention Group and 75.6% in the Control Group knew that the BMD test could diagnose osteoporosis. The high baseline knowledge on these two items made it hard for the intervention program to improve the knowledge level further regarding these two questionnaire items.

Associations between the post-intervention response to individual questionnaire items and the baseline characteristics were explored by logistic regression models. The dependent variable was the post-intervention response (correct vs. incorrect), the explanatory variables were study group, baseline response to the questionnaire item, and one baseline characteristic variable as indicated in Table 13. Due to data limitations, the potential correlation among participants from the same organization was not included in the models, which may result in more variables being identified as influential at the p-value of 0.05. The details of the analyses are provided in Appendix A and a summary of

the resulting p-values in Table 13. The table shows that the baseline response was a significant variable for its corresponding post-intervention response consistently for all 12 individual questionnaire items, which was also consistent with the finding regarding the overall knowledge score. The study group was significant for 7 out the 12 items. Other baseline characteristic variables were mostly not significant or marginally significant.

After the significant variables were identified, the intervention effect was further analyzed by logistic regression models adjusting for baseline variables. The dependent variable was the post-intervention response (correct vs. incorrect), and the explanatory variables were study group, baseline response to the item, and significant baseline variables identified. The adjusted treatment effects for each individual questionnaire items are provided in Table 14. The correlation of participants from the same organization was not modeled in these logistic analyses, because otherwise the logistic models would not converge to give estimates. Additionally, the baseline intention stage and education level were modeled as a numeric rather than a character variable.

Table 14 shows that the intervention program was most effective in improving the knowledge about sardine and bachoy being high in calcium. The adjusted odds ratios (Intervention Group/Control Group) of knowing these food were rich in calcium were 4.77 (95% CI: 1.66, 13.72; p-value=0.004) for sardine and 5.42 (95% CI: 2.33, 12.64; p-value<0.001) for bachoy. Additionally, the intervention program was effective in improving the knowledge about osteoporosis not causing bone cancer, and about the chances of getting osteoporosis by using HRT, wearing properly fitted shoes, or walking. The odds ratios (Intervention Group vs. Control Group) of a correct response were 2.81

(95% CI: 1.07, 7.36; p-value=0.035) about osteoporosis not causing bone cancer; 3.03 (95% CI: 1.17, 7.87; p-value=0.023) about using HRT; 4.18 (95% CI: 1.46, 11.91; p-value=0.008) about wearing properly fitted shoes; and 3.41 (95% CI: 1.07, 10.91; p-value=0.039) about walking. Furthermore, the intervention program probably was effective in improving the knowledge about the ability of vitamin D in reducing the chance of osteoporosis. The odds ratio was statistically significant after adjusting for baseline response alone but was not after adjusting for both baseline response and significant characteristic variables. The odds ratios were 3.29 (95% CI: 1.42, 7.63; p-value=0.005) adjusting for baseline response alone and 2.65 (95% CI: 0.91, 7.71; p-value=0.074). It is clear that in the latter case the adjusted odds ratio was still large, but reduced sample sizes (n=79 in the Intervention Group and 64 in the Control Group) and variability of the data reduced the precision of the estimate and caused the odds ratio not to be significantly different from 1.

Table 12. Summary of Individual Knowledge Items by Study Group and Time

Time Point	Response	Intervention Group n (%)	Control Group n (%)
Bone Cancer Can Be Caused By Osteoporosis.			
Baseline	No Response	2	2
	Total Responders	100	88
	Agree	6 (6.0)	13 (14.8)
	Disagree[1]	24 (24.0)	18 (20.5)
	Don't Know	70 (70.0)	57 (64.8)
Post-Intervention	No Response	10	3
	Total Responders	92	87
	Agree	9 (9.8)	28 (32.2)
	Disagree[1]	49 (53.3)	28 (32.2)
	Don't Know	34 (37.0)	31 (35.6)
Bone Fractures Can Be Caused By Osteoporosis.			
Baseline	No Response	0	2
	Total Responders	102	88
	Agree[1]	90 (88.2)	72 (81.8)
	Disagree	1 (1.0)	0 (0.0)
	Don't Know	11 (10.8)	16 (18.2)
Post-Intervention	No Response	1	1
	Total Responders	101	89
	Agree[1]	91 (90.1)	74 (83.1)
	Disagree	5 (5.0)	3 (3.4)
	Don't Know	5 (5.0)	12 (13.5)
Sardine Is Rich In Calcium.			
Baseline	No Response	3	4
	Total Responders	99	86
	Agree[1]	56 (56.6)	39 (45.3)
	Disagree	3 (3.0)	6 (7.0)
	Don't Know	40 (40.4)	41 (47.7)
Post-Intervention	No Response	3	4
	Total Responders	99	86
	Agree[1]	81 (81.8)	42 (48.8)
	Disagree	1 (1.0)	2 (2.3)
	Don't Know	17 (17.2)	42 (48.8)
Bachoy Is Rich In Calcium.			
Baseline	No Response	3	4
	Total Responders	99	86
	Agree[1]	27 (27.3)	15 (17.4)
	Disagree	14 (14.1)	13 (15.1)
	Don't Know	58 (58.6)	58 (67.4)
Post-Intervention	No Response	5	3
	Total Responders	97	87
	Agree[1]	66 (68.0)	27 (31.0)
	Disagree	7 (7.2)	14 (16.1)
	Don't Know	24 (24.7)	46 (52.9)

Table 12. (Continued)

Time Point	Response	Intervention Group n (%)	Control Group n (%)
Osteoporosis Is Caused By A Virus.			
Baseline	No Response	3	7
	Total Responders	99	83
	Agree	0 (0.0)	14 (16.9)
	Disagree[1]	51 (51.5)	33 (39.8)
	Don't Know	48 (48.5)	36 (43.4)
Post-Intervention	No Response	2	0
	Total Responders	100	90
	Agree	4 (4.0)	14 (15.6)
	Disagree[1]	53 (53.0)	39 (43.3)
	Don't Know	43 (43.0)	37 (41.1)
Osteoporosis Can Be Diagnosed By A Bone Mineral Density Test.			
Baseline	No Response	5	4
	Total Responders	97	86
	Agree[1]	81 (83.5)	65 (75.6)
	Disagree	2 (2.1)	1 (1.2)
	Don't Know	14 (14.4)	20 (23.3)
Post-Intervention	No Response	4	1
	Total Responders	98	89
	Agree[1]	87 (88.8)	70 (78.7)
	Disagree	2 (2.0)	0 (0.0)
	Don't Know	9 (9.2)	19 (21.3)
Being Overweight Will Increase My Chance Of Getting Osteoporosis.			
Baseline	No Response	4	6
	Total Responders	98	84
	Agree	43 (43.9)	37 (44.0)
	Disagree[1]	10 (10.2)	13 (15.5)
	Don't Know	45 (45.9)	34 (40.5)
Post-Intervention	No Response	6	4
	Total Responders	96	86
	Agree	46 (47.9)	47 (54.7)
	Disagree[1]	22 (22.9)	13 (15.1)
	Don't Know	28 (29.2)	26 (30.2)
Getting Enough Vitamin D Will Decrease My Chance Of Getting Osteoporosis.			
Baseline	No Response	4	3
	Total Responders	98	87
	Agree[1]	54 (55.1)	61 (70.1)
	Disagree	6 (6.1)	8 (9.2)
	Don't Know	38 (38.8)	18 (20.7)
Post-Intervention	No Response	6	2
	Total Responders	96	88
	Agree[1]	80 (83.3)	61 (69.3)
	Disagree	5 (5.2)	5 (5.7)
	Don't Know	11 (11.5)	22 (25.0)

Table 12. (Continued)

Time Point	Response	Intervention Group n (%)	Control Group n (%)
Eating Red Meat Will Decrease My Chance of Getting Osteoporosis.			
Baseline	No Response	6	3
	Total Responders	96	87
Post-Intervention	Agree	15 (15.6)	21 (24.1)
	Disagree[1]	38 (39.6)	24 (27.6)
	Don't Know	43 (44.8)	42 (48.3)
	No Response	9	3
	Total Responders	93	87
	Agree	23 (24.7)	15 (17.2)
	Disagree[1]	36 (38.7)	30 (34.5)
	Don't Know	34 (36.6)	42 (48.3)
Taking Estrogen After Menopause Will Decrease My Chance Of Getting Osteoporosis.			
Baseline	No Response	3	3
	Total Responders	99	87
Post-Intervention	Agree[1]	32 (32.3)	23 (26.4)
	Disagree	10 (10.1)	15 (17.2)
	Don't Know	57 (57.6)	49 (56.3)
	No Response	11	4
	Total Responders	91	86
	Agree[1]	45 (49.5)	23 (26.7)
	Disagree	17 (18.7)	19 (22.1)
	Don't Know	29 (31.9)	44 (51.2)
Wearing Properly Fitted Shoes Will Decrease My Chance Of Getting Osteoporosis.			
Baseline	No Response	4	3
	Total Responders	98	87
Post-Intervention	Agree	20 (20.4)	33 (37.9)
	Disagree[1]	19 (19.4)	14 (16.1)
	Don't Know	59 (60.2)	40 (46.0)
	No Response	9	3
	Total Responders	93	87
	Agree	29 (31.2)	35 (40.2)
	Disagree[1]	33 (35.5)	21 (24.1)
	Don't Know	31 (33.3)	31 (35.6)
Walking Will Decrease My Chance Of Getting Osteoporosis.			
Baseline	No Response	3	4
	Total Responders	99	86
Post-Intervention	Agree[1]	58 (58.6)	53 (61.6)
	Disagree	10 (10.1)	12 (14.0)
	Don't Know	31 (31.3)	21 (24.4)
	No Response	9	4
	Total Responders	93	86
	Agree[1]	75 (80.6)	58 (67.4)
	Disagree	9 (9.7)	14 (16.3)
	Don't Know	9 (9.7)	14 (16.3)

[1]=Correct response.

Percentages are based on number of participants with response.

CI=Confidence interval. N=Number of participants. n=Number of participants in each category.

Table 13. Summary of P-Values for Testing Associations Between Post-Intervention Responses to Individual Knowledge Components and Baseline Variables

	C12 Cancer	C13 Fracture	C14 Sardine	C15 Bachoy	C16 Virus	C17 BMD	C18 Overwt	C19 EnoughD	C20 Meat	C21 Estrogen	C22 Shoe	C23 Walk
TRT	0.002***	-	<0.001**	<0.001**	-	-	-	0.005***	0.039*	0.003***	-	0.036*
Baseline	0.020***	0.003***	<0.001**	0.001***	<0.001**	<0.001**	<0.001**	<0.001***	<0.001***	<0.001**	<0.001**	<0.001**
Efficacy	0.003***	-	-	-	-	0.002***	-	-	-	0.030***	-	-
Intention	0.005***	-	0.040*	-	-	-	-	-	-	-	-	-
Severity	-	-	-	-	-	0.021**	-	-	-	-	0.029*	-
Barrier	-	-	-	-	-	-	-	-	-	-	-	0.027*
Concerned	-	-	-	-	-	-	-	-	-	-	-	-
Likely	-	-	-	-	-	-	0.021**	-	-	-	-	-
Age	-	-	-	-	-	-	-	-	-	-	-	-
Weight	-	-	-	-	-	-	0.002***	-	0.048*	-	-	-
Height	-	-	0.036*	-	-	-	-	-	-	-	-	-
Check-Up	-	-	-	-	-	-	-	-	-	-	-	-
Vita/Calcium	-	-	-	-	-	-	-	-	-	-	-	-
HRT	-	-	-	-	-	-	-	-	-	-	-	-
Medication	-	-	-	-	-	-	-	-	-	-	-	-
Osteoporosis	-	-	-	-	-	-	-	-	-	-	-	-
Family	-	-	-	-	-	-	-	-	-	-	-	-
BMD	-	-	-	-	-	-	-	-	-	-	-	0.025**
Years	-	-	-	-	-	-	-	-	-	-	-	-
Marital	-	-	-	-	-	-	-	-	-	-	-	-
Education	-	-	-	-	-	-	-	0.048*	-	-	-	-
Employment	-	-	-	-	-	-	-	-	-	-	-	-
Income	-	-	-	-	-	-	-	-	-	-	-	-
Insurance	-	-	-	-	-	-	-	-	-	-	-	-
English	-	-	-	-	-	-	-	-	-	-	-	-
Internet	-	-	-	-	-	-	-	-	-	-	-	-

Significance Level of p-values:

***<0.01, ** between 0.01 and 0.025, * between 0.025 and 0.05, and - >0.05.

C12Cancer=Bone Cancer Can Be Caused By Osteoporosis.

C13Fracture= Bone Fractures Can Be Caused By Osteoporosis.

C14Sardine=Sardine Is Rich In Calcium.

C15Bachoy=Bachoy Is Rich In Calcium.

C16Virus=Osteoporosis Is Caused By A Virus.

C17BMD=Osteoporosis Can Be Diagnosed By A Bone Mineral Density Test.

C18Overwt= Being Overweight Will Increase My Chance Of Getting Osteoporosis.

C19EnoughD=Getting Enough Vitamin D Will Decrease My Chance Of Getting Osteoporosis.

C20Meat=Eating Red Meat Will Decrease My Chance of Getting Osteoporosis.

C21Estrogen=Taking Estrogen After Menopause Will Decrease My Chance Of Getting Osteoporosis.

C22Shoe= Wearing Properly Fitted Shoes Will Decrease My Chance Of Getting Osteoporosis.

C23Walk= Walking Will Decrease My Chance Of Getting Osteoporosis.

TRT=Study Group. Baseline=Corresponding baseline value. Efficacy=Baseline efficacy score.

Intention=Baseline intention stage. Severity=Baseline severity score. Barrier=Baseline barrier score.

Concerned=Being concerned at baseline. Likely=Likely to get osteoporosis at baseline. Age=Age at baseline.

Weight=Weight at baseline. Height=Had height reduction. Check-Up=Timing of last check-up.

Vita/Calcium=Taking vitamin and calcium. HRT=Taking hormone replacement therapy.

Medication=Taking osteoporosis medication. Osteoporosis=Told to have osteoporosis.

Family=Having family members with osteoporosis. BMD=Had bone mineral density measured before.

Years=Years lived in the U.S Marital=Marital status. Education=Education level. Employment=Employment Status.

Income=Income level. Insurance=Having health insurance. English=English proficiency. Internet=Internet use.

Table 14. Analysis of Post-Intervention Responses to Individual Knowledge Items

Bone Cancer Can Be Caused By Osteoporosis							
Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	100	0.32 (0.20, 0.50)	88	0.26 (0.15, 0.43)	1.23 (0.61, 2.45)	0.561
	Post	92	1.14 (0.76, 1.72)	87	0.47 (0.30, 0.74)	2.40 (1.31, 4.41)	0.005
Baseline Response	Post	90	3.21 (1.64, 6.28)	85	1.16 (0.60, 2.24)	2.77 (1.35, 5.69)	0.006
Baseline Response, Significant Baseline Variables [1][2]	Post	74	5.46 (1.71, 17.43)	68	1.94 (0.60, 6.26)	2.81 (1.07, 7.36)	0.035
Bone Fractures Can Be Caused By Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	102	7.50 (4.11, 13.70)	88	4.50 (2.62, 7.74)	1.67 (0.74, 3.75)	0.216
	Post	101	9.10 (4.74, 17.48)	89	4.93 (2.83, 8.59)	1.84 (0.78, 4.35)	0.161
Baseline Response	Post	101	5.78 (2.86, 11.67)	87	3.29 (1.79, 6.02)	1.76 (0.73, 4.25)	0.209
Baseline Response, Significant Baseline Variables [1]	Post	86	5.60 (1.56, 20.08)	63	6.00 (1.45, 24.87)	0.93 (0.32, 2.72)	0.901
Sardine Is Rich In Calcium							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	1.30 (0.88, 1.94)	86	0.83 (0.54, 1.27)	1.57 (0.88, 2.81)	0.129
	Post	99	4.50 (2.70, 7.50)	86	0.95 (0.63, 1.46)	4.71 (2.43, 9.15)	<.001
Baseline Response	Post	96	8.17 (3.98, 16.78)	83	1.24 (0.67, 2.27)	6.61 (2.70, 16.17)	<.001
Baseline Response, Significant Baseline Variables [1]	Post	79	4.69 (1.90, 11.60)	60	0.98 (0.35, 2.74)	4.77 (1.66, 13.72)	0.004
Bachoy Is Rich In Calcium							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	0.37 (0.24, 0.58)	86	0.21 (0.12, 0.37)	1.77 (0.87, 3.61)	0.114
	Post	97	2.13 (1.39, 3.26)	87	0.45 (0.29, 0.71)	4.73 (2.54, 8.82)	<.001
Baseline Response	Post	94	3.87 (2.16, 6.94)	83	0.74 (0.41, 1.31)	5.27 (2.64, 10.53)	<.001
Baseline Response, Significant Baseline Variables [1]	Post	82	3.16 (1.46, 6.87)	62	0.58 (0.23, 1.46)	5.42 (2.33, 12.64)	<.001

Table 14. (Continued)

Osteoporosis Is Caused By A Virus							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	1.06 (0.72, 1.58)	83	0.66 (0.43, 1.02)	1.61 (0.89, 2.91)	0.114
	Post	100	1.13 (0.76, 1.67)	90	0.76 (0.50, 1.16)	1.47 (0.83, 2.61)	0.184
Baseline Response	Post	97	1.10 (0.69, 1.76)	83	1.00 (0.60, 1.66)	1.11 (0.55, 2.21)	0.773
Baseline Response, Significant Baseline Variables [1]	Post	84	0.90 (0.44, 1.85)	61	0.78 (0.33, 1.84)	1.16 (0.49, 2.73)	0.732
Osteoporosis Can Be Diagnosed By A Bone Mineral Density Test							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	97	5.06 (2.96, 8.65)	86	3.10 (1.89, 5.06)	1.64 (0.79, 3.39)	0.185
	Post	98	7.91 (4.22, 14.81)	89	3.68 (2.22, 6.12)	2.15 (0.96, 4.81)	0.063
Baseline Response	Post	93	5.28 (2.58, 10.79)	85	2.96 (1.62, 5.42)	1.78 (0.70, 4.54)	0.227
Baseline Response, Significant Baseline Variables [1]	Post	80	6.60 (2.15, 20.25)	63	3.42 (0.95, 12.24)	1.93 (0.53, 7.03)	0.318
Being Overweight Will Increase My Chance Of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	98	0.11 (0.06, 0.22)	84	0.18 (0.10, 0.33)	0.62 (0.26, 1.50)	0.289
	Post	96	0.30 (0.18, 0.48)	86	0.18 (0.10, 0.32)	1.67 (0.78, 3.56)	0.185
Baseline Response	Post	92	0.56 (0.31, 1.01)	81	0.27 (0.14, 0.53)	2.06 (0.91, 4.66)	0.083
Baseline Response, Significant Baseline Variables [1]	Post	74	0.42 (0.14, 1.22)	58	0.19 (0.06, 0.57)	2.21 (0.70, 7.02)	0.177
Getting Enough Vitamin D Will Decrease My Chance Of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	98	1.23 (0.82, 1.83)	87	2.35 (1.48, 3.71)	0.52 (0.28, 0.96)	0.037
	Post	96	5.00 (2.92, 8.55)	88	2.26 (1.44, 3.55)	2.21 (1.10, 4.47)	0.027
Baseline Response	Post	92	5.97 (3.19, 11.17)	86	1.81 (1.06, 3.09)	3.29 (1.42, 7.63)	0.005
Baseline Response, Significant Baseline Variables [1]	Post	79	4.03 (1.66, 9.78)	64	1.52 (0.54, 4.30)	2.65 (0.91, 7.71)	0.074

Table 14. (Continued)

Eating Red Meat Will Decrease My Chance of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	96	0.66 (0.44, 0.99)	87	0.38 (0.24, 0.61)	1.72 (0.92, 3.21)	0.088
	Post	93	0.63 (0.42, 0.96)	87	0.53 (0.34, 0.82)	1.20 (0.65, 2.20)	0.557
Baseline Response	Post	87	0.68 (0.41, 1.11)	84	0.77 (0.46, 1.29)	0.88 (0.43, 1.81)	0.731
Baseline Response, Significant Baseline Variables [1]	Post	71	0.64 (0.29, 1.39)	59	0.55 (0.21, 1.40)	1.17 (0.46, 2.96)	0.740
Taking Estrogen After Menopause Will Decrease My Chance Of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	0.48 (0.31, 0.73)	87	0.36 (0.22, 0.58)	1.33 (0.70, 2.51)	0.381
	Post	91	0.98 (0.65, 1.48)	86	0.37 (0.23, 0.59)	2.68 (1.43, 5.03)	0.002
Baseline Response	Post	90	1.64 (0.96, 2.80)	84	0.51 (0.29, 0.91)	3.21 (1.49, 6.89)	0.003
Baseline Response, Significant Baseline Variables [1]	Post	74	1.16 (0.51, 2.65)	60	0.38 (0.14, 1.06)	3.03 (1.17, 7.87)	0.023
Wearing Properly Fitted Shoes Will Decrease My Chance Of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	98	0.24 (0.15, 0.40)	87	0.19 (0.11, 0.34)	1.25 (0.59, 2.68)	0.559
	Post	93	0.55 (0.36, 0.84)	87	0.32 (0.19, 0.52)	1.73 (0.90, 3.31)	0.099
Baseline Response	Post	90	0.96 (0.57, 1.64)	84	0.50 (0.28, 0.90)	1.93 (0.94, 3.98)	0.075
Baseline Response, Significant Baseline Variables [1]	Post	77	0.74 (0.31, 1.77)	63	0.18 (0.06, 0.52)	4.18 (1.46, 11.91)	0.008
Walking Will Decrease My Chance Of Getting Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	1.41 (0.95, 2.11)	86	1.61 (1.04, 2.48)	0.88 (0.49, 1.59)	0.674
	Post	93	4.17 (2.49, 6.97)	86	2.07 (1.32, 3.25)	2.01 (1.01, 3.99)	0.045
Baseline Response	Post	90	4.43 (2.51, 7.82)	82	1.96 (1.18, 3.26)	2.26 (1.05, 4.83)	0.036
Baseline Response, Significant Baseline Variables [1]	Post	77	4.60 (1.89, 11.18)	60	1.35 (0.48, 3.82)	3.41 (1.07, 10.91)	0.039
[1] Significant baseline characteristics variables are those for family member with osteoporosis, had BMD measured before the current study, education level, health insurance, internet usage, baseline barrier score, and additional variables identified in Table 12.							
[2] Due to model convergence problem, the variables for health insurance and internet usage were removed from the model.							
CI=Confidence interval. Odds=Probability of responding correctly vs. incorrectly							

Self-Efficacy for Adopting a Calcium-Rich Diet

The self-efficacy for adopting a calcium-rich diet was measured by an efficacy score that consisted of 5 components, each measuring participants' perceived capability of performing a task related to improving dietary calcium intake. Refer to Section Description of Questionnaires for more details. The efficacy score was calculated as the total number of tasks that the participants perceive themselves to be capable of performing divided by the total number of tasks they responded to. The score ranged from 0 to 1, 0 when a participant perceived that she was not capable of performing any of the five tasks and 1 when a participant perceived that she was capable of performing all five tasks. If a participant did not respond to a task item, the item was not contributed to the score calculation. If a participant did not respond to any items, her efficacy score was set to missing.

A summary of efficacy scores by study group and time is provided in Figure 4. The efficacy score increased from baseline to post-intervention in the Intervention Group but remained at about the same level in the Control Group. Specifically, the mean efficacy scores were 0.52 (95% CI: 0.45, 0.60) at baseline and 0.77 (95% CI: 0.71, 0.84) at post-intervention for the Intervention Group, and 0.52 (95% CI: 0.44, 0.61) and 0.50 (95% CI: 0.42, 0.59) for the Control Group. The analysis (Table 15) showed that the intervention program was effective as evidence by higher efficacy scores in the Intervention Group. The estimated difference (Intervention Group - Control Group) was 0.31 (95% CI: 0.08, 0.53; p-value=0.019) not adjusted; 0.28 (95% CI: 0.10, 0.46; p-value=0.015) after adjusting for baseline efficacy score; and 0.34 (95% CI: 0.12, 0.56; p-value=0.011) after adjusting for baseline efficacy score and significant characteristic

variables. Clearly, the intervention program had increased efficacy score at post-intervention.

The significant characteristic variables used to adjust the intervention effect in Table 15 were the five baseline demographic variables that were found different between the two groups at baseline and the influential baseline variables identified by the method similar to the one used for the knowledge score. The results of influential variable analysis are presented in Table 16. Besides the study group, the baseline efficacy score was an influential variable ($p\text{-value} < 0.001$) but its impact was small. For each one tenth of increase in the baseline score, which ranges from 0 to 1, the post-intervention score increased 0.05. Other influential variables identified were those for having family member with osteoporosis, having had BMD measured before, having osteoporosis, employment status, and English proficiency.

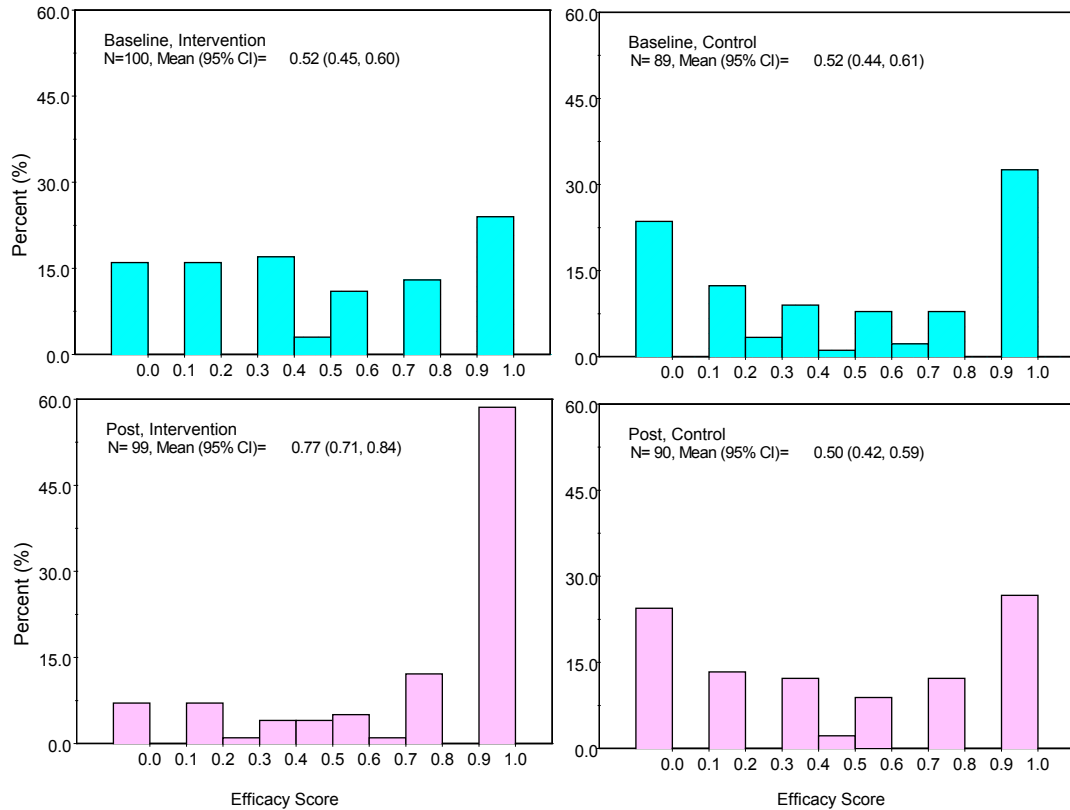


Figure 4. Distributions of Overall Efficacy Scores by Study Group and Time

Table 15. Analysis of Intervention Effects Regarding Post-Intervention Efficacy Scores

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Difference (Intervention - Control)	P-value
		n	Mean (95% CI)	n	Mean (95% CI)		
No Adjustment	Baseline	100	0.55 (0.20, 0.89)	89	0.50 (0.29, 0.72)	0.04 (-0.35, 0.43)	0.703
	Post-Intervention	99	0.80 (0.62, 0.99)	90	0.50 (0.36, 0.63)	0.31 (0.08, 0.53)	0.019
Baseline Score	Post-Intervention	97	0.78 (0.60, 0.97)	89	0.50 (0.40, 0.59)	0.28 (0.10, 0.46)	0.015
Baseline Score, Significant Baseline Variables	Post-Intervention	79	0.76 (0.60, 0.92)	64	0.42 (0.27, 0.57)	0.34 (0.12, 0.56)	0.011

Difference is Intervention Group minus Control Group.

Significant baseline characteristics variables are variables for having family member with osteoporosis, having had BMD measured before, education level, health insurance status, internet usage, having osteoporosis, employment status, and English proficiency.

CI=Confidence interval. N=Number of participants. n=Number of participants contributed to the analysis.

Table 16. Analysis of Associations Between Post-Intervention Efficacy Score and Baseline Variables

Variable	Parameter (95% CI)	P-value
Study Group	0.28 (0.10. 0.46)	0.015
Baseline Efficacy Score	0.05 (0.03. 0.06)	<.001
BMD Measured (Yes/No)	0.12 (0.02. 0.22)	0.015
Had Osteoporosis (Yes/No)	0.10 (0.00. 0.19)	0.047
Osteoporosis in Family (Yes/No)	0.15 (0.04. 0.25)	0.008
Employment Status (Reference=Homemaker)		
Employed	0.10 (-0.07. 0.27)	0.263
Unemployed/Retired	0.16 (0.05. 0.27)	0.004
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.06 (-0.14. 0.27)	0.538
Not Well	0.13 (0.03. 0.23)	0.012
Baseline Knowledge Score	0.02 (-0.00. 0.04)	0.116
Baseline Severity Score	-0.00 (-0.02. 0.01)	0.705
Baseline Barrier Score	-0.01 (-0.03. 0.01)	0.342
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	-0.11 (-0.27. 0.06)	0.203
Thinking About It	0.00 (-0.21. 0.21)	0.981
Will Do So Next Month	-0.08 (-0.19. 0.04)	0.214
Will Do So Next Week	0.22 (-0.09. 0.52)	0.160
Doing So Currently	0.14 (-0.16. 0.44)	0.363
Baseline Being Concerned or Not	-0.01 (-0.11. 0.09)	0.846
Baseline Response to How likely (Agree/Other)	0.00 (-0.10. 0.11)	0.928
Age	0.00 (-0.01. 0.01)	0.860
Weight	0.00 (-0.00. 0.00)	0.824
Reduced Height (Yes/No)	0.05 (-0.05. 0.15)	0.344
Taking Osteoporosis Medication (Yes/No)	0.07 (-0.03. 0.17)	0.154
Last Health Check-Up (Reference=Never Checked)		
<12 Months	-0.08 (-0.26. 0.11)	0.413
>1 Year	0.07 (-0.04. 0.17)	0.229
Taking Vitamin/Calcium (Yes/No)	0.10 (-0.01. 0.21)	0.082
Taking HRT (Yes/No)	0.09 (-0.14. 0.32)	0.433
Years Lived in US	-0.00 (-0.01. 0.00)	0.710
Marital Status (Reference=Widow)	0.01 (-0.09. 0.11)	0.863
Education Level (Reference=<Elementary School)		
<High School Graduate	-0.06 (-0.20. 0.08)	0.377
High School	0.02 (-0.14. 0.18)	0.808
University and Above	0.02 (-0.12. 0.17)	0.743
Income Level (At Least 10K/Below 10K)	0.09 (-0.05. 0.23)	0.193
Health Insurance (Have/Not Have)	0.11 (-0.01. 0.23)	0.086
Internet Use (Yes/No)	0.06 (-0.07. 0.20)	0.362
P-values are the statistical significance for testing no difference, i.e. the parameter being 0.		
In addition to the indicated variable, all models included the variables for baseline efficacy score and study group.		
CI=Confidence interval. HRT=Hormone Replacement Therapy.		

In addition to the overall efficacy score, the intervention effect was further evaluated regarding participants' perceived ability of performing the five tasks on the questionnaire that constituted the overall efficacy score. The summaries (Table 17) show that the proportions of participants who perceived themselves as capable of performing the tasks increased more than 20 percentage points from baseline to post-intervention consistently for all five tasks in the Intervention Group but not in the Control Group. Specifically, the proportions of efficacy in the Intervention Group increased:

- from 60.6% to 80.4% for the questionnaire item “I Can Find Calcium Content of Food by Reading Their Food Labels”,
- from 36.0% to 65.3% for “I know Which Food Items Are High in Calcium Content”,
- from 59.2% to 83.0% for “Consuming Calcium-Rich Food Is Not Difficult”,
- from 47.5% to 80.2% for “I Know How to Select Appropriate Food to Increase My Calcium Intake”, and
- from 58.6% to 79.8% for “I Can Eat Calcium-Rich Food on a Regular Basis”.

The large increases in the Intervention Group but not in the Control Group indicated that the intervention program was effective in increasing participants' perceived self-efficacy about performing the 5 tasks.

Similar to the process used in analysis of individual components for knowledge score, the baseline variables influencing individual self-efficacy components were explored by logistic regression models. The resulting p-values are summarized in Table 18 and the details are provided in Appendix B. The analyses show that study group was significant for all five tasks as evidenced by p-values<0.05, suggesting that the intervention program had increased perceived self-efficacy at post-intervention for each

task. Another consistently significant variable was corresponding baseline response. The associated p-values were all highly significant (<0.001).

After the significant variables were identified, the intervention effects regarding individual efficacy components were further evaluated adjusting for baseline variables. The results from these analyses (Table 19) show that the intervention program significantly increased the participants' self-efficacy for all five components. Specifically, the adjusted odds ratios (Intervention Group/Control Group) of individual self-efficacy were:

- 11.32 (95% CI: 2.96, 43.28; p-value<0.001) for “I Can Find Calcium Content of Food by Reading Their Food Labels”;
- 3.56 (95% CI: 1.09, 11.62; p-value=0.035) for “I Know Which Food Items Are High in Calcium Content”;
- 13.21 (95% CI: 3.57, 48.92; p-value<0.001) for “Consuming Calcium-Rich Food Is Not Difficult”;
- 8.01 (95% CI: 2.55, 25.19; p-value<0.001) for “I know How to Select Appropriate Food to Increase My Calcium Intake”; and
- 4.38 (95% CI: 1.25, 15.30; p-value=0.021) for “I Can Eat Calcium-Rich Food on a Regular Basis”.

Table 17. Summary of Individual Efficacy Items by Study Group and Time

Time Point	Response	Intervention Group n (%)	Control Group n (%)	P-Value		
I Can Find Calcium Contents From Food Labels.						
Baseline	No Response	3	6	0.494		
	Total Responders	99	84			
Post-Intervention	Agree	60 (60.6)	44 (52.4)			
	Disagree	5 (5.1)	4 (4.8)			
	Don't Know	34 (34.3)	36 (42.9)			
	No Response	5	3			
	Total Responders	97	87			
Post-Intervention	Agree	78 (80.4)	43 (49.4)	<.001		
	Disagree	3 (3.1)	9 (10.3)			
	Don't Know	16 (16.5)	35 (40.2)			
	I Know Which Food Items Are High In Calcium Content.					
	Baseline	No Response	2		5	0.415
Total Responders		100	85			
Post-Intervention	Agree	36 (36.0)	37 (43.5)			
	Disagree	5 (5.0)	6 (7.1)			
	Don't Know	59 (59.0)	42 (49.4)			
	No Response	4	2			
	Total Responders	98	88			
Post-Intervention	Agree	64 (65.3)	34 (38.6)	0.001		
	Disagree	6 (6.1)	9 (10.2)			
	Don't Know	28 (28.6)	45 (51.1)			
	Consuming Calcium-Rich Food Is Not Difficult.					
Baseline	No Response	4	3	0.522		
	Total Responders	98	87			
Post-Intervention	Agree	58 (59.2)	51 (58.6)			
	Disagree	1 (1.0)	3 (3.4)			
	Don't Know	39 (39.8)	33 (37.9)			
	No Response	8	3			
	Total Responders	94	87			
Post-Intervention	Agree	78 (83.0)	46 (52.9)	<.001		
	Disagree	4 (4.3)	7 (8.0)			
	Don't Know	12 (12.8)	34 (39.1)			
	I Know How To Select Appropriate Food To Increase My Calcium Intake.					
Baseline	No Response	3	3	0.589		
	Total Responders	99	87			
Post-Intervention	Agree	47 (47.5)	46 (52.9)			
	Disagree	3 (3.0)	4 (4.6)			
	Don't Know	49 (49.5)	37 (42.5)			
	No Response	11	3			
	Total Responders	91	87			
Post-Intervention	Agree	73 (80.2)	45 (51.7)	<.001		
	Disagree	0 (0.0)	2 (2.3)			
	Don't Know	18 (19.8)	40 (46.0)			
	I Can Eat Calcium-Rich Food On A Regular Basis.					
Baseline	No Response	3	4	0.508		
	Total Responders	99	86			
Post-Intervention	Agree	58 (58.6)	46 (53.5)			
	Disagree	7 (7.1)	4 (4.7)			
	Don't Know	34 (34.3)	36 (41.9)			
	No Response	8	4			
	Total Responders	94	86			
Post-Intervention	Agree	75 (79.8)	55 (64.0)	0.053		
	Disagree	2 (2.1)	2 (2.3)			
	Don't Know	17 (18.1)	29 (33.7)			
	Percentages are based on number of participants with response. CI=Confidence interval. N=Number of participants. n=Number of participants in each category.					

Table 18. Summary of P-Values for Testing Associations Between Post-intervention Knowledge Score And Baseline Variables

Baseline Variable	G41Label	G42Item	G43Difficult	G44HowCa	G45EatCa
TRT	<0.001***	<0.001***	<0.001***	<0.001***	0.023**
Baseline Response	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
Efficacy Score	0.005***	-	-	0.003***	0.035*
Intention Stage	0.002***	-	-	-	-
Severity Score	-	0.037*	-	-	-
Barrier score	-	-	-	-	-
Concerned	-	-	-	-	-
Likely	-	-	-	-	-
Age	-	-	-	-	-
Weight	-	-	-	-	-
Height	-	-	-	-	-
Check-Up	-	-	-	-	-
Vita/Calcium	0.044*	-	-	-	-
HRT	-	-	-	-	-
Medication	-	-	-	-	-
Osteoporosis	-	-	-	-	-
Family	0.037*	-	-	0.041*	0.039*
BMD	0.018**	0.045*	-	0.009	-
Years	-	-	-	-	-
Marital	-	-	-	-	-
Education	-	-	-	-	-
Employment	-	0.043	<0.001***	-	0.026*
Income	-	0.022**	-	-	-
Insurance	-	-	-	-	-
English	-	-	0.004***	0.028*	0.009***
Internet	-	-	-	-	-

Significance Level of p-values:

*** <0.01, ** between 0.01 and 0.025, * between 0.025 and 0.05, - for >0.05.

G41Label= I Can Find Calcium Contents From Food Labels.

G42Item= I Know Which Food Items Are High In Calcium Content.

G43Difficult= Consuming Calcium-Rich Food Is Not Difficult.

G44HowCa= I Know How To Select Appropriate Food To Increase My Calcium Intake.

G45EatCa= I Can Eat Calcium-Rich Food On A Regular Basis.

TRT=Study Group. Concerned=Being concerned at baseline. Likely=Likely to get osteoporosis at baseline.

Age=Age at baseline. Weight=Weight at baseline. Height=Had height reduction. Check-Up=Timing of last check-up.

Vita/Calcium=Taking vitamin and calcium. HRT=Taking hormone replacement therapy.

Medication=Taking osteoporosis medication. Osteoporosis=Told to have osteoporosis.

Family=Having family members with osteoporosis. BMD=Had bone mineral density measured before.

Years=Years lived in the U.S. Marital=Marital status. Education=Education level. Employment=Employment Status.

Income=Income level. Insurance=Having health insurance. English=English proficiency. Internet=Internet use.

Table 19. Analysis of Intervention Effects Regarding Individual Efficacy Items

I Can Find Calcium Contents From Food Labels							
Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	1.54 (1.03, 2.30)	84	1.10 (0.72, 1.69)	1.40 (0.78, 2.52)	0.264
	Post	97	4.11 (2.49, 6.78)	87	0.98 (0.64, 1.49)	4.20 (2.18, 8.08)	<.001
Baseline Response	Post	95	4.01 (2.33, 6.89)	83	0.86 (0.54, 1.39)	4.64 (2.25, 9.57)	<.001
Baseline Response, Significant Baseline Variables	Post	74	3.71 (1.31, 10.54)	57	0.33 (0.09, 1.19)	11.32 (2.96, 43.28)	<.001
I Know Which Food Items Are High In Calcium Content							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	100	0.56 (0.37, 0.85)	85	0.77 (0.50, 1.18)	0.73 (0.40, 1.32)	0.297
	Post	98	1.88 (1.24, 2.85)	88	0.63 (0.41, 0.97)	2.99 (1.64, 5.43)	<.001
Baseline Response	Post	96	3.00 (1.79, 5.01)	83	0.67 (0.41, 1.10)	4.47 (2.17, 9.18)	<.001
Baseline Response, Significant Baseline Variables	Post	64	3.51 (1.22, 10.15)	50	0.99 (0.33, 2.97)	3.56 (1.09, 11.62)	0.035
Consuming Calcium-Rich Food Is Not Difficult							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	98	1.45 (0.97, 2.17)	87	1.42 (0.92, 2.17)	1.02 (0.57, 1.84)	0.938
	Post	94	4.87 (2.85, 8.35)	87	1.12 (0.74, 1.71)	4.35 (2.19, 8.60)	<.001
Baseline Response	Post	91	4.73 (2.70, 8.29)	84	0.98 (0.62, 1.54)	4.85 (2.34, 10.05)	<.001
Baseline Response, Significant Baseline Variables	Post	74	5.85 (2.01, 16.99)	61	0.44 (0.14, 1.35)	13.21 (3.57, 48.92)	<.001
I Know How To Select Appropriate Food To Increase My Calcium Intake							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	0.90 (0.61, 1.34)	87	1.12 (0.74, 1.71)	0.81 (0.45, 1.43)	0.463
	Post	91	4.06 (2.42, 6.79)	87	1.07 (0.70, 1.63)	3.79 (1.95, 7.36)	<.001
Baseline Response	Post	90	5.21 (2.92, 9.29)	85	1.01 (0.63, 1.60)	5.18 (2.45, 10.97)	<.001
Baseline Response, Significant Baseline Variables	Post	76	4.47 (1.55, 12.91)	62	0.56 (0.19, 1.66)	8.01 (2.55, 25.19)	<.001
I Can Eat Calcium-Rich Food On A Regular Basis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds (95% CI)		
No Adjustment	Baseline	99	1.41 (0.95, 2.11)	86	1.15 (0.75, 1.76)	1.23 (0.69, 2.20)	0.486
	Post	94	3.95 (2.39, 6.53)	86	1.77 (1.14, 2.76)	2.22 (1.14, 4.34)	0.019
Baseline Response	Post	93	5.01 (2.76, 9.10)	83	2.06 (1.21, 3.52)	2.43 (1.13, 5.22)	0.023
Baseline Response, Significant Baseline Variables	Post	75	10.62 (2.88, 39.14)	58	2.42 (0.65, 9.02)	4.38 (1.25, 15.30)	0.021
Significant baseline characteristics variables are those for family member with osteoporosis, had BMD measured before the current study, education level, health insurance, internet usage, and significant baseline variables as indicated in Table 16.							
CI=Confidence interval. Odds=Ratio of probabilities for feeling confident and not-confident to perform the task							

Intention to Consume More Calcium-Rich Food Items

Intention to consume more calcium-rich food item was measured by statements of six progressive stages as specified in Section Description of Questionnaires. Table 20 provides a summary of the distributions of stage by study group and time point. The table shows that the distributions for the two study groups were similar at baseline (p-value=0.078) but became different at post-intervention (p-value<0.001). The proportion of participants who “Never Thought About It” decreased in the Intervention Group, from 11.7% at baseline to 5.6% post-intervention. However, no decrease was observed in the Control Group; the proportions were 25.6% at both time points. The proportion of participants who perceived that they were “Doing So Currently” in the Intervention Group increased from 36.2% at baseline to 45.6% post-intervention, but no such increase was observed in the Control Group.

The associations between baseline characteristic variables with post-intervention Intention stage were evaluated for each variable individually using multinomial models where the post-intervention intention stage was the dependent variable, and baseline intention stage, study group, and one additional variable (as indicated in Table 22) were the explanatory variables. The results showed that the study group was a significant variable. The odds of being at a higher intention stage in the Intervention Group were 2.79 (95% CI: 1.51, 5.20) times as high as the odds in the Control Group. The p-value for testing the significance of study group adjusted for baseline intention stage was 0.001 (shown in Table 22) and were <0.05 in all other models (not shown). The baseline intention stage was a strong influential variable as well. The p-value for testing the

significance of baseline stage adjusted for study group was <0.001 (shown in Table 22) and were <0.001 in all other models (not shown). The odds among participants who were in a particular baseline intention stage were 2.03 (95% CI: 1.69, 2.48) times as high as the odds among the participants in the intention stage one level lower. Additionally, Table 22 shows that the post-intervention intention stage was also associated with baseline efficacy score, the status of last health check-up, and whether or not they were taking vitamins and calcium supplement.

After the influential variables were identified, the intervention effect on the post-intervention intention stage was further assessed adjusting for baseline intention stage, and the five baseline characteristic variables and significant influential variables identified by the multinomial logistic models, i.e., baseline efficacy score and status of last health check-up. The result of this sensitivity analysis is provided in Table 21. The odds ratio (Intervention Group/Control Group) of being at a more advanced stage was 2.81 (95% CI: 1.61, 4.92, p -value <0.001) with no adjustment; 2.79 (95% CI: 1.51, 5.16; p -value= 0.001) with adjustment for baseline stage alone; and 3.29 (95% CI: 1.23, 8.82; p -value=0.018) with adjustment for baseline stage and significant baseline variables. All three estimated odds ratios were consistently substantially larger than 1, which demonstrated that the intervention program had a strong effect in advancing participants' intention stage for consuming more calcium-rich food items.

Table 20. Summary of Intention Stages by Study Group and Time

Time Point	Intention	Intervention Group (N=102) n (Proportion)	Control Group (N=90) n (Proportion)	P-value
Baseline	No Response	8	4	0.078
	Total Responders	94	86	
	Never Thought About It	11(11.7)	22(25.6)	
	Decided Against It	5(5.3)	7(8.1)	
	Thinking About It	37(39.4)	27(31.4)	
	Will Do So Next Month	4(4.3)	1(1.2)	
	Will Do So Next Week	3(3.2)	2(2.3)	
	Doing So Currently	34(36.2)	27(31.4)	
Post-Intervention	No Response	12	4	<.001
	Total Responders	90	86	
	Never Thought About It	5(5.6)	22(25.6)	
	Decided Against It	3(3.3)	10(11.6)	
	Thinking About It	34(37.8)	24(27.9)	
	Will Do So Next Month	4(4.4)	2(2.3)	
	Will Do So Next Week	3(3.3)	2(2.3)	
	Doing So Currently	41(45.6)	26(30.2)	

Percentages are based on number of subjects with response.
 CI=Confidence interval. N=Number of participants. n=Number of participants in each category.

Table 21. Analysis of Intervention Effects Regarding Post-Intervention Intention Stages

Adjustment	Odds Ratio (95% CI) (Intervention/Control)	P-value
No Adjustment	2.81 (1.61, 4.92)	<.001
Baseline Stage	2.79 (1.51, 5.16)	0.001
Baseline Stage, Significant Baseline Variables [1]	3.29 (1.23, 8.82)	0.018

[1] These variables were whether or not having family member with osteoporosis, had BMD measured before the current study, education level, health insurance, internet usage, baseline efficacy score and last health check-up status.
 CI=Confidence interval.

Table 22. Analysis of Associations Between Post-Intervention Intention Stages and Baseline Variables

Variable	Odds Ratio (95% CI) (Intervention/Control)	P-value
Study Group	2.79 (1.51, 5.20)	0.001
Baseline Intention Stage	2.03 (1.69, 2.48)	<.001
Baseline Efficacy Score	1.18 (1.08, 1.30)	<.001
Last Health Check-Up (Reference=More Than 1 Year)		
Never	0.60 (0.18, 1.88)	0.383
Within 1 Year	2.50 (1.26, 5.02)	0.009
Taking Vitamin/Calcium (Yes/No)	2.67 (1.30, 5.55)	0.008
Baseline Knowledge Score	1.01 (0.88, 1.16)	0.854
Baseline Severity Score	1.00 (0.90, 1.10)	0.954
Baseline Barrier Score	0.87 (0.74, 1.01)	0.072
Baseline Response to Being Concerned (Yes/No)	0.84 (0.43, 1.59)	0.587
Baseline Response to How likely (Likely/Not Likely)	1.13 (0.59, 2.13)	0.716
Age	0.99 (0.96, 1.03)	0.621
Weight	1.00 (0.99, 1.02)	0.635
Reduced Height (Yes/No)	1.49 (0.79, 2.85)	0.220
BMD Measured (Yes/No)	1.32 (0.70, 2.50)	0.393
Taking Osteoporosis Medication (Yes/No)	1.37 (0.73, 2.59)	0.332
Taking HRT (Yes/No)	2.17 (0.44, 13.7)	0.369
Had Osteoporosis (Yes/No)	1.18 (0.64, 2.16)	0.600
Osteoporosis in Family (Yes/No)	1.59 (0.77, 3.30)	0.212
Years Lived in US	0.98 (0.95, 1.01)	0.123
Marital Status (Not Married/Married)	0.67 (0.36, 1.25)	0.209
Education Level (Reference=<Elementary School)		
University and above	1.80 (0.78, 4.13)	0.165
High School	0.94 (0.39, 2.25)	0.892
<High School Graduate	1.50 (0.59, 3.83)	0.393
Employment Status (Reference=Homemaker)		
Employed	1.58 (0.57, 4.50)	0.385
Unemployed/Retired	1.37 (0.68, 2.75)	0.381
Income Level (At Least 10K/Below 10K)	0.74 (0.33, 1.70)	0.480
Health Insurance (Have/Not Have)	1.07 (0.51, 2.24)	0.860
English Proficiency (Reference= Not Well at All)		
Well/Very Well	1.30 (0.38, 4.99)	0.688
Not Well	1.57 (0.82, 3.03)	0.171
Internet Use (Yes/No)	0.84 (0.33, 2.09)	0.716

Besides indicated variable, all models included baseline intention stage and study group.
BMD=Bone mineral density. CI=Confidence interval. HRT=Hormone replacement therapy.

Additionally, change patterns (stage advanced, not changed, or reverted) from baseline to post-intervention were also evaluated using the data from participants who had intention stage responses at both time points. Table 23 provides a summary of proportions of participants with each change pattern by study group. It is observed that

more participants who advanced their intervention stages in the Intervention Group than in the Control Group. The proportions of participants advanced their intention stages were 24.1% (95% CI: 15.4, 34.7) in the Intervention Group and 19.3% (95% CI: 11.4, 29.4) in the Control Group. Figure 5 provides the details of the stage change patterns. The shaded cells provide the number and percentage of participants whose intention stages were not changed between the two measurement times; the cells above the shaded cells provide the number of participants whose stage advanced, and the cells underneath the shaded cells provide number of participants whose stages reserved.

Table 23. Summary of Changes in Intention Stages by Study Group

Status of Stage Change (From Baseline to Post-Intervention)	Intervention Group		Control Group	
	n	Proportion (95% CI)	n	Proportion (95% CI)
Advanced	20	24.1 (95% CI: 15.4, 34.7)	16	19.3 (95% CI: 11.4, 29.4)
Not Change	53	63.9 (95% CI: 52.6, 74.1)	47	56.6 (95% CI: 45.3, 67.5)
Reverted	10	12.0 (95% CI: 5.9, 21.0)	20	24.1 (95% CI: 15.4, 34.7)

n=Number of participants with indicated stage change status.

Intervention Group

Post-Intervention Stage

Baseline Stage	Frequency	1	2	3	4	5	6	Total
	Percent							
1	3 3.61	0 0.00	3 3.61	0 0.00	0 0.00	4 4.82	10 12.05	
2	0 0.00	1 1.20	2 2.41	0 0.00	0 0.00	2 2.41	5 6.02	
3	2 2.41	1 1.20	20 24.10	2 2.41	0 0.00	5 6.02	30 36.14	
4	0 0.00	0 0.00	2 2.41	1 1.20	0 0.00	1 1.20	4 4.82	
5	0 0.00	0 0.00	0 0.00	1 1.20	1 1.20	1 1.20	3 3.61	
6	0 0.00	0 0.00	2 2.41	0 0.00	2 2.41	27 32.53	31 37.35	
Total	5 6.02	2 2.41	29 34.94	4 4.82	3 3.61	40 48.19	83 100.00	

Control Group

Post-Intervention Stage

Baseline Stage	Frequency	1	2	3	4	5	6	Total
	Percent							
1	14 16.87	1 1.20	3 3.61	0 0.00	1 1.20	2 2.41	21 25.30	
2	0 0.00	4 4.82	0 0.00	1 1.20	0 0.00	1 1.20	6 7.23	
3	5 6.02	3 3.61	13 15.66	1 1.20	0 0.00	5 6.02	27 32.53	
4	0 0.00	0 0.00	1 1.20	0 0.00	0 0.00	0 0.00	1 1.20	
5	1 1.20	0 0.00	0 0.00	0 0.00	0 0.00	1 1.20	2 2.41	
6	1 1.20	1 1.20	7 8.43	0 0.00	1 1.20	16 19.28	26 31.33	
Total	21 25.30	9 10.84	24 28.92	2 2.41	2 2.41	25 30.12	83 100.00	

Figure 5. Summary of Changes in Intention Stages From Baseline to Post-Intervention

Perceived Susceptibility

The perceived susceptibility was measured by asking the participants whether they agreed with the following two statements: 1) I am concerned about getting osteoporosis. 2) It is very likely that I will get osteoporosis. Analysis results are provided in this section.

Post-Intervention Response to “I Am Concerned That I May Get Osteoporosis”

Table 24 shows that the proportions of study participants who agreed with the statement were 68.8% in the Intervention Group and 63.5% in the Control Group at baseline, and 61.3% in the Intervention Group and 59.8% in the Control Group at post-intervention. The p-values from the χ^2 testing the association between the study group and the agreement with the statement were 0.755 at baseline and 0.923 at post-intervention, indicating the concern responses were not statistically different between the study groups at both time points. It also seems that the proportions of being concerned about getting osteoporosis were lowered in both study groups at post-intervention.

The variables that might have influenced participants' post-intervention concerns were explored using hierarchical logistic regression models. The dependent variable was the post-intervention concern response, and the explanatory variables were baseline concern response, study group, and one additional baseline variable as indicated in Table 26. The table shows that post-intervention concerns were strongly influenced by participants' baseline concerns. The odds of being concerned at post-intervention among participants who were also concerned at baseline were 4.79 (95% CI: 1.92, 11.96) times

as high as the odds among the participants who were not concerned at baseline. Baseline knowledge score, efficacy score, and severity score were also significant. Higher baseline knowledge scores and efficacy scores led to lower post-intervention concerns. For each one tenth of baseline knowledge score increase, the odds reduced by 11% (i.e. $100 \times (1 - 0.89)$); 95% CI: 5%, 18%; p -value=0.001); for each one tenth of baseline efficacy score increase, the odds reduced by 9% (95% CI: 3%, 16%; p -value=0.005). On the other hand, higher baseline severity scores led to higher post-intervention concerns. The odds ratio was 1.22 (95% CI: 1.09, 1.35; p -value<0.001) for a one tenth difference in baseline severity score. The baseline intention stage was not a significant factor in post-intervention concerns (p -value>0.05).

Additional influential baseline variables were those whether or not participants were taking osteoporosis medication (p -value=0.012), were taking hormone replacement therapy (p -value<0.001), had been told by their doctors of having osteoporosis (p -value=0.005), years lived in the U.S. (p -value=0.005), income level (p -value=0.006), English proficiency (p -values <0.001 and 0.076) and education level (p -values=0.555, 0.120, and 0.040). The odds ratios of being concerned were 1.69 (95% CI: 1.12, 2.55) between the participants who were taking osteoporosis medication and those who were not; 5.34 (95% CI: 2.63, 10.85) between those who were taking HRT and those who were not; 1.84 (95% CI: 1.20, 2.81) between those who had been told by their doctor that they had osteoporosis and those who had not; 0.47 (95% CI: 0.28, 0.81) between those with income of \geq \$10,000 and those with income of <\$10,000. The odds of being concerned were lower in the participants who rated their English proficiency high. Compared with participants whose English proficiency rating was “Not Well at All”, the odds ratios were

0.17 (95% CI: 0.08, 0.35; p-value<0.001) for participants whose proficiency rating was “Well” or “Very Well”, and 0.54 (95% CI: 0.27, 1.07; p-value=0.076) for “Not Well”.

Years living in the U.S. was also a significant variable that influenced the post-intervention concern (p-value=0.010), but its effect was small. For each additional year lived in the U.S., the odds of being concerned decreased by 3% (95% CI: 1%, 5%). Education level was marginally significant.

Based on the analysis of influential baseline variables, the effect of the intervention program was further analyzed adjusting for these variables. As shown in Table 25, both study groups had similar odds of being concerned at baseline and at post-intervention. The odds at baseline was 1.26 (95% CI: 0.67, 2.38; p-value=0.471). At post-intervention, the odds ratios were 1.07 (95% CI: 0.67, 1.71; p-value=0.791) with no adjustment; 1.04 (95% CI: 0.59, 1.85; p-value=0.886) adjusted for baseline concern; and 0.62 (95% CI: 0.30, 1.29; p-value=0.201) adjusted for the baseline concern and significant baseline characteristics as indicated in Table 26 and the five baseline characteristic variables that were different between the study groups. None of these odds ratios were statistically different from the no-difference odds ratio of 1, which confirmed that the intervention program did not change participants' perceived susceptibility regarding their post-intervention concerns of getting osteoporosis.

Table 24. Summary of Post-Intervention Responses to “I Am Concerned That I May Get Osteoporosis”

Time Point	Variable	Intervention Group (N=102)	Control Group (N=90)	P-Value
Baseline	No Response	6	5	0.755
	Total Responders	96	85	
	Agree	66 (68.8%)	54 (63.5%)	
	Disagree	15 (15.6%)	15 (17.6%)	
	Don't Know	15 (15.6%)	16 (18.8%)	
Post-Intervention	No Response	9	3	0.923
	Total Responders	93	87	
	Agree	57 (61.3%)	52 (59.8%)	
	Disagree	21 (22.6%)	19 (21.8%)	
	Don't Know	15 (16.1%)	16 (18.4%)	

Percentage is based on total responders.

Table 25. Analysis of Intervention Effects Regarding Post-Intervention Responses to “I am Concerned That I May Get Osteoporosis”

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	96	2.20 (1.35, 3.58)	85	1.74 (1.16, 2.62)	1.26 (0.67, 2.38)	0.471
	Post-Intervention	93	1.58 (1.17, 2.14)	87	1.49 (1.04, 2.13)	1.07 (0.67, 1.71)	0.791
Baseline Score	Post-Intervention	89	1.30 (0.81, 2.11)	82	1.25 (0.85, 1.85)	1.04 (0.59, 1.85)	0.886
Baseline Score, Significant Baseline Variables [1]	Post-Intervention	55	1.83 (0.66, 5.06)	45	2.94 (1.39, 6.21)	0.62 (0.30, 1.29)	0.201

[1] Significant baseline characteristics variables are those for family member with osteoporosis, having had BMD measured, education level, health insurance status, internet usage, taking medications for osteoporosis, taking hormone replacement therapy, income level, English proficiency, baseline knowledge score, efficacy score, severity score, and years lived in the U.S..
Odds= (Probability of concerned)/(probability of not concerned). CI=Confidence interval.

Table 26. Analysis of Associations Between Post-Intervention Responses to “I Am Concerned That I May Get Osteoporosis” and Baseline Variables

Variable	Odds Ratio (95% CI)	P-value
Study Group	0.96 (0.54, 1.70)	0.886
Baseline Concerned (Agree/Other)	4.79 (1.92, 11.96)	<.001
Baseline Knowledge Score	0.89 (0.82, 0.95)	0.001
Baseline Efficacy Score	0.91 (0.84, 0.97)	0.005
Baseline Severity Score	1.22 (1.09, 1.35)	<.001
Taking Osteoporosis Medication (Yes/No)	1.69 (1.12, 2.55)	0.012
Taking HRT (Yes/No)	5.34 (2.63, 10.85)	<.001
Had Osteoporosis (Yes/No)	1.84 (1.20, 2.81)	0.005
Income Level (At Least 10K/Below 10K)	0.47 (0.28, 0.81)	0.006
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.17 (0.08, 0.35)	<.001
Not Well	0.54 (0.27, 1.07)	0.076
Years Lived in US	1.03 (1.01, 1.05)	0.010
Education Level (Reference=<Elementary School)		
<High School Graduate	1.20 (0.65, 2.22)	0.555
High School	0.67 (0.40, 1.11)	0.120
University and Above	0.44 (0.20, 0.96)	0.040
Baseline Barrier Score	1.04 (0.87, 1.25)	0.650
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	2.16 (0.51, 9.19)	0.296
Thinking About It	1.36 (0.89, 2.08)	0.155
Will Do So Next Month	0.79 (0.53, 1.17)	0.230
Will Do So Next Week	0.28 (0.02, 5.12)	0.391
Doing So Currently	2.35 (0.59, 9.41)	0.226
Baseline Response to Likely (Agree/Other)	1.41 (0.88, 2.26)	0.149
Weight	0.99 (0.98, 1.00)	0.270
Reduced Height (Yes/No)	1.22 (0.85, 1.73)	0.277
BMD Measured (Yes/No)	1.03 (0.68, 1.54)	0.896
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.91 (0.57, 6.42)	0.297
>1 Year	1.44 (0.63, 3.30)	0.385
Taking Vitamin/Calcium (Yes/No)	1.29 (0.55, 3.04)	0.555
Osteoporosis in Family (Yes/No)	1.43 (0.96, 2.13)	0.077
Marital Status (Reference=Widow)	0.96 (0.60, 1.52)	0.856
Employment Status (Reference=Homemaker)		
Employed	0.42 (0.11, 1.65)	0.215
Unemployed/Retired	0.75 (0.26, 2.10)	0.578
Health Insurance (Have/Not Have)	0.87 (0.38, 1.97)	0.734
Internet Use (Yes/No)	1.15 (0.87, 1.52)	0.332

P-values are for testing the significance of odds ratio being 1 for no difference.
In addition to the indicated variable, all models include the variables for baseline agreement and study group.
CI=Confidence interval. HRT=Hormone Replacement Therapy.

Post-Intervention Response to “It Is Very Likely That I Will Get Osteoporosis”

The distributions of the responses to the questionnaire item “It Is Very Likely That I Will Get Osteoporosis” are summarized in Table 27. The proportions of agreeing with the statement that it was very likely that they would get osteoporosis were 73.7% in the Intervention Group and 53.5% in the Control Group at baseline, and 65.6% in the Intervention Group and 56.8% in the Control Group at post-intervention. The p-values from the χ^2 test for the association between agreement with the statement and study group designation were 0.015 at baseline and 0.341 at post-intervention, suggesting differences at baseline but not at post-intervention. Additionally, it seems that the proportion of agreeing decreased in the Intervention Group. However, the large difference between the two study groups at baseline made the adjustment necessary when evaluating the post-intervention responses, which was performed and described below.

Similar to the analyses for the responses to “I Am Concerned That I May Get Osteoporosis”, the variables that might have influenced participants' post-intervention responses to “It Is Very Likely That I Will Get Osteoporosis” were explored using hierarchical logistic regression models, and results are presented in Table 29. The results show that post-intervention responses were strongly associated with the baseline responses. The odds of agreeing with the statement at post-intervention among the participants who also agreed with the statement at baseline were 9.02 (95% CI: 5.72, 14.22; p-value <0.001) times as high as the odds among those who did not agree with the statement at baseline. However, the study group was not significant (p-value=0.771) after

adjusting for baseline responses, which suggested that the intervention program did not have any effects on perceived susceptibility as measured by post-intervention response to the perceived likelihood of getting osteoporosis.

Other baseline variables that influenced the post-intervention agreement with the statement are variables for whether or not the participants were taking osteoporosis medication (p-value=0.001), were taking HRT (p-value=0.009), or had been told by their doctors of having osteoporosis (p-value=0.001). The odds ratios of agreeing with the statement were 3.09 (95% CI: 1.54, 6.18) between the participants who were taking medication for osteoporosis and those who were not; 2.32 (95% CI: 1.23, 4.37) between those who were taking HRT and those who were not taking HRT; 3.32 (95% CI: 1.62, 6.81) between those had been told by their doctors of having had osteoporosis and those had not.

The weight and years living in the U.S. were also statistically significant. However, the effects were small. For each pound of increase in weight, the odds reduced by 1% (95% CI: 0%, 2%; p-value=0.017); for each additional year lived in the U.S., the odds increased by 5% (95% CI: 1%, 9%; p-value=0.005).

Based on the analysis of influential variables, the effect of the intervention program regarding “It Is Very Likely That I Will Get Osteoporosis” was further evaluated adjusting for these variables and the five baseline characteristic variables that were different between the two study groups at baseline. As shown in Table 28, the odds ratio (Intervention Group/Control Group) of agreeing with the statement was 1.45 (95% CI: 0.95, 2.22; p-value=0.089) with no adjustment; 0.95 (95% CI: 0.65, 1.37; p-value=0.771) with adjustment of baseline response; and 0.95 (95% CI: 0.62, 1.55; p-value=0.919) with adjustment of both baseline response and significant baseline variables. All these odds ratios suggested no intervention effect regarding this endpoint.

Table 27. Summary of Post-Intervention Responses to “It Is Very Likely That I Will Get Osteoporosis”

Time Point	Variable	Intervention Group (N=102)	Control Group (N=90)	P-Value
Baseline	No Response	7	4	0.015
	Total Responders	95	86	
	Agree	70 (73.7%)	46 (53.5%)	
	Disagree	5 (5.3%)	11 (12.8%)	
	Don't Know	20 (21.1%)	29 (33.7%)	
Post-Intervention	No Response	9	2	0.341
	Total Responders	93	88	
	Agree	61 (65.6%)	50 (56.8%)	
	Disagree	8 (8.6%)	13 (14.8%)	
	Don't Know	24 (25.8%)	25 (28.4%)	

Percentage is based on total responders.

Table 28. Analysis of Intervention Effects Regarding Post-Intervention Responses to “It Is Very Likely That I Will Get Osteoporosis”

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	95	2.80 (1.49, 5.28)	86	1.15 (0.82, 1.61)	2.43 (1.19, 4.99)	0.015
	Post-Intervention	93	1.91 (1.37, 2.66)	88	1.32 (1.01, 1.72)	1.45 (0.95, 2.22)	0.089
Baseline Score	Post-Intervention	89	1.15 (0.85, 1.54)	84	1.21 (0.99, 1.48)	0.95 (0.65, 1.37)	0.771
Baseline Score, Significant Baseline Variables [1]	Post-Intervention	70	0.97 (0.34, 2.81)	55	1.00 (0.25, 3.99)	0.98 (0.62, 1.55)	0.919

[1] Significant baseline characteristics variables are those for family member with osteoporosis, having had BMD measured, education level, health insurance status, internet usage, taking medications for osteoporosis, taking hormone replacement therapy, weight, and years lived in the U.S.
N=Number of participants in each study group;
Odds=(Probability of likely)/(probability of not likely). CI=Confidence interval.

Table 29. Analysis of Associations Between Post-Intervention Responses to “It Is Very Likely that I Will Get Osteoporosis” and Baseline Variables

Variable	Odds Ratio (95% CI)	P-value
Study Group	1.06 (0.73, 1.53)	0.771
Baseline Response to Likely (Agree/Other)	9.02 (5.72, 14.22)	<.001
Weight	0.99 (0.98, 1.00)	0.017
Taking Osteoporosis Medication (Yes/No)	3.09 (1.54, 6.18)	0.001
Taking HRT (Yes/No)	2.32 (1.23, 4.37)	0.009
Had Osteoporosis (Yes/No)	3.32 (1.62, 6.81)	0.001
Years Lived in US	1.05 (1.01, 1.09)	0.005
Baseline Knowledge Score	1.07 (0.87, 1.31)	0.547
Baseline Efficacy Score	1.01 (0.95, 1.07)	0.789
Baseline Severity Score	1.11 (0.99, 1.25)	0.083
Baseline Barrier Score	0.97 (0.85, 1.10)	0.597
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	1.35 (0.47, 3.89)	0.582
Thinking About It	0.97 (0.32, 2.96)	0.964
Will Do So Next Month	0.77 (0.41, 1.47)	0.434
Will Do So Next Week	1.05 (0.25, 4.31)	0.949
Doing So Currently	2.05 (0.59, 7.07)	0.258
Baseline Being Concerned or Not	0.99 (0.45, 2.19)	0.982
Reduced Height (Yes/No)	1.54 (0.95, 2.50)	0.081
BMD Measured (Yes/No)	1.47 (0.53, 4.02)	0.458
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.79 (0.21, 3.01)	0.730
>1 Year	1.07 (0.53, 2.18)	0.844
Taking Vitamin/Calcium (Yes/No)	1.34 (0.62, 2.89)	0.461
Osteoporosis in Family (Yes/No)	1.45 (0.70, 3.02)	0.318
Marital Status (Reference=Widow)	1.12 (0.70, 1.79)	0.645
Education Level (Reference=<Elementary School)		
<High School Graduate	0.94 (0.47, 1.85)	0.849
High School	0.56 (0.30, 1.03)	0.061
University and Above	0.90 (0.49, 1.66)	0.743
Employment Status (Reference=Homemaker)		
Employed	0.55 (0.20, 1.52)	0.247
Unemployed/Retired	0.57 (0.18, 1.82)	0.340
Income Level (At Least 10K/Below 10K)	2.11 (0.74, 6.04)	0.162
Health Insurance (Have/Not Have)	3.01 (0.94, 9.61)	0.063
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.80 (0.42, 1.55)	0.513
Not Well	0.94 (0.74, 1.19)	0.611
Internet Use (Yes/No)	1.70 (0.78, 3.68)	0.179

P-values are for testing the significance of odds ratio being 1 for no difference.
In addition to the indicated variable, all models include the variables for baseline agreement and study group.
CI=Confidence interval. HRT=Hormone Replacement Therapy.

Perceived Severity

The perceived Severity was measured by participants' agreement with the following five questionnaire statements: (1) "The thought of getting osteoporosis scares me, and if I get osteoporosis", (2) "My whole life will change", (3) "I will not be able to walk around", (4) "I will lose height", and (5) "I will not be able to do house work". A score for an overall measure of severity was calculated as the total number of "Agree" responses divided by the total number of items that participants responded to. The items to which a participant did not respond were excluded from the score calculation. The severity score ranged from 0 to 1, 0 when a participant did not agree with any of the items she responded to and 1 when she agreed to all items she responded to. If a participant did not respond to any items, her severity score was set to missing.

The distributions of the severity score by study group and time point are presented in Figure 6. The mean severity score in the Intervention Group was 0.41 (95% CI: 0.35, 0.47) at baseline and 0.50 (95% CI: 0.44, 0.57) at post-intervention, and In the Control Group was 0.39 (95% CI: 0.32, 0.45) at baseline and 0.36 (95% CI: 0.29, 0.43), which suggested that the intervention program increased severity scores in the Intervention Group.

To further evaluate the intervention effect adjusting for differences in baseline characteristic variables, the associations between baseline characteristic variables with the post-intervention severity score were first evaluated for each variable individually using a mixed model and the results are presented in Table 31. The results showed that the study group was not statistically significant. The p-value was 0.342 adjusted for baseline severity score. On the other hand, the baseline severity score was a strong

influential variable ($p\text{-value} < 0.001$). For each one tenth increase in the baseline severity score, there was a 0.05 increase in the post-intervention severity score. Additionally, it appeared that the overall severity scores at post-intervention were not associated with most of the baseline characteristic variables except the educational level, which was only marginally influential.

The analysis results of adjusted intervention effects regarding perceived severity (Table 30) suggest that the difference between the two study groups was not statistically significant, leading to a conclusion that the intervention program did not increase post-intervention severity scores. However, there was a noticeable increase of post-intervention severity scores in the Intervention Group and noticeable difference between the study groups at post-intervention, especially when adjusted for baseline scores and significant baseline variables. This difference was 0.16 (95% CI: -0.08, 0.40), quite substantial for a score with a possible range from 0 to 1. The lack of statistical significance could be due to the limited sample size.

In addition to the overall severity score, the intervention effects were also evaluated regarding the five components that made up the overall severity score. A summary of the responses to the five questionnaire statements is provided in Table 32. The table indicates that the two study groups were not different at baseline regarding each of the five components as evidenced by the p-values of Pearson's $\chi^2 > 0.05$ although there were numerical differences between the two groups. At post-intervention, there were some indications that the two study groups became different. The p-values for testing the association of study group and post-intervention response were 0.046 for the questionnaire statement regarding being scared of osteoporosis, 0.098 regarding whole

life change, 0.053 regarding the ability to walk, 0.009 regarding losing height, and 0.094 regarding the ability to perform house work. The perceived severity increased from baseline to post-intervention regarding all five questionnaire statements but one in the Intervention Group. The increases in the Intervention Group were 14.2% regarding whole life change, 14.6% regarding the ability to walk, 6.6% regarding losing height, and 13.3% regarding the ability to perform house work. In contrast with the increases in the Intervention Group, the changes in the Control Group were not consistent and small in magnitude. The changes in the Control Group were -8.5% regarding being scared, -6.8% regarding whole life change, 1.7% regarding the ability to walk, 2.8% regarding losing height, and -3.5% regarding the ability to perform house work.

The potential intervention effect to increase perceived severity at post-intervention was further evaluated adjusting for baseline variables. The significant baseline variables were first identified using hierarchical logistic models as described before for each component. The results of this analysis are summarized in Table 33 and the details are provided in Appendix C.

After the associations were analyzed, the odds ratios (Intervention Group/Control Group) were adjusted for the significant variables identified and the five baseline characteristic variables. The adjusted odds ratios, presented in Table 34, show that the analysis results regarding each individual statement of perceived severity were consistent with these regarding the overall severity score. The odds in the Intervention Group were at least twice as high as the odds in the Control Group post-intervention. Specifically, the odds ratios after adjusting for both baseline response and significant baseline variables were 2.85 (95% CI: 1.00, 8.11; p-value=0.050) regarding being scared; 3.74 (95% CI:

2.22, 6.31; p-value<0.001) regarding whole life change; 2.18 (95% CI: 0.72, 6.63; p-value=0.170) regarding the ability to walk; 3.14 (95% CI: 1.09, 9.08; p-value=0.035) regarding loss height; and 3.47 (95% CI: 0.56, 21.66; p-value=0.183) regarding the ability to perform house work. Although the p-values were not all significant, there were some indications that the intervention program had increased perceived severity as measured by both the overall score and individual questionnaire statements.

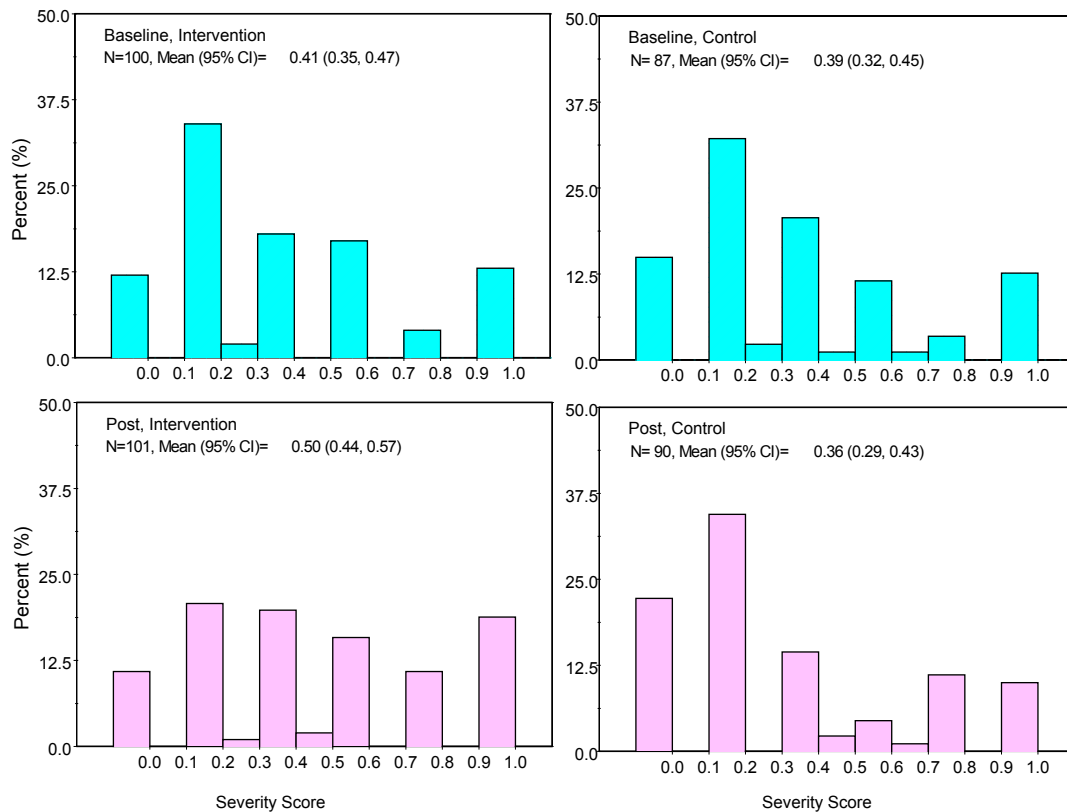


Figure 6. Distributions of Severity Scores by Study Group and Time Point

Table 30. Analysis of Intervention Effects Regarding Post-Intervention Severity Scores

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Difference (95% CI)	P-value
		n	Mean (95% CI)	n	Mean (95% CI)		
No Adjustment	Baseline	100	0.40 (0.22, 0.58)	87	0.39 (0.27, 0.51)	0.00 (-0.20, 0.21)	0.963
	Post-Intervention	101	0.48 (0.27, 0.68)	90	0.41 (0.25, 0.57)	0.07 (-0.19, 0.33)	0.523
Baseline Score	Post-Intervention	99	0.49 (0.32, 0.66)	87	0.40 (0.27, 0.53)	0.09 (-0.13, 0.30)	0.342
Baseline Score, Significant Baseline Variables [1]	Post-Intervention	86	0.52 (0.35, 0.70)	64	0.36 (0.21, 0.52)	0.16 (-0.08, 0.40)	0.140

Difference is Intervention Group minus Control Group.
 [1] Significant baseline characteristics variables are those for family member with osteoporosis, having had BMD measured, education level, health insurance status, internet usage, and education level.
 CI=Confidence interval. N=Number of participants. n=Number of participants contributed to the analysis.

Table 31. Analysis of Associations Between Post-Intervention Severity Scores and Baseline Variables

Variable	Parameter (95% CI)	P-value
Study Group	0.09 (-0.13. 0.30)	0.342
Baseline Severity Score	0.05 (0.04. 0.07)	<.001
Education Level (Reference=<Elementary School)		
Graduate and above	0.13 (-0.20. 0.46)	0.439
University	-0.15 (-0.27. -0.03)	0.018
High School	-0.07 (-0.20. 0.06)	0.308
<High School Graduate	-0.12 (-0.24. -0.00)	0.048
Baseline Knowledge Score	-0.02 (-0.03. 0.00)	0.057
Baseline Efficacy Score	-0.00 (-0.01. 0.01)	0.622
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	-0.03 (-0.15. 0.10)	0.670
Thinking About It	-0.09 (-0.36. 0.17)	0.500
Will Do So Next Month	-0.05 (-0.32. 0.22)	0.723
Will Do So Next Week	-0.12 (-0.24. 0.00)	0.053
Doing So Currently	0.05 (-0.14. 0.24)	0.616
Baseline Response to Being Concerned	-0.01 (-0.10. 0.07)	0.753
Baseline Response to How likely	0.01 (-0.08. 0.10)	0.807
Age	0.00 (-0.01. 0.01)	0.966
Weight	0.00 (-0.00. 0.00)	0.640
Reduced Height (Yes/No)	0.00 (-0.09. 0.09)	0.991
BMD Measured (Yes/No)	0.00 (-0.08. 0.09)	0.910
Taking Osteoporosis Medication (Yes/No)	0.03 (-0.06. 0.12)	0.503
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.00 (-0.15. 0.15)	0.995
>1 Year	-0.04 (-0.20. 0.12)	0.625
>3 Years	0.06 (-0.16. 0.27)	0.606
Taking Vitamin/Calcium (Yes/No)	-0.01 (-0.10. 0.09)	0.853
Taking HRT (Yes/No)	-0.03 (-0.23. 0.17)	0.738
Had Osteoporosis (Yes/No)	0.05 (-0.04. 0.13)	0.300
Osteoporosis in Family (Yes/No)	0.03 (-0.07. 0.13)	0.511
Years Lived in US	0.00 (-0.00. 0.00)	0.692
Marital Status (Reference=Widow)		
Married	-0.02 (-0.12. 0.07)	0.639
Never Married	0.12 (-0.16. 0.40)	0.393
Divorced/Separated	-0.07 (-0.24. 0.11)	0.454
Employment Status (Reference=Homemaker)		
Employed	-0.09 (-0.25. 0.06)	0.246
Unemployed/Retired	-0.03 (-0.13. 0.06)	0.515
Income Level (At Least 10K/Below 10K)	-0.02 (-0.14. 0.09)	0.698
Health Insurance (Have/Not Have)	0.03 (-0.08. 0.14)	0.620
English Proficiency (Reference=Not Well at All)		
Well/Very Well	0.10 (-0.09. 0.30)	0.293
Not Well	0.01 (-0.08. 0.10)	0.815
Internet Use (Yes/No)	0.05 (-0.07. 0.18)	0.421

P-values are the statistical significance for testing no difference, i.e. the parameter being 0.
In addition to the indicated variable, all models include the variables for baseline severity score and study group.
CI=Confidence interval. HRT=Hormone Replacement Therapy.

Table 32. Summary of Responses to Individual Severity Statements by Study Group and Time

Time Point	Response	Intervention Group	Control Group	P-Value
It scares me to think that I may get osteoporosis				
Pre-Intervention	No Response	n (%) 4	n (%) 5	0.261
	Total Responders	98	85	
	Agree	55(56.1)	40(47.1)	
	Disagree	34(34.7)	31(36.5)	
	Don't Know	9(9.2)	14(16.5)	
Post-Intervention	No Response	10	2	0.046
	Total Responders	92	88	
	Agree	51(55.4)	34(38.6)	
	Disagree	30(32.6)	34(38.6)	
	Don't Know	11(12.0)	20(22.7)	
My whole life will change if I get osteoporosis.				
Pre-Intervention	No Response	n (%) 4	n (%) 5	0.593
	Total Responders	98	85	
	Agree	37(37.8)	37(43.5)	
	Disagree	37(37.8)	32(37.6)	
	Don't Know	24(24.5)	16(18.8)	
Post-Intervention	No Response	4		0.098
	Total Responders	98	90	
	Agree	51(52.0)	33(36.7)	
	Disagree	33(33.7)	42(46.7)	
	Don't Know	14(14.3)	15(16.7)	
I won't be able to walk around if I get osteoporosis.				
Pre-Intervention	No Response	n (%) 4	n (%) 5	0.816
	Total Responders	98	85	
	Agree	15(15.3)	16(18.8)	
	Disagree	63(64.3)	52(61.2)	
	Don't Know	20(20.4)	17(20.0)	
Post-Intervention	No Response	5	2	0.053
	Total Responders	97	88	
	Agree	29(29.9)	18(20.5)	
	Disagree	57(58.8)	49(55.7)	
	Don't Know	11(11.3)	21(23.9)	
I will loss height if I get osteoporosis				
Pre-Intervention	No Response	n (%) 4	n (%) 4	0.173
	Total Responders	98	86	
	Agree	73(74.5)	53(61.6)	
	Disagree	10(10.2)	13(15.1)	
	Don't Know	15(15.3)	20(23.3)	
Post-Intervention	No Response	7	3	0.009
	Total Responders	95	87	
	Agree	77(81.1)	56(64.4)	
	Disagree	14(14.7)	16(18.4)	
	Don't Know	4(4.2)	15(17.2)	
I won't be able to do house work if I get osteoporosis.				
Pre-Intervention	No Response	n (%) 4	n (%) 4	0.371
	Total Responders	98	86	
	Agree	19(19.4)	19(22.1)	
	Disagree	64(65.3)	48(55.8)	
	Don't Know	15(15.3)	19(22.1)	
Post-Intervention	No Response	4	4	0.094
	Total Responders	98	86	
	Agree	32(32.7)	16(18.6)	
	Disagree	52(53.1)	56(65.1)	
	Don't Know	14(14.3)	14(16.3)	
Percentages are based on number of participants with response. CI=Confidence interval. N=Number of participants. n=Number of participants in each category.				

Table 33. Summary of P-Values Testing Associations Between Responses to Individual Severity Statements and Baseline Variables at Post-intervention

Baseline Variable	E29Score	E30Change	E31Walk	E32Short	E33HouseWork
TRT	0.012**	-	-	0.038*	0.025**
Baseline Response	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
Baseline Efficacy Score	0.025**	-	-	-	-
Baseline Knowledge Score	0.002***	0.012**	<0.001***	0.011**	0.032*
Intention Stage	0.010***	0.005***	-	0.018**	0.024**
Severity Score	-	-	-	-	-
Barrier score	-	-	-	-	-
Concerned	-	-	-	-	-
Likely	-	-	-	-	-
Age	-	-	-	-	-
Weight	0.019**	-	-	-	0.034*
Height	-	-	-	-	-
Check-Up	-	-	0.029*	-	-
Vita/Calcium	-	-	-	-	-
HRT	-	-	-	-	0.016**
Medication	-	-	-	-	-
Osteoporosis	-	-	-	-	-
Family	-	-	-	-	-
BMD	-	-	-	-	-
Years	-	-	-	-	-
Marital	0.002***	0.001***	0.008***	-	-
Education	-	<0.001***	0.001***	-	0.036*
Employment	0.001***	-	-	-	-
Income	-	-	-	-	-
Insurance	-	-	-	-	-
English	-	0.035*	0.041*	-	0.009***
Internet	-	-	-	0.022**	-

Significance Level of p-values:
 *** <0.01, ** between 0.01 and 0.025, * between 0.025 and 0.05, - for >0.05.

E29Scare=It Scares Me To Think That I May Get Osteoporosis.
 E30Change=My Whole Life Will Change If I Get Osteoporosis.
 E31Walk=I Will Not Be Able To Walk Around If I Get Osteoporosis.
 E32Short=I Will Loss Height If I Get Osteoporosis.
 E33HouseWork=I Will Not Be Able To Do House Work If I Get Osteoporosis.

TRT=Study Group. Concerned=Being concerned at baseline. Likely=Likely to get osteoporosis at baseline. Age=Age at baseline. Weight=Weight at baseline. Height=Had height reduction. Check-Up=Timing of last check-up. Vita/Calcium=Taking vitamin and calcium. HRT=Taking hormone replacement therapy. Medication=Taking osteoporosis medication. Osteoporosis=Told to have osteoporosis. Family=Having family members with osteoporosis. BMD=Had bone mineral density measured before. Years=Years lived in the U.S Marital=Marital status. Education=Education level. Employment=Employment Status. Income=Income level. Insurance=Having health insurance. English=English proficiency. Internet=Internet use.

Table 34. Analysis of Post-Intervention Responses to Individual Severity Statements

It scares Me to Think That I May Get Osteoporosis							
Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	98	1.10 (0.74, 1.62)	85	0.93 (0.35, 2.43)	1.18 (0.42, 3.34)	0.753
	Post	92	1.24 (1.11, 1.39)	88	0.64 (0.34, 1.21)	1.94 (1.01, 3.72)	0.046
Baseline Score	Post	89	1.02 (0.86, 1.23)	84	0.50 (0.30, 0.85)	2.04 (1.17, 3.56)	0.012
Baseline Score, Significant Baseline Variables [1]	Post	65	0.58 (0.21, 1.60)	58	0.20 (0.05, 0.91)	2.85 (1.00, 8.11)	0.050
My Whole Life Will Change If I Get Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	98	0.63 (0.63, 0.64)	85	0.77 (0.69, 0.84)	0.82 (0.75, 0.91)	<.001
	Post	98	1.01 (0.65, 1.57)	90	0.61 (0.31, 1.21)	1.64 (0.73, 3.67)	0.230
Baseline Score	Post	95	1.46 (0.89, 2.40)	85	0.61 (0.30, 1.26)	2.39 (0.95, 5.98)	0.064
Baseline Score, Significant Baseline Variables [1]	Post	77	2.16 (1.10, 4.24)	60	0.58 (0.33, 1.01)	3.74 (2.22, 6.31)	<.001
I Will Not Be Able to Walk Around If I Get Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	98	0.20 (0.17, 0.24)	85	0.23 (0.15, 0.37)	0.87 (0.54, 1.40)	0.564
	Post	97	0.40 (0.26, 0.63)	88	0.27 (0.14, 0.53)	1.48 (0.66, 3.30)	0.336
Baseline Score	Post	94	1.01 (0.61, 1.68)	84	0.51 (0.20, 1.33)	1.97 (0.72, 5.39)	0.189
Baseline Score, Significant Baseline Variables [1]	Post	74	4.38 (1.17, 16.47)	55	2.01 (0.54, 7.54)	2.18 (0.72, 6.63)	0.170
I Will Loss Height If I Get Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	98	2.82 (1.88, 4.23)	86	1.58 (1.09, 2.28)	1.79 (1.03, 3.09)	0.038
	Post	95	4.95 (2.17, 11.32)	87	2.02 (0.98, 4.18)	2.44 (0.81, 7.34)	0.111
Baseline Score	Post	92	3.77 (2.23, 6.40)	83	1.55 (0.82, 2.95)	2.43 (1.05, 5.61)	0.038
Baseline Score, Significant Baseline Variables [1]	Post	76	3.43 (1.97, 5.98)	59	1.09 (0.33, 3.60)	3.14 (1.09, 9.08)	0.035
I Will Not Be Able to Do House Work If I Get Osteoporosis							
Adjustment	Time Point	Intervention Group		Control Group		Odds Ratio (95% CI) (Intervention/Control)	P-value
		n	Odds(95% CI)	n	Odds(95% CI)		
No Adjustment	Baseline	98	0.26 (0.18, 0.38)	86	0.28 (0.19, 0.42)	0.93 (0.54, 1.59)	0.781
	Post	98	0.38 (0.19, 0.79)	86	0.26 (0.15, 0.45)	1.47 (0.59, 3.65)	0.409
Baseline Score	Post	94	0.96 (0.54, 1.71)	83	0.36 (0.17, 0.76)	2.69 (1.13, 6.38)	0.025
Baseline Score, Significant Baseline Variables [1]	Post	71	0.61 (0.23, 1.62)	53	0.18 (0.04, 0.74)	3.47 (0.56, 21.66)	0.183
[1] Significant baseline characteristics variables are those for family member with osteoporosis, had BMD measured before, education level, health insurance, internet usage, and significant variable (p-value<0.05) as identified in Table 32. CI=Confidence interval. BMD=Bone mineral density. HRT=Hormone replacement therapy. Odds=(Probability of agree)/(probability of not agree).							

Perceived Barriers to Increasing Calcium Intake

Perceived barriers to increasing calcium intake were measured by the number of barriers the participants perceived to have by responding to the following seven statements.

1. I don't know which food items are high in calcium.
2. My neighborhood grocery stores do not carry calcium-rich food items that I like.
3. I don't know how to cook calcium-rich food item.
4. I don't like the taste of calcium-rich food items.
5. My family members don't like the taste of calcium-rich food items.
6. Calcium-rich food costs too much.
7. Calcium-rich food items contain too much fat.

Similar to the calculations of the knowledge score, efficacy score, and severity score, the barrier score was calculated by adding the total number of barriers a participant perceived to have and dividing it by the total statements that she responded to. The items that a participant did not respond to were excluded from her barrier score calculation. The barrier score ranged from 0 to 1, 0 when a participant responded either "Disagree" or "Don't Know" to all items that she responded to and 1 when she responded "Agree" to all items that she responded to. If a participant did not respond to any items, her barrier score was set to missing.

A summary of barrier scores by study group and time is provided in Figure 7. The mean barrier scores were 0.22 (95% CI: 0.18, 0.26) in the Intervention Group and 0.22 (95% CI: 0.15, 0.24) in the Control Group at baseline; and 0.24 (95% CI: 0.19, 0.28) in

the Intervention Group and 0.18 (95% CI: 0.14, 0.22) in the Control Group at post-intervention. The two study groups were not statistically different from each other at baseline (p-value=0.5601, Table 35) or post-intervention (p-value=0.4529, Table 35), which suggested that the intervention program did not decrease the number of perceived barriers to increasing calcium intake.

The seven individual barrier items that made up the perceived barrier score were also evaluated and a summary is provided in Table 36. Judged by the p-values from the Pearson's χ^2 testing, the response distributions between the two study groups at baseline were comparable for five out seven items, namely:

- Stores Don't Carry Calcium-Rich Food Items That I Like,
- I Don't Like the Taste of Calcium-Rich Food Items,
- My Family Members Don't Like the Taste of Calcium-Rich Food,
- Calcium-Rich Food Cost Too Much, and
- Calcium-rich Food Contain Too Much Fat.

However, they were different for the other two, “I Don't Know Which Food Items Are High in Calcium” and “I Don't Know How to Cook Calcium-Rich Food Items”. At post-intervention, the two study groups displayed differences in more items. In addition to the two items that were different at baseline, the two study groups were different post-intervention for “My Family Members Don't Like the Taste of Calcium-Rich Food” and “Calcium-Rich Food Cost Too Much”. However, the proportions of participants with perceived barriers were not uniformly decreased from baseline to post-intervention in the Intervention Group, suggesting either no effect or a mixed effect of the intervention program on participants' perceived barriers.

Further exploratory analyses were conducted to identify variables that were significantly associated with the post-intervention barrier scores using the same method as the one used to identify significant variables for the knowledge score, efficacy score and severity score. The results, presented in Table 37, confirmed that the intervention program (i.e., study group) did not have a significant impact on post-intervention barrier score. On the other hand, the results show that the baseline barrier score was an influential variable which impacted the post-intervention barrier score, although the influence was small. For each one tenth increase of the baseline barrier score, the post-intervention barrier score increased 0.03, out of a maximum of 1. Other significant variables for post-intervention barrier score were whether or not a participants had lost height (p-value=0.026) and education level (p-value=0.974 for the education level of “<High School” and 0.660 for “High School” and 0.012 for “University And Above”, all compared to “<Elementary School”). The results for adjusted intervention effects are provided in Table 35. The two study groups were not statistically significantly different regarding post-intervention barrier scores, again suggesting that the intervention program had no impact regarding this endpoint.

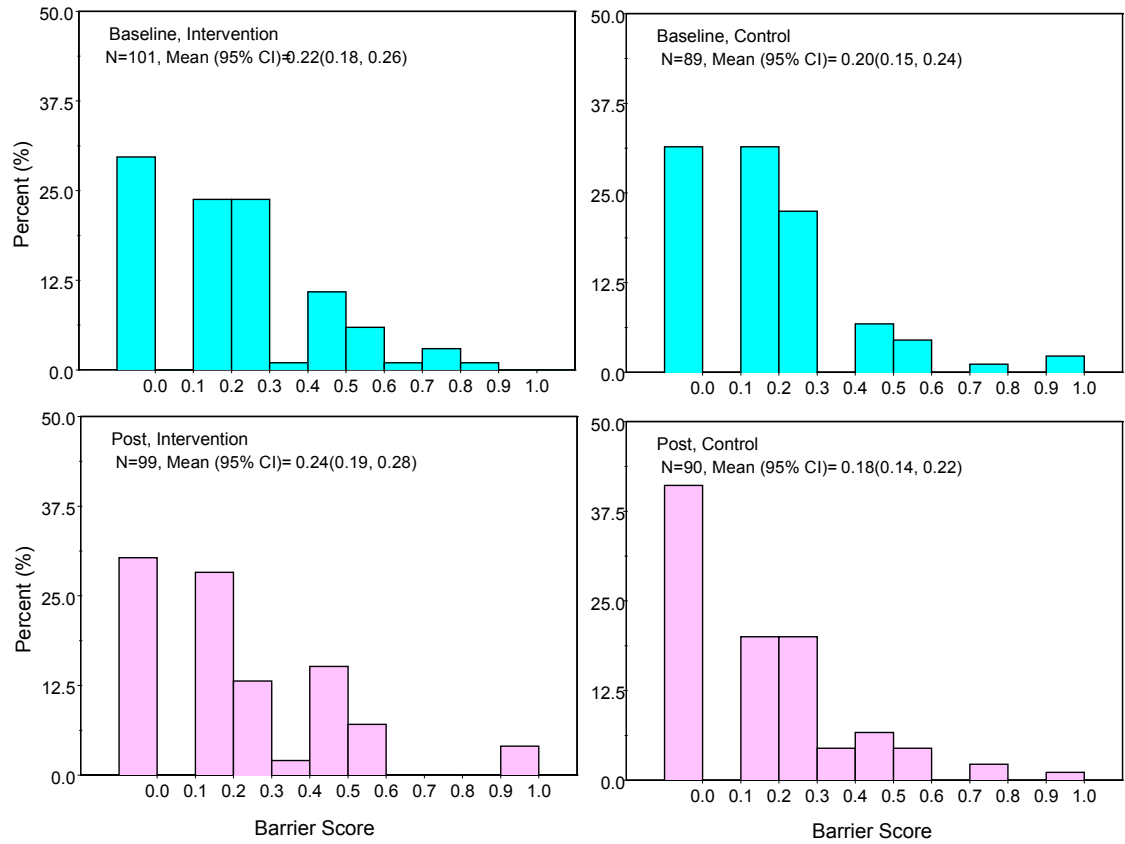


Figure 7. Distributions of Barrier Scores by Study Group and Time

Table 35. Analysis of Intervention Effects Regarding Post-Intervention Barrier Scores

Adjustment	Time Point	Intervention Group (N=102)		Control Group (N=90)		Difference	P-value
		n	Mean (95% CI)	n	Mean (95% CI)		
No Adjustment	Baseline	101	0.22 (0.11, 0.33)	89	0.18 (0.09, 0.26)	0.04 (-0.10, 0.18)	0.506
	Post-Intervention	99	0.21 (0.11, 0.32)	90	0.17 (0.09, 0.25)	0.04 (-0.09, 0.17)	0.453
Baseline Score	Post-Intervention	98	0.21 (0.12, 0.31)	89	0.18 (0.11, 0.26)	0.03 (-0.09, 0.15)	0.542
Baseline Score, Significant Baseline Variables	Post-Intervention	81	0.24 (0.12, 0.36)	62	0.15 (0.04, 0.25)	0.09 (-0.08, 0.26)	0.204

Difference is Intervention Group minus Control Group.
 Significant baseline characteristics variables are variables for having family member with osteoporosis, having BMD measured before, education level, health insurance status, internet usage, and height reduction within next 5 years.
 CI=Confidence interval. N=Number of participants. n=Number of participants contributed to the analysis.

Table 36. Summary of Individual Barriers by Study Group and Time

Time Point	Response	Intervention Group n (%)	Control Group n (%)	P-Value
I Don't Know Which Food Items Are High in Calcium.				
Baseline	No Response	2	4	0.021
	Total Responders	100	86	
	Agree	43 (43.0)	21 (24.4)	
	Disagree	17 (17.0)	24 (27.9)	
Post-Intervention	Don't Know	40 (40.0)	41 (47.7)	0.020
	No Response	5	1	
	Total Responders	97	89	
	Agree	35 (36.1)	33 (37.1)	
	Disagree	37 (38.1)	19 (21.3)	
	Don't Know	25 (25.8)	37 (41.6)	
Stores Don't Carry Calcium-Rich Food Items That I Like.				
Baseline	No Response	4	3	0.176
	Total Responders	98	87	
	Agree	8 (8.2)	12 (13.8)	
	Disagree	30 (30.6)	33 (37.9)	
Post-Intervention	Don't Know	60 (61.2)	42 (48.3)	0.064
	No Response	6	2	
	Total Responders	96	88	
	Agree	17 (17.7)	10 (11.4)	
	Disagree	43 (44.8)	30 (34.1)	
	Don't Know	36 (37.5)	48 (54.5)	
I Don't Know How to Cook Calcium-Rich Food Item.				
Baseline	No Response	1	1	0.022
	Total Responders	101	89	
	Agree	49 (48.5)	32 (36.0)	
	Disagree	6 (5.9)	16 (18.0)	
Post-Intervention	Don't Know	46 (45.5)	41 (46.1)	<.001
	No Response	7	3	
	Total Responders	95	87	
	Agree	31 (32.6)	23 (26.4)	
	Disagree	40 (42.1)	17 (19.5)	
	Don't Know	24 (25.3)	47 (54.0)	
I Don't Like the Taste of Calcium-Rich Food Item.				
Baseline	No Response	2	3	0.671
	Total Responders	100	87	
	Agree	13 (13.0)	11 (12.6)	
	Disagree	42 (42.0)	42 (48.3)	
Post-Intervention	Don't Know	45 (45.0)	34 (39.1)	0.077
	No Response	8		
	Total Responders	94	90	
	Agree	25 (26.6)	14 (15.6)	
	Disagree	43 (45.7)	39 (43.3)	
	Don't Know	26 (27.7)	37 (41.1)	

Table 36 (Continued)

Time Point	Response	Intervention Group n (%)	Control Group n (%)	P-Value
My Family Members Don't Like the Taste of Calcium-Rich Food.				
Baseline	No Response	4	4	0.606
	Total Responders	98	86	
	Agree	14 (14.3)	12 (14.0)	
	Disagree	32 (32.7)	34 (39.5)	
	Don't Know	52 (53.1)	40 (46.5)	
Post-Intervention	No Response	7	2	0.009
	Total Responders	95	88	
	Agree	23 (24.2)	8 (9.1)	
	Disagree	45 (47.4)	41 (46.6)	
	Don't Know	27 (28.4)	39 (44.3)	
Calcium-Rich Food Cost Too Much.				
Baseline	No Response	3	2	0.485
	Total Responders	99	88	
	Agree	19 (19.2)	21 (23.9)	
	Disagree	31 (31.3)	31 (35.2)	
	Don't Know	49 (49.5)	36 (40.9)	
Post-Intervention	No Response	7	1	0.019
	Total Responders	95	89	
	Agree	11 (11.6)	14 (15.7)	
	Disagree	61 (64.2)	39 (43.8)	
	Don't Know	23 (24.2)	36 (40.4)	
Calcium-Rich Food Contain Too Much Fat.				
Baseline	No Response	2	2	0.581
	Total Responders	100	88	
	Agree	9 (9.0)	12 (13.6)	
	Disagree	45 (45.0)	36 (40.9)	
	Don't Know	46 (46.0)	40 (45.5)	
Post-Intervention	No Response	7	1	0.056
	Total Responders	95	89	
	Agree	11 (11.6)	10 (11.2)	
	Disagree	56 (58.9)	38 (42.7)	
	Don't Know	28 (29.5)	41 (46.1)	
Percentages are based on number of participants with response. CI=Confidence interval. N=Number of participants. n=Number of participants in each category.				

Table 37. Analysis of Associations Between Post-Intervention Barrier Scores And Baseline Variables

Variable	Parameter (95% CI)	P-value
Study Group	0.03 (-0.09. 0.15)	0.542
Baseline Barrier Score	0.03 (0.02. 0.05)	<.001
Reduced Height (Yes/No)	-0.08 (-0.14. -0.01)	0.026
Education Level (Reference=<Elementary School)		
<High School Graduate	0.00 (-0.09. 0.09)	0.974
High School	-0.02 (-0.12. 0.08)	0.660
University and Above	-0.12 (-0.21. -0.03)	0.012
Baseline Knowledge Score	-0.01 (-0.02. 0.01)	0.311
Baseline Efficacy Score	0.00 (-0.00. 0.01)	0.384
Baseline Severity Score	-0.00 (-0.01. 0.01)	0.797
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	-0.05 (-0.15. 0.04)	0.265
Thinking About It	-0.00 (-0.14. 0.14)	0.986
Will Do So Next Month	-0.03 (-0.11. 0.05)	0.452
Will Do So Next Week	0.02 (-0.18. 0.23)	0.819
Doing So Currently	-0.11 (-0.31. 0.09)	0.291
Baseline Being Concerned or Not	-0.01 (-0.08. 0.07)	0.887
Baseline Response to How likely (Agree/Other)	0.04 (-0.03. 0.11)	0.224
Age	-0.00 (-0.01. 0.00)	0.624
Weight	0.00 (-0.00. 0.00)	0.098
BMD Measured (Yes/No)	0.03 (-0.04. 0.09)	0.396
Taking Osteoporosis Medication (Yes/No)	0.01 (-0.06. 0.07)	0.830
Last Health Check-Up (Reference=Never Checked)		
<12 Months	-0.03 (-0.15. 0.09)	0.644
>1 Year	-0.04 (-0.16. 0.07)	0.443
Taking Vitamin/Calcium (Yes/No)	-0.02 (-0.09. 0.06)	0.661
Taking HRT (Yes/No)	0.04 (-0.12. 0.20)	0.615
Had Osteoporosis (Yes/No)	-0.01 (-0.07. 0.06)	0.852
Osteoporosis in Family (Yes/No)	-0.03 (-0.11. 0.04)	0.382
Years Lived in US	0.00 (-0.00. 0.00)	0.630
Marital Status (Reference=Widow)	-0.06 (-0.12. 0.01)	0.088
Employment Status (Reference=Homemaker)		
Employed	0.05 (-0.07. 0.16)	0.444
Unemployed/Retired	0.04 (-0.03. 0.12)	0.275
Income Level (At Least 10K/Below 10K)	-0.04 (-0.13. 0.06)	0.434
Health Insurance (Have/Not Have)	0.01 (-0.08. 0.09)	0.880
English Proficiency (Reference= Not Well at All)		
Well/Very Well	-0.05 (-0.20. 0.10)	0.482
Not Well	-0.04 (-0.10. 0.03)	0.287
Internet Use (Yes/No)	0.06 (-0.03. 0.15)	0.197

P-values are the statistical significance for testing no difference, i.e. the parameter being 0.
In addition to the indicated variable, all models include the variables for baseline barrier score and study group.
CI=Confidence interval. HRT=Hormone Replacement Therapy.

Evaluation of the Intervention Effects at Month 3 After the Intervention

As stated in Section S Description of Questionnaires, the perceived self-efficacy for adopting a calcium-rich diet, intention to consume more calcium-rich food items, and the number of calcium-rich food items consumed were measured at Month 3 after the intervention.

An error occurred when printing the Month 3 questionnaires for the Coffee Cup site, the largest and first organization that participated in this study. The consequence of the error was that the identification pages were accidentally not printed and, therefore, were not included in the questionnaires. As a result, the Month 3 questionnaires from the Coffee Cup site could not be identified at the individual level. However, it is clear that these nameless questionnaires were all from the Coffee Cup site because the Month 3 data were collected one site at a time. This error affected 49 questionnaires, about 66.2% of a total 74 Month 3 questionnaires collected from the Intervention Group. The results presented in this section are based on site-level identifications. No adjustments based on individual-level baseline characteristics were performed. A preliminary summary of Month 3 data from the Intervention Group was present in this section.

Number of Calcium-Rich Food Items Consumed

The number of calcium-rich food items was measured by the modified food frequency questionnaires (FFQ) as described in Section Description of Questionnaires. The FFQ contained 23 calcium-rich food items, and was administered at two time points: baseline and Month 3 after the intervention. The group means of total number of calcium-

rich food items and their 95% confidence intervals at each time point are presented in Figure 8. The figure shows that the means were not changed from baseline and Month 3 after the intervention, suggesting that the intervention program may not have any discernable effects on the total number of calcium-rich food items consumed.

An interesting observation is that the proportions of participants who consumed dairy products were high, despite the fact that 95% of Asians are lactose-intolerant (USDHHS, 2006). Table 38 provides the proportions of participants who consumed each food item by time (baseline or post-intervention). There were about 82% to 84% of participants who drank milk, 40.0% to 71.0% who ate yogurt, and 28.9% to 39.4% who ate cheese. The proportions of participants who consumed other calcium-rich food items were also high. For example, about 87.8% to 93.1% of participants ate tofu, 89.2% to 93.4% ate broccoli or Chinese broccoli, and similar proportions for cabbage or green vegetables. From the data collected in this study, it was not possible to estimate the quantities of these assumptions. Therefore we could not assess the intervention effect on the amount of dietary calcium intake.

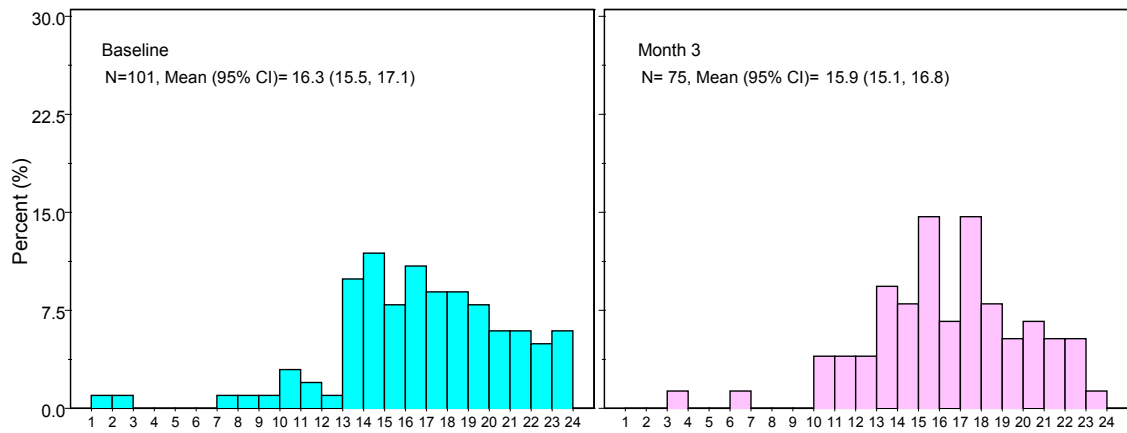


Figure 8. Distributions of Total Calcium-Rich Food Items in the Intervention Group by Time

Table 38. Proportions of Participants Who Consumed Individual Food Items in the Intervention Group by Time

Food Items	Baseline (N=102) n (%)	Month 3 (N=76) n (%)
Milk (Beverage)	84 (82.4)	65 (85.5)
Cold Breakfast Cereals With Milk	73 (71.6)	59 (77.6)
Pancakes or Waffles	44 (43.1)	31 (40.8)
Yogurt	64 (62.7)	54 (71.1)
Cheese	39 (38.2)	22 (28.9)
Broccoli or Chinese Broccoli	91 (89.2)	71 (93.4)
Cabbage or Napa Cabbage	92 (90.2)	69 (90.8)
Dark Green, Leafy Vegetables	93 (91.2)	70 (92.1)
Beans or Peas	96 (94.1)	66 (86.8)
Tofu	95 (93.1)	68 (89.5)
Taro	57 (55.9)	48 (63.2)
Fish	94 (92.2)	71 (93.4)
Other Seafood	82 (80.4)	60 (78.9)
Sandwiches with Ham, Bacon, or Sausage	54 (52.9)	37 (48.7)
Egg	95 (93.1)	69 (90.8)
Steamed Bun	85 (83.3)	61 (80.3)
Bread	78 (76.5)	56 (73.7)
Bagel or English Muffin	49 (48.0)	21 (27.6)
Deep-Fried Wheat Dough Stick	22 (21.6)	13 (17.1)
Chinese Sweet Pastry	70 (68.6)	52 (68.4)
Ice Cream	50 (49.0)	29 (38.2)
Salty Snacks	57 (55.9)	36 (47.4)
Peanuts or Other Nuts or Seeds	82 (80.4)	66 (86.8)

Percentages are based on number of participants with questionnaire.
CI=Confidence interval.
N=Number of participants with questionnaire.
n=Number of participants in each category.

Self-Efficacy for Adopting a Calcium-Rich Diet

The self-efficacy for adopting a calcium-rich diet was measured by an efficacy score that consisted of five statements, each measuring perceived self-efficacy for performing five tasks related to improving dietary calcium intake. Refer to Section Description of Questionnaires for more details. The self-efficacy was measured at all three time points (baseline, post-intervention, and Month 3 after the intervention). A summary of the efficacy scores by time is presented in Figure 9. The mean of efficacy scores in the Intervention Group was 0.52 (95% CI: 0.45, 0.60) at baseline, increased to 0.77 (95% CI: 0.71, 0.84) at post-intervention, and maintained at the increased level at 0.69 (95% CI: 0.62, 0.77) at Month 3 after the intervention. A further investigation was performed to assess changes regarding individual efficacy tasks. Figure 10 presents a summary of proportions of participants who felt confident in performing each efficacy task. The changes in the efficacy proportions over time were consistent for all five tasks and were also consistent with the changes over time observed in the overall efficacy scores. A consistent trend is that the efficacy proportions at post-intervention were increased from their baseline levels and largely maintained at about the increased level at Month 3 after the intervention, suggesting that the intervention effect observed at the post-intervention probably have persisted to three months after the intervention.

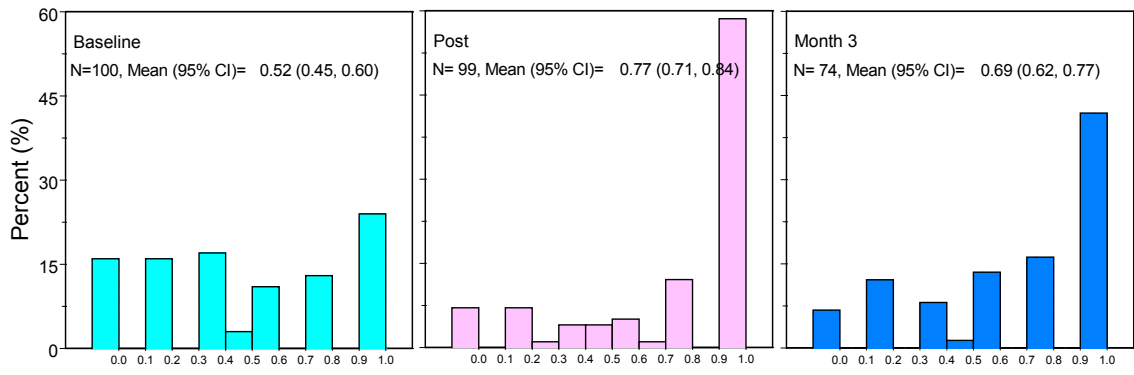


Figure 9. Distributions of Overall Efficacy Scores in the Intervention Group by Time

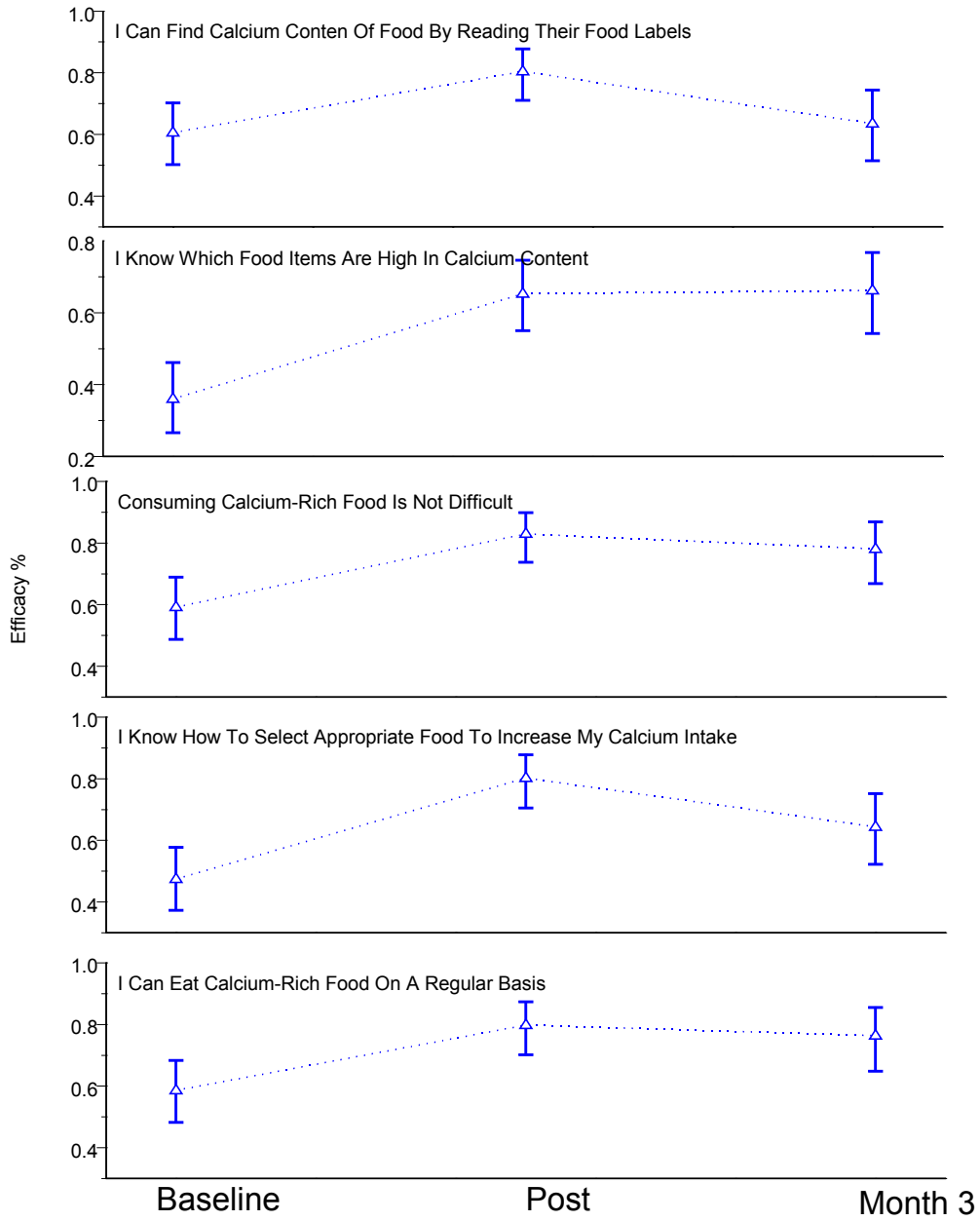


Figure 10. Proportions of Participants Who Felt Confident in Performing Each Task by Time

Intention to Consume More Calcium-Rich Food Items

The intention to consume more calcium-rich food items was measured by statements of six progressive stages at all three (3) time points. The results at baseline and post-intervention are described in details in Section Evaluation of The Intervention Effects at Post-Intervention. The summaries of the results at Month 3 after the intervention are presented in Table 39, along with the results from baseline and post-intervention for reference purposes. As shown in Table 39, the proportions of participants who “Never Thought About It” were 11.7 at baseline, 5.6% at post-intervention, and 10.1% at Month 3 after the intervention; the proportions of those who “Doing So Currently” were 36.2% at baseline, 45.6% at post-intervention, and 37.7% at Month 3 after the intervention.

Table 39. Summary of Intention Stages in the Intervention Group by Time

	Baseline (N=102)	Post-Intervention (N=102)	Month 3 (N=102)
Intention Stage	n (%)	n (%)	n (%)
No Response	8	12	5
Total Responders	94	90	69
Never Thought About It	11(11.7)	5(5.6)	7(10.1)
Decided Against It	5(5.3)	3(3.3)	9(13.0)
Thinking About It	37(39.4)	34(37.8)	25(36.2)
Will Do So Next Month	4(4.3)	4(4.4)	1(1.4)
Will Do So Next Week	3(3.2)	3(3.3)	1(1.4)
Doing So Currently	34(36.2)	41(45.6)	26(37.7)

Percentages are based on the total number of responders.
 CI=Confidence interval.
 N=Number of participants with questionnaires at each time point.
 n=Number of participants in each category.

CHAPTER 5

DISCUSSION

The purpose of this dissertation study was to evaluate the efficacy of an osteoporosis intervention program for Chinese women who lived in the Greater Philadelphia area. An effective program for this high risk population will provide a useful tool for public health professionals who work with them. The *Health People 2020* calls for a 10 percent reduction in the proportion of adults with osteoporosis. Towards this goal, we strive to establish an effective intervention program against osteoporosis by increasing the knowledge level of osteoporosis, self-efficacy for adopting a calcium-rich diet, and the intention to consume more calcium-rich food items. The intervention program being evaluated was designed based on the main constructs of the Health Belief Model, and was tailored to the cultural background and characteristics of the population.

The study recruited eight Chinese community organizations and assigned them to either the Intervention Group or the Control Group based on the timing of their agreement to participate and the balance of the total participants cumulated in each study group at the time. This random nature of the study group assignment was put in place to prevent investigators from assigning favorable organizations to the Intervention Group and thereby reduced the biases in assessing the intervention effects. The inclusion of a concurrent control group minimized the effects that confounding factors may cause and therefore provided a foundation to evaluate the intervention effects with more scientific rigor.

The questionnaires used in this study were developed first in English, and then translated into Chinese. The Chinese version was then back-translated to English to assess the accuracy of the translations. The Chinese version was used in the study.

The population for this study was Chinese women who were at least 50 years of age and living in the Greater Philadelphia area. The participants were recruited from the Chinese community organizations in the area with the assistance from the organizations' leaders. The participants in this study displayed characteristics that are typical in elderly Chinese women living in or near major metropolitan areas. Their English proficiency and education level were low. Nearly 93% of participants rated their English proficiency as 'Not Well at All' or 'Not Well'; 46% had an education level below high school graduate. These characteristics were consistent with observations from many studies of Chinese communities in other metropolitan areas, such as New York City (Babbar et al., 2006; Wang et al., 2010) or Chicago (Shah et al., 2010). Because of the limitations in language skill and education level, the education intervention programs those are effective for the general American population may not work in this population. In this study, we built the content of the program with a language that was easy to understand and delivered the program in Mandarin Chinese. Additionally, we had assistants who speak Cantonese and other Chinese regional languages standing by to help any participants with language barriers.

The two study groups in this quasi-experimental study were comparable in many baseline characteristics but were not entirely similar. The differences that were most relevant to the assessment of the intervention program were that the participants in the Intervention Group had more education, were more likely to have a family member with

osteoporosis, to have BMD measured before, to have health insurance, and to use the internet. To ensure valid comparisons between the two study groups, all analyses were adjusted for these differences and other baseline variables that were significantly associated with the endpoints under evaluation.

Significance of the Study Findings

The study confirms that the proportion of low bone mass (osteopenia and osteoporosis) is high. The proportion of participants with low bone mass was 59%, 24% with T-score < -2.5 and 35% between -1 to -2.5 , in this study population as measured by the T-scores at the heel bone site by an ultrasound device using the young-normal reference provided by the device manufacture. The low bone mass was indicated if a participant's T-score was < -1.0 based on the instruction from the device's user manual. Because it is well established that the T-scores from ultrasound peripheral devices are higher than those from dual-energy x-ray absorptiometry machines and tend to underestimate the proportion of low bone mass (Miller, 2006). It is most likely that the proportion of low bone mass in this population was actually even higher. The National Osteoporosis Risk Assessment study (Siris et al., 2001) showed that the women with low bone mass had an increased risk of bone fracture. For example, compared with women with normal bone mass, the risk of a hip fracture was 2.74 times as high among women with a T-score ≤ -2.5 and 1.73 among women with a T-score between -1 and -2.5 . The high proportion of participants with low bone mass indicates real public health needs for effective interventions against osteoporosis in elderly Chinese women.

The findings from this study also indicated that the intervention program we designed for the elderly Chinese women was effective. First, the results suggested that the intervention program was effective in increasing the knowledge level of osteoporosis at post-intervention. The knowledge levels in the Intervention Group were similar to those in the Control Group at baseline, but were significantly higher at post-intervention. The difference (Intervention Group – Control Group) in the mean knowledge score at post-intervention was 0.17 (p-value=0.037), adjusted for variables that were different at baseline or were significantly associated with the post-intervention knowledge score.

Additionally, the intervention effects were also demonstrated by the large increases in the components of the knowledge score. The increases of the proportions of participants who knew that sardine and bachoy are rich in calcium were substantial in the Intervention Group: 25 percentage points for sardine and 39 for bachoy. In contrast, the increases in the Control Group were relatively small: 3 for sardine and 12 for bachoy. The presentation in the education session for the Intervention Group specifically pointed out a list of calcium-rich food items including sardine and bachoy. The increased knowledge about them indicated that the participants in the Intervention Group were learning during the session.

The finding that the intervention program increased the knowledge level in this study was consistent with other studies of osteoporosis intervention programs. Education programs of different types and lengths have been found effective in increasing the knowledge in diverse populations. Sedlak, Doheny, and Jones (2000) implemented three education programs of various intensities in different target populations: an intense program for young college women, an intermediate program for a general community

sample of women, and a brief program for women nurses. In all three samples, the knowledge level increased after the programs regardless of their intensity levels. Similar increases of knowledge level were reported by Blalock et al. (2000), Ribeiro and Blakeley (2001), Tussing and Chapman-Novakofski (2005), Lv and Brown (2011), and Leslett et al. (2011). Although the increase in knowledge level does not necessarily translate to behavior changes, the increase is important because previous studies (Blalock et al., 2000; Oudshoorn et al., 2012) have shown that a higher knowledge level was associated with higher calcium-intake.

Second, the results indicated that the intervention program increased self-efficacy substantially. The mean efficacy score in the Intervention Group increased from 0.52 at baseline to 0.77 at post-intervention. In contrast, the mean efficacy score in the Control Group remained about the same, 0.52 at baseline and 0.50 at post-intervention. The difference in the post-intervention efficacy scores between the two study groups was 0.34 (p -value=0.011). The proportions of participants who felt confident to perform the tasks for calcium intake increased more than 20 percentage points from baseline to post-intervention for all five individual tasks in the Intervention Group. At post-intervention, the participants in the Intervention Group felt more confident that they could find calcium contents from food labels, eat calcium-rich food on a regular basis, knew which food items are high in calcium content, and how to select appropriate food to increase their calcium intake. Additionally, they felt consuming calcium-rich food was not difficult. Furthermore, the study showed that the increased self-efficacy level was maintained at Month 3 after the intervention. The mean self-efficacy scores in the Intervention Group were 0.52 at baseline, 0.77 at post-intervention, and 0.69 at Month 3 after the intervention.

The intervention program's ability to increase perceived self-efficacy is significant because changing an eating habit requires long-term actions by the participants. The confidence in performing tasks to consume more calcium-rich food items is essential to enable such long-term behavior changes. In fact, Rosenstock, Strecher, and Becker (1988) felt that self-efficacy is so important to lifestyle change that they recommend it be added to the HBM. Indeed, a higher self-efficacy has been linked to higher calcium-intake. In their study of an osteoporosis intervention program, Tussing and Chapman-Novakofski (2005) found the increase in self-efficacy was significantly associated with the increase in calcium-intake.

Third, the study suggested that intervention program was useful to increase participants' intentions of consuming more calcium-rich food items. The proportion of participants who never thought about consuming more calcium-rich food items decreased from 12% at baseline to 6% at post-intervention in the Intervention Group. In contrast, the proportions at both time points remained the same in the Control Group. Similarly, the proportions of participants who perceived that they were currently consuming more calcium-rich food items increased from 36% at baseline to 41% at post-intervention in the Intervention Group but did not increase in the Control Group. The odds ratio (Intervention Group/Control Group) of being at a higher intention stage was 3.29 (p-value=0.018), adjusted for significant baseline variables at post-intervention. However, the study also found that this increase may not have sustained through Month 3 after the intervention. The distributions of the intention stage at Month 3 after the intervention were similar to that at baseline in the Intervention Group.

Additionally, there were indications that the intervention program increased the participants' perceived severity of osteoporosis. The observed mean severity scores in the Intervention Group were 0.41 at baseline but increased to 0.50 at post-intervention. The proportions of participants who perceived severity towards individual severity components were also increased substantially more in the Intervention Group as compared with the Control Group. From baseline to post-intervention, the increases in the Intervention Group were 14 percentage points for the proportion of participants who perceived their "whole life will change", 15 for those who perceived that they "won't be able to walk around", 7 for those who perceived that they "will loss height", and 13 for those who perceived that they "won't be able to do housework". The only proportion that did not increase was for participants who agreed with "It scares me to think that I may get osteoporosis"; it decreased 0.7 percentage points. The adjusted odds ratios (Intervention Group/Control Group) for these individual components were all >2. Even though the statistical significances were achieved for only three out of the five components, the changes in the Intervention Group may still be real and meaningful. It should be pointed out that the statistical significance depends on the number of participants in each study group. For a fixed difference, larger sample sizes tend to yield results that are more statistically significant. In our case, a larger sample size might have yielded significant results. Therefore, the non-significance results need to be viewed in the context of the magnitudes of the differences and the consistency of the differences in these endpoints. The large increases in the overall severity score and individual severity components, and the consistency of the changes lend evidences that the intervention program increased perceived severity of osteoporosis.

The intervention program did not seem to reduce the perceived barriers overall. The mean of the total barriers in the Intervention Group at post-intervention was not reduced from its baseline level. The changes regarding the seven individual barriers were not consistent with each other and did not suggest any intervention effects. The lack of intervention effect to reduce perceived barriers may in part due to the fact that the barrier levels were low at the baseline. The mean barrier scores at baseline were 0.22 and 0.18 in the Intervention Group and the Control Group, respectively. The proportions of participants who identified the potential barriers listed on the questionnaire were low (<20%) for five barriers. The exceptions were the two barriers for not knowing which food items were high in calcium and how to cook calcium-rich food items. Interestingly, the intervention program appeared to be effective regarding these two particular barriers. The proportions of participants who identified them as barriers were reduced in the Intervention Group from baseline to post-intervention: from 43% to 36% for not knowing which food items were high in calcium and from 49% to 33% for not knowing how to cook calcium-rich food items. The intervention program may be effective to reduce the true perceived barriers.

On the other hand, it seems that the intervention program did not increase participants' perceived susceptibility at post-intervention. The proportions of participants who were concerned that they might get osteoporosis or those who thought they were very likely to get osteoporosis did not change after the intervention program.

Additionally, our study found no increases in the number of calcium-rich food items consumed at Month 3 after the intervention, which was not entirely unexpected. The intervention programs that aimed at increasing calcium intake had mixed results.

While some showed no effects (Ribeiro & Blakeley, 2001; Sedlak, Doheny, & Jones, 2000), others reported significant increases (Brecher et al., 2002; Wong et al., 2004; Tussing & Chapman-Novakofski, 2005; Lv & Brown, 2010). A noted difference between the programs that worked and those who did not is that the ones worked were more interactive and over repeated sessions. For example, the program by Lv and Brown (2011) was six (6) weekly interactive sessions that each lasted 1.5 to 2 hours long. The programs by Tussing and Chapman-Novakofski (2005) had eight (8) weekly interactive lessons. Their lesson plans included games of guessing calcium contents of food items, and portion practices where the participants were asked to cut out a 1-oz chesses then weight it or to pour out an 8-oz of milk then measure it. They found their program increased calcium intake from 644 mg/day at baseline to 821 mg/day at post-intervention.

Furthermore, it may be of interest to note that this study found a significant proportion of participants consumed dairy products, despite a common condition of lactose intolerance. More than 80% of participants drank milk, more than 40% ate yogurt, and around 30% ate cheese. We could not, however, calculate the amount they consumed and consequently we could not determine whether or not the amount was large enough to contribute sufficiently to the recommended the dose of 1200 mg/day.

Limitations of the Study

Although the study indicated that the intervention program was effective in many ways, the study has some limitations. The mean age of the study population was about 70 years. Investigators who study intervention programs for elderly populations need to be mindful about the burden that the study procedures placed on the participants. To ease the

burden, the educational session was designed to be only about 30 minutes long. The need of data collection was balanced with its burden to participants. For example, a long questionnaire at baseline before the education session was balanced with a short post-intervention questionnaire. Similarly, we limited the number of items on the Month 3 questionnaire to avoid negative feelings towards completing the questionnaires and to encourage participants' responses. In doing so, however, some information was not collected at Month 3. For example, the knowledge level or self-efficacy was not measured at Month 3 so we were not able to assess whether the increased knowledge level or self-efficacy was maintained in a longer period.

Additionally, the FFQ we used in this study may not be appropriate for this population in the workshop setting. For each food item, the FFQ asks for three pieces of information: how many servings in what period (day, week, or month) and the serving size. Although women in the focus group and those who participated in the test-retest were able to provide the three pieces of the information for each food item, greater than 25% of the women in the workshop missed at least one piece of the information. Consequently, we were not able to calculate the amount of their calcium intakes.

Recommendations for Future Researches

Our intervention program provides a base for future investigations of an effective intervention program. It will be of interest to investigate whether incorporating interactive activities and reinforcement sessions can improve the intervention effectiveness of increasing dietary calcium intake.

As shown in Lv and Brown (2005), repeated interventions may be necessary for participants to take actions. It may be useful for future intervention programs to add weekly or bi-weekly reinforcement sessions. The main objective of these sessions can be to remind the participants of the key messages of osteoporosis intervention. The sessions can be of a short duration or even a phone call. These reinforce sessions may help participants maintain their increased intention to consume more calcium-rich food item during times after the intervention.

Additionally, interactive features may facilitate the learning process and increase self-efficacy (Tussing & Chapman-Navokofski, 2005). At the design stage, interactive activities for the intervention program, such as sharing personal experiences with osteoporosis, activities to learn how to read food labels, and pot-luck party with calcium-rich dishes, were considered. However, the organization leaders were reluctant to participate. They concerned about the time and effort it would take to plan and implement these activities. Given the limited budget and the deadline of the dissertation, these interactive activities were not implemented. However, future researchers may be able to incorporate these activities into their intervention programs and study the efforts of these interactive activities.

Future researchers may want to improve the FFQ we used in this study. Unless it is a small group setting, where participants' attention can be more easily directed to focus on answering questionnaires, the FFQ may not be suitable for use in this elderly population. It may be necessary to reduce the number of food items on the FFQ by including only items with higher calcium content. For each food item a participant consumes the FFQ asks three pieces of information. For elderly women, this may be too

much a mental burden for them to complete all three responses for all 23 food items. Although the reduction may result in less accurate estimates of calcium intake, it may yield more complete sets of responses to each food item which at least may provide some useful estimates.

Conclusions

The effectiveness of the intervention program was demonstrated in this quasi-experimental, 2-group parallel comparison study. The study showed that the intervention program, if designed and delivered properly for the characteristics of the target population, can increase the knowledge level of osteoporosis, self-efficacy for adopting a calcium-rich diet, and intention to consume more calcium-rich food items. The intervention program, while still needed some improvement, provides a useful tool for public health professionals to work with. Additionally, the elderly Chinese women living in the Greater Philadelphia area studied in this study in many ways resembled those living in other metropolitan cities, the findings from this study may reasonably be extended to them. The success of this intervention program shows that a culturally appropriate intervention program can be effective in elderly Chinese women with limited English proficiency and education level.

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Appendix A

Analysis of Associations Between the Post-Intervention Knowledge Items and Baseline Variables

Knowledge Item: Bone Cancer Can Be Caused By Osteoporosis

Variable	Odds Ratio (95% CI)	P-value
Study Group	0.24 (0.10, 0.58)	0.002
Baseline Response	3.66 (1.23, 10.87)	0.020
Baseline Efficacy Score	0.84 (0.75, 0.94)	0.003
Baseline Intention Stage	0.70 (0.54, 0.90)	0.005
Baseline Severity Score	1.03 (0.90, 1.17)	0.701
Baseline Barrier Score	1.03 (0.85, 1.24)	0.793
Baseline Being Concerned or Not	0.46 (0.19, 1.09)	0.079
Baseline Response to How likely (Agree/Other)	0.56 (0.24, 1.29)	0.172
Age	1.02 (0.97, 1.07)	0.457
Weight	1.00 (0.99, 1.02)	0.820
Reduced Height (Yes/No)	0.77 (0.32, 1.82)	0.547
BMD Measured (Yes/No)	1.01 (0.44, 2.34)	0.983
Taking Osteoporosis Medication (Yes/No)	0.71 (0.30, 1.72)	0.454
Last Health Check-Up (Reference=Never Checked)		
<12 Months	3.45 (0.81, 14.66)	0.093
>1 Year	1.92 (0.69, 5.37)	0.212
Taking Vitamin/Calcium (Yes/No)	0.45 (0.19, 1.08)	0.075
Taking HRT (Yes/No)	1.00 (0.11, 9.32)	1.000
Had Osteoporosis (Yes/No)	1.08 (0.48, 2.41)	0.854
Osteoporosis in Family (Yes/No)	0.35 (0.10, 1.31)	0.119
Years Lived in US	1.02 (0.99, 1.05)	0.264
Marital Status (Reference=Widow)	1.78 (0.78, 4.05)	0.171
Education Level (Reference=<Elementary School)		
<High School Graduate	0.59 (0.20, 1.78)	0.350
High School	0.72 (0.24, 2.19)	0.568
University and Above	0.36 (0.11, 1.15)	0.085
Employment Status (Reference=Homemaker)		
Employed	0.41 (0.09, 1.84)	0.244
Unemployed/Retired	0.45 (0.18, 1.12)	0.085
Income Level (At Least 10K/Below 10K)	1.38 (0.38, 5.02)	0.628
Health Insurance (Have/Not Have)	1.24 (0.46, 3.36)	0.675
English Proficiency (Reference=Not Well at All)		
Well/Very Well	0.71 (0.08, 6.50)	0.762
Not Well	0.90 (0.37, 2.20)	0.822
Internet Use (Yes/No)	3.95 (0.49, 31.76)	0.197

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Bone Fractures Can Be Caused By Osteoporosis

Variable	Odds Ratio (95% CI)	P-value
Study Group	1.76 (0.73, 4.25)	0.209
Baseline Response	4.34 (1.66, 11.34)	0.003
Baseline Efficacy Score	1.08 (0.96, 1.23)	0.214
Baseline Severity Score	1.01 (0.88, 1.16)	0.899
Baseline Barrier Score	0.94 (0.77, 1.15)	0.531
Baseline Intention Stage	0.96 (0.75, 1.24)	0.761
Baseline Being Concerned or Not	1.04 (0.41, 2.65)	0.939
Baseline Response to How likely (Agree/Other)	1.17 (0.47, 2.94)	0.734
Age	0.97 (0.92, 1.02)	0.249
Weight	1.01 (0.99, 1.03)	0.524
Reduced Height (Yes/No)	1.10 (0.44, 2.78)	0.836
BMD Measured (Yes/No)	1.17 (0.46, 2.98)	0.737
Taking Osteoporosis Medication (Yes/No)	1.21 (0.47, 3.10)	0.697
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.66 (0.16, 2.76)	0.573
>1 Year	1.19 (0.40, 3.55)	0.757
Taking Vitamin/Calcium (Yes/No)	1.36 (0.48, 3.81)	0.560
Taking HRT (Yes/No)	12E9 (0.00,) [1]	1.000
Had Osteoporosis (Yes/No)	1.31 (0.54, 3.16)	0.547
Osteoporosis in Family (Yes/No)	2.45 (0.66, 9.07)	0.180
Years Lived in US	0.98 (0.95, 1.02)	0.355
Marital Status (Reference=Widow)	0.83 (0.34, 2.06)	0.695
Education Level (Reference=<Elementary School)		
<High School Graduate	0.84 (0.26, 2.66)	0.763
High School	3.06 (0.59, 15.86)	0.183
University and Above	1.80 (0.51, 6.39)	0.363
Employment Status (Reference=Homemaker)		
Employed	0.80 (0.17, 3.84)	0.778
Unemployed/Retired	0.67 (0.23, 1.94)	0.461
Income Level (At Least 10K/Below 10K)	0.96 (0.26, 3.47)	0.948
Health Insurance (Have/Not Have)	1.34 (0.49, 3.69)	0.566
English Proficiency (Reference=Not Well at All)		
Well/Very Well	0.83 (0.09, 7.54)	0.871
Not Well	0.60 (0.24, 1.51)	0.276
Internet Use (Yes/No)	0.30 (0.04, 2.38)	0.252

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Sardine Is Rich In Calcium.

Variable	Odds Ratio (95% CI)	P-value
Study Group	6.61 (2.70, 16.17)	<.001
Baseline Response	32.50 (11.52, 91.64)	<.001
Baseline Intention Stage	1.28 (1.01, 1.62)	0.040
Reduced Height (Yes/No)	2.72 (1.07, 6.94)	0.036
Baseline Efficacy Score	1.07 (0.96, 1.19)	0.244
Baseline Severity Score	0.93 (0.81, 1.07)	0.301
Baseline Barrier Score	0.98 (0.79, 1.20)	0.826
Baseline Being Concerned or Not	1.20 (0.48, 2.98)	0.698
Baseline Response to How likely (Agree/Other)	0.89 (0.36, 2.22)	0.803
Age	1.04 (0.99, 1.09)	0.135
Weight	1.02 (1.00, 1.04)	0.051
BMD Measured (Yes/No)	1.34 (0.56, 3.21)	0.507
Taking Osteoporosis Medication (Yes/No)	0.96 (0.39, 2.40)	0.938
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.89 (0.39, 9.22)	0.434
>1 Year	0.66 (0.24, 1.82)	0.421
Taking Vitamin/Calcium (Yes/No)	0.59 (0.21, 1.70)	0.331
Taking HRT (Yes/No)	0.77 (0.09, 6.66)	0.812
Had Osteoporosis (Yes/No)	0.68 (0.29, 1.64)	0.394
Osteoporosis in Family (Yes/No)	1.56 (0.54, 4.48)	0.408
Years Lived in US	1.02 (0.98, 1.06)	0.279
Marital Status (Reference=Widow)	1.11 (0.44, 2.76)	0.830
Education Level (Reference=<Elementary School)		
<High School Graduate	1.69 (0.49, 5.81)	0.406
High School	1.31 (0.37, 4.67)	0.677
University and Above	0.83 (0.28, 2.49)	0.743
Employment Status (Reference=Homemaker)		
Employed	1.49 (0.32, 7.00)	0.616
Unemployed/Retired	1.55 (0.57, 4.19)	0.389
Income Level (At Least 10K/Below 10K)	2.00 (0.54, 7.43)	0.303
Health Insurance (Have/Not Have)	2.54 (0.91, 7.09)	0.075
English Proficiency (Reference= Not Well at All)		
Well/Very Well	3.12 (0.32, 30.22)	0.326
Not Well	1.25 (0.52, 3.01)	0.619
Internet Use (Yes/No)	1.73 (0.50, 5.94)	0.384

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Bachoy Is Rich In Calcium.

Variable	Odds Ratio (95% CI)	P-value
Study Group	5.27 (2.64, 10.53)	<.001
Baseline Response	7.42 (2.90, 19.02)	<.001
Baseline Efficacy Score	1.07 (0.97, 1.17)	0.160
Baseline Severity Score	0.95 (0.84, 1.06)	0.352
Baseline Barrier Score	1.03 (0.87, 1.22)	0.721
Baseline Intention Stage	1.04 (0.86, 1.25)	0.724
Baseline Being Concerned or Not	0.59 (0.27, 1.27)	0.175
Baseline Response to How likely (Agree/Other)	0.68 (0.32, 1.45)	0.319
Age	1.00 (0.96, 1.04)	0.907
Weight	1.00 (0.98, 1.02)	0.946
Reduced Height (Yes/No)	0.93 (0.46, 1.91)	0.852
BMD Measured (Yes/No)	1.00 (0.48, 2.08)	0.991
Taking Osteoporosis Medication (Yes/No)	0.95 (0.47, 1.93)	0.881
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.66 (0.42, 6.60)	0.470
>1 Year	1.54 (0.68, 3.45)	0.298
Taking Vitamin/Calcium (Yes/No)	0.69 (0.29, 1.62)	0.390
Taking HRT (Yes/No)	0.82 (0.12, 5.48)	0.836
Had Osteoporosis (Yes/No)	0.76 (0.38, 1.53)	0.441
Osteoporosis in Family (Yes/No)	1.48 (0.66, 3.33)	0.343
Years Lived in US	0.99 (0.96, 1.03)	0.702
Marital Status (Reference=Widow)	1.39 (0.67, 2.87)	0.370
Education Level (Reference=<Elementary School)		
<High School Graduate	0.54 (0.19, 1.54)	0.248
High School	0.54 (0.19, 1.54)	0.247
University and Above	0.54 (0.21, 1.42)	0.214
Employment Status (Reference=Homemaker)		
Employed	1.88 (0.57, 6.15)	0.297
Unemployed/Retired	1.10 (0.48, 2.52)	0.815
Income Level (At Least 10K/Below 10K)	1.35 (0.52, 3.49)	0.538
Health Insurance (Have/Not Have)	1.26 (0.55, 2.93)	0.584
English Proficiency (Reference=Not Well at All)		
Well/Very Well	0.49 (0.12, 2.08)	0.336
Not Well	1.02 (0.49, 2.13)	0.951
Internet Use (Yes/No)	1.56 (0.58, 4.18)	0.376

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Osteoporosis Is Caused By A Virus.

Variable	Odds Ratio (95% CI)	P-value
Study Group	0.70 (0.17, 2.90)	0.621
Baseline Response	16.25 (3.79, 69.62)	<.001
Baseline Efficacy Score	0.94 (0.81, 1.10)	0.442
Baseline Severity Score	1.04 (0.86, 1.25)	0.693
Baseline Barrier Score	1.01 (0.77, 1.32)	0.951
Baseline Intention Stage	0.83 (0.59, 1.16)	0.266
Baseline Being Concerned or Not	0.76 (0.21, 2.71)	0.670
Baseline Response to How likely (Agree/Other)	1.33 (0.35, 5.09)	0.681
Age	1.03 (0.96, 1.10)	0.462
Weight	1.01 (0.99, 1.04)	0.348
Reduced Height (Yes/No)	0.64 (0.17, 2.41)	0.513
BMD Measured (Yes/No)	0.57 (0.16, 2.04)	0.384
Taking Osteoporosis Medication (Yes/No)	0.70 (0.18, 2.70)	0.607
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.93 (0.10, 8.39)	0.945
>1 Year	1.45 (0.32, 6.50)	0.626
Taking Vitamin/Calcium (Yes/No)	4.66 (0.50, 43.05)	0.175
Taking HRT (Yes/No)	0.00 (0.00,) [1]	1.000
Had Osteoporosis (Yes/No)	0.88 (0.26, 2.95)	0.840
Osteoporosis in Family (Yes/No)	0.60 (0.11, 3.16)	0.549
Years Lived in US	0.99 (0.93, 1.05)	0.681
Marital Status (Reference=Widow)	1.01 (0.30, 3.40)	0.982
Education Level (Reference=<Elementary School)		
<High School Graduate	0.32 (0.06, 1.70)	0.182
High School	0.17 (0.02, 1.67)	0.129
University and Above	0.15 (0.02, 1.38)	0.094
Employment Status (Reference=Homemaker)		
Employed	0.00 (0.00,) [1]	1.000
Unemployed/Retired	0.55 (0.16, 1.92)	0.346
Income Level (At Least 10K/Below 10K)	0.00 (0.00,) [1]	1.000
Health Insurance (Have/Not Have)	0.76 (0.17, 3.36)	0.719
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.00 (0.00,) [1]	1.000
Not Well	0.26 (0.06, 1.14)	0.074

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Osteoporosis Can Be Diagnosed By A Bone Mineral Density Test.

Variable	Odds Ratio (95% CI)	P-value
Study Group	1.78 (0.70, 4.54)	0.227
Baseline Response	11.30 (4.49, 28.46)	<.001
Baseline Efficacy Score	1.27 (1.09, 1.49)	0.002
Baseline Severity Score	0.84 (0.73, 0.97)	0.021
Baseline Barrier Score	0.92 (0.74, 1.14)	0.448
Baseline Intention Stage	1.18 (0.92, 1.52)	0.200
Baseline Being Concerned or Not	0.47 (0.16, 1.40)	0.175
Baseline Response to How likely (Agree/Other)	1.07 (0.40, 2.88)	0.888
Age	1.01 (0.96, 1.06)	0.825
Weight	1.01 (0.99, 1.04)	0.244
Reduced Height (Yes/No)	1.67 (0.56, 4.94)	0.355
BMD Measured (Yes/No)	2.14 (0.72, 6.40)	0.172
Taking Osteoporosis Medication (Yes/No)	1.45 (0.55, 3.83)	0.451
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.65 (0.26, 10.46)	0.596
>1 Year	1.04 (0.36, 3.00)	0.944
Taking Vitamin/Calcium (Yes/No)	0.85 (0.27, 2.63)	0.772
Taking HRT (Yes/No)	1.46 (0.14, 15.66)	0.753
Had Osteoporosis (Yes/No)	1.02 (0.40, 2.58)	0.964
Osteoporosis in Family (Yes/No)	1.28 (0.39, 4.20)	0.686
Years Lived in US	0.98 (0.94, 1.02)	0.276
Marital Status (Reference=Widow)	0.77 (0.30, 2.00)	0.592
Education Level (Reference=<Elementary School)		
<High School Graduate	0.90 (0.25, 3.25)	0.872
High School	2.04 (0.51, 8.16)	0.316
University and Above	2.32 (0.58, 9.25)	0.235
Employment Status (Reference=Homemaker)		
Employed	0.85 (0.21, 3.40)	0.820
Unemployed/Retired	2.35 (0.82, 6.72)	0.110
Income Level (At Least 10K/Below 10K)	3.06 (0.59, 15.97)	0.184
Health Insurance (Have/Not Have)	1.04 (0.35, 3.09)	0.939
English Proficiency (Reference= Not Well at All)		
Well/Very Well	1.55 (0.15, 15.49)	0.710
Not Well	0.90 (0.33, 2.40)	0.826
Internet Use (Yes/No)	0.85 (0.22, 3.25)	0.817

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Being Overweight Will Increase My Chance Of Getting Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	0.60 (0.30, 1.21)	0.150
Baseline Response	10.04 (4.90, 20.55)	<.001
Baseline Response to How likely (Agree/Other)	0.38 (0.17, 0.87)	0.021
Weight	1.03 (1.01, 1.06)	0.002
Baseline Efficacy Score	1.00 (0.91, 1.10)	0.928
Baseline Severity Score	0.91 (0.80, 1.03)	0.133
Baseline Barrier Score	0.99 (0.83, 1.18)	0.909
Baseline Intention Stage	1.15 (0.94, 1.39)	0.166
Baseline Being Concerned or Not	1.27 (0.60, 2.70)	0.536
Age	1.00 (0.97, 1.04)	0.845
Reduced Height (Yes/No)	1.29 (0.62, 2.69)	0.497
BMD Measured (Yes/No)	1.60 (0.76, 3.37)	0.216
Taking Osteoporosis Medication (Yes/No)	1.46 (0.70, 3.02)	0.312
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.53 (0.11, 2.42)	0.408
>1 Year	0.99 (0.44, 2.22)	0.975
Taking Vitamin/Calcium (Yes/No)	1.13 (0.48, 2.66)	0.784
Taking HRT (Yes/No)	1.30 (0.23, 7.21)	0.764
Had Osteoporosis (Yes/No)	1.26 (0.63, 2.55)	0.515
Osteoporosis in Family (Yes/No)	2.28 (0.98, 5.31)	0.056
Years Lived in US	0.97 (0.94, 1.01)	0.155
Marital Status (Reference=Widow)	1.50 (0.72, 3.14)	0.280
Education Level (Reference=<Elementary School)		
<High School Graduate	0.69 (0.23, 2.02)	0.496
High School	0.82 (0.28, 2.41)	0.716
University and Above	0.64 (0.24, 1.67)	0.359
Employment Status (Reference=Homemaker)		
Employed	1.00 (0.28, 3.52)	0.999
Unemployed/Retired	0.82 (0.35, 1.95)	0.654
Income Level (At Least 10K/Below 10K)	1.00 (0.36, 2.74)	0.994
Health Insurance (Have/Not Have)	1.53 (0.64, 3.63)	0.338
English Proficiency (Reference=Not Well at All)		
Well/Very Well	0.67 (0.15, 2.89)	0.589
Not Well	0.55 (0.26, 1.20)	0.135
Internet Use (Yes/No)	1.25 (0.45, 3.48)	0.675

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Getting Enough Vitamin D Will Decrease My Chance Of Getting
Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	3.29 (1.42, 7.63)	0.005
Baseline Response	9.48 (4.06, 22.12)	<.001
Education Level (Reference=<Elementary School)		
<High School Graduate	0.93 (0.32, 2.76)	0.902
High School	0.69 (0.23, 2.04)	0.499
University and Above	3.70 (1.01, 13.54)	0.048
Baseline Efficacy Score	1.08 (0.98, 1.21)	0.134
Baseline Severity Score	0.99 (0.88, 1.12)	0.905
Baseline Barrier Score	0.91 (0.75, 1.11)	0.358
Baseline Intention Stage	1.03 (0.83, 1.28)	0.795
Baseline Being Concerned or Not	0.53 (0.22, 1.26)	0.150
Baseline Response to How likely (Agree/Other)	1.03 (0.44, 2.37)	0.951
Age	0.99 (0.95, 1.04)	0.717
Weight	1.00 (0.98, 1.02)	0.970
Reduced Height (Yes/No)	1.76 (0.69, 4.48)	0.235
BMD Measured (Yes/No)	1.16 (0.50, 2.71)	0.733
Taking Osteoporosis Medication (Yes/No)	0.88 (0.38, 2.03)	0.764
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.36 (0.09, 1.38)	0.136
>1 Year	0.93 (0.37, 2.34)	0.872
Taking Vitamin/Calcium (Yes/No)	1.61 (0.66, 3.90)	0.295
Taking HRT (Yes/No)	2.53 (0.27, 23.74)	0.417
Had Osteoporosis (Yes/No)	0.53 (0.23, 1.21)	0.131
Osteoporosis in Family (Yes/No)	1.27 (0.49, 3.30)	0.620
Years Lived in US	0.99 (0.96, 1.03)	0.734
Marital Status (Reference=Widow)	0.77 (0.34, 1.72)	0.521
Employment Status (Reference=Homemaker)		
Employed	1.46 (0.39, 5.49)	0.576
Unemployed/Retired	2.21 (0.92, 5.29)	0.076
Income Level (At Least 10K/Below 10K)	1.49 (0.41, 5.46)	0.549
Health Insurance (Have/Not Have)	1.04 (0.41, 2.68)	0.929
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.56 (0.09, 3.28)	0.517
Not Well	1.47 (0.63, 3.42)	0.372
Internet Use (Yes/No)	1.03 (0.29, 3.66)	0.967

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Eating Red Meat Will Decrease My Chance of Getting Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.41 (1.04, 5.56)	0.039
Baseline Response	7.67 (3.22, 18.23)	<.001
Weight	1.02 (1.00, 1.04)	0.048
Baseline Efficacy Score	1.01 (0.91, 1.13)	0.803
Baseline Severity Score	0.98 (0.86, 1.13)	0.823
Baseline Barrier Score	1.03 (0.85, 1.25)	0.757
Baseline Intention Stage	1.08 (0.87, 1.35)	0.476
Baseline Being Concerned or Not	2.76 (0.98, 7.80)	0.055
Baseline Response to How likely (Agree/Other)	1.50 (0.59, 3.82)	0.397
Age	1.04 (0.99, 1.09)	0.092
Reduced Height (Yes/No)	1.71 (0.74, 3.97)	0.210
BMD Measured (Yes/No)	1.25 (0.54, 2.88)	0.601
Taking Osteoporosis Medication (Yes/No)	0.79 (0.34, 1.84)	0.585
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.82 (0.17, 3.98)	0.808
>1 Year	1.03 (0.41, 2.58)	0.955
Taking Vitamin/Calcium (Yes/No)	2.53 (0.83, 7.71)	0.103
Taking HRT (Yes/No)	0.65 (0.07, 5.85)	0.697
Had Osteoporosis (Yes/No)	0.85 (0.38, 1.89)	0.687
Osteoporosis in Family (Yes/No)	0.93 (0.35, 2.49)	0.892
Years Lived in US	1.02 (0.98, 1.06)	0.272
Marital Status (Reference=Widow)	1.47 (0.64, 3.38)	0.366
Education Level (Reference=<Elementary School)		
<High School Graduate	0.42 (0.11, 1.60)	0.205
High School	0.30 (0.07, 1.26)	0.099
University and Above	1.11 (0.39, 3.13)	0.850
Employment Status (Reference=Homemaker)		
Employed	0.83 (0.17, 4.05)	0.814
Unemployed/Retired	1.26 (0.46, 3.47)	0.656
Income Level (At Least 10K/Below 10K)	0.45 (0.12, 1.63)	0.222
Health Insurance (Have/Not Have)	0.76 (0.28, 2.07)	0.597
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.92 (0.16, 5.16)	0.925
Not Well	1.09 (0.45, 2.63)	0.853
Internet Use (Yes/No)	0.42 (0.14, 1.22)	0.110

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Taking Estrogen After Menopause Will Decrease My Chance Of
Getting Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	3.21 (1.49, 6.89)	0.003
Baseline Response	12.75 (5.62, 28.93)	<.001
Baseline Efficacy Score	1.13 (1.01, 1.26)	0.030
Baseline Severity Score	0.92 (0.81, 1.05)	0.223
Baseline Barrier Score	1.03 (0.86, 1.22)	0.759
Baseline Intention Stage	1.15 (0.93, 1.41)	0.202
Baseline Being Concerned or Not	1.15 (0.52, 2.55)	0.726
Baseline Response to How likely (Agree/Other)	0.79 (0.36, 1.74)	0.561
Age	0.96 (0.92, 1.00)	0.065
Weight	1.02 (1.00, 1.03)	0.092
Reduced Height (Yes/No)	1.03 (0.48, 2.24)	0.938
BMD Measured (Yes/No)	1.28 (0.60, 2.76)	0.521
Taking Osteoporosis Medication (Yes/No)	0.83 (0.39, 1.79)	0.643
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.54 (0.12, 2.46)	0.424
>1 Year	0.76 (0.33, 1.76)	0.529
Taking Vitamin/Calcium (Yes/No)	0.98 (0.41, 2.38)	0.972
Taking HRT (Yes/No)	3.28 (0.64, 16.81)	0.155
Had Osteoporosis (Yes/No)	1.63 (0.75, 3.51)	0.215
Osteoporosis in Family (Yes/No)	0.75 (0.30, 1.85)	0.530
Years Lived in US	0.97 (0.94, 1.01)	0.123
Marital Status (Reference=Widow)	1.60 (0.74, 3.44)	0.229
Education Level (Reference=<Elementary School)		
<High School Graduate	1.14 (0.36, 3.64)	0.820
High School	1.74 (0.56, 5.45)	0.338
University and Above	1.81 (0.66, 4.99)	0.250
Employment Status (Reference=Homemaker)		
Employed	1.67 (0.46, 6.10)	0.435
Unemployed/Retired	1.19 (0.46, 3.05)	0.721
Income Level (At Least 10K/Below 10K)	1.05 (0.39, 2.88)	0.917
Health Insurance (Have/Not Have)	0.82 (0.33, 2.08)	0.681
English Proficiency (Reference= Not Well at All)		
Well/Very Well	4.35 (0.96, 19.63)	0.056
Not Well	1.73 (0.78, 3.82)	0.176
Internet Use (Yes/No)	0.76 (0.26, 2.17)	0.605

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Wearing Properly Fitted Shoes Will Decrease My Chance Of Getting
Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	0.97 (0.47, 1.99)	0.924
Baseline Response	9.97 (4.56, 21.78)	<.001
Baseline Severity Score	1.14 (1.01, 1.29)	0.029
Baseline Efficacy Score	0.98 (0.89, 1.07)	0.629
Baseline Barrier Score	0.93 (0.78, 1.11)	0.430
Baseline Intention Stage	0.98 (0.81, 1.19)	0.861
Baseline Being Concerned or Not	1.20 (0.55, 2.62)	0.655
Baseline Response to How likely (Agree/Other)	1.11 (0.50, 2.46)	0.803
Age	1.00 (0.96, 1.04)	0.908
Weight	1.01 (0.99, 1.02)	0.481
Reduced Height (Yes/No)	1.95 (0.94, 4.05)	0.072
BMD Measured (Yes/No)	1.49 (0.69, 3.25)	0.310
Taking Osteoporosis Medication (Yes/No)	1.93 (0.93, 4.01)	0.078
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.91 (0.23, 3.61)	0.890
>1 Year	0.93 (0.42, 2.07)	0.865
Taking Vitamin/Calcium (Yes/No)	1.45 (0.58, 3.65)	0.428
Taking HRT (Yes/No)	0.87 (0.14, 5.49)	0.884
Had Osteoporosis (Yes/No)	1.90 (0.92, 3.95)	0.084
Osteoporosis in Family (Yes/No)	1.98 (0.87, 4.52)	0.103
Years Lived in US	1.03 (0.99, 1.07)	0.098
Marital Status (Reference=Widow)	1.06 (0.51, 2.19)	0.874
Education Level (Reference=<Elementary School)		
<High School Graduate	1.19 (0.42, 3.32)	0.744
High School	0.60 (0.20, 1.84)	0.370
University and Above	0.58 (0.22, 1.52)	0.266
Employment Status (Reference=Homemaker)		
Employed	0.86 (0.24, 3.11)	0.813
Unemployed/Retired	1.17 (0.50, 2.75)	0.723
Income Level (At Least 10K/Below 10K)	1.13 (0.41, 3.09)	0.819
Health Insurance (Have/Not Have)	1.04 (0.42, 2.58)	0.926
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.87 (0.19, 4.06)	0.862
Not Well	0.82 (0.38, 1.77)	0.610
Internet Use (Yes/No)	1.75 (0.58, 5.33)	0.322

Analysis of Associations Between the Post-Intervention Knowledge Items
and Baseline Variables (Continued)

Knowledge Item: Walking Will Decrease My Chance Of Getting Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.26 (1.05, 4.83)	0.036
Baseline Response	6.19 (2.86, 13.40)	<.001
Baseline Barrier Score	0.82 (0.69, 0.98)	0.027
BMD Measured (Yes/No)	2.58 (1.13, 5.91)	0.025
Education Level (Reference=<Elementary School)		
<High School Graduate	0.63 (0.19, 2.10)	0.453
High School	0.68 (0.18, 2.51)	0.559
University and Above	0.31 (0.10, 0.95)	0.041
Baseline Efficacy Score	1.00 (0.91, 1.10)	0.985
Baseline Severity Score	1.00 (0.88, 1.14)	0.951
Baseline Intention Stage	0.92 (0.74, 1.13)	0.400
Baseline Being Concerned or Not	0.66 (0.29, 1.52)	0.329
Baseline Response to How likely (Agree/Other)	1.20 (0.54, 2.65)	0.655
Age	1.03 (0.99, 1.08)	0.155
Weight	1.00 (0.98, 1.01)	0.646
Reduced Height (Yes/No)	1.18 (0.53, 2.64)	0.686
Taking Osteoporosis Medication (Yes/No)	1.69 (0.74, 3.84)	0.214
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.92 (0.22, 3.73)	0.902
>1 Year	1.08 (0.44, 2.63)	0.863
Taking Vitamin/Calcium (Yes/No)	0.75 (0.30, 1.89)	0.539
Taking HRT (Yes/No)	0.80 (0.12, 5.13)	0.809
Had Osteoporosis (Yes/No)	1.97 (0.92, 4.23)	0.082
Osteoporosis in Family (Yes/No)	1.31 (0.52, 3.27)	0.568
Years Lived in US	1.04 (1.00, 1.07)	0.061
Marital Status (Reference=Widow)	2.13 (0.93, 4.87)	0.072
Employment Status (Reference=Homemaker)		
Employed	0.60 (0.17, 2.12)	0.430
Unemployed/Retired	0.83 (0.35, 1.98)	0.673
Income Level (At Least 10K/Below 10K)	0.76 (0.26, 2.20)	0.614
Health Insurance (Have/Not Have)	1.57 (0.62, 3.96)	0.338
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.37 (0.08, 1.71)	0.203
Not Well	0.84 (0.38, 1.85)	0.657
Internet Use (Yes/No)	2.81 (0.99, 7.93)	0.051
<p>[1] Models for these variables did not converge so the estimates and p-values are not reliable. P-values are for testing the significance of odds ratio being 1 for no difference. Models evaluating individual variables besides baseline response and study group all included the variables for baseline agreement and study group. BMD=Bone mineral density. CI=Confidence interval. HRT=Hormone Replacement Therapy. Other=Disagree and Do Not Know combined.</p>		

Appendix B

Analysis of Associations Between the Post-Intervention Self-Efficacy Items and Baseline Variables

Self-Efficacy Item: I Can Find Calcium Contents From Food Labels.

Variable	Odds Ratio (95% CI)	P-value
Study Group	4.64 (2.25, 9.57)	<.001
Baseline Response	0.18 (0.09, 0.36)	<.001
Baseline Efficacy Score	1.21 (1.06, 1.39)	0.005
Baseline Intention Stage	1.41 (1.13, 1.75)	0.002
BMD Measured (Yes/No)	2.47 (1.17, 5.22)	0.018
Taking Vitamin/Calcium (Yes/No)	2.36 (1.02, 5.43)	0.044
Osteoporosis in Family (Yes/No)	2.72 (1.06, 6.99)	0.037
Baseline Severity Score	0.94 (0.84, 1.06)	0.333
Baseline Barrier Score	0.93 (0.78, 1.11)	0.430
Baseline Being Concerned or Not	0.82 (0.38, 1.76)	0.610
Baseline Response to How likely (Agree/Other)	1.15 (0.54, 2.46)	0.721
Age	0.99 (0.95, 1.03)	0.684
Weight	1.00 (0.98, 1.01)	0.632
Reduced Height (Yes/No)	1.25 (0.59, 2.65)	0.555
Taking Osteoporosis Medication (Yes/No)	1.79 (0.84, 3.81)	0.128
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.33 (0.08, 1.28)	0.107
>1 Year	1.13 (0.49, 2.61)	0.774
Taking HRT (Yes/No)	3.43 (0.39, 30.23)	0.267
Had Osteoporosis (Yes/No)	1.95 (0.95, 3.99)	0.069
Years Lived in US	0.97 (0.94, 1.01)	0.112
Marital Status (Reference=Widow)	1.12 (0.54, 2.35)	0.758
Education Level (Reference=<Elementary School)		
<High School Graduate	0.44 (0.16, 1.23)	0.119
High School	0.90 (0.30, 2.73)	0.856
University and Above	1.73 (0.61, 4.89)	0.304
Employment Status (Reference=Homemaker)		
Employed	0.87 (0.25, 3.02)	0.832
Unemployed/Retired	1.62 (0.71, 3.72)	0.250
Income Level (At Least 10K/Below 10K)	1.27 (0.43, 3.73)	0.663
Health Insurance (Have/Not Have)	2.27 (0.97, 5.32)	0.060
English Proficiency (Reference= Not Well at All)		
Well/Very Well	2.28 (0.40, 13.13)	0.355
Not Well	1.53 (0.71, 3.30)	0.275
Internet Use (Yes/No)	1.06 (0.37, 3.08)	0.912

Analysis of Associations Between the Post-Intervention Self-Efficacy Items
and Baseline Variables (Continued)

Self-Efficacy Item: I Know Which Food Items Are High In Calcium Content.

Variable	Odds Ratio (95% CI)	P-value
Study Group	4.47 (2.17, 9.18)	<.001
Baseline Response	0.14 (0.07, 0.30)	<.001
Baseline Severity Score	0.89 (0.79, 0.99)	0.037
BMD Measured (Yes/No)	2.08 (1.02, 4.24)	0.045
Employment Status (Reference=Homemaker)		
Employed	5.29 (1.53, 18.28)	0.008
Unemployed/Retired	2.30 (1.03, 5.13)	0.043
Income Level (At Least 10K/Below 10K)	3.32 (1.19, 9.25)	0.022
Baseline Efficacy Score	1.16 (1.00, 1.35)	0.053
Baseline Barrier Score	0.86 (0.73, 1.01)	0.068
Baseline Intention Stage	1.15 (0.94, 1.41)	0.174
Baseline Being Concerned or Not	0.73 (0.35, 1.52)	0.407
Baseline Response to How likely (Agree/Other)	0.86 (0.41, 1.81)	0.690
Age	0.99 (0.95, 1.03)	0.576
Weight	1.00 (0.98, 1.01)	0.790
Reduced Height (Yes/No)	0.82 (0.41, 1.64)	0.575
Taking Osteoporosis Medication (Yes/No)	1.61 (0.80, 3.24)	0.184
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.78 (0.21, 2.95)	0.716
>1 Year	1.68 (0.77, 3.67)	0.196
Taking Vitamin/Calcium (Yes/No)	1.93 (0.86, 4.34)	0.113
Taking HRT (Yes/No)	1.19 (0.24, 5.95)	0.836
Had Osteoporosis (Yes/No)	1.53 (0.78, 2.99)	0.217
Osteoporosis in Family (Yes/No)	1.99 (0.88, 4.52)	0.100
Years Lived in US	0.98 (0.95, 1.01)	0.296
Marital Status (Reference=Widow)	0.98 (0.48, 1.99)	0.950
Education Level (Reference=<Elementary School)		
<High School Graduate	0.65 (0.23, 1.89)	0.432
High School	1.21 (0.42, 3.50)	0.726
University and Above	1.45 (0.57, 3.68)	0.436
Health Insurance (Have/Not Have)	2.01 (0.87, 4.66)	0.105
English Proficiency (Reference= Not Well at All)		
Well/Very Well	3.06 (0.70, 13.43)	0.139
Not Well	1.54 (0.75, 3.17)	0.243
Internet Use (Yes/No)	1.08 (0.43, 2.74)	0.873

Analysis of Associations Between the Post-Intervention Self-Efficacy Items
and Baseline Variables (Continued)

Self-Efficacy Item: Consuming Calcium-Rich Food Is Not Difficult.

Variable	Odds Ratio (95% CI)	P-value
Study Group	4.85 (2.34, 10.05)	<.001
Baseline Response	0.28 (0.14, 0.57)	<.001
Employment Status (Reference=Homemaker)		
Employed	1.61 (0.48, 5.43)	0.442
Unemployed/Retired	4.61 (1.98, 10.76)	<.001
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.66 (0.15, 2.89)	0.579
Not Well	3.24 (1.45, 7.28)	0.004
Baseline Efficacy Score	1.14 (0.99, 1.32)	0.068
Baseline Severity Score	1.00 (0.89, 1.12)	0.940
Baseline Barrier Score	1.09 (0.91, 1.30)	0.363
Baseline Intention Stage	1.06 (0.87, 1.30)	0.557
Baseline Being Concerned or Not	0.83 (0.38, 1.79)	0.627
Baseline Response to How likely (Agree/Other)	1.19 (0.56, 2.53)	0.655
Age	1.02 (0.98, 1.06)	0.340
Weight	1.00 (0.98, 1.02)	0.976
Reduced Height (Yes/No)	1.21 (0.58, 2.50)	0.609
BMD Measured (Yes/No)	2.10 (0.99, 4.45)	0.053
Taking Osteoporosis Medication (Yes/No)	1.30 (0.63, 2.70)	0.478
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.48 (0.13, 1.83)	0.281
>1 Year	1.43 (0.63, 3.23)	0.393
Taking Vitamin/Calcium (Yes/No)	1.43 (0.62, 3.29)	0.399
Taking HRT (Yes/No)	1.21 (0.20, 7.33)	0.834
Had Osteoporosis (Yes/No)	1.66 (0.82, 3.38)	0.160
Osteoporosis in Family (Yes/No)	2.02 (0.82, 4.92)	0.124
Years Lived in US	1.00 (0.97, 1.03)	0.888
Marital Status (Reference=Widow)	0.95 (0.46, 1.96)	0.881
Education Level (Reference=<Elementary School)		
<High School Graduate	0.79 (0.29, 2.18)	0.653
High School	1.55 (0.51, 4.72)	0.441
University and Above	1.05 (0.39, 2.83)	0.921
Income Level (At Least 10K/Below 10K)	1.58 (0.49, 5.10)	0.441
Health Insurance (Have/Not Have)	1.45 (0.63, 3.33)	0.379
Internet Use (Yes/No)	1.56 (0.55, 4.43)	0.405

Analysis of Associations Between the Post-Intervention Self-Efficacy Items
and Baseline Variables (Continued)

Self-Efficacy Item: I Know How To Select Appropriate Food To Increase My Calcium
Intake.

Variable	Odds Ratio (95% CI)	P-value
Study Group	5.18 (2.45, 10.97)	<.001
Baseline Response	0.19 (0.09, 0.39)	<.001
Baseline Efficacy Score	1.28 (1.09, 1.51)	0.003
BMD Measured (Yes/No)	2.78 (1.29, 5.98)	0.009
Osteoporosis in Family (Yes/No)	2.69 (1.04, 6.97)	0.041
English Proficiency (Reference= Not Well at All)		
Well/Very Well	1.28 (0.27, 6.13)	0.761
Not Well	2.42 (1.10, 5.32)	0.028
Baseline Severity Score	1.03 (0.92, 1.16)	0.584
Baseline Barrier Score	0.88 (0.74, 1.05)	0.155
Baseline Intention Stage	1.18 (0.95, 1.47)	0.133
Baseline Being Concerned or Not	1.03 (0.48, 2.19)	0.948
Baseline Response to How likely (Agree/Other)	1.22 (0.58, 2.57)	0.607
Age	1.01 (0.97, 1.06)	0.482
Weight	1.00 (0.99, 1.02)	0.555
Reduced Height (Yes/No)	1.58 (0.75, 3.31)	0.229
Taking Osteoporosis Medication (Yes/No)	1.28 (0.61, 2.69)	0.508
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.29 (0.08, 1.09)	0.067
>1 Year	1.13 (0.49, 2.60)	0.766
Taking Vitamin/Calcium (Yes/No)	1.71 (0.76, 3.86)	0.197
Taking HRT (Yes/No)	1.11 (0.17, 7.16)	0.914
Had Osteoporosis (Yes/No)	1.87 (0.92, 3.81)	0.086
Years Lived in US	0.99 (0.96, 1.02)	0.433
Marital Status (Reference=Widow)	0.67 (0.33, 1.39)	0.284
Education Level (Reference=<Elementary School)		
<High School Graduate	0.64 (0.24, 1.74)	0.384
High School	1.38 (0.46, 4.10)	0.565
University and Above	1.65 (0.60, 4.50)	0.331
Employment Status (Reference=Homemaker)		
Employed	1.05 (0.33, 3.35)	0.929
Unemployed/Retired	2.10 (0.92, 4.77)	0.078
Income Level (At Least 10K/Below 10K)	1.95 (0.63, 5.99)	0.245
Health Insurance (Have/Not Have)	1.73 (0.76, 3.95)	0.191
Internet Use (Yes/No)	1.34 (0.47, 3.86)	0.588

Analysis of Associations Between the Post-Intervention Self-Efficacy Items
and Baseline Variables (Continued)

Self-Efficacy Item: I Can Eat Calcium-Rich Food On A Regular Basis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.43 (1.13, 5.22)	0.023
Baseline Response	0.10 (0.04, 0.23)	<.001
Baseline Efficacy Score	1.18 (1.01, 1.37)	0.035
Osteoporosis in Family (Yes/No)	3.05 (1.06, 8.81)	0.039
Employment Status (Reference=Homemaker)		
Employed	2.24 (0.59, 8.56)	0.239
Unemployed/Retired	2.71 (1.13, 6.50)	0.026
English Proficiency (Reference= Not Well at All)		
Well/Very Well	1.91 (0.32, 11.42)	0.478
Not Well	3.21 (1.34, 7.65)	0.009
Baseline Severity Score	1.05 (0.93, 1.19)	0.446
Baseline Barrier Score	0.98 (0.82, 1.18)	0.862
Baseline Intention Stage	1.14 (0.89, 1.46)	0.289
Baseline Being Concerned or Not	1.22 (0.54, 2.74)	0.638
Baseline Response to How likely (Agree/Other)	1.00 (0.44, 2.29)	0.999
Age	1.00 (0.96, 1.05)	0.883
Weight	1.01 (0.99, 1.03)	0.256
Reduced Height (Yes/No)	2.08 (0.91, 4.76)	0.082
BMD Measured (Yes/No)	1.58 (0.71, 3.51)	0.266
Taking Osteoporosis Medication (Yes/No)	1.06 (0.48, 2.33)	0.886
Last Health Check-Up (Reference=Never Checked)		
<12 Months	2.43 (0.57, 10.40)	0.231
>1 Year	2.15 (0.85, 5.44)	0.105
Taking Vitamin/Calcium (Yes/No)	2.09 (0.87, 5.02)	0.099
Taking HRT (Yes/No)	1.02 (0.15, 6.74)	0.988
Had Osteoporosis (Yes/No)	0.99 (0.46, 2.14)	0.988
Years Lived in US	1.02 (0.99, 1.05)	0.242
Marital Status (Reference=Widow)	0.83 (0.38, 1.79)	0.629
Education Level (Reference=<Elementary School)		
<High School Graduate	1.27 (0.42, 3.86)	0.677
High School	1.43 (0.45, 4.60)	0.545
University and Above	1.19 (0.40, 3.51)	0.755
Income Level (At Least 10K/Below 10K)	1.16 (0.36, 3.71)	0.802
Health Insurance (Have/Not Have)	1.98 (0.82, 4.80)	0.129
Internet Use (Yes/No)	1.00 (0.32, 3.07)	0.993
P-values are for testing the significance of odds ratio being 1 for no difference.		
Models evaluating individual variables besides baseline efficacy score and study group all included the variables for baseline agreement and study group.		
BMD=Bone mineral density. CI=Confidence interval. HRT=Hormone Replacement Therapy.		
Other=Disagree and Do Not Know combined.		

Appendix C

Analysis of Associations Between the Post-Intervention Severity Items and Baseline Variables

Severity Item: It scares Me to Think That I May Get Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.04 (1.17, 3.56)	0.012
Baseline Response	14.09 (6.41, 30.97)	<.001
Baseline Knowledge Score	0.83 (0.74, 0.93)	0.002
Baseline Efficacy Score	0.91 (0.84, 0.99)	0.025
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	0.40 (0.10, 1.63)	0.202
Thinking About It	1.05 (0.22, 4.89)	0.953
Will Do So Next Month	0.07 (0.00, 1.13)	0.061
Will Do So Next Week	0.24 (0.08, 0.71)	0.010
Doing So Currently	1.09 (0.20, 5.93)	0.916
Weight	0.98 (0.97, 1.00)	0.019
Marital Status (Reference=Widow)		
Married	0.62 (0.24, 1.57)	0.314
Never Married	2.95 (1.10, 7.95)	0.032
Divorced/Separated	0.18 (0.06, 0.53)	0.002
Employment Status (Reference=Homemaker)		
Employed	0.64 (0.14, 3.06)	0.579
Unemployed/Retired	0.40 (0.23, 0.70)	0.001
Age	0.98 (0.94, 1.03)	0.433
Reduced Height (Yes/No)	1.47 (0.73, 2.96)	0.282
BMD Measured (Yes/No)	1.17 (0.67, 2.06)	0.582
Taking Osteoporosis Medication (Yes/No)	1.24 (0.58, 2.63)	0.582
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.44 (0.49, 4.23)	0.503
>1 Year	1.66 (0.39, 7.16)	0.495
>3 Years	2.19 (0.92, 5.24)	0.077
Taking Vitamin/Calcium (Yes/No)	1.50 (0.42, 5.38)	0.530
Taking HRT (Yes/No)	1.74 (0.91, 3.31)	0.094
Had Osteoporosis (Yes/No)	1.74 (0.62, 4.87)	0.294
Osteoporosis in Family (Yes/No)	1.25 (0.39, 3.98)	0.709
Years Lived in US	0.99 (0.96, 1.01)	0.222
Education Level (Reference=<Elementary School)		
Graduate and above	0.39 (0.00, 72.34)	0.725
University	0.43 (0.18, 1.00)	0.050
High School	0.61 (0.15, 2.39)	0.473
<High School Graduate	0.41 (0.13, 1.36)	0.145
Income Level (At Least 10K/Below 10K)	0.65 (0.17, 2.56)	0.542
Health Insurance (Have/Not Have)	0.90 (0.45, 1.81)	0.773
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.98 (0.10, 9.90)	0.983
Not Well	1.13 (0.47, 2.71)	0.792
Internet Use (Yes/No)	1.18 (0.45, 3.06)	0.738

Analysis of Associations Between the Post-Intervention Severity Items
and Baseline Variables (Continued)

Severity Item: My Whole Life Will Change If I Get Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.39 (0.95, 5.98)	0.064
Baseline Response	6.23 (3.50, 11.08)	<.001
Baseline Knowledge Score	0.88 (0.79, 0.97)	0.012
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	0.51 (0.08, 3.23)	0.473
Thinking About It	0.34 (0.03, 3.83)	0.381
Will Do So Next Month	1.25 (0.15, 10.21)	0.838
Will Do So Next Week	0.16 (0.04, 0.58)	0.005
Doing So Currently	1.31 (0.12, 14.22)	0.827
Marital Status (Reference=Widow)		
Married	0.50 (0.30, 0.85)	0.009
Never Married	5.73 (1.99, 16.47)	0.001
Divorced/Separated	0.62 (0.11, 3.54)	0.592
Education Level (Reference=<Elementary School)		
Graduate and above	0.59 (0.04, 9.57)	0.707
University	0.25 (0.11, 0.54)	<.001
High School	0.44 (0.15, 1.30)	0.135
<High School Graduate	0.23 (0.10, 0.50)	<.001
Health Insurance (Have/Not Have)	1.64 (1.16, 2.32)	0.005
English Proficiency (Reference= Not Well at All)		
Well/Very Well	1.64 (1.03, 2.60)	0.035
Not Well	1.65 (0.98, 2.79)	0.061
Baseline Efficacy Score	0.94 (0.88, 1.01)	0.090
Age	1.00 (0.95, 1.05)	0.933
Weight	0.99 (0.97, 1.01)	0.426
Reduced Height (Yes/No)	0.99 (0.56, 1.74)	0.967
BMD Measured (Yes/No)	0.67 (0.36, 1.22)	0.191
Taking Osteoporosis Medication (Yes/No)	1.19 (0.55, 2.55)	0.658
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.00 (0.27, 3.74)	0.997
>1 Year	0.34 (0.06, 1.88)	0.216
>3 Years	0.61 (0.11, 3.20)	0.555
Taking Vitamin/Calcium (Yes/No)	1.06 (0.59, 1.89)	0.849
Taking HRT (Yes/No)	0.60 (0.32, 1.13)	0.115
Had Osteoporosis (Yes/No)	1.58 (0.77, 3.22)	0.209
Osteoporosis in Family (Yes/No)	1.15 (0.83, 1.59)	0.411
Years Lived in US	1.02 (0.99, 1.06)	0.238
Employment Status (Reference=Homemaker)		
Employed	0.70 (0.19, 2.57)	0.592
Unemployed/Retired	0.70 (0.30, 1.66)	0.422
Income Level (At Least 10K/Below 10K)	1.14 (0.36, 3.61)	0.824
Internet Use (Yes/No)	1.85 (0.99, 3.46)	0.054

Analysis of Associations Between the Post-Intervention Severity Items
and Baseline Variables (Continued)

Severity Item: I Will Not Be Able to Walk Around If I Get Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	1.97 (0.72, 5.39)	0.189
Baseline Response	15.65 (10.76, 22.74)	<.001
Baseline Knowledge Score	0.83 (0.77, 0.90)	<.001
Last Health Check-Up (Reference=Never Checked)		
<12 Months	2.84 (0.70, 11.53)	0.145
>1 Year	2.86 (0.87, 9.45)	0.084
>3 Years	7.23 (1.22, 42.70)	0.029
Taking HRT (Yes/No)	1.42 (1.06, 1.88)	0.017
Marital Status (Reference=Widow)		
Married	1.04 (0.50, 2.18)	0.907
Never Married	3.11 (0.45, 21.66)	0.252
Divorced/Separated	2.95 (1.33, 6.55)	0.008
Education Level (Reference=<Elementary School)		
Graduate and above	7.24 (1.03, 50.73)	0.046
University	0.34 (0.18, 0.66)	0.001
High School	0.96 (0.43, 2.11)	0.916
<High School Graduate	0.58 (0.25, 1.34)	0.203
English Proficiency (Reference= Not Well at All)		
Well/Very Well	2.04 (1.03, 4.02)	0.041
Not Well	0.89 (0.57, 1.37)	0.589
Baseline Efficacy Score	0.95 (0.90, 1.01)	0.133
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	1.26 (0.35, 4.50)	0.727
Thinking About It	0.24 (0.03, 1.77)	0.162
Will Do So Next Month	2.87 (0.32, 25.47)	0.345
Will Do So Next Week	0.78 (0.14, 4.25)	0.776
Doing So Currently	1.88 (0.14, 24.72)	0.629
Age	0.98 (0.95, 1.01)	0.186
Weight	1.02 (1.00, 1.04)	0.050
Reduced Height (Yes/No)	0.94 (0.55, 1.63)	0.838
BMD Measured (Yes/No)	0.93 (0.61, 1.41)	0.727
Taking Osteoporosis Medication (Yes/No)	0.81 (0.46, 1.42)	0.456
Taking Vitamin/Calcium (Yes/No)	0.78 (0.44, 1.40)	0.412
Had Osteoporosis (Yes/No)	0.69 (0.33, 1.41)	0.305
Osteoporosis in Family (Yes/No)	1.80 (0.67, 4.86)	0.243
Years Lived in US	0.99 (0.95, 1.03)	0.577
Employment Status (Reference=Homemaker)		
Employed	0.82 (0.34, 1.97)	0.661
Unemployed/Retired	1.15 (0.65, 2.06)	0.626
Income Level (At Least 10K/Below 10K)	1.07 (0.82, 1.39)	0.623
Health Insurance (Have/Not Have)	0.76 (0.37, 1.54)	0.443
Internet Use (Yes/No)	0.70 (0.47, 1.03)	0.071

Analysis of Associations Between the Post-Intervention Severity Items
and Baseline Variables (Continued)

Severity Item: I Will Loss Height If I Get Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.43 (1.05, 5.61)	0.038
Baseline Response	4.52 (3.01, 6.78)	<.001
Baseline Knowledge Score	1.09 (1.02, 1.16)	0.011
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	2.28 (1.15, 4.53)	0.018
Thinking About It	2.83 (0.52, 15.35)	0.228
Will Do So Next Month	0.61 (0.12, 3.12)	0.555
Will Do So Next Week	1.07 (0.43, 2.63)	0.887
Doing So Currently	1.39 (0.41, 4.72)	0.600
Internet Use (Yes/No)	1.60 (1.07, 2.38)	0.022
Baseline Efficacy Score	1.06 (0.99, 1.12)	0.088
Age	1.03 (0.98, 1.09)	0.285
Weight	1.00 (0.98, 1.02)	0.730
Reduced Height (Yes/No)	2.16 (0.84, 5.56)	0.111
BMD Measured (Yes/No)	1.08 (0.81, 1.43)	0.600
Taking Osteoporosis Medication (Yes/No)	1.54 (0.90, 2.63)	0.115
Last Health Check-Up (Reference=Never Checked)		
<12 Months	0.85 (0.15, 4.82)	0.859
>1 Year	0.83 (0.15, 4.53)	0.827
>3 Years	4.05 (0.26, 63.65)	0.320
Taking Vitamin/Calcium (Yes/No)	0.86 (0.41, 1.81)	0.696
Taking HRT (Yes/No)	0.65 (0.17, 2.45)	0.525
Had Osteoporosis (Yes/No)	1.31 (0.80, 2.13)	0.284
Osteoporosis in Family (Yes/No)	1.35 (0.75, 2.43)	0.325
Years Lived in US	1.02 (0.99, 1.04)	0.166
Marital Status (Reference=Widow)		
Married	1.20 (0.95, 1.52)	0.119
Never Married	0.80 (0.28, 2.28)	0.675
Divorced/Separated	1.02 (0.46, 2.24)	0.967
Employment Status (Reference=Homemaker)		
Employed	0.38 (0.10, 1.42)	0.150
Unemployed/Retired	1.45 (0.60, 3.46)	0.408
Income Level (At Least 10K/Below 10K)	0.70 (0.28, 1.78)	0.456
Health Insurance (Have/Not Have)	1.44 (0.95, 2.19)	0.089
English Proficiency (Reference= Not Well at All)		
Well/Very Well	0.43 (0.13, 1.39)	0.160
Not Well	1.08 (0.60, 1.96)	0.787

Analysis of Associations Between the Post-Intervention Severity Items
and Baseline Variables (Continued)

Severity Item: I Will Not Be Able to Do House Work If I Get Osteoporosis.

Variable	Odds Ratio (95% CI)	P-value
Study Group	2.69 (1.13, 6.38)	0.025
Baseline Response	12.71 (5.94, 27.19)	<.001
Baseline Knowledge Score	0.86 (0.76, 0.99)	0.032
Baseline Intention Stage (Reference=Never Thought About It)		
Decided Against It	0.91 (0.28, 2.95)	0.869
Thinking About It	0.25 (0.07, 0.83)	0.024
Will Do So Next Month	0.82 (0.22, 2.98)	0.759
Will Do So Next Week	0.55 (0.17, 1.83)	0.329
Doing So Currently	1.22 (0.22, 6.88)	0.822
Weight	1.02 (1.00, 1.04)	0.034
Taking HRT (Yes/No)	0.48 (0.26, 0.87)	0.016
Education Level (Reference=<Elementary School)		
Graduate and above	5.66 (0.80, 39.98)	0.082
University	0.30 (0.13, 0.74)	0.009
High School	0.89 (0.32, 2.48)	0.829
<High School Graduate	0.27 (0.08, 0.92)	0.036
English Proficiency (Reference= Not Well at All)		
Well/Very Well	2.62 (1.23, 5.59)	0.013
Not Well	0.56 (0.36, 0.87)	0.009
Baseline Efficacy Score	0.99 (0.93, 1.04)	0.622
Age	1.00 (0.98, 1.02)	0.850
Reduced Height (Yes/No)	0.67 (0.36, 1.23)	0.193
BMD Measured (Yes/No)	0.93 (0.41, 2.09)	0.860
Taking Osteoporosis Medication (Yes/No)	0.82 (0.53, 1.28)	0.385
Last Health Check-Up (Reference=Never Checked)		
<12 Months	1.10 (0.30, 4.04)	0.888
>1 Year	0.84 (0.22, 3.27)	0.804
>3 Years	1.91 (0.55, 6.63)	0.311
Taking Vitamin/Calcium (Yes/No)	0.50 (0.22, 1.12)	0.090
Had Osteoporosis (Yes/No)	0.84 (0.47, 1.50)	0.551
Osteoporosis in Family (Yes/No)	0.70 (0.40, 1.22)	0.207
Years Lived in US	1.01 (0.99, 1.03)	0.484
Marital Status (Reference=Widow)		
Married	1.27 (0.47, 3.43)	0.635
Never Married	1.23 (0.22, 6.91)	0.813
Divorced/Separated	0.72 (0.27, 1.95)	0.521
Employment Status (Reference=Homemaker)		
Employed	1.10 (0.41, 2.96)	0.854
Unemployed/Retired	1.45 (0.69, 3.03)	0.322
Income Level (At Least 10K/Below 10K)	0.95 (0.48, 1.86)	0.874
Health Insurance (Have/Not Have)	1.40 (0.45, 4.29)	0.560
Internet Use (Yes/No)	1.38 (0.70, 2.69)	0.350

P-values are for testing the significance of odds ratio being 1 for no difference.
Models evaluating individual variables besides baseline response and study group all included the variables for baseline agreement and study group.
BMD=Bone mineral density. CI=Confidence interval. HRT=Hormone Replacement Therapy.

Appendix D
Questionnaires Used (Chinese)

预防骨质疏松症调查问卷（第一天）

您的 ID _____ 今天的日期 _____

1. 年龄 _____ 年
2. 体重 _____ 英磅
3. 在过去 5 年里您的身高有没有降低？ <u>①有</u> <u>②没有</u>
4. 您最近的全身健康检查是什么时候？
<u>①从来没有</u> <u>②最近 12 个月之内</u> <u>③ 1 年多以前</u> <u>④ 3 年多以前</u>
5. 目前您在服用维生素和钙片吗？ <u>①有</u> <u>②没有</u>
6. 您抽烟吗？ <u>①有</u> <u>②没有</u>
7. 您有没有在使用激素替代疗法？ <u>①有</u> <u>②没有</u>
8. 您的医生有没有告诉过您有骨质疏松症 <u>①有</u> <u>②没有</u>
9. 您家人和亲属中有人患骨质疏松症吗？ <u>①有</u> <u>②没有</u>
如果有的，请告知您和患者的关系 (比如：母亲，阿姨，祖母, 等) _____
10. 您有没有测过您的骨密度？ <u>①有</u> <u>②没有</u>
11. 您目前在服药治疗骨质疏松症吗？ <u>①有</u> <u>②没有</u>
您同意以下的说法吗？
12. 骨癌是骨质疏松症引起的。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u>
13. 骨质疏松症可能造成骨折。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u>

14. 沙丁鱼含钙量非常高。①同意 ②不同意 ③不知道
15. 白菜含钙量非常高。①同意 ②不同意 ③不知道
16. 骨质疏松症是由病毒引起的。①同意 ②不同意 ③不知道
17. 骨密度测试可以诊断骨质疏松症。①同意 ②不同意 ③不知道
18. 超重会增加我得骨质疏松症的机会。①同意 ②不同意 ③不知道
19. 摄取足够的维生素D会减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
20. 吃肉会减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
21. 绝经后服用雌激素会减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
22. 穿合适的鞋子会适当减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
23. 行走会减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
24. 我担心我会得骨质疏松症。①同意 ②不同意 ③不知道
25. 我很有可能会得骨质疏松症。①同意 ②不同意 ③不知道
26. 食用足够的钙会减少我得骨质疏松症的机会。①同意 ②不同意 ③不知道
27. 大多数对我很重要的人都认为我应该食用足够的钙。①同意 ②不同意 ③不知道
28. 骨质疏松症是可以预防的。①同意 ②不同意 ③不知道
29. 想到我可能会骨质疏松症我就害怕。①同意 ②不同意 ③不知道
30. 如果我得了骨质疏松症，我的整个生活都将改变。①同意 ②不同意 ③不知道
31. 如果我得了骨质疏松症，我就不能走动了。①同意 ②不同意 ③不知道
32. 如果我得了骨质疏松症，我会变矮。①同意 ②不同意 ③不知道
33. 如果我得了骨质疏松症，我就不能做家务了。①同意 ②不同意 ③不知道
34. 我不知道哪些食物含钙量高。①同意 ②不同意 ③不知道
35. 我家附近的超市里没有我喜欢的高钙食物。①同意 ②不同意 ③不知道

36. 我不知道如何烹饪高钙食物。 ①同意 ②不同意 ③不知道

37. 我不喜欢高钙食物的味道。 ①同意 ②不同意 ③不知道

38. 我的家人不喜欢高钙食品的味道。 ①同意 ②不同意 ③不知道

39. 高钙食品太贵。 ①同意 ②不同意 ③不知道

40. 高钙食品含太多的脂肪。 ①同意 ②不同意 ③不知道

41. 我能从食品含量表中找到食品的钙含量。 ①同意 ②不同意 ③不知道

42. 我知道哪些食物含钙量高。 ①同意 ②不同意 ③不知道

43. 食用高钙食品并不难。 ①同意 ②不同意 ③不知道

44. 我知道如何选择合适的食物以增加我的钙摄入量。 ①同意 ②不同意 ③不知道

45. 我能经常吃含钙丰富的食物。 ①同意 ②不同意 ③不知道

46. 请从以下语句中选择一个最能描述您的当前行为的语句。

- 我从来没有认真考虑过要多吃高钙食品。
- 我曾考虑过多吃高钙食品，但决定不予采纳。
- 我目前正考虑要设法多吃高钙食品。
- 我将在下个月多吃高钙食品。
- 我将在下个星期多吃高钙食品。
- 目前我正在多吃高钙食品。

47. 您在美国住多久了? _____ 年

48. 您目前的婚姻状况是 ①已婚 ②从未结婚 ③离婚/分居 ④丧偶

49. 您完成的最高学业是 (请从下面选一个)

- ①没有受过教育或只有小学教育
- ②高中毕业以下
- ③高中毕业
- ④大学 (或大专或大学学业, 或副学士)
- ⑤研究生及以上

50. 您目前的就职状况是 ①在职 ②失业 ③退休 ④家庭主妇

51. 您家庭的年收入是?

①少于一万 ②一万至两万 ③一万至三万 ④三万至四万 ⑤多于四万

52. 您目前有健康保险吗? ①有 ②没有

53. 您觉得您的英文程度如何? ①很不好 ②不好 ③好 ④很好

54. 你是否经常使用互联网来获取信息? ①没有 ②有

Picture A (图片 A)

2 tablespoons 大勺

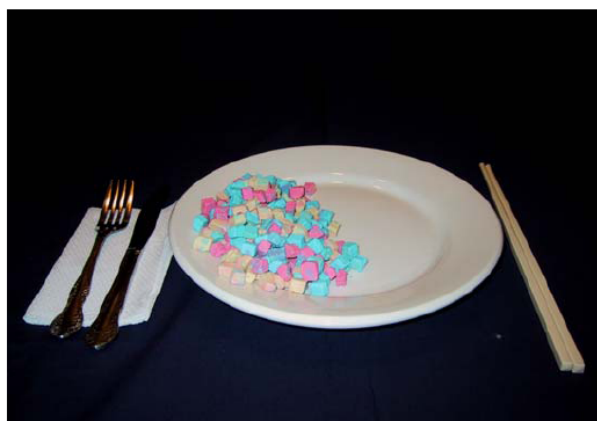
1/4 cup 杯 = 4 tablespoons 大勺



1/2 cup 杯 = 1/2 bowl 碗



1 cup 杯 = 1 bowl 碗 = 50 g (一两)



<p>How often do you drink the following beverages? 你是否经常喝下列饮料？</p>		
<p>Milk, as a beverage 牛奶, 做饮品</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来 not 喝, 或每月不到一次 (到下一食物)</p>	<p>_____ glass(es) 杯 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size cup or glass? 杯子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz</p>
<p>The following foods are cereals and dairy products. How often do you eat the following? 下面是谷类早餐麦片和乳制品。</p>		
<p>Cold breakfast cereals with milk 冷的谷类早餐麦片加牛奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? (see PICTURE A 参看图片A) <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Pancakes or waffles 薄煎饼或威化饼</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>
<p>Yogurt 酸奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ container(s) 盒 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size container? 盒子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz (1 cup 杯)</p>
<p>Cheese, in slices or wedges, including on sandwiches 起司, 乳酪, 片状或尖块状, 包括夹在三明治中的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>

<p>The next foods are vegetables, including fresh, frozen, canned, or stir-fried, eaten at home, outside, or as leftovers. For the questions about how much you eat each time, please look at PICTURE A. 下列蔬菜, 包括新鲜的、冷冻的、罐装的, 热炒的、家煮的、外买的或剩余的。 (吃的数量请参看图片A)</p>		
<p>Broccoli or Chinese broccoli 绿菜花、芥蓝</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Cabbage or Napa cabbage 卷心菜或大白菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Dark green, leafy vegetables, such as bok choy, spinach, or mustard greens 绿叶蔬菜, 如白菜、菠菜或芥菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Beans or peas, such as green beans, snow peas, or green peas 豆子或豌豆, 如绿豆、雪豆、或青豆</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Tofu, including soft, dried, and fried 豆腐, 包括软豆腐、硬豆腐、豆腐干、油豆腐</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Taro 芋头</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> <¼ cup 杯 <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 cup 杯</p>

<p>These next foods are meat, poultry, and fish, eaten at home or from a restaurant. For the questions about how much you eat each time, please look at PICTURE A. 下列是鸡、肉、鱼，不论是在家或在外。 请参看图片A</p>		
<p>Fish, including steamed, broiled, or baked 鱼；包括蒸的、烤的、烘的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少？ <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Other seafood, such as shrimp or crab 其它海味，如虾或螃蟹</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少？ <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Sandwiches with ham, bacon, or sausage 三明治中的火腿、熏肉、香肠</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只？ <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2</p>
<p>scrambled, or stir-fried 蛋，煮蛋、炒蛋、炸蛋</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只？ <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4</p>

These next foods are bread and dessert items. 下面是面包和甜品		
Steamed bun 馒头	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4
Bread, including in sandwiches or hamburgers 面包; 包括三明治和汉堡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4
Bagel or English muffin 面包圈或英式松饼	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Deep-fried wheat dough stick 油条	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 3" (7.5 cm) <input type="checkbox"/> 6" (15 cm) <input type="checkbox"/> 9" (23 cm) <input type="checkbox"/> 12" (30.5 cm)
Chinese sweet pastry, such as bean paste cake or buns 中式甜点, 如豆沙包或甜面包	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Ice cream 冰淇淋	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How many scoops each time? 每次吃几瓢? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4

预防骨质疏松症调查问卷（后续）

您的 ID _____ 今天的日期 _____

您同意以下的说法吗？

- | |
|--|
| 1. 骨癌是骨质疏松症引起的。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 2. 骨质疏松症可能造成骨折。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 3. 沙丁鱼含钙量非常高。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 4. 白菜含钙量非常高。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 5. 骨质疏松症是由病毒引起的。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 6. 骨密度测试可以诊断骨质疏松症。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 7. 超重会增加我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 8. 摄取足够的维生素D会减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 9. 吃肉会减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 10. 绝经后服用雌激素会减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 11. 穿合适的鞋子会适当减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 12. 行走会减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 13. 我担心我会得骨质疏松症。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 14. 我很有可能会得骨质疏松症。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 15. 食用足够的钙会减少我得骨质疏松症的机会。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 16. 大多数对我很重要的人都认为我应该食用足够的钙。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 17. 骨质疏松症是可以预防的。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |
| 18. 想到我可能会骨质疏松症我就害怕。 <u>①同意</u> <u>②不同意</u> <u>③不知道</u> |

19. 如果我得了骨质疏松症, 我的整个生活都将改变。①同意 ②不同意 ③不知道
20. 如果我得了骨质疏松症, 我就不能走动了。①同意 ②不同意 ③不知道
21. 如果我得了骨质疏松症, 我会变矮。①同意 ②不同意 ③不知道
22. 如果我得了骨质疏松症, 我就不能做家务了。①同意 ②不同意 ③不知道
23. 我不知道哪些食物含钙量高。①同意 ②不同意 ③不知道
24. 我家附近的超市里没有我喜欢的高钙食物。①同意 ②不同意 ③不知道
25. 我不知道如何烹饪高钙食物。①同意 ②不同意 ③不知道
26. 我不喜欢高钙食物的味道。①同意 ②不同意 ③不知道
27. 我的家人不喜欢高钙食品的味道。①同意 ②不同意 ③不知道
28. 高钙食品太贵。①同意 ②不同意 ③不知道
29. 高钙食品含太多的脂肪。①同意 ②不同意 ③不知道
30. 我能从食品含量表中找到食品的钙含量。①同意 ②不同意 ③不知道
31. 我知道哪些食物含钙量高。①同意 ②不同意 ③不知道
32. 食用高钙食品并不难。①同意 ②不同意 ③不知道
33. 我知道如何选择合适的食物来增加我的钙摄入量。①同意 ②不同意 ③不知道
34. 我能经常吃含钙丰富的食物。①同意 ②不同意 ③不知道
35. 请从以下语句中选择一个最能描述您的当前行为的语句。 ——我从来没有认真考虑过要多吃高钙食品。 ——我曾考虑过多吃高钙食品, 但决定不予采纳。 ——我目前正考虑要设法多吃高钙食品。 ——我将在下个月多吃高钙食品。 ——我将在下个星期多吃高钙食品。 ——目前我正在多吃高钙食品。

预防骨质疏松症调查问卷（三月后续）

您的 ID _____ 今天的日期 _____

您同意以下的说法吗？

1. 我能从食品含量表中找到食品的钙含量。①同意 ②不同意 ③不知道

2. 我知道哪些食物含钙量高。①同意 ②不同意 ③不知道

3. 食用高钙食品并不难。①同意 ②不同意 ③不知道

4. 我知道如何选择合适的食物来增加我的钙摄入量。①同意 ②不同意 ③不知道

5. 我能经常吃含钙丰富的食物。①同意 ②不同意 ③不知道

6. 请从以下语句中选择一个最能描述您的当前行为的语句。

——我从来没有认真考虑过要多吃高钙食品。

——我曾考虑过多吃高钙食品，但决定不予采纳。

——我目前正考虑要设法多吃高钙食品。

——我将在下个月多吃高钙食品。

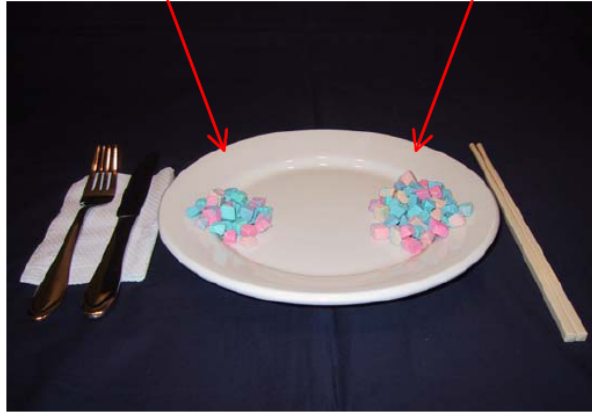
——我将在下个星期多吃高钙食品。

——目前我正在多吃高钙食品。

Picture A (图片 A)

2 tablespoons 大勺

1/4 cup 杯 = 4 tablespoons 大勺



1/2 cup 杯 = 1/2 bowl 碗



1 cup 杯 = 1 bowl 碗 = 50 g (一两)



<p>How often do you drink the following beverages? 你是否经常喝下列饮料？</p>		
<p>Milk, as a beverage 牛奶, 做饮品</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来 not 喝, 或每月不到一次 (到下一食物)</p>	<p>_____ glass(es) 杯 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size cup or glass? 杯子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz</p>
<p>The following foods are cereals and dairy products. How often do you eat the following? 下面是谷类早餐麦片和乳制品。</p>		
<p>Cold breakfast cereals with milk 冷的谷类早餐麦片加牛奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? (see PICTURE A 参看图片A) <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Pancakes or waffles 薄煎饼或威化饼</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>
<p>Yogurt 酸奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ container(s) 盒 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size container? 盒子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz (1 cup 杯)</p>
<p>Cheese, in slices or wedges, including on sandwiches 起司, 乳酪, 片状或尖块状, 包括夹在三明治中的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>

<p>The next foods are vegetables, including fresh, frozen, canned, or stir-fried, eaten at home, outside, or as leftovers. For the questions about how much you eat each time, please look at PICTURE A. 下列蔬菜, 包括新鲜的、冷冻的、罐装的, 热炒的、家煮的、外买的或剩余的。 (吃的数量请参看图片A)</p>		
<p>Broccoli or Chinese broccoli 绿菜花、芥蓝</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Cabbage or Napa cabbage 卷心菜或大白菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Dark green, leafy vegetables, such as bok choy, spinach, or mustard greens 绿叶蔬菜, 如白菜、菠菜或芥菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Beans or peas, such as green beans, snow peas, or green peas 豆子或豌豆, 如绿豆、雪豆、或青豆</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Tofu, including soft, dried, and fried 豆腐, 包括软豆腐、硬豆腐、豆腐干、油豆腐</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Taro 芋头</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> <¼ cup 杯 <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 cup 杯</p>

<p>These next foods are meat, poultry, and fish, eaten at home or from a restaurant. For the questions about how much you eat each time, please look at PICTURE A. 下列是鸡、肉、鱼，不论是在家或在外。 请参看图片A</p>		
<p>Fish, including steamed, broiled, or baked 鱼；包括蒸的、烤的、烘的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少？ <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Other seafood, such as shrimp or crab 其它海味，如虾或螃蟹</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少？ <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Sandwiches with ham, bacon, or sausage 三明治中的火腿、熏肉、香肠</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只？ <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2</p>
<p>scrambled, or stir-fried 蛋，煮蛋、炒蛋、炸蛋</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只？ <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4</p>

These next foods are bread and dessert items. 下面是面包和甜品		
Steamed bun 馒头	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4
Bread, including in sandwiches or hamburgers 面包; 包括三明治和汉堡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4
Bagel or English muffin 面包圈或英式松饼	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Deep-fried wheat dough stick 油条	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 3" (7.5 cm) <input type="checkbox"/> 6" (15 cm) <input type="checkbox"/> 9" (23 cm) <input type="checkbox"/> 12" (30.5 cm)
Chinese sweet pastry, such as bean paste cake or buns 中式甜点, 如豆沙包或甜面包	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Ice cream 冰淇淋	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How many scoops each time? 每次吃几瓢? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4

Appendix E
Questionnaires in English

Osteoporosis Intervention Questionnaire (Day 1)

Your Study ID _____ Date _____

1. Age _____ years
2. Weight _____ lb
3. Did you lose height in the last 5 years? _____ ① Yes _____ ② No
4. When was your last general health check-up? _____ 1) I never had a general health check-up _____ 2) Within the last 12 months _____ 3) More than 1 year ago _____ 4) More than 3 year ago
5. I am currently taking vitamins or calcium supplement. _____ ① Yes _____ ② No
6. Do you smoke? _____ ① Yes _____ ② No
7. Do you use hormone replacement therapy? _____ ① Yes _____ ② No
8. Did your doctor tell you that you have osteoporosis? _____ ① Yes _____ ② No
9. Do you have any family members with osteoporosis? _____ ① Yes _____ ② No if Yes, what is your relationship with she/he (e.g., mother, aunt, grandmother, etc.)
10. Did you have your bone mineral density measured before? _____ ① Yes _____ ② No
11. Are you currently taking any medications to treat osteoporosis? _____ ① Yes _____ ② No
12. Bone cancer can be caused by osteoporosis. ①Agree ②Disagree ③Don't know
13. Bone fractures can be caused by osteoporosis. ①Agree ②Disagree ③Don't know
14. Sardine is rich in calcium. ①Agree ②Disagree ③Don't know
15. Bachoy is rich in calcium. ①Agree ②Disagree ③Don't know
16. Osteoporosis is caused by a virus. ①Agree ②Disagree ③Don't know
17. Osteoporosis can be diagnosed by a bone mineral density test. ①Agree ②Disagree ③Don't know

18. Being overweight will increase my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
19. Getting enough Vitamin D will decrease my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
20. Eating red meat will decrease my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
21. Taking estrogen after menopause will decrease my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
22. Wearing properly fitted shoes will decrease my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
23. Walking will decrease my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
24. I am concerned that I may get osteoporosis. ①Agree ②Disagree ③Don't know
25. It is very likely that I will get osteoporosis. ①Agree ②Disagree ③Don't know
26. Consuming an adequate amount of calcium will reduce my chance of getting osteoporosis. ①Agree ②Disagree ③Don't know
27. Most people who are important to me think that I should consume adequate calcium. ①Agree ②Disagree ③Don't know
28. Osteoporosis can be prevented. ①Agree ②Disagree ③Don't know
29. It scares me to think that I may get osteoporosis. ①Agree ②Disagree ③Don't know
30. My whole life will change if I get osteoporosis. ①Agree ②Disagree ③Don't know
31. I won't be able to walk around if I get osteoporosis. ①Agree ②Disagree ③Don't know
32. I will loss height if I get osteoporosis. ①Agree ②Disagree ③Don't know
33. I won't be able to do house work if I get osteoporosis. ①Agree ②Disagree ③Don't know
34. I don't know which food items are high in calcium. ①Agree ②Disagree ③Don't know
35. My neighborhood grocery stores do not carried calcium-rich food items that I like. ①Agree ②Disagree ③Don't know
36. I don't know how to cook calcium-rich food items. ①Agree ②Disagree ③Don't know
37. I don't like the taste of calcium-rich food items. ①Agree ②Disagree ③Don't know
38. My family members don't like the taste of calcium-rich food. ①Agree ②Disagree ③Don't know
39. Calcium-rich food items cost too much. ①Agree ②Disagree ③Don't know

40. Calcium-rich food items contain too much fat. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
41. I can find calcium contents by reading food labels. ①Agree ②Disagree ③Don't know
42. I know which food items are high in calcium content. ①Agree ②Disagree ③Don't know
43. Consuming calcium-rich food is not difficult. ①Agree ②Disagree ③Don't know
44. I know how to select appropriate food to increase my calcium intake. ①Agree ②Disagree ③Don't know
45. I can eat calcium-rich food on a regular basis. ①Agree ②Disagree ③Don't know
46. Please select ONLY ONE statement that best describes your current behavior. ——I have never seriously thought about consuming more calcium-rich food items. ——I have thought about consuming more calcium-rich food items but decided against it. ——I am thinking about trying to consume more calcium-rich food items. ——I will consume more calcium-rich food items in next month. ——I will more calcium-rich food items in next week. ——I am currently doing things to consuming more calcium-rich food items.
47. How many years have you lived in the U.S.? _____ years
48. What is your current marital status? ____ 1) Married ____ 2) Never married ____ 3) Divorced/Separated ____ 4) Widower
49. What is the highest grade of school you completed? (Check one below) ____ 1) No education or elementary school ____ 2) Below high school graduate ____ 3) High school ____ 4) University (or college or some college, or associate degree) ____ 5) Graduate and above
50. Which of the following describes you currently? ____ 1) Employed ____ 2) Unemployed ____ 3) Retired

___ 4) Homemaker
___ 5) Student
51. What is your annual household income?
___ 1) Less than \$10,000
___ 2) \$10,000-\$20,000
___ 3) \$20,000-\$30,000
___ 4) \$30,000-\$40,000
___ 5) Above \$40,000
52. Do you currently have health insurance? ___ ① Yes ___ ② No
53. How well do you think you speak English?
___ 1) not at all ___ 2) not well ___ 3) well ___ 4) very well
54. Do you often use the Internet for sources of information? ___ ① Yes ___ ② No

Osteoporosis Prevention for Chinese Women 华人妇女骨质疏松症预防 Food Frequency Questionnaire 饮食问卷

Thank you for agreeing to answer these questions. These questions are about different foods you eat. Please think about how often you've eaten these foods over the last month, and also how much you usually eat when you eat it. Try to include every time you eat the food, whether you made it at home, bought it from a restaurant, or had it as leftovers. Although the answers may be hard to remember, please do the best you can.

多谢你回答这些问题。问题主要是你所吃的不同食物。请想一下你在过去的一月中吃此食物的次数。请尽量想一下是在家吃还是在外面餐馆买还是剩饭。虽然回忆起来有困难，但请尽量回忆。

For example, if you drink 2 cups of coffee a day, and your cup is 8 oz size, this is what you would fill in:
比如，你某天喝了2杯咖啡，杯子大小为8 oz，请按以下方式填写

EXAMPLE 例子:

Coffee 咖啡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不喝，或每月不到一次（到下一食物）	<div style="display: flex; justify-content: space-between;"> <u>2</u> glass(es) 杯 per <input checked="" type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> What size cup or glass? 杯子的大小 <input type="checkbox"/> 6oz <input checked="" type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz </div>
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Or if you eat rice once every day and have 1½ bowls each time, this is what you would fill in:
如果你每天吃米饭，一次吃1½碗，请按以下方式填写

EXAMPLE 例子:

Rice 饭	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次（到下一食物）	<div style="display: flex; justify-content: space-between;"> <u>1</u> time(s) 次 per <input checked="" type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> How much each time? 每次吃多少？ <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 (1 bowl) <input checked="" type="checkbox"/> 1½ cup 杯 <input type="checkbox"/> 2 cups 杯 </div>
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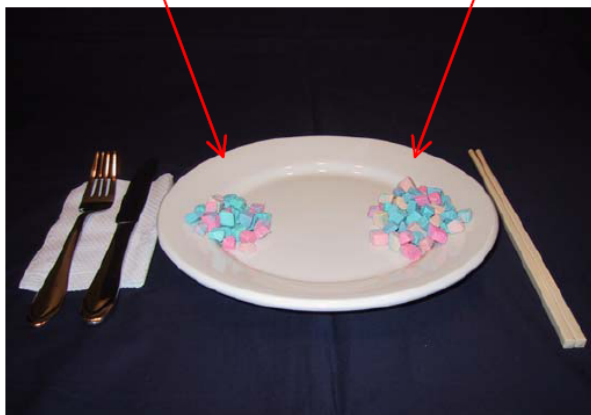
You can use the PICTURES to help you think about how much you eat. Choose the one that's closest to the amount that you usually eat. 你可以参考所给的图片。选择最接近的数量。

Please remember that your participation is voluntary, and all the information that you provide will be kept confidential. If there is any question that you do not want to answer, you may skip it and go on to the next question. 请记住，你的参加是自愿的，所有的资料都会被保密。如果有问题你不想回答，跳过去到下一个问题。

Picture A (图片 A)

2 tablespoons 大勺

¼ cup 杯 = 4 tablespoons 大勺



½ cup 杯 = ½ bowl 碗



1 cup 杯 = 1 bowl 碗 = 50 g (一两)



<p>How often do you drink the following beverages? 你是否经常喝下列饮料？</p>		
<p>Milk, as a beverage 牛奶，做饮品</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来 not 喝，或每月不到一次 (到下一食物)</p>	<p>_____ glass(es) 杯 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size cup or glass? 杯子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz</p>
<p>The following foods are cereals and dairy products. How often do you eat the following? 下面是谷类早餐麦片和乳制品。</p>		
<p>Cold breakfast cereals with milk 冷的谷类早餐麦片加牛奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 (see PICTURE A 参看图片A) <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Pancakes or waffles 薄煎饼或威化饼</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>
<p>Yogurt 酸奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ container(s) 盒 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size container? 盒子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz (1 cup 杯)</p>
<p>Cheese, in slices or wedges, including on sandwiches 起司，乳酪，片状或尖块状，包括夹在三明治中的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>

<p>The next foods are vegetables, including fresh, frozen, canned, or stir-fried, eaten at home, outside, or as leftovers. For the questions about how much you eat each time, please look at PICTURE A. 下列蔬菜, 包括新鲜的、冷冻的、罐装的, 热炒的、家煮的、外买的或剩余的。 (吃的数量请参看图片A)</p>		
<p>Broccoli or Chinese broccoli 绿菜花、芥蓝</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Cabbage or Napa cabbage 卷心菜或大白菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Dark green, leafy vegetables, such as bok choy, spinach, or mustard greens 绿叶蔬菜, 如白菜、菠菜或芥菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Beans or peas, such as green beans, snow peas, or green peas 豆子或豌豆, 如绿豆、雪豆、或青豆</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Tofu, including soft, dried, and fried 豆腐, 包括软豆腐、硬豆腐、豆腐干、油豆腐</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>

<p>Taro 芋头</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> <1/4 cup 杯 <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 cup 杯</p>
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<p>These next foods are meat, poultry, and fish, eaten at home or from a restaurant. For the questions about how much you eat each time, please look at PICTURE A. 下列是鸡、肉、鱼, 不论是在家或在外。 请参看图片A</p>		
<p>Fish, including steamed, broiled, or baked 鱼; 包括蒸的、烤的、烘的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1/2 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 1/2 cup 杯</p>
<p>Other seafood, such as shrimp or crab 其它海味, 如虾或螃蟹</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1/2 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 1/2 cup 杯</p>
<p>Sandwiches with ham, bacon, or sausage 三明治中的火腿、熏肉、香肠</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1/2 <input type="checkbox"/> 1 <input type="checkbox"/> 1 1/2 <input type="checkbox"/> 2</p>
<p>scrambled, or stir-fried 蛋, 煮蛋、炒蛋、炸蛋</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4</p>

These next foods are bread and dessert items. 下面是面包和甜品		
Steamed bun 馒头	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4
Bread, including in sandwiches or hamburgers 面包; 包括三明治和汉堡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4
Bagel or English muffin 面包圈或英式松饼	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Deep-fried wheat dough stick 油条	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 3" (7.5 cm) <input type="checkbox"/> 6" (15 cm) <input type="checkbox"/> 9" (23 cm) <input type="checkbox"/> 12" (30.5 cm)
Chinese sweet pastry, such as bean paste cake or buns 中式甜点, 如豆沙包或甜面包	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Ice cream 冰淇淋	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How many scoops each time? 每次吃几瓢? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4

Osteoporosis Intervention Questionnaire (Post-Intervention)

Your Study ID _____ Date _____

- | |
|--|
| 1. Bone cancer can be caused by osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 2. Bone fractures can be caused by osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 3. Sardine is rich in calcium. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 4. Bachoy is rich in calcium. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 5. Osteoporosis is caused by a virus. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 6. Osteoporosis can be diagnosed by a bone mineral density test. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 7. Being overweight will increase my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 8. Getting enough Vitamin D will decrease my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 9. Eating red meat will decrease my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 10. Taking estrogen after menopause will decrease my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 11. Wearing properly fitted shoes will decrease my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 12. Walking will decrease my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 13. I am concerned that I may get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 14. It is very likely that I will get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 15. Consuming an adequate amount of calcium will reduce my chance of getting osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 16. Most people who are important to me think that I should consume adequate calcium. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 17. Osteoporosis can be prevented. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 18. It scares me to think that I may get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 19. My whole life will change if I get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |
| 20. I won't be able to walk around if I get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u> |

21. I will loss height if I get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
22. I won't be able to do house work if I get osteoporosis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
23. I don't know which food items are high in calcium. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
24. My neighborhood grocery stores do not carried calcium-rich food items that I like. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
25. I don't know how to cook calcium-rich food items. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
26. I don't like the taste of calcium-rich food items. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
27. My family members don't like the taste of calcium-rich food. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
28. Calcium-rich food items cost too much. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
29. Calcium-rich food items contain too much fat. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
30. I can find calcium contents by reading food labels. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
31. I know which food items are high in calcium content. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
32. Consuming calcium-rich food is not difficult. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
33. I know how to select appropriate food to increase my calcium intake. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
34. I can eat calcium-rich food on a regular basis. <u>①Agree</u> <u>②Disagree</u> <u>③Don't know</u>
35. Please select ONLY ONE statement that best describes your current behavior. ——I have never seriously thought about consuming more calcium-rich food items. ——I have thought about consuming more calcium-rich food items but decided against it. ——I am thinking about trying to consume more calcium-rich food items. ——I will consume more calcium-rich food items in next month. ——I will more calcium-rich food items in next week. ——I am currently doing things to consuming more calcium-rich food items.

Osteoporosis Intervention Questionnaire (Month 3 Follow-Up)

Your Study ID _____ Date _____

- | |
|---|
| 1. I can find calcium contents by reading food labels. ①Agree ②Disagree ③Don't know |
| 2. I know which food items are high in calcium content. ①Agree ②Disagree ③Don't know |
| 3. Consuming calcium-rich food is not difficult. ①Agree ②Disagree ③Don't know |
| 4. I know how to select appropriate food to increase my calcium intake. ①Agree ②Disagree ③Don't know |
| 5. I can eat calcium-rich food on a regular basis. ①Agree ②Disagree ③Don't know |
| 6. Please select ONLY ONE statement that best describes your current behavior.
——I have never seriously thought about consuming more calcium-rich food items.
——I have thought about consuming more calcium-rich food items but decided against it.
——I am thinking about trying to consume more calcium-rich food items.
——I will consume more calcium-rich food items in next month.
——I will more calcium-rich food items in next week.
——I am currently doing things to consuming more calcium-rich food items. |

Osteoporosis Prevention for Chinese Women 华人妇女骨质疏松症预防 Food Frequency Questionnaire 饮食问卷

Thank you for agreeing to answer these questions. These questions are about different foods you eat. Please think about how often you've eaten these foods over the last month, and also how much you usually eat when you eat it. Try to include every time you eat the food, whether you made it at home, bought it from a restaurant, or had it as leftovers. Although the answers may be hard to remember, please do the best you can.

多谢你回答这些问题。问题主要是你所吃的不同食物。请想一下你在过去的一月中吃此食物的次数。请尽量想一下是在家吃还是在外面餐馆买还是剩饭。虽然回忆起来有困难，但请尽量回忆。

For example, if you drink 2 cups of coffee a day, and your cup is 8 oz size, this is what you would fill in:
比如，你某天喝了2杯咖啡，杯子大小为8 oz，请按以下方式填写

EXAMPLE 例子:

Coffee 咖啡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不喝，或每月不到一次（到下一食物）	<div style="display: flex; justify-content: space-between;"> <u>2</u> glass(es) 杯 per <input checked="" type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> What size cup or glass? 杯子的大小 <input type="checkbox"/> 6oz <input checked="" type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz </div>
--------------	--	--

Or if you eat rice once every day and have 1½ bowls each time, this is what you would fill in:
如果你每天吃米饭，一次吃1½碗，请按以下方式填写

EXAMPLE 例子:

Rice 饭	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次（到下一食物）	<div style="display: flex; justify-content: space-between;"> <u>1</u> time(s) 次 per <input checked="" type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> How much each time? 每次吃多少？ <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 (1 bowl) <input checked="" type="checkbox"/> 1½ cup 杯 <input type="checkbox"/> 2 cups 杯 </div>
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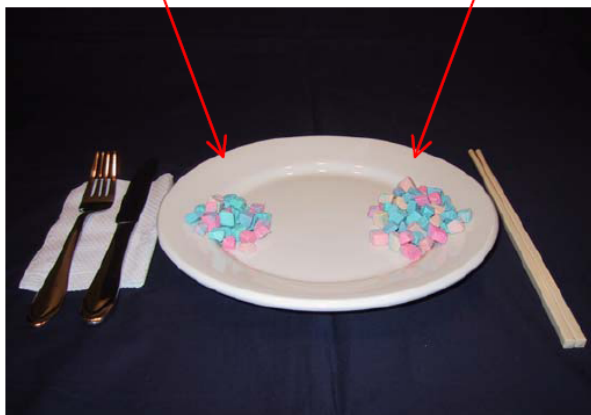
You can use the PICTURES to help you think about how much you eat. Choose the one that's closest to the amount that you usually eat. 你可以参考所给的图片。选择最接近的数量。

Please remember that your participation is voluntary, and all the information that you provide will be kept confidential. If there is any question that you do not want to answer, you may skip it and go on to the next question. 请记住，你的参加是自愿的，所有的资料都会被保密。如果有问题你不想回答，跳过去到下一个问题。

Picture A (图片 A)

2 tablespoons 大勺

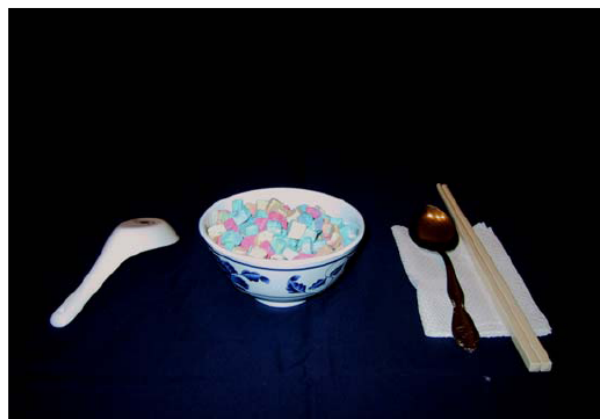
¼ cup 杯 = 4 tablespoons 大勺



½ cup 杯 = ½ bowl 碗



1 cup 杯 = 1 bowl 碗 = 50 g (一两)



<p>How often do you drink the following beverages? 你是否经常喝下列饮料？</p>		
<p>Milk, as a beverage 牛奶，做饮品</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来 not 喝，或每月不到一次 (到下一食物)</p>	<p>_____ glass(es) 杯 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size cup or glass? 杯子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz <input type="checkbox"/> 12 oz <input type="checkbox"/> 16 oz</p>
<p>The following foods are cereals and dairy products. How often do you eat the following? 下面是谷类早餐麦片和乳制品。</p>		
<p>Cold breakfast cereals with milk 冷的谷类早餐麦片加牛奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 (see PICTURE A 参看图片A) <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Pancakes or waffles 薄煎饼或威化饼</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>
<p>Yogurt 酸奶</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ container(s) 盒 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 What size container? 盒子的大小 <input type="checkbox"/> 6 oz <input type="checkbox"/> 8 oz (1 cup 杯)</p>
<p>Cheese, in slices or wedges, including on sandwiches 起司，乳酪，片状或尖块状，包括夹在三明治中的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃，或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>

<p>The next foods are vegetables, including fresh, frozen, canned, or stir-fried, eaten at home, outside, or as leftovers. For the questions about how much you eat each time, please look at PICTURE A. 下列蔬菜, 包括新鲜的、冷冻的、罐装的, 热炒的、家煮的、外买的或剩余的。 (吃的数量请参看图片A)</p>		
<p>Broccoli or Chinese broccoli 绿菜花、芥蓝</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Cabbage or Napa cabbage 卷心菜或大白菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Dark green, leafy vegetables, such as bok choy, spinach, or mustard greens 绿叶蔬菜, 如白菜、菠菜或芥菜</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Beans or peas, such as green beans, snow peas, or green peas 豆子或豌豆, 如绿豆、雪豆、或青豆</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>
<p>Tofu, including soft, dried, and fried 豆腐, 包括软豆腐、硬豆腐、豆腐干、油豆腐</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> ¼ cup 杯 <input type="checkbox"/> ½ cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1½ cup 杯</p>

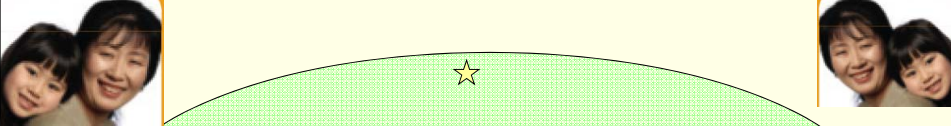
<p>Taro 芋头</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> <1/4 cup 杯 <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 1/2 cup 杯</p>
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<p>These next foods are meat, poultry, and fish, eaten at home or from a restaurant. For the questions about how much you eat each time, please look at PICTURE A. 下列是鸡、肉、鱼, 不论是在家或在外。 请参看图片A</p>		
<p>Fish, including steamed, broiled, or baked 鱼; 包括蒸的、烤的、烘的</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1/2 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 1/2 cup 杯</p>
<p>Other seafood, such as shrimp or crab 其它海味, 如虾或螃蟹</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 1/4 cup 杯 <input type="checkbox"/> 1/2 cup 杯 <input type="checkbox"/> 1 cup 杯 <input type="checkbox"/> 1 1/2 cup 杯</p>
<p>Sandwiches with ham, bacon, or sausage 三明治中的火腿、熏肉、香肠</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1/2 <input type="checkbox"/> 1 <input type="checkbox"/> 1 1/2 <input type="checkbox"/> 2</p>
<p>scrambled, or stir-fried 蛋, 煮蛋、炒蛋、炸蛋</p>	<p><input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)</p>	<p>_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4</p>

These next foods are bread and dessert items. 下面是面包和甜品		
Steamed bun 馒头	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (1 cup 杯) <input type="checkbox"/> 4
Bread, including in sandwiches or hamburgers 面包; 包括三明治和汉堡	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几片? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4
Bagel or English muffin 面包圈或英式松饼	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Deep-fried wheat dough stick 油条	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 每次吃多少? <input type="checkbox"/> 3" (7.5 cm) <input type="checkbox"/> 6" (15 cm) <input type="checkbox"/> 9" (23 cm) <input type="checkbox"/> 12" (30.5 cm)
Chinese sweet pastry, such as bean paste cake or buns 中式甜点, 如豆沙包或甜面包	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How much each time? 一次吃几只? <input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 1½ <input type="checkbox"/> 2
Ice cream 冰淇淋	<input type="checkbox"/> never, or less than once a month (GO TO NEXT FOOD) 从来不吃, 或每月不到一次 (到下一食物)	_____ time(s) 次 per <input type="checkbox"/> day 天 <input type="checkbox"/> week 周 <input type="checkbox"/> month 月 How many scoops each time? 每次吃几瓢? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4



Appendix F

Presentation Slides for the Education Workshop



骨质疏松讲座



天普大學亞裔健康中心
许智瑾（博士生）
马学勤（指导教授）



1

骨骼系统的重要性

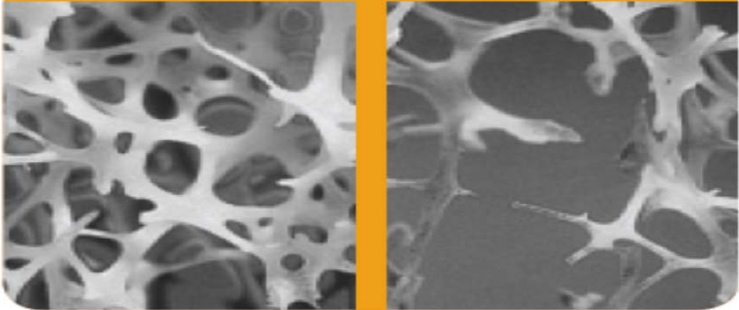
- ★ 能够活动
- ★ 保护器官
- ★ 储藏矿物质



2

什么是骨质疏松?

骨質疏鬆症使骨骼變弱



正常的骨骼 骨質疏鬆症病人的骨骼

This slide illustrates the difference between normal bone and osteoporosis-affected bone. The left image shows a dense, interconnected network of bone trabeculae, labeled '正常的骨骼' (Normal bone). The right image shows a significantly thinner and more fragmented network, labeled '骨質疏鬆症病人的骨骼' (Bone of an osteoporosis patient). The slide is decorated with a smiling emoji and a red apple on the left, and three sad emojis on the right.

骨质疏松的后果



骨折

活动能力降低



脊椎骨变形

怎么知道自己有骨质疏松

- 骨密度测试
 - DEXA扫描—双能X线骨密度测试
 - 超声波密度测试
- 骨折

5

骨密度测试结果

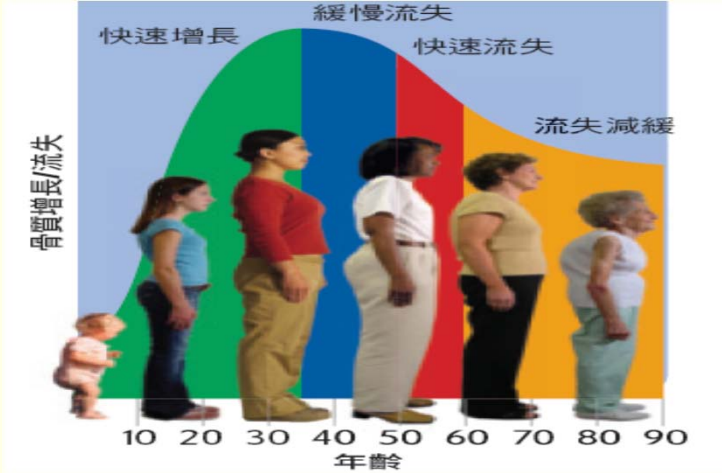
正常 T 值 ≥ -1

低骨量 $-1 \sim -2.5$ 之间

骨质疏松症 ≤ -2.5

6

骨质和年龄的关系



7

骨质疏松发病率

年龄	发病率
80以上	十里有八
70 to 79	十里有七
60 to 69	十里有六
50 to 59	十里有二
40 to 49	百里有五
30 to 39	百里有一

<http://courses.washington.edu/bonephys/opbmd.html#old>, 3/8/11



8

Liao et al. 2002; WHO, 2003



骨质疏松的风险因子

- 高龄
- 食钙不够
- 体格瘦小
- 运动不够
- 有家族史
- 吸烟，过量饮酒

9



不管您現在幾歲，
您都可以採取措施來
增進自己的骨骼健康



10




多吃富含鈣的食物

多吃富含維生素D的食物




11

足夠的鈣摄入量是多少？

不同年齡的人需要的鈣量	
年齡	每日所需鈣量 (以毫克為單位)
零歲～六個月	210
七～十二個月	270
一～三歲	500
四～八歲	800
九～十八歲	1,300
十九～五十歲	1,000
五十歲以上	1,200

➔

一杯牛奶或一杯加鈣橘汁含大約300毫克的鈣

12

营养成分标示一例 (1) 牛奶

Nutrition Facts			
Serving Size 1 cup (236mL)			
Servings Per Container 8			
Amount Per Serving			
Calories	90	Calories from Fat	0
% Daily Value*			
Total Fat	0g		0%
Saturated Fat	0g		0%
Cholesterol	5mg		2%
Sodium	125mg		5%
Total Carbohydrate	13g		4%
Dietary Fiber	0g		0%
Sugars	12g		
Protein	8g		
Vitamin A	10%	Vitamin C	4%
Calcium	30%	Iron	0%
Vitamin D	25%		

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营养成分标示一例 (2)
豆奶

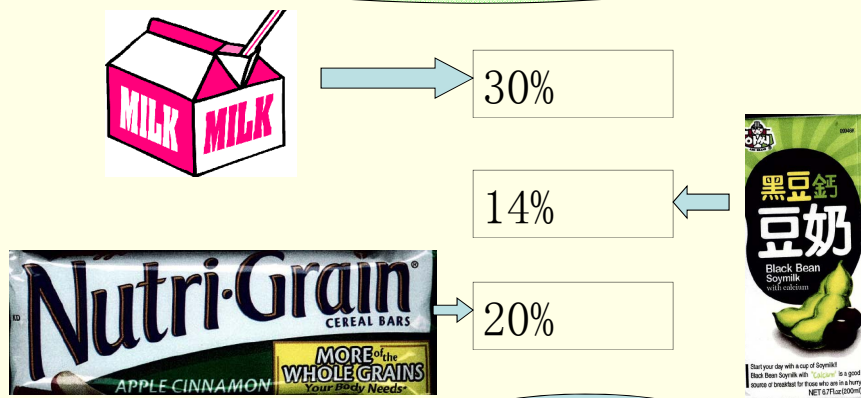
Nutrition Facts			
Serving Size 200ml			
Servings Per Container About 1			
Amount Per Serving			
Calories	145	Calories From Fat	63
% Daily Value*			
Total Fat	7g		11%
Saturated Fat	1g		5%
Trans Fat	0g		
Cholesterol	0mg		0%
Sodium	150mg		6%
Total Carbohydrate	14g		5%
Dietary Fiber	0g		0%
Sugar	14g		
Protein	6g		12%
Vitamin A	0%	Vitamin C	0%
Calcium	14%	Iron	0%
Percent Daily Values are based on a 2,000 calorie diet.			
INGREDIENTS: SOYBEAN MILK BLACK SOYBEAN MILK FROM			

营养成分标示一例 (3) 健康小食

Nutrition Facts		Amount/Serving	%DV*	Amount/Serving	%DV*
Serv. Size	1 Bar (37g)	Total Fat 3g	5%	Total Carbohydrate 24g	8%
Calories	120	Saturated Fat 0.5g	3%	Dietary Fiber 3g	10%
Calories from Fat	30	Trans Fat 0g		Sugars 12g	
		Cholesterol 0mg	0%	Protein 2g	
		Sodium 110mg	5%		
* Percent Daily Values (DV) are based on a 2,000 calorie diet.		Vitamin A 15% • Vitamin C 0%	Calcium 20%	Iron 10% • Thiamin 15%	
		Riboflavin 25% • Niacin 25%	Vitamin B6 25%	Folic Acid 10% • Zinc 10%	



15

钙总量够了吗?



16

富含钙的食物

脫脂牛奶, 1杯		302	30 %
奶昔, 1杯		300	
原味低脂優酪乳 (優格), 1杯		300	

17

富含钙的食物



20 %

含鈣硬豆腐 (1/2杯) 含鈣 204毫克

18

富含钙的食物



30
%

罐裝沙丁魚(3盎司), 含鈣324毫克

19

富含钙的食物



30
%

青菜200克, 含鈣324毫克

20

富含钙的食物

虾皮2000，虾米882，芝麻酱870，
海带（鲜）455，紫菜422，
小黄鱼（咸）385，大豆367，
大头菜351，木耳295，空心菜283，
银鱼（鲜）258，南瓜子235，苋菜228，
海蛰207，大黄鱼（咸）188，菠菜158，
油菜148，鸡蛋黄134，圆白菜117，
牛奶120，豆浆57，鸡蛋55

100 g

21

富钙食谱—虾皮豆腐汤

虾皮50克，嫩豆腐200克。

制法：虾皮洗净后泡发；嫩豆腐切成小方块；加葱花、姜末及料酒，油锅内煸香后加水烧汤。

功效：虾皮每100克钙含量高达991毫克，豆腐含钙量也较高，常食此汤对缺钙的骨质疏松症有效。

<http://baike.baidu.com/view/432077.htm>

22

富钙食谱—黄豆猪骨汤

鲜猪骨250克、黄豆100克。

制法：黄豆泡6-8小时；将猪骨放入砂锅内，加生姜、黄酒，食盐适量，加水1000毫升，经煮沸后，用文火煮至骨烂，放入黄豆继续煮至豆烂，即可食用。

功效：鲜猪骨含天然钙质、骨胶原等，对骨骼生长有补充作用。黄豆含黄酮甙、钙、铁、磷等，有促进骨骼生长和补充骨中所需的营养。此汤有较好的预防骨骼老化、骨质疏松作用。

<http://baike.baidu.com/view/432077.htm>

23

富钙食谱—在线菜谱



清炖鲤鱼



排骨焖土豆

美食杰
www.Meishi.cc

24

促进骨骼健康, 你可以做到!



多食高钙食物
促进骨骼健康
防止骨质疏松

26

A central graphic with a yellow circular border containing the text "多食高钙食物 促进骨骼健康 防止骨质疏松". Surrounding the circle are six images of high-calcium foods: a container of Dannon Light n' Fit strawberry yogurt, a tray of various cheeses, a carton of milk, a smiling apple emoji holding a red apple, a basket of leafy green vegetables, and a tray of fish.

Appendix G

IRB Approval Letter

PI: MA, GRACE X **Date: 01-Aug-2011**
Committee: B BEHAVIORAL AND SOCIAL SCIENCES
Protocol Number: 13816
Project Title: Osteoporosis Prevention in Chinese American Women - Knowledge, Self-Efficacy, and Intention

The Temple Institutional Review Board acknowledges receipt of your memo dated July 27, 2011 requesting the following amendments to the above referenced protocol:

- 1.The questionnaires regarding food intake have been modified.
2. Time point for collecting osteoporosis knowledge has been changed.

The modified consent forms in English and Chinese have been attached to this submission.

This amendment and associated documents have been reviewed and approved within the IRB Office for its intended use.

Thank you for keeping the IRB informed of your research.

Appendix H

A Sample Informed Consent Form

知情同意书
在美华人妇女骨质疏松症预防—知识，自我效能及意向

亲爱的参与者:

天普大学亚裔健康中心正要进行一项研究来评估一个干预计划的有效性。这个干预计划旨在提高华裔妇女对骨质疏松症的知识，提高她们采纳高钙饮食的能力及多食高钙食品的意向。如果您选择参加这项研究，您将被邀请参加一个干预计划或控制计划 (约一个半小时的时间)。您还会被要求在干预计划开始之前和之后完成一个问卷调查，在 3 月随访时通过与健康教育者的电话交谈完成问卷。如果您在这项研究中接受的是控制计划，您有权在这项研究完成后收到干预计划。

所有的问卷将会被保存在上锁的柜子里。我们欢迎来自于您的关于本项调查的任何问题。参加这项研究完全出于自愿，您可选择不参与。您有权在任何时间离开这项研究。离开这项研究不承担任何后果。请在下面签字表明您已经通读并且理解这份知情同意书的内容并且同意参与这项研究。

作为此项研究参与者，您同意以下的说法:

我理解如果我有任何关于我作为研究参与者的权利，我可以联系天普大学医学伦理委员会协调员，电话：215-707-3390，电子邮件：IRB@temple.edu，或以下通讯地址：

Temple University
Temple Research Administration
Institutional Review Board Coordinator
Student Faculty Conference Center
3340 North Broad Street, Suite 304
Philadelphia, PA 19140

尽管研究团队严格保密我的个人资料，我理解潜在的泄密风险是不可避免的。所有和该项目相关的资讯将持续严格保密。除非应有关部门，比如联邦，州，地区执法单位要求，该研究相关的文件和资料都将保密。我理解天普大学，该项目资助单位，以及政府部门可以检查该项目资料和记录，以确保该研究项目的正确性。我理解研究成果也许会发表。我的名字不会出现在发表物上。

真诚的，

马学勤，博士，注册健康教育专家，
主任，首席研究员
亚裔健康中心，公共卫生学系，天普大学
1301 Cecil B. Moore Avenue, Ritter Annex, Room 932, Philadelphia, PA, 19122

签署您的姓名表明您理解了同意书，并同意参与这项研究。

参与者签名

日期

获取这个同意书的工作人员的签名

日期