Knowledge, behaviors, and beliefs of college freshmen women regarding osteoporosis

Alison Laureen Winans

Medical University of Ohio

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Knowledge, Behaviors and Beliefs of College Freshmen Women Regarding Osteoporosis

Submitted by
Alison Winans

In partial fulfillment of the requirements for the degree of Master of Science in Biomedical Sciences

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Academic Advisory Committee

Major Advisor
Karen Graham, MPAS, PA-C

Department Chairperson
Patricia Hogue, M.S., PA-C

Dean, College of Health Sciences
Christopher E. Bork, Ph.D., P.T.

Dean, College of Graduate Studies
Keith K. Schlender, Ph.D.
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DEDICATION

This manuscript is dedicated to my grandparents, parents, and husband.

Thank you for all of the love and prayers.

Grandma and Pepa, I am blessed to have you as role models of true generosity and love.

Mom and Dad, thank you for all of your love and support. I appreciate the values you instilled in me. You taught me by example how to be a good “wooka” and to persevere. Mom, your phone line is always open whenever I’m in a panic or need good advice . . . and yes, moms do give the best advice, even if their kids don’t want to admit it. I could not ask for a better friend or prayer warrior. Dad, you always played devil’s advocate, but you forced me to prove what I know.

Because of that fact, I solidly learned medicine and will be a better PA.

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INTRODUCTION

Osteoporosis is a silent disease, often asymptomatic until an individual’s first fracture. More than one-half of all women and one-fourth of all men will have a fracture related to osteoporosis in their lifetime. In the United States alone, ten million individuals have osteoporosis and 34 million more have low bone mass, putting them at high risk for developing the disease (National Osteoporosis Foundation [NOF], 2004). Osteoporosis is a systemic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue, resulting in compromised bone strength and increased susceptibility to fracture development (Burns & Kumar, 2003). This disease is highly preventable, but yet 1.5 million fractures occur annually. Hip fractures comprise 300,000 of these fractures and vertebral fractures comprise 700,000. It is estimated that 17 billion dollars are spent each year treating osteoporosis and its resultant fractures (NOF). According to the Surgeon General’s Report on Bone Health (2004), the initial treatment cost of a hip fracture in the year 2002 ranged from $30,100-43,400. Adding in the cost of therapy, hospitalization, and nursing home stays, the overall lifetime cost of treating and caring for a hip fracture could exceed $81,000.

Several studies have shown that osteoporosis knowledge does not correlate with behavior to prevent the disease (Kasper, Peterson, Allegrante, Galsworthy, & Gutin, 1994; Wallace, 2002; Ziccardi, Sedlak, & Doheny, 2004). Despite the knowledge that the women in these studies had about osteoporosis, only a small number of them took action to prevent its development. This is especially true in younger populations because they do not believe that osteoporosis affects them at such a young age. The younger population may not realize that peak bone mass is achieved by the age of 30, with 90% of bone formation occurring by the time adolescents finish their growth spurt (National Institute of Child Health & Human Development [NICHD], 1998). It is crucial
that these individuals are taught about osteoporosis, its risk factors, and prevention, so they can make informed decisions regarding whether to take steps to prevent the development of the disease. Few studies have strictly examined the traditional college setting to determine what these young females know about osteoporosis. College students are often living on their own and making decisions about their diet, physical activity, and health independent of their parents for the first time in their lives. It is vital that healthcare professionals understand what this age group knows about osteoporosis and the actions they are willing to take to prevent the disease. Therefore, the purpose of this study is to evaluate the knowledge, behaviors, and beliefs of college freshmen women concerning osteoporosis prevention.
LITERATURE REVIEW

Bone is a dynamic organ that remodels itself throughout life. This remodeling is regulated by osteoblasts, cells responsible for bone formation, and osteoclasts, cells responsible for bone resorption. When the activity of these two cell types becomes unbalanced in favor of osteoclasts, bone disease often results. From birth to 30 years of age, bone is deposited faster than it is broken down (osteoblasts working faster than osteoclasts); from 30 to 50 years of age, bone is deposited and broken down at the same rate (osteoblast and osteoclast activity is in balance); and, from 50 years of age and older, bone is broken down much faster than it is deposited (osteoclasts working faster than osteoblasts) (National Institute of Health Osteoporosis and Related Bone Diseases National Resource Center [NIH ORBD-NRC], 2003). The development of primary osteoporosis can be narrowed to three factors: failure to achieve peak bone mass during childhood, accelerated bone loss as an adult, or a combination of the two. The achievement of peak bone mass is an important determinant of the subsequent risk of osteoporosis. Ninety percent of bone growth occurs between the ages of 10 and 20 (Hightower, 2000), and by age 20 a female has acquired approximately 98% of her skeletal mass (NOF, 2004). Thus, the adolescent and young adult years are a crucial time to optimize bone density and prevent the development of osteoporosis.

Some risk factors associated with osteoporosis cannot be changed. For example, the prevalence of osteoporosis is higher in Caucasian and Asian females with thin body structures than in any other group. The risk of osteoporosis also increases with age and with family history of the disease. Additionally, estrogen level is an important determinant in osteoporosis risk because it serves to protect bones. Late menarche, menstrual irregularities, amenorrhea, and menopause are all associated with decreased estrogen levels and thus increased risk of
osteoporosis (Tudor-Locke & McColl, 2000). In fact, twenty percent of a woman’s bone mass can be lost in the five to seven years following menopause (NOF, 2004).

Several other risk factors of osteoporosis can be modified to help prevent development of the disease. Even though osteoporosis often does not reveal itself until older age, it can and should be considered a pediatric disease. It is vitally important to consume a multitude of calcium rich foods throughout life, but this is especially important in childhood and adolescence. During the adolescent growth spurt, calcium content in the bones triples (Hightower, 2000); thus, this is a prime opportunity to develop dense bones. This is only possible, however, if enough calcium is consumed. The recommended calcium intake for 9-18 year olds is 1300 mg/day (Surgeon General’s Report, 2004). A NICHD-supported study reported a 14% bone density increase in 12-16 year old girls supplemented with 500 mg calcium citrate-malate compared to nonsupplemented controls. Based on this study every 5% increase in bone density decreases future fracture risk by 40% if that bone mass is maintained (NICHD, 1998). This is supported by increased bone density observed in a study of 80 adolescent females in Sheffield, England. Forty-four of the subjects supplemented their diets with 568 ml of milk per day. At the end of the 18 month trial the supplemented group had a significantly greater bone mineral content and density, gaining an extra 37 grams of bone mineral overall (Cadogan, Eastell, Jones, & Barker, 1997).

Childhood and adolescence are critical times to prevent the development of osteoporosis later in life. According to the National Institute of Health, fracture incidence is increasing among children and young adults. Additionally, rickets is increasing: a disease that was virtually nonexistent after milk was supplemented with vitamin D in the 1950s (2001). In a study by Fleming and Patrick (2002), only 23 and 32 percent of pediatricians sampled could identify the
Recommended Daily Allowance (RDA) for calcium in children and adolescents, respectively. Furthermore, only 46% of the pediatricians reported that they counseled patients or parents on osteoporosis prevention. When counseling occurred it was due to specific patient characteristics, for example an eating disorder or family history. Counseling also occurred when the provider had a personal interest in osteoporosis prevention. Interestingly, a history of irregular menses or amenorrhea triggered counseling only 59% of the time, and anticonvulsant or steroid medication use triggered counseling only 54% of the time. A study by Berarducci (2004) reported that only 20% of the nursing students sampled claimed that their healthcare provider had discussed osteoporosis with them. A previous study by Berarducci and colleagues demonstrated that osteoporosis education by primary healthcare providers is generally postponed until women are 50 years of age or older (Berarducci, Burns, Lengacher, & Sellers, 2000).

Physical activity is another modifiable risk factor of osteoporosis. Activity is important for maximizing bone mass during childhood, maintaining bone density during the adult years, decreasing bone loss with aging, and reducing falls in the elderly (Kohrt, Bloomfield, Little, Nelson, & Yingling, 2004). Bone is a living tissue and thus when force is applied to it during exercise, it remodels to support the extra demand. Weight-bearing physical activity, such as jogging, gymnastics, plyometrics, and weight training, is particularly beneficial for increasing bone mineral density. The Nurses’ Health Study (Feskanich, Willett, & Colditz, 2002) found that postmenopausal women with high levels of physical activity (24 Met-h/wk which is equivalent to jogging approximately 3.5 h/wk or walking 8 h/wk) had a 67% lower incidence of hip fracture. This is comparable to a 60-70% reduction seen in women on hormone replacement therapy (HRT) when compared to sedentary postmenopausal females not on HRT (Feskanich et
Thus, high levels of exercise during and after the menopause may be as effective as HRT in preventing fractures.

Additionally, hip fracture incidence appears to be 20-40% lower in individuals reporting to be physically active compared to those who report little physical activity (Gregg, Pereira, & Caspersen, 2000). A much lower level of physical activity, walking four hours per week, has also been reported to lower hip fracture risk by 41% (Feskanich et al.). Several other studies also display this positive correlation between walking and increased bone density (Coupland et al., 1999; Krall & Dawson-Hughes, 1994; Cummings et al., 1995). The American College of Sports Medicine suggests that children get 10-20 minutes of weight-bearing exercise at least 3 days per week to increase bone mineral density. Adults should get 30-60 minutes of weight-bearing endurance activities 3-5 times per week and resistance exercise 2-3 times per week to maintain bone health (Kohrt et al.). Research by MacKelvie and colleagues suggests that weight-bearing physical activity should be maximized before and around the time a girl reaches menarche in order to reach optimum bone density. At this point in development estrogen, testosterone, growth hormone, and insulin-like growth factor-I are at higher levels, augmenting bone formation (MacKelvie, Khan, & McKay, 2002). Thus, supported by several studies, weight-bearing physical activity throughout life is a primary component of maintaining bone health and decreasing osteoporosis risk.

In addition to low levels of calcium intake and weight-bearing exercise, excessive alcohol and caffeine consumption and cigarette smoking have also been linked to increased osteoporosis risk (NIH ORBD-NRC, 2003; NOF, 2004). At excessive levels, alcohol seems to affect bone by transiently decreasing parathyroid hormone resulting in increased calcium excretion (Laitinen & Valimaki, 1993). A review article by Tudor-Locke and McColl reported that moderate levels of
alcohol consumption do not appear to be detrimental to bone health and may even be osteoprotective (2000). A study by Feskanich et al. found that women who consumed 75 or more grams of alcohol per week had significantly greater lumbar spine bone densities than non-drinking women. They also found a linear increase in spinal bone mineral density correlating to alcohol consumption up to 75 grams. No increase in femoral bone mineral density was observed in correlation to alcohol intake. It is suggested that modest alcohol consumption increases bone density by promoting calcitonin secretion or by increasing endogenous estrogens (1999). Further research is necessary before promotion of alcohol consumption should be utilized as a means to help prevent osteoporosis.

Caffeine may affect bone by: 1) cola consumption replacing milk intake, 2) increasing urinary calcium excretion up to three hours following consumption, or 3) high phosphorous containing colas limiting calcium absorption (Kim, Morton, & Barrett-Connor, 1997). Modest caffeine consumption with adequate milk intake does not appear to be detrimental to bone in the younger population who can compensate for the increase in urinary calcium loss. Unfortunately, the elderly cannot compensate as well (Massey, 2001).

Smoking is detrimental to bone mineral density. It is unknown exactly how smoking affects bone, but reduced calcium absorption and accelerated bone turnover due to decreased estrogen levels have both been suggested (Tudor-Locke & McColl, 2000). A study of 402 (32 smokers, 370 nonsmokers) men and women over the age of 65 examined calcium absorption and bone mineral density loss in supplemented and unsupplemented individuals. The supplemented group consumed 500 mg/day of elemental calcium and 700 IU/day cholecalciferol (vitamin D). Overall, total body annual bone mineral density loss was greater in smokers compared to
nonsmokers, and average calcium absorption was approximately 1.7% lower in smokers compared to nonsmokers (Krall & Dawson-Hughes, 1999).

Knowledge

It is striking how little women know about osteoporosis. Terrio & Auld examined three age groups of women by dividing 75 subjects into three groups: young (25-35 year olds), middle-aged (36-46 years old), and postmenopausal (50+ years old). They hypothesized that older women would have higher knowledge scores than middle-aged women, and that middle-aged women would have higher scores than young women. There was no significant difference in knowledge levels between the three groups, but trends were present supporting their hypothesis. Regardless of age group, knowledge scores were limited with an average of 32-44 points out of 183 possible points (2002). Most of the literature examining osteoporosis knowledge reveals that lay people do not have an adequate knowledge base about disease prevention. In one study, only 10% and 15% of participants, respectively, recognized that low calcium intake and little weight-bearing activity were risk factors for osteoporosis (Ribeiro, Blakeley, & Laryea, 1998). These are the two chief modifiable risk factors for the disease.

Williams, Cullen, and Barlow (2002) surveyed 162 females ages 18 to 73 (mean=40) and found the average of osteoporosis knowledge questions answered correctly to be 20.19 out of 47. These women lacked knowledge in the areas of osteoprotective exercise, bone density scans, and hormone replacement therapy. Again, a trend between increased age and increased osteoporosis knowledge was observed. Berarducci (2004) surveyed 95 senior nursing students who averaged a 66% correct response rate on an osteoporosis knowledge questionnaire. This is higher than reports in other studies, but these participants had completed entry level nursing classes. It is noteworthy that 65% of the respondents did not know that one in two females will suffer from an
osteoporosis related fracture, and 80% of respondents did not know the daily calcium requirement for menstruating women. This information is vital for healthcare professionals to know in order to educate patients.

Beliefs

Regardless of age, osteoporosis is not a topic that frequents an individual’s thoughts. A majority of the women (94%) in the study by Ribeiro et al. (2000) had heard or read something about osteoporosis, but only 55% of these women found the information useful. How much a person thinks about osteoporosis is generally in direct proportion to their age and life experiences (Backett-Milburn, Parry, & Mauthner, 2000). For example, having a friend or relative with osteoporosis or having the disease themselves may motivate an individual to research and attempt to understand the disease. Backett-Milburn and colleagues report that their study participants, women ages 40-55 years old, showed disinterest in this topic unless the disease had directly impacted their life in some way. Likewise, Williams, Cullen, and Barlow’s study demonstrated that few of these women viewed osteoporosis as a current serious threat to their health, but the view of seriousness to future health increased with age (2002). It is a challenge to determine how to help younger women realize that neglecting their bone health today may greatly affect their quality of life in the future.

Two studies by Kasper and colleagues measured women’s beliefs about heart disease, breast cancer, osteoporosis, HIV or AIDS, and Alzheimer’s disease. The women in both studies held the belief that osteoporosis is considerably less serious than the above-mentioned diseases. These women also believed that they were less responsible for developing osteoporosis than for developing heart disease (Kasper et al., 1994; Kasper, Peterson, & Allegrante, 2001). Distribution of educational osteoporosis materials may increase the degree of control one feels
over disease development (Blalock et al., 2000). This is an important finding because if one feels helpless in disease prevention, no preventative actions will be taken. Even though research has not shown that disease knowledge leads to behavior change, education is the first step.

**Behaviors**

Preadolescent and adolescent children ages 9-18 need 1300 mg of calcium per day, yet a study by Harel and colleagues found that the average high school freshman female consumes only 536 mg calcium in 24 hours, 45% of the RDA (Harel, Riggs, Vaz, White, & Menzies, 1998). The Center for Disease Control’s 2004 MMWR Surveillance Survey of high school students reports that nationwide only 17.1% of students drink three or more glasses of milk per day, and only 11.2% of female students meet this requirement. According to the U.S. Department of Health and Human Services’ Healthy People 2010 document (2000), only 19% of American women ages 9-19 meet the RDA for calcium intake, and overall, only 46% of American men and women meet this RDA. A similar story prevails when looking at young females 19-30 years of age. Several studies of this age group have found that at least two-thirds to three-fourths of these females are far below the recommended RDA for calcium intake (Kasper et al., 1994; Kasper et al., 2001; Ali, 1996; Ribeiro et al., 2000; Ziccardi et al., 2004). These are alarming statistics considering that they are approaching or have already reached their peak bone mass.

Weight-bearing activity is another modifiable risk factor of osteoporosis, but as with calcium deficiency, Americans of all ages are not getting adequate exercise for cardiovascular health or osteoporosis prevention. To discourage osteoporosis, a minimum of 90 minutes of weight-bearing activity is needed per week (Kasper et al., 1994; Wallace, 2002). Both Kasper et al. and Wallace found that over half of the women they sampled in their studies did not reach the
minimum criteria for osteoporosis preventing activity. In a survey of Canadian women (n=178, ages 25-84), only 29% of the respondents exercised with the intent of preventing osteoporosis. In this sample 16% did not exercise at all and 19% only exercised once or twice a week. Twelve percent of this sample had a known diagnosis of osteoporosis, but it is not possible to determine from the report if this population is included in the group who exercised to prevent the disease (Ribeiro et al., 2000). The Center for Disease Control’s 2004 national survey of high school students reports that 33.4% of male and female students combined, and 40% of female students have insufficient amounts of exercise. Eleven and one-half percent of this population reported no physical activity. Healthy People 2010 reports that overall, 40% of Americans over the age of 18 practice no leisure-time physical activity, once again with the percentage of women being greater than men. Additionally, 31% of 18-24 year olds do not engage in leisure-time physical activity (2000).

Since the separate statistics of those who demonstrate adequate calcium consumption and weight-bearing physical activity are grim, the combination of these two activities is shockingly low. Kasper and colleagues’ 1994 and 2001 studies report that only 6.7% and 3.8% of subjects, respectively, had both adequate exercise and calcium intake. Wallace had slightly higher results with 15% of participants meeting both criteria (2002). Overall, few women are protecting themselves from osteoporosis.

**How Knowledge Affects Beliefs and Behaviors**

Regardless of the topic of interest, many studies have demonstrated that educational materials increase participant knowledge. During follow-up interviews after an osteoporosis educational program, the interviewers noted that the participants discussed what they had learned rather than what they planned to do with the new information (Sedlak, Doheny, & Jones, 2004).
Many studies have demonstrated that educational materials increase osteoporosis knowledge but do not facilitate preventative behaviors (Taggart & Connor, 1995; Blalock et al., 2000; Sedlak, Doheny, & Jones, 2000; Terrio & Auld, 2002; Wallace, 2002; Sharp & Thombs, 2003; Ziccardi et al., 2004). Blalock and colleagues observed that educational materials increased the knowledge of the participants and their perceptions of the effectiveness of exercise in preventing osteoporosis. Unfortunately, these findings were not statistically significant in association to behavior changes. However, there was a trend that perception changes were associated with a greater likelihood of meeting osteoprotective exercise guidelines. They also found that increased osteoporosis knowledge had a trend toward increased compliance to the recommended guidelines for calcium intake; however, this finding was not statistically significant.

Tepper and Nayga (1998) surveyed 472 females over the age of 50 and found that women who were aware of the association between calcium and osteoporosis generally had a higher calcium intake. Likewise, a study involving 110 women ages 25 to 75 evaluated the effectiveness of a three-hour osteoporosis prevention program in increasing participants’ knowledge, calcium intake, and exercise. They found that the treatment group, which received the three-hour intervention, was more likely to be planning to increase their calcium intake, or were currently engaging in it post-intervention. However, there was no significant change in exercise intentions or engagement. This may be due to needing increased motivation to change this aspect of lifestyle, or the fact that 73% of the respondents already walked at least one hour per week with a mean of 2.9 hours/week. Most importantly, at three-month follow-up 83% of treatment subjects versus 58% of control subjects reported increased calcium intake. However, their daily calcium food frequency recordings did not support the subject’s reports. This discrepancy may be due to
the questionnaire requesting only number of servings and not serving size (Brecher et al., 2002). Thus, educational materials may increase calcium intake long-term.

A study specifically examining exercise adherence, found that intensive interventions to assist women in maintaining long-term adequate exercise regimens were not effective. One hundred and twenty previously sedentary women were divided into three groups. The control group had scheduled 35-50 minute exercise classes three times per week for 18 weeks. A relapse prevention group had additional training on pitfalls that might cause temporary cessation of exercise and how to overcome those pitfalls, and another group had reinforcement and rewards for regular attendance. Attendance for the first nine weeks was significantly higher for the relapse prevention group compared to the control group, however, no significant difference was observed for the second half of the class (Marcus & Stanton, 1993). Since research has repeatedly unveiled that knowledge about osteoporosis is not enough to consistently motivate preventative behaviors, research needs to explore what stimulates one to value personal health and what interventions encourage this.

Equipping the public with knowledge is the first step. Most women do not have adequate knowledge about osteoporosis to begin practicing preventative behaviors. Understanding what preventative behaviors should be practiced does not ensure that action will be taken, but research has shown trends that knowledge may encourage some women to improve their osteoprotective physical activity and even more so, to enhance their calcium intake. Healthcare providers cannot force their patients to take action to protect their bones from osteoporosis, but they can and should give them the tools, at a young age, to understand the seriousness of the disease and what can be done to prevent it.
METHODS

Participants and procedures. Following approval by the institutional review board, a modified questionnaire created by Kasper et al. (1994, 2001) was distributed to a convenience sample of one hundred and three college women residing in four of the freshmen residence halls at Ohio Northern University. Each woman in attendance at a hall program or meeting was given the opportunity to complete an anonymous survey and participate in the study. Upon collection of the surveys in an enclosed box to assure anonymity, an informatory pamphlet about osteoporosis was made available to those who were interested.

Questionnaire. The Multiple Osteoporosis Prevention Survey (MOPS) was designed, pretested, and used by Kasper et al. (1994, 2001) to examine the knowledge, beliefs, and behaviors of 325 undergraduate women. The questionnaire contained 23 sections and included content on hormonal contraceptive use, menstrual history, preferred learning sources, and medical visits, all of which did not correspond with the purpose of this study and were eliminated. The remainder of the questionnaire covered material addressed in this research. The content included 14 questions on how much the individual had heard about osteoporosis, demographic information, self-reported height and weight, perceived exercise and calcium intake, cigarette use, and other sections described below.

Knowledge. Risk-factor knowledge was evaluated by a list of common risk factors that the respondent identified as (1) definitely increasing, (2) probably increasing, (3) probably not increasing, (4) definitely not increasing, or (5) don’t know if it increases the risk of developing osteoporosis. A response of 1 or 2 was considered a correct answer, and a response of 3, 4, or 5 was considered a wrong answer.
Beliefs. Using a five-point Likert scale, respondents rated how concerned, how likely, how serious, and how responsible they are for developing heart disease, breast cancer, osteoporosis, HIV or AIDS, Alzheimer’s disease, and the common cold.

Exercise. Respondents indicated from a list of 14 different exercises or sports which activities they participated in over the past 14 days. If she had participated in one of the exercises she was to list how many times she participated in the past 14 days, how many minutes she participated during each outing, and whether her heart rate had a small, moderate, large, or no increase. The frequency and minutes of each activity were multiplied and those with a moderate to large increase in heart rate were scored as osteoporosis preventative exercise. Adequate osteoporosis preventative exercise is equivalent to 180 minutes weight bearing exercise per 2 weeks (equivalent to three 30 minute sessions per week).

Calcium Intake. Kasper, Peterson, and Allegrante assessed calcium intake using a modification of a food frequency questionnaire designed by Block et al. (1986). Ten calcium containing foods, soft drinks, coffee, and alcohol were listed along with what a medium serving size would be. The respondents were asked to list how many times a day, week, month, or year they eat each food and if their typical serving size is small, medium, or large, compared to the stated medium serving size. The calcium content of each food was multiplied by the number of servings consumed and then converted to per year intake. The sum of the respondent’s calcium intake was divided by 365 to determine their average daily calcium intake. Each respondent’s calcium intake was defined as adequate (at least 1,300 mg/day) or inadequate (less than 1,300 mg/day).

Data Analysis. Frequency distributions were developed for each variable. Mann-Whitney Rank Sum was used to evaluate for significant differences between osteoporosis beliefs and other disease beliefs based on the median osteoporosis score, as well as comparing other variables.
RESULTS

Respondent characteristics. One hundred and twenty-six women completed surveys, with one hundred and three surveys being entirely completed. All statistical evaluations were performed for all 103 subjects unless otherwise noted. Average (±SD) age of the respondents was 18.73±0.55 years with 101 (98.06%) of the respondents being Caucasian. Forty-eight respondents (46.60%) had science-related majors (pharmacy, chemistry, biology, athletic training, and nursing), while 55 (53.40%) had non-science related majors or were undecided on a major. The mean body mass index (weight/height$^2$) of the respondents, calculated from self-reported height and weight, was 24.03±4.27 with one respondent not supplying this information. Six respondents (5.83%) report that they currently smoke. Ninety-four respondents (91.26%) regularly eat in the school cafeteria.

Risk factor identification. Fifteen subjects (14.56%) report knowing a lot of information about osteoporosis, 85 (82.52%) report knowing some information, and 3 (2.91%) report knowing nothing at all about osteoporosis. Average knowledge score was 11.15 (61.94%) questions answered correctly out of 18 possible points. Mean score of those reporting a high degree, some, and no osteoporosis knowledge was 12.67 (70.39%), 10.81 (60.06%), and 13 (72.22%) respectively. Using the Mann-Whitney Rank Sum Test it was statistically significant (p<0.01) that those who stated a higher degree of osteoporosis information had a higher knowledge score. Mean knowledge score of respondents with a science related major was 11.21 (62.28%), and non-science related major was 11.09 (61.61%). The percentage of respondents who correctly identified osteoporosis risk factors is shown in Table 1. A large percentage of respondents (90.29%) correctly identified lack of exercise as an osteoporosis risk factor. Also, 97.09% recognized inadequate calcium consumption as a risk factor. Ninety respondents (87.38%)
correctly identified *both* lack of exercise and adequate calcium consumption as risk factors. One hundred and two respondents (99.03%) correctly identified family history of osteoporosis as a risk factor. However, only 30 (29.13%) respondents correctly identified being Caucasian as a risk factor for developing osteoporosis, and only 59 (57.28%) identified cigarette smoking as a risk factor. Four of the six smokers in this study correctly identified smoking as a risk factor for osteoporosis development.

**Beliefs.** Using a five-point Likert scale, respondents rated how concerned, how likely, how serious, and how responsible they are for developing heart disease, breast cancer, osteoporosis, HIV or AIDS, Alzheimer’s disease, and the common cold. As shown in table 2, significant results for those respondents who were concerned about osteoporosis (median=3) were also concerned about heart disease, breast cancer, HIV, and Alzheimer’s disease when compared to those respondents who were not concerned about osteoporosis. Respondents reported significant results when asked how likely they thought they were to develop osteoporosis. Those who thought they were likely to develop osteoporosis (median=3) also thought they were likely to develop heart disease, breast cancer, and HIV when compared to those who thought they were not likely to develop osteoporosis. It was also statistically significant that respondents who view osteoporosis as a serious disease (median=4) also view heart disease and breast cancer as serious diseases. When asked how responsible one is for developing the different diseases, statistically significant results were seen for those who thought one is responsible for developing osteoporosis (median=3). These respondents also thought that one is responsible for developing heart disease, breast cancer, HIV, and the common cold when compared to those who did not believe that one is responsible for developing osteoporosis. Interestingly, it is statistically
significant ($p=0.024$) that respondents with high osteoporosis concern (median $\geq 3$) had overall higher knowledge scores.

**Osteoprotective exercise.** Respondents reported an average of 437.53 minutes of osteoprotective exercise within the 2 weeks prior to the study. Adequate osteoprotective exercise is equivalent to 180 minutes weight bearing exercise per 2 weeks (equivalent to three 30 minute sessions per week). The osteoprotective exercise median was 220 minutes and the mode was 0 minutes ($n=22$, $21.36\%$). Sixty respondents ($58.25\%$) self-reported adequate bone protective exercise over the prior two-week period. Twenty-six respondents ($25.24\%$) viewed themselves as more active than their peers (average=799 minutes osteoprotective exercise, median=582 minutes); twenty-three of these respondents ($88.46\%$) had adequate osteoprotective exercise. Forty-five respondents ($43.69\%$) viewed themselves as about as active as their peers (average=419 minutes osteoprotective exercise, median=121 minutes); twenty-five ($55.56\%$) of these respondents had adequate osteoprotective exercise. Thirty-four respondents ($33.01\%$) reported lifting weights, one of the best osteoprotective exercises, in the two weeks prior to the survey. Twenty of the twenty-six respondents ($76.92\%$) who believe they are more active than their peers report lifting weights. Twelve of the forty-five respondents ($26.67\%$) who believe they are about as active as their peers report lifting weights, and only two of the thirty-two respondents ($6.25\%$) who believe they are less active than their peers report lifting weights. Overall, thirty-one out of the thirty-four respondents ($91.18\%$) who lift weights had adequate osteoprotective exercise.

**Calcium intake.** The respondents reported a mean daily calcium intake of $913.72\pm495.39$ mg. However, only 26 ($25.24\%$) respondents had adequate calcium intake ($\geq 1,300$mg/day for 18-24 year olds). Sadly, only eighteen ($17.48\%$) of respondents had both adequate calcium intake and
osteoprotective exercise. No significant difference was seen for high osteoporosis concern (median=3) and calcium intake (p=0.66), or osteoprotective exercise (p=0.73).
DISCUSSION

Much of the previous research on osteoporosis has focused on perimenopausal or postmenopausal females who may have a more imminent encounter with the disease. Few studies have strictly examined the traditional college setting to determine what these young females know about osteoporosis. College students are often living on their own and making decisions about their diet, physical activity, and health independent of their parents for the first time in their lives. It is suspected that since this population does not have a pressing risk of osteoporosis that they will not be very concerned about developing the disease, and likewise, will not be participating in adequate osteoprotective exercise or consuming an adequate amount of calcium. Previous studies have shown that women who have higher knowledge about osteoporosis tend to have more osteoprotective habits. Therefore, the purpose of this study is to evaluate the knowledge, behaviors, and beliefs of college freshmen women concerning osteoporosis prevention.

The respondents of this study were mostly Caucasian and were younger adults than those previously sampled for osteoporosis surveys. This sample was strictly college freshmen females (median age = 18.73 years) living in the resident halls of an Ohio campus. Most of the respondents reported eating in the school’s cafeteria. The BMI of this population (24.03) was higher than those of two Kasper et al. studies that assessed undergraduate women (1994, 2001). The BMIs of these two studies were 21.9 and 23.6 respectively. Thus, this contributes to the literature stating that the United States is gradually becoming heavier, though this population as a whole is not yet considered overweight (BMI=25-29.9) or obese (BMI≥30). Looking at the trend in current smoking prevalence for these three studies, smoking may be on the decline in today’s young adults, being 24% in the 1994 study, 18% in the 2001 study, and 5.8% in this study.
However, recent data does not reveal percentages this low (Bombard, 2004; Centers for Disease Control and Prevention, 2003). This discrepancy could be due to differences in the sample populations, that these are college-attending females who, on average, have a lower smoking rate, or due to an increased number of recent anti-smoking campaigns.

Women do not have adequate knowledge about osteoporosis to ensure that they do not develop the disease. Supporting the literature, the mean knowledge score in this population would rank at a D minus with only 61.9% of questions answered correctly. Fortunately, the ability of women in this study to correctly identify both lack of calcium intake and lack of exercise as osteoporosis risk factors is high at 87% and similar to that stated in previous literature. Thus, most women are aware of the two predominantly preventable osteoporosis risk factors and, therefore, can decrease their risk of developing the disease. When dichotomized by science versus non-science major, no difference was seen in knowledge scores. Unfortunately, in this predominantly Caucasian sample, only 29% of respondents recognized Caucasian race as a risk factor for developing osteoporosis.

Supporting the previous two studies by Kasper et al. (1994, 2001), the respondents of this study were only moderately concerned about osteoporosis. Respondents were as concerned or more concerned about developing heart disease, breast cancer, HIV, or Alzheimer’s disease than they were concerned about developing osteoporosis. Interestingly, respondents’ average ranking for how likely they thought they were to develop osteoporosis was their lowest response compared to how concerned, how responsible, and how serious they believe osteoporosis is. This supports the idea that young females do not believe that osteoporosis affects them at such a young age and, thus, are less likely to take action to prevent the disease. These women thought that they are as likely or more likely to develop heart disease, breast cancer, and HIV than they
are to develop osteoporosis. The prevalence of osteoporosis is much higher than these other
diseases, with 50% of women having an osteoporosis related fracture in their lifetime (NOF,
2004). Thirty-four percent of women in the U.S. will develop heart disease (American Heart
Association, 2005). Twelve percent of women will develop breast cancer in their lifetime
(Giuliano, 2004). Approximately 0.35% of the U.S. population is living with HIV or AIDS
(Osmond, 2003). Supporting previous literature, the women in this study did view osteoporosis
as a serious disease, along with both heart disease and breast cancer. Unlike both Kasper et al.
samples, it is statistically significant that the respondents of this study who had high osteoporosis
concern also had overall higher knowledge scores. However, similar to the results of Kasper and
colleagues, higher knowledge scores did not correlate with increased calcium intake or
osteoprotective exercise.

Twenty-one percent of respondents reported no osteoprotective exercise. Kasper and
colleagues 1994 and 2001 studies reported lack of osteoprotective exercise at 30% and 13.4% of
their samples respectively. Consistent with the Kasper et al. studies, forty-two percent of this
population had an inadequate amount of osteoprotective exercise based on the minimum of three
thirty-minute exercise sessions per week (180 minutes/2 weeks). Thirty-three percent (n=34) of
respondents reported lifting weights within the two weeks prior to the study. Weight lifting is
possibly the best osteoprotective exercise. Interestingly, the respondents who viewed themselves
as more active than their peers were more likely to be getting adequate osteoprotective exercise.
These respondents were also more likely to participate in weight lifting. Thirty of the thirty-four
respondents who reported lifting weights had adequate osteoprotective exercise, thus, people
who lift weights are very likely to perform an adequate amount of osteoprotective exercise.
Only twenty-five percent of respondents had adequate calcium intake. This is higher than reported in the Kasper et al. (1994, 2001) studies (17.5% and 6.6%), but less than the 32% reported in a study by Wallace (2000). Only 17% of respondents had both adequate calcium and osteoprotective exercise compared to 6.7% and 3.8% in the two Kasper and colleagues studies. Once again, the percentage obtaining both adequate calcium and osteoprotective exercise is similar to Wallace’s study (15%). One possible explanation to the discrepancy in calcium consumption between this study and the two studies performed by Kasper et al., is that most of the subjects in this study eat in the school cafeteria. Many of the subjects reported drinking calcium fortified orange juice as a major source of their calcium intake. Upon further investigation, the school purchases orange juice that is not calcium fortified.

Caution should be used when interpreting the results of this study due to the limitations of the research. Participants were asked to recall their exercise habits over the two weeks prior to the survey distribution. They were also required to recall their calcium consumption over the past year. Thus, many of the survey results are dependent on the subject’s memory about these matters. Additionally, the population was very homogenous, consisting of mostly Caucasian females attending a small university in rural Ohio whose main source of nutrition came from the school’s cafeteria.
CONCLUSION

This study supports previous literature showing that young women do not have adequate osteoporosis knowledge, and thus do not realize that they may need to modify several aspects of their lifestyle to prevent the development of the disease. Women who are concerned about osteoporosis tend to have higher knowledge levels about osteoporosis, but this does not lead to higher levels of action taken to prevent the disease. Younger women also tend to be only moderately concerned about osteoporosis. Most women are aware of the two predominantly preventable osteoporosis risk factors and can decrease their risk of developing the disease; but the percentage of women getting both adequate calcium intake and osteoprotective exercise is consistently low throughout the literature. Thus, osteoporosis remains a pediatric disease since childhood and adolescence are critical times to reach optimal bone mass and prevent the development of the disease. More literature and short educational sessions need to be utilized by physicians and other healthcare workers during patient office visits. Young women need to be educated on the high osteoporosis prevalence, morbidity, and mortality of the disease in order to be motivated to take action to prevent its development.

This study is simply a stepping stone for preventing the development of osteoporosis during peak bone production. Once women understand the prevalence, morbidity, and mortality of the disease they tend to execute more osteoprotective habits. As the research has shown, more women are likely to increase calcium consumption than to participate in osteoprotective exercise. Thus, one of the biggest challenges to the prevention of osteoporosis is understanding the types of educational material that are effective for behavior changes in relation to exercise. This is one area in which further research would be beneficial. Previous studies have found the best types of osteoprotective exercise based on age groups and how to help motivate people to exercise, but
the results have been dismal for long-term continuation of exercise. Since women are less likely to change their exercise habits than calcium consumption and more likely to start an exercise program than to stick with it, future research investigating what helps individuals continue an exercise program would be beneficial.
REFERENCES


Retrieved August 18, 2005 from http://www.americanheart.org


### Table 1. Correct osteoporosis risk factor identification.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Correct responses, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive alcohol consumption</td>
<td>n=62, 60.19%</td>
</tr>
<tr>
<td>Excessive caffeine consumption</td>
<td>n=83, 80.58%</td>
</tr>
<tr>
<td>Diet low in dairy products</td>
<td>n=100, 97.09%</td>
</tr>
<tr>
<td>Lack of physical exercise</td>
<td>n=93, 90.29%</td>
</tr>
<tr>
<td>Smoking cigarettes</td>
<td>n=59, 57.28%</td>
</tr>
<tr>
<td>Taking thyroid or steroid medications</td>
<td>n=61, 59.22%</td>
</tr>
<tr>
<td>Infrequent menstrual periods</td>
<td>n=60, 58.25%</td>
</tr>
<tr>
<td>Being post menopausal</td>
<td>n=76, 73.79%</td>
</tr>
<tr>
<td>Early or surgically induced menopause</td>
<td>n=62, 60.19%</td>
</tr>
<tr>
<td>Family history of osteoporosis</td>
<td>n=102, 99.03%</td>
</tr>
<tr>
<td>Scoliosis or curved spine</td>
<td>n=75, 72.82%</td>
</tr>
<tr>
<td>Caucasian race</td>
<td>n=30, 29.13%</td>
</tr>
<tr>
<td>Asian race</td>
<td>n=12, 11.65%</td>
</tr>
<tr>
<td>Having a small, thin frame</td>
<td>n=63, 61.17%</td>
</tr>
</tbody>
</table>
Table 2. Women’s beliefs about osteoporosis and other diseases.†

<table>
<thead>
<tr>
<th>Disease</th>
<th>How concerned are you about getting ________ disease? (mean, p value)</th>
<th>How likely are you to get ________ disease? (mean, p value)</th>
<th>How serious is ________ disease? (mean, p value)</th>
<th>How responsible do you think a person is for getting ________ disease? (mean, p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoporosis</td>
<td>3.02, median=3</td>
<td>2.96, median=3</td>
<td>4.36, median=4</td>
<td>3.29, median=3</td>
</tr>
<tr>
<td>Heart disease</td>
<td>3.11, *p=0.002</td>
<td>3.03, *p=0.019</td>
<td>4.76, *p=0.041</td>
<td>3.17, *p&lt;0.001</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>3.42, *p&lt;0.001</td>
<td>3.00, *p=0.002</td>
<td>4.79, *p=0.009</td>
<td>1.92, *p&lt;0.001</td>
</tr>
<tr>
<td>HIV or AIDs</td>
<td>1.83, *p&lt;0.001</td>
<td>1.40, *p=0.034</td>
<td>4.89, p=0.180</td>
<td>4.09, *p&lt;0.024</td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>2.95, *p&lt;0.001</td>
<td>2.72, p=0.158</td>
<td>4.71, p=0.219</td>
<td>1.60, p=0.097</td>
</tr>
<tr>
<td>Common cold</td>
<td>2.85, p=0.752</td>
<td>4.48, p=0.862</td>
<td>1.92, p=0.863</td>
<td>2.82, *p&lt;0.001</td>
</tr>
</tbody>
</table>

†The range of scores for each response was 1-5; 1 = Not at all, 5 = Extremely
*Statistically significant using Mann-Whitney Rank sum; Those who viewed osteoporosis as important also viewed the indicated diseases as important.
I am a Physician Assistant student at the Medical College of Ohio in Toledo. For my scholarly project (thesis), I am doing research on what college females at Ohio Northern University think and know about osteoporosis. The results of this study will help health care providers understand the information needs of college women.

Participation in this project is completely voluntary. The survey is anonymous; no information will be collected that will connect you to your responses. Please do not write your name on the survey.

If you decide to participate, you will be asked to complete a five-page survey that should take approximately 10 minutes to complete. After you have completed the survey, please put it in the box located at the exit of the room. If you decide not to participate in this study, your refusal will not affect any future relations you may have with the Medical College of Ohio.

There are no reasonably foreseeable risks or discomforts of participating in this study, and you will not be compensated in any way for your participation in this study. There is an educational brochure about osteoporosis available by the collection box if you are interested in learning more about recent research on the topic. You do not have to participate in the study to take a brochure. If you have any questions about osteoporosis, consult your health care provider.

If you have any questions about this study, please contact my major advisor, Karen Graham, Assistant Professor, Department of Physician Assistant Studies, at (419) 383-6624.

Thank you for taking your time to participate in this study.

Alison L. Winans, PAS- II
Karen Graham, MPAS, PA-C
Assistant Professor

Please work independently on the survey.
Turn the page and begin with question 1.
A Modified Multiple Osteoporosis Prevention Survey

1. How much information have you heard or read about the health condition OSTEOPOROSIS, sometimes called brittle or weak bones?
   - A lot
   - Some
   - Nothing at all

2. There are many factors that may or may not increase your risk of developing OSTEOPOROSIS. For each factor listed below, circle the number in the corresponding column if you think it definitely increases, probably increases, probably does not or definitely does not increase the chances of developing OSTEOPOROSIS.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Definitely increases</th>
<th>Probably increases</th>
<th>Probably not</th>
<th>Definitely not</th>
<th>Unsure or don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking alcohol in excess</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being Caucasian</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrequent or skipped menstrual periods</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking caffeine in excess</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A family history of osteoporosis</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of physical exercise</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being African-American</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A diet low in dairy products or other sources of calcium</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking thyroid medication or steroids for asthma, arthritis, or cancer</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Having a small, thin frame</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worry or anxiety</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being Asian</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being post menopausal</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Having high blood cholesterol</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An early or surgically induced menopause</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting a sunburn</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking cigarettes</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scoliosis or curved spine</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Kasper et al, 1994, 2001
3. At one time or another, most of us have been concerned of becoming ill. Circle the number between 1 to 5, where 1 means you are not at all concerned and 5 means you are extremely concerned, which indicates how concerned are you of …

<table>
<thead>
<tr>
<th>Illness</th>
<th>Not at all concerned</th>
<th>Extremely concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. heart disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>b. breast cancer?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>c. osteoporosis?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>d. HIV or AIDS?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>e. Alzheimer’s disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>f. a common cold?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

4. Now thinking about the future, indicate how likely you think it is that you will get the illness, where 1 means you are not at all likely to get the illness and 5 means you are extremely likely to get the illness. How likely are you to get …

<table>
<thead>
<tr>
<th>Illness</th>
<th>Not at all likely</th>
<th>Extremely likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. heart disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>b. breast cancer?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>c. osteoporosis?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>d. HIV or AIDS?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>e. Alzheimer’s disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>f. a common cold?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

5. Please indicate how serious you think each illness is, where 1 means the illness is not at all serious and 5 means the illness is extremely serious. How serious is …

<table>
<thead>
<tr>
<th>Illness</th>
<th>Not at all serious</th>
<th>Extremely serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. heart disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>b. breast cancer?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>c. osteoporosis?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>d. HIV or AIDS?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>e. Alzheimer’s disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>f. a common cold?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

6. Now please indicate how personally responsible you think a person is for having each illness, where 1 means a person is not at all responsible and 5 means a person is completely responsible. In general, how responsible do you think a person is for having …

<table>
<thead>
<tr>
<th>Illness</th>
<th>Not at all responsible</th>
<th>Completely responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. heart disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>b. breast cancer?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>c. osteoporosis?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>d. HIV or AIDS?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>e. Alzheimer’s disease?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>f. a common cold?</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
EXERCISE
This section is about your usual exercise habits. Thinking back over the past 14 days, have you done any of the following exercises, sports, or physically active hobbies?

<table>
<thead>
<tr>
<th>Exercise/Activity</th>
<th>On the average how many times in the past 14 days did you play/go/do:</th>
<th>About how many minutes did you spend on each occasion?</th>
<th>What usually happened to your heart rate or breathing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Jogging or running</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>8. Walking</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>9. Aerobic dance</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>10. Modern, folk, square or ballroom dance</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>11. Lifting weights</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>12. Swimming or water exercises</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>13. Volleyball</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>14. Soccer</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>15. Racquetball or tennis</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>16. Basketball</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>17. Bicycling (including stationary)</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>18. Stair Machine</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>19. Rollerblading</td>
<td>_____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
<tr>
<td>20. Have you done any other exercises, sports, or physically active hobbies in the past 2 weeks other than the ones listed above? If yes, what were they?</td>
<td>_____ _____ times</td>
<td>_____ minutes</td>
<td>Small Increase Moderate Increase Large Increase No Increase</td>
</tr>
</tbody>
</table>

21. Would you say that the exercise, sports, or physically active hobbies that you have participated in over the past 2 weeks are less than, about the same or more than you usually have done in the past 12-months?
   - Less than (why? _________________________________________________)
   - About the same
   - More than (why? _________________________________________________)

22. Would you say that you are physically more active, less active, or about as active as another person your age?
   - More active
   - Less active
   - About as active

Kasper et al, 1994, 2001
**EATING HABITS**

This section is about your usual eating habits for specific foods. Thinking back over the PAST YEAR, how often do you usually eat the foods listed below?

First check whether your usual serving size is small, medium or large. (A small portion is about one-half the medium serving size shown, or less: a large portion is about one-and-a-half times as much, or more).

Then, put a NUMBER in the most appropriate column to indicate HOW OFTEN, on the average, you eat the food. For example, if you eat bananas TWICE A WEEK (put a 2 in the “week” column). If you never eat the food, check “Never”. Please DO NOT SKIP foods. And please BE CAREFUL which column you put your answer in. It will make a big difference if you say “Hamburger once a day” when you mean “Hamburger once a week”!

Please look at EXAMPLE A and B below. This person
1). eats a small serving of mashed potatoes twice a week.
2). Has a large slice of apple pie about three times per month.

<table>
<thead>
<tr>
<th>Item</th>
<th>Serving</th>
<th>Medium</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Day</th>
<th>Week</th>
<th>Month</th>
<th>Year</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Mashed Potatoes</td>
<td>1/2 cup</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B. Apple Pie</td>
<td>1 slice</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>23 Milk including lactaid and milk used in cereal if you drink it</td>
<td>8 oz. glass</td>
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<tr>
<td>24 Yogurt (do NOT include frozen)</td>
<td>1 cup or 8 oz</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>25 Ice Cream</td>
<td>1 scoop</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>26 Cottage Cheese</td>
<td>1/2 cup</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>27 Other cheese/spreads</td>
<td>2 slices or 2 oz</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>28 Broccoli</td>
<td>1/2 cup</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>29 Pizza</td>
<td>2 slices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>30 Sardines, canned with bones</td>
<td>8 sardines</td>
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<td></td>
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<td></td>
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<tr>
<td>31 Bread white or whole wheat</td>
<td>2 slices</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>32 Calcium Fortified Orange Juice</td>
<td>8 oz. glass</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>33 Soft drinks (regular or diet)</td>
<td>1 can or 12 oz.</td>
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<tr>
<td>34 Coffee (regular)</td>
<td>1 cup</td>
<td></td>
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<td></td>
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<tr>
<td>35 Alcohol</td>
<td>1 beer, 1 shot, or 1 glass of wine</td>
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</tbody>
</table>
36. During the past year, have you taken a multivitamin?
   No
   Yes, almost every day
   Yes, but not regularly

37. During the past year, have you taken any calcium supplements?
   No
   Yes, almost every day
   Yes, but not regularly

38a. Have you smoked at least 100 cigarettes (5 packs) in your life?
38b. Do you smoke cigarettes now?

Other Information
39. How old are you? ________ years old

40. What is your major?
   __________________________

41. Where do you eat most often?
   Parent’s home
   Own home/apartment
   Restaurants
   School cafeteria
   Other (please specify) __________________________

42. How tall are you without shoes?
   __________ feet and __________ inches

43. How much do you weigh without shoes?
   __________ lbs.

44. What is your racial or ethnic background?
   White, not of Hispanic origin
   Black, not of Hispanic origin
   Hispanic
   American Indian / Alaskan native
   Asian
   Pacific Islander
   Other (please specify) __________________________

THIS COMPLETES THE SURVEY. THANK YOU VERY MUCH FOR TAKING THE TIME TO PARTICIPATE. YOUR EFFORTS TODAY WILL ASSIST HEALTH CARE PROFESSIONALS TO HELP OTHERS LIKE YOURSELF IN ENSURING A HEALTHY TOMORROW!

Kasper et al, 1994, 2001
ABSTRACT

Knowledge, Behaviors, and Beliefs of College Freshmen Women Regarding Osteoporosis

Alison L. Winans, PAS-III
Karen Graham, MPAS, PA-C
Assistant Professor, Department of Physician Assistant Studies

Objective. To evaluate the knowledge, behaviors, and beliefs of college freshmen women concerning osteoporosis prevention.

Method. An anonymous survey was completed by 103 college freshmen females living in the residence halls of an Ohio university. The survey examined knowledge and beliefs about osteoporosis, calcium food analysis, and exercise habits.

Results. Average knowledge score was 61.9% of questions answered correctly. Higher knowledge scores did not correlate with increased calcium intake or osteoprotective exercise. Only 17% of respondents had both adequate calcium intake and osteoprotective exercise. Respondents were only moderately concerned about osteoporosis.

Conclusion. Young women do not have adequate osteoporosis knowledge, and thus do not realize that they may need to modify several aspects of their lifestyle to prevent the development of the disease. Young women need to be educated on osteoporosis prevalence and morbidity in order to be motivated to take action to prevent the disease.