

OSTEOPOROSIS KNOWLEDGE, BELIEFS, AND BONE PROMOTION BEHAVIORS OF  
POSTMENOPAUSAL AFRICAN AMERICAN (AA) WOMEN

by

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## ABSTRACT

Osteoporosis remains a major health issue worldwide. Although it has been associated with Caucasian women in the United States, attention is being drawn to other ethnicities. The National Institutes of Health (NIH) are concerned that people perceive osteoporosis to only affect Caucasian women, given that African-American (AA) women have higher bone mineral density and lower postmenopausal bone loss. This perception ignores observations that AA women are at significant risk of developing osteoporosis. As such, there is considerable delay in the prevention and treatment of osteoporosis among AA women. This cross-sectional study's design primary purpose was to describe postmenopausal AA women's knowledge, beliefs and behaviors concerning osteoporosis. Secondary to this purpose, was exploration of correlations between the Health Belief Model (HBM) theoretical constructs with osteoporosis preventive behavior, especially calcium intake and physical exercise. One hundred and fifty three postmenopausal AA women completed a questionnaire containing 1) the Osteoporosis Knowledge Test (OKT), 2) the Osteoporosis Health Belief Scale (OHBS), 3) the Osteoporosis Self-Efficacy Scale (OSES), 4) the Osteoporosis Attitude Knowledge Test (OAKT) and 5) the Osteoporosis Preventing Behaviors Survey (OPBS). The data were analyzed in SPSS version 21.0. The results of the study varied. Women in the study had greater knowledge about osteoporosis overall; they had less knowledge about preventing osteoporosis with exercise. They regularly used diet to prevent osteoporosis and reported recurrent physical activity. Participants had a general knowledge of osteoporosis but they experienced a moderate number of barriers that limited exercise. Few barriers for calcium intake were reported. Correlational analysis between age, number of months post-menopause, and education and the dependent variables

(osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities) revealed significant correlations. Age and number of years post menopause were significantly negatively correlated with use of physical activity to prevent osteoporosis. As women aged, they engaged in less osteoporosis prevention using exercise and as the number of months post menopause increased, the exercise behaviors associated with osteoporosis prevention decreased. This is an indication that women at this age have to be educated on the importance of exercising at this stage in their life.

## CHAPTER I: INTRODUCTION

Osteoporosis is a serious public health issue of concern worldwide, with approximately 9 million fractures (Ford, Bass, Zhao, Bai, & Zhao, 2011; Sadat-Ali & Al-Turki, 2012; Tranah, Taylor, & Lui, 2008). Osteoporosis has widespread economic and health impacts. Osteoporosis and osteoporotic fractures cause large numbers of disabilities, deaths, and huge health care costs through hospital and rehabilitation expenses (Harvey, Dennison, & Cooper, 2010; Ioannidis, et al., 2009). Although arguably significant strategies have been proposed in the prevention of osteoporosis, only a few participants have engaged in such preventive activities. Additionally, there are risk factors which are beyond change. For instance, more women than men are at risk of osteoporosis, with the risk increasing significantly during the postmenopausal period for women, when the majority of fractures are diagnosed. Women accounted for 71% of the more than 2 million fractures projected in 2005 (Burge, et al., 2007). Given that the U.S. population is aging (Schneider & Guralnik, 1990), by 2020, the United States is expected to have 14 million osteoporosis cases and more than 47 million Americans with low bone mass, a risk factor for osteoporosis (National Osteoporosis Foundation, 2002). This is an indication that special attention should be given to the prevention of osteoporosis, which starts with knowledge, beliefs, and behaviors about osteoporosis. Previous literature has been found to have amply investigated knowledge, beliefs, and behaviors about osteoporosis among Caucasian women. However, previous studies have neglected the AA population, and hence little is known about AA women's knowledge, beliefs and behavior about osteoporosis. Findings from the extant literature suggest it is important to understand osteoporosis knowledge, beliefs, and behaviors in all ethnic groups in

order to understand why some women engage in bone health promotion activities and others do not.

Osteoporosis is a serious threat to the independence, quality of life, and life of postmenopausal women (Estok, Sedlak, Doheny, & Hall, 2009). Werner (2005), after a comprehensive review of osteoporotic knowledge literature, called on researchers to expand osteoporotic knowledge so as to enhance preventive programs and early diagnosis of osteoporosis. Ford and colleagues agreed and noted that the understanding and knowledge that a population has about a disease is a key component of ensuring that effective programs are developed (Ford, Bass, Zhao, Bai, & Zhao, 2011). Burge and associates found that osteoporosis prevention, education, and treatment should focus on all ethnicities (Burge, et al., 2007). In response to this appeal, this study was conducted to enhance osteoporosis prevention among AA women.

The ultimate goal of this research was to enhance osteoporosis prevention among AA women; the first step is to investigate the knowledge, beliefs, and osteoporosis behaviors of this understudied group of women. The underlying assumption of the proposed study is that sufficient knowledge and bone health behavior among AA women are important tools in the prevention of osteoporosis (Eslamian, Jamshidi, & Kanani, 2007; Urgan & Tumer, 2008). The alarming figures on the increasing incidence of osteoporosis, 50% of Americans aged over 50 with osteoporosis by 2020, (Estok, Sedlak, Doheny, & Hall, 2009) come at a time when people can easily implement many behaviors effective in the prevention of osteoporosis. However, designing and implementing successful preventive programs or interventions inevitably depends on the knowledge and behaviors of the target population concerning the disease in question.

Osteoporosis preventive behaviors include adequate calcium and Vitamin D intake, exercise, weight bearing activities, avoidance of smoking and high and excessive intake of alcohol, plus hormonal and non-hormonal drug therapies (Estok, Sedlak, Doheny, & Hall, 2009).

### ***Statement of the Problem***

Too little is known about knowledge levels, beliefs, and behaviors of AA women regarding osteoporosis at a time when osteoporosis and osteoporotic fractures are on the increase in the United States (Burge, et al., 2007). By the year 2020, 50% of Americans over 50 years of age will have osteoporosis or be at risk of osteoporosis (Estok, Sedlak, Doheny, & Hall, 2009). Osteoporotic fractures are highly associated with postmenopausal women and cause high incidence of dependence, morbidity, and mortality (Harvey, Dennison, & Cooper, 2010; Ioannidis, et al., 2009; Kannegaard, van der Mark, Eiken, & Abrahmsen, 2010). Interventions or preventive programs that deter the occurrence of osteoporotic fractures should be implemented to improve quality of life and survival among postmenopausal women (Ioannidis, et al., 2009). However, designing and implementing successful preventive programs or interventions inevitably depends on the knowledge and behaviors of the target population concerning the disease in question. In the study, sufficient knowledge and appropriate behavior among the AA women are important tools in the prevention of osteoporosis (Eslamian, Jamshidi, & Kanani, 2007; Ugan & Tumer, 2008). The alarming figures on the increasing incidence of osteoporosis (Estok, Sedlak, Doheny, & Hall, 2009) come at a time when people can easily and effectively implement many behaviors effective in the prevention of osteoporosis. These preventive behaviors include calcium intake, vitamin D intake, exercise, weight bearing activities,

avoidance of smoking and high and excessive intake of alcohol, and hormonal and non-hormonal drug therapies (Estok, Sedlak, Doheny, & Hall, 2009).

### ***Purpose of the Study***

The purpose of this study was to describe postmenopausal AA women's knowledge, beliefs, and behaviors about osteoporosis, using the HBM as a study framework.

### ***Background***

**Osteoporosis among AA women.** AA women have been found to have the lowest risks of developing osteoporosis when compared with Caucasians, Hispanics, and Asian Americans (Baron, et al., 1994; Bohannon, 1999; Kellie & Brody, 1990; Kessenich, 2000; National Institutes of Health, 2012; Pollitzer & Anderson, 1989). The consistent observations on low risk for osteoporosis and osteoporotic fractures among AAs are explained by observations that AAs attain higher bone mass during their growth and development (Baron, et al., 1994; Bohannon, 1999; Farmer, White, Brody, & Bailey, 1984; Kellie & Brody, 1990; Pollitzer & Anderson, 1989). As a result, they enter menopause with higher bone mineral density and experience low rates of bone loss after menopause, and as such they have low incidences of fracture (Bohannon, 1999; Kessenich, 2000). Despite this, the risk of osteoporosis and osteoporotic fractures is certainly present (Jackson & Savaiano, 2001; National Institutes of Health, 2012). Once the fractures occur, morbidity and mortality risks are significantly high (Bohannon, 1999).

As they grow old, AA women have a risk for osteoporosis almost resembling that of their Caucasian counterparts (Aloia, Vaswani, Yeh, & Flaster, 1996; Wilkins & Goldfeder, 2004). In fact, studies have demonstrated that AA women who have a hip fracture have high morbidity and almost twice the mortality rates of white women (Baron, et al., 1994; Jacobsen, Goldberg, &

Miles, 1992). As a consequence, preventive measures should be designed for prevention of osteoporosis and osteoporosis fractures among postmenopausal AA women (National Institutes of Health, 2012). Because effective prevention programs should take into account osteoporosis knowledge of the target population (Edmonds, 2009; Ugan & Tumer, 2008), the study examined osteoporosis knowledge, beliefs, and behaviors among AA women. Among AA women, studies have indicated that osteoporotic knowledge, attitudes and behaviors are poor and need to be improved through appropriate educational programs (Geller & Derman, 2001).

**Risk factors.** Geller and Derman (2001) identified several risk factors for osteoporosis among AA and Hispanic women. The factors identified included family history of osteoporosis, history of fracture, low dietary calcium, lack of physical exercise, cigarette smoking, high fat diet, postmenopausal status, and excessive caffeine and alcohol use. Other risk factors include ethnicity or race, insufficient vitamin D, prolonged steroid use, amenorrhea, and small, thin body frame. The use of glucocorticoids is a specific risk factor for osteoporosis as it leads to the loss of the bone and poor bone quality. Diagnosis of osteoporosis and estimation of a risk for bone breaking involves at least one of the steps below: medical history, bone density test (dual-energy X-ray absorptiometry (DXA), FRA® score, and laboratory tests (National Osteoporosis Foundation, 2002).

**Treatment and prevention.** Prevention of osteoporosis involves supporting bone health, which includes consuming enough calcium and vitamin D, engaging in regular exercises, and eating fruits and vegetables. The primary therapies for osteoporosis are calcium and vitamin D, although their efficacy in the prevention of osteoporotic fractures is uncertain (Gupta & Aronow, 2007). For regular exercise, special emphasis should be accorded to activities such as weight-

bearing activities, which include jogging, dancing, walking, and weight training (National Institutes of Health, 2012). Further, having a healthy lifestyle should be of importance. A healthy lifestyle involves avoiding smoking, engaging in physical activity, avoiding excessive drinking, and preventing falls. These preventive measures can best be achieved through patient education, with a view of addressing some risk factors (Gemalmaz & Oge, 2008; Ungan & Tumer, 2008). However, literature strongly demonstrates that sufficient and appropriate preventive measures should be designed along cultural lines (Ailinger, Braun, Lasus, & Whitt, 2005; Baheiraei, Ritchie, Eisman, & Nguyen, 2006).

Despite the fact that there are numerous preventive strategies, not all people engage in them. The HBM framed this study (Johnson, McLeod, Kennedy, & McLeod, 2008). HBM is used by health care providers to develop interventions aimed at preventing diseases (Chan, Kwong, Zang, & Wan, 2007; Sedlak, Doheny, & Jones, 2000; Turner L., Hunt, DiBrezza, & Jones, 2004). The model helps in understanding why interventions aimed at preventing disease do not get complete compliance (Johnson, McLeod, Kennedy, & McLeod, 2008). This way, HBM helps in explaining why some people do not engage in preventive measures. HBM has six theoretical constructs, which include perceived seriousness, perceived susceptibility, perceived benefits, perceived barriers, modifying variables, cues to action, and self-efficacy. These constructs work either individually or together to explain health behavior (Glanz, Rimer, & Lewis, 2002; Johnson, McLeod, Kennedy, & McLeod, 2008; Stretcher & Rosenstock, 1997).

Treatment aims to slow or stop bone loss and help in preventing broken bones in the future. For those with broken bones, they are often referred to a physical therapist who helps the patient by teaching safe exercises for the purposes of improving strength, balance, and posture,

as well as helping them prevent falls and broken bones (National Osteoporosis Foundation, 2002). Osteoporosis treatment has faced various challenges, including distrust of the efficacy of medication, possible adverse effects of the medications, and questions over the competency of prescribing personnel, significantly hindering treatment of osteoporosis (Baheiraei, Ritchie, Eisman, & Nguyen, 2006; Unson, et al., 2003). In this light, another study found that AA women and their Hispanic counterparts were not adhering to osteoporotic treatment because they were concerned about the competence of the doctors to give correct prescriptions (Unson, et al., 2003). This is an implication that a clear patient-doctor relationship should be established to help in building trust among people with osteoporosis that their doctors are competent and would not give incorrect prescriptions.

**Why osteoporosis is a problem to the healthcare system and the society.** Recently, Sadat-Ali and Al-Turki (2012) described osteoporosis as a major epidemic for health care providers. Studies conducted at the beginning of this century found that 25 million women will develop osteoporosis in the United States (Chopra, 2000; Iqbal, 2000).

### **Costs of Osteoporosis**

Osteoporosis has severe consequences for both the individual and the health care system when a fracture occurs. In this light, the cost of osteoporosis may be viewed in social, economic, and health terms (Berry, et al., 2010; Cummings & Melton (2002); Magaziner, Simonsick, & Kashner, 1990). Fractures associated with osteoporosis are highly costly in economic terms. In the 1990s, about \$5 billion in health care costs were associated with osteoporotic fractures (Marshall, Johnell, & Wedel, 1996). The cost has been increasing. Early in the 21<sup>st</sup> century, Cummings and Melton (2002) estimated that fractures in the United States could cost about \$20

billion a year, in which hip fractures would make about a third of this cost. To confirm these approximations, Berry and colleagues reported that in the United States in 2005 when more than 2 million bone fracture incidences were reported, osteoporotic fractures were responsible for approximately \$19 billion, which clearly points to an increasing cost (Berry, et al., 2010), likely to rise because of an aging population (Burge, et al., 2007; Richards, Rivadeneira, & Inouye, 2008; Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). Projections for the cost of osteoporosis in the future show that by the year 2025, the United States alone will spend \$25.3 billion for osteoporosis related fractures (Burge, et al., 2007; Sadat-Ali & Al-Turki, 2012). The U.S. government incurs expenses resulting from fractures because most people with osteoporosis are aged over 65. The costs are paid through Medicaid and Medicare (Edmonds, 2009). Most of the costs are incurred by Caucasian women.

In terms of health, survival rates or mortality and functional outcome after a hip fracture depend on the kind of fracture. A prospective study of elderly women found that as they were discharged from the hospital, women who had sustained an intertrochanteric hip fracture had higher rates of mortality and inability to walk compared to women who had femoral neck fracture. After a year, the findings remained the same, indicating that the rate of mortality due to hip fracture strongly depends on the kind of hip fracture (Haentjens, et al., 2007). In addition, another study was carried out in Canada involving a random sample of 7753 participants aged over 50, of which 5566 were men, drawn from across Canada. The authors reported that vertebral and hip fractures were significant predictors of death (Ioannidis, et al., 2009). In this study, which took five years, people who had vertebral fractures in year two of the follow-up were at increased risk of death when they were compared with those who had no fractures by the

second year of the follow-up (Ioannidis, et al., 2009). Additionally, participants who had hip fractures during the first year of the study faced increased risk of death. Another nationwide study from Denmark reported by Kannegaard, et al. (2010) found that people with hip fractures had excess mortality rates compared to the healthy population. Kannegaard and colleagues reported that advanced age and presence of several morbidities experienced by a patient increased the risk for death in the first year following the fracture. Further, in the nationwide study, men had higher mortality rates compared to women (Kannegaard, van der Mark, Eiken, & Abrahmsen, 2010).

These findings on mortality rates along gender lines contrasted with findings of previous studies (Alegre-Lopez, Cordero-Guevara, Alonso-Valdivielso, & Fernandez-Melon, 2005; Ioannidis, et al., 2009), which reported that mortality rates resulting from osteoporotic fractures were higher among men than among women. Alegre-Lopez and colleagues did a one-year follow-up of 218 hip fracture patients (Alegre-Lopez, Cordero-Guevara, Alonso-Valdivielso, & Fernandez-Melon, 2005). Upon adjustments, findings by Kannegaard et al. (2010) did not show any significant differences in mortality rates along gender lines. In an attempt to explain the inconsistency of their findings with those of previous researchers, Kannegaard and colleagues explained that the perceived differences along gender lines may result from numerous individual differences that had not been controlled in the study and that are unequally distributed between men and women (Kannegaard, van der Mark, Eiken, & Abrahmsen, 2010). However, Kannegaard and colleagues did not rule out the possibility that their study might “have had insufficient power to detect sex differences” (Kannegaard, van der Mark, Eiken, & Abrahmsen, 2010). Nevertheless the study has key strengths, especially the huge, random sample

representing Canada. The study sample, additionally, was representative of sex, age, and region. These qualities enhanced the generalizability of study findings.

Cummings and Melton (2002) reported that 10-20% more women died of hip fractures than had been expected within a year, with the mortality having been higher in men. Mortality rates are higher immediately after the fracture occurs and decreases as the fracture ages. Some mortality occurs as a result of the hip fracture itself while some results from other chronic illnesses responsible for the fractures and death. As a result it is not clear whether preventing hip fractures can extend life; if it can, the degree of this life extension is not clearly understood. Vertebral fractures have a higher mortality that goes beyond the first year following the fracture. Researchers (Cummings & Melton, 2002) observed that women with vertebral fractures are more vulnerable to death resulting from cardiovascular and pulmonary diseases. Cummings and Melton (2002) cautioned against attributing high mortality rates in persons with vertebral fractures to the direct effect of the vertebral fractures themselves, noting that such mortality could be as a result of other risky conditions and poor health.

Other than mortality, osteoporotic fractures are associated with morbidity. Older adults have functional impairment, which causes longer hospital stays, re-hospitalization, and poor recovery efforts (Magaziner, Simonsick, & Kashner, 1990). This impairment is enhanced by osteoporotic fractures that include fractures of the spine, distal forearm, and hip, which are responsible for dependence on others for daily living. For this dependence, hip fractures have the highest share. Among the disabilities, the impairment to walk is among the most common. More than 50% of patients with hip fractures become dependent, with high chance of being institutionalized (Tracey, Forte, & Fagbemi, 2007). For vertebral fractures, primary morbidity

occurs in the form of loss of height, back pain, and kyphosis. Vertebral fractures are observed by chance in routine population radiographs (Magaziner, Simonsick, & Kashner, 1990). In women with those incidentally observed vertebral fractures, the risk of chronic back pain and functional difficulties, as well as future fractures, is high. This is a possible indication that medical practice misses most of the actual vertebral fractures. Further, vertebral fractures negatively affect the individual's self-esteem, body image, and mood, just as hip fractures do (Reginster, et al., 2000).

### ***Specific Aims***

The four specific aims for this study were:

1. To describe postmenopausal AA women's knowledge, beliefs, and attitudes about osteoporosis.
2. To describe postmenopausal AA women's bone health promotion behaviors of calcium intake and bone health promoting physical activity.
3. To describe postmenopausal AA women's barriers to engaging in bone health promotion activities.
4. To examine the relationships between postmenopausal AA women's age, education, and number of months post menopause and osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities.

### ***Significance of the Study***

This study is highly significant to AA postmenopausal women and to health care providers who care for them. Nurses are fundamental to educating AA women about osteoporosis risks and prevention behaviors. The findings of the study highlight areas that should be considered in developing osteoporosis preventive programs for AA women.

### ***Assumptions***

Following are the assumptions for this study. First, the author assumes that in responding to question items on the osteoporosis knowledge test, osteoporosis health belief scale, and osteoporosis self-efficacy scale, postmenopausal AA women will provide honest and accurate answers. Second, the author assumes that data collection tools are sufficient to elicit and collect the appropriate data needed from participants for the purposes of this study. Third, the sampling technique employed to select the participants, purposive sampling, will not exclude potential participants from the study. Fourth, the author assumes that upon reading the letter of information and consent form and receiving any relevant clarifications, the participants will be competent to respond to questions on the data collection tool appropriately.

### ***Definitions***

***Bone mineral density.*** Responsible for bone strength and hence fracture resistance, bone mineral density is the “amount of bone mineral within a cubic centimeter of bone” (Edmonds, 2009).

***Cues to action.*** These are those factors responsible for the activation of an individual’s readiness to act or to implement an intervention (Stretcher & Rosenstock, 1997).

***Health behavior.*** This refers to the actions that an individual engages in, its determinants, correlates, and consequences in relation to particular disease (Glanz, Rimer, & Lewis, 2002). The term *osteoporotic behavior* in the study refers to those actions that people engage in as a way of preventing and treating osteoporosis.

***Health belief model.*** This is a theoretical framework used to explain change and maintenance of health behaviors, a model which has been used to guide formulation and implementation of health behavior interventions (Stretcher & Rosenstock, 1997).

***Menopause.*** This is the age at which a woman experiences her last menstrual period. The National Institutes of Health put the average age for menstruation cessation, or menopause, at 51 (National Institutes of Health, 2012). During menopause, production of hormones and ovarian function diminish, which gives way to hot flashes, dryness of the vaginal wall, breast changes, and even depression (Insel & Roth, 2010).

***Osteopenia.*** This refers to the reduction in bone mass as a result of excessive bone breakdown and low bone formation. In other words, the rate of bone resorption is higher than that of formation, which causes loss of bone minerals, a risk factor for osteoporosis (Germano & Cabot, 2000).

***Osteoporosis.*** This is a skeletal disorder in which bone mass decreases gradually and painlessly, resulting in weak, fragile, brittle bones which are prone to fractures (Germano & Cabot, 2000).

***Osteoporosis risk factors.*** These refer to all that put a person at increased possibility of developing osteoporosis. Some risks are fixed, such as age or family history of osteoporosis, while others are modifiable, such as alcohol use, smoking, and poor nutrition (International Osteoporosis Foundation, 2012).

***Perceived barriers.*** These are the perceived difficulties that people experience in adopting new behaviors, since change does not occur smoothly (Stretcher & Rosenstock, 1997).

***Perceived benefits.*** This construct refers to those beliefs about the benefits gained after, or associated with, an intervention (Stretcher & Rosenstock, 1997).

***Perceived seriousness.*** This refers to the belief about the extent to which a condition or illness and its consequences are serious (Stretcher & Rosenstock, 1997).

***Perceived susceptibility.*** This refers to the belief concerning the chances of getting a particular illness (Stretcher & Rosenstock, 1997).

***Self-efficacy.*** This refers to the individual's confidence in one's ability to take action (Insel & Roth, 2010).

In summary, this chapter provided background information about the study. The chapter also described and justified the research problem the author addressed. The next chapter will provide a critical review of the theoretical and empirical research on osteoporosis, with special focus on AAs.

## CHAPTER II: LITERATURE REVIEW

This chapter is basically a review of the theoretical and empirical literature on osteoporosis knowledge, beliefs, and behaviors and how they correlate with HBM variables. The primary purpose of this chapter is to show where the proposed study sits, and then identify gaps in the literature that justify the necessity for the study. The chapter begins by defining osteoporosis and using diagrams to demonstrate that definition. The chapter next reviews literature on osteoporosis as a disease in which its diagnosis, cost, and prevention and treatment receive special attention. This is preceded by a review of literature on osteoporotic fractures and a description of the most common osteoporotic fractures. Having established the clinical basis for osteoporosis and osteoporotic fractures, the chapter shifts attention to osteoporosis knowledge, beliefs, and behaviors, and how they relate with HBM variables. This is where the HBM is described. Studies that have addressed osteoporosis knowledge are reviewed in this section. Throughout this chapter, an attempt is made to identify gaps in literature regarding postmenopausal AA women and osteoporosis. The concluding paragraph of this chapter states the gap in the literature.

### *Defining Osteoporosis*

Osteoporosis is among the world's significant concerns to public health (Faulkner, et al., 2006). Osteoporosis is a disease in which the net loss of bone surpasses bone formation, and it occurs in women after estrogen loss in postmenopausal age (Rosen, 2003; Sadat-Ali & Al-Turki, 2012). In broad terms, osteoporosis is a state of increased fracture risk after minimal trauma resulting from low bone density (Bonnick, 2009). The symptoms and pain associated with osteoporosis appear only when a fracture has occurred. If prevention and treatment are not

initiated, osteoporosis develops until there is bone breakage basically at the hip, spine, or wrist. Hip fractures interfere severely with a person's mobility and independence, while vertebral fractures lead to height loss, stooped posture, and chronic pain (National Institutes of Health, 2012).

Figure 1 below shows normal bones and figure 2 shows osteoporotic bones.

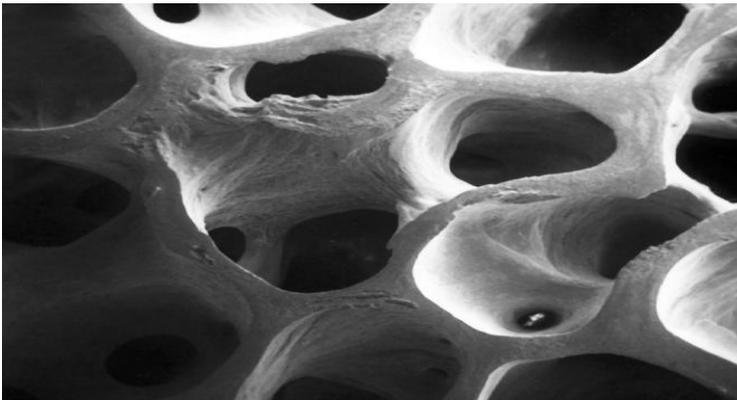


FIGURE 1. Normal bone (source: (National Osteoporosis Foundation, 2002)

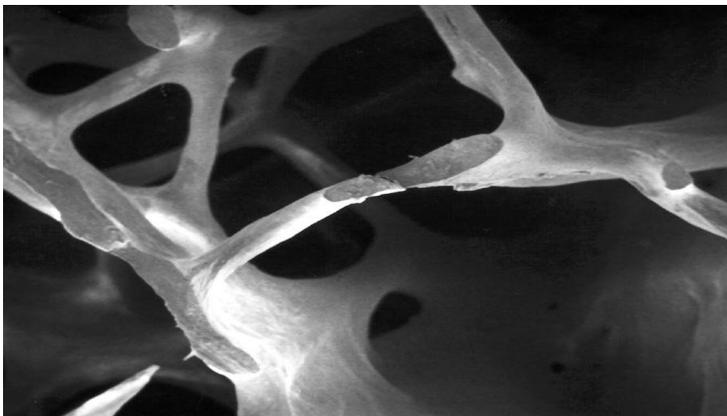


FIGURE 2. Osteoporotic bone (source: (National Osteoporosis Foundation, 2002)

### ***Fractures Associated with Osteoporosis***

Osteoporotic fractures include fractures of the vertebrae (spine), proximal femur (hip), and distal forearm (wrist). Burge and colleagues reported that of the more than 2 million fractures projected in 2005, vertebral fractures constituted 27%; wrist fractures 19%; hip fractures 14%; pelvic fractures 7%; and others 33% of the more than 2 million fracture incidents estimated (Burge, et al., 2007). However, the heavily studied osteoporotic fractures are those of the spine and the hip (Cummings & Melton, 2002). Hip fractures are addressed in osteoporotic literature because, according to Harvey and colleagues, they cause a large proportion of morbidity and mortality, as well as enormous hospital and rehabilitation costs (Harvey, Dennison, & Cooper, 2010). In a study to quantify the global burden of osteoporotic fractures, Johnell and Kanis (2006) found that in 2000, the world had about 9.0 million fractures, with hip fractures contributing 1.6 million; forearm fractures contributing 1.7 million; and clinical vertebral fractures contributing 1.4 million.

**Hip fractures.** Hip fracture is the most serious osteoporotic fracture because it incurs high medical costs, patient functional impairment, morbidity, and mortality (Faulkner, et al., 2009). Hip fractures are strongly associated with low bone mineral density, are more costly to repair, and are responsible for most of disabilities associated with osteoporosis. Hip fractures are often treated at the hospital, which enhances counting and comparisons. Because of these two reasons, hip fractures have, according to Cummings and Melton (2002), become the barometer of osteoporosis internationally. In most world regions, incidence of hip fractures increases with age for both men and women, associated with decrease in bone mineral density (BMD) as women

pass menopause and men advance in age. Advanced age, in addition, increases risk for falls among the elderly, which also cause fractures.

Johnell and Kanis (2006) reported that 70% of the 1.6 million hip fractures in 2000 were in women. This can be explained by noting that women have more bone loss and fall incidents than men, explaining why hip fractures are twice as common in women as in men for populations in the United States and Europe. There is higher incidence of hip fractures in women than in men because most women live longer than men and hence over 75% of hip fractures occur in women. Cummings and Melton (2002) reported that for white women in the United States aged over 50, the risk of hip fractures was 17% compared to 6% of white men. It is necessary to point out that these figures refer to white Americans and exclude AAs. This may be attributed to the possibility that the authors did not have information about risk for hip fractures among the AA population. This should point to a possible gap in literature regarding risk for hip fractures.

**Vertebrae fractures.** Vertebral fractures are responsible for back pain ranging from moderate to severe. Vertebral fractures do not get special attention because people with vertebral fractures tend to overlook them and as a consequence vertebral fractures do not influence health cost directly (Harvey, Dennison, & Cooper, 2010). However, vertebral fractures are associated with high mortality rates (Ioannidis, et al., 2009; Naves, Gomez, Rodriguez-Rebollar, Rodriguez-Garcia, & Cannata-Andia, 2003), and poor quality of life (Oleksik, Ewing, Shen, van Schoor, & Lips, 2005). Knowledge about vertebral fractures is limited because there is no agreed definition of these fractures. Further, most of the vertebral fractures do not receive medical or clinical attention, making it difficult to account for all vertebral fractures as it is possible with hip

fractures (Cummings & Melton, 2002). For instance, only one third of deformities of the vertebrae observed in radiographs receive medical attention. Of these, less than 10% receive admissions. As a result, few vertebral fractures receive treatment or preventive measures. American and European women aged over 60 have a higher incidence of vertebral fractures (often three times higher) than their male counterparts. This may be explained by the lifetime risk associated with fractures since women live longer than men and therefore are at higher risk of developing clinically diagnosed vertebral fracture. However, up to 50 or 60 years, the prevalence of vertebrae fractures in men and women are similar, with men having greater incidence than women in some cases (Cummings & Melton, 2002).

### ***Osteoporosis Risk Factors***

Basically, osteoporosis risk factors are genetic, nutritional, hormonal, and lifestyle. Genetic history of osteoporosis in the family is a risk factor for osteoporosis, implying that the disease is heritable. Genetic factors are more significant as risk factors for osteoporosis than all the others combined—nutritional, hormonal, lifestyle and environmental factors (Cohen & Roe, 2000). Clinical definition of osteoporosis takes account of BMD, a highly heritable trait. It has been estimated in cohort studies that bone density has an estimated 78% heritability at the lumbar spine, and 84% at the femoral neck. These population-based studies have demonstrated that having a first degree relative with a hip fracture predicts future hip fractures (Arden, Baker, Hoqq, Baan, & Spector, 1996).

A population-based study of twins measured three significant risk factors for osteoporosis to determine their genetic components (Stuart & Crombrughe, 2006). These risk factors were postmenopausal BMD (measured at multiple sites), ultrasound of calcaneus, and hip axis length.

The study found that bone density had a strong genetic component at every site measured, of which heritability estimates ranged from 0.46 to 0.84. Further, measurements taken for the hip axis length and velocity of the sound of the calcaneus demonstrated that there were major genetic components, which were estimated from 0.61 to 0.62. Further, the genetic component of the broadband ultrasound attenuation of the calcaneus was estimated at a moderate level of 0.53, which reduced to 0.45 when BMD adjustments were done. The researchers concluded that the three bone measurements, which independently predict hip fractures, are independently heritable (Arden, Baker, Hoqq, Baan, & Spector, 1996). The implication of the study is that a combination of various genetic factors acting on three aspects of the bone, including bone structure, dimensions, and density, are responsible for hip fractures in families with osteoporotic fracture history.

Low bone mineral density (BMD; DXA at spine or hip) is among the risk factors validated to be included in the randomized controlled trials. In a genome-wide association study, Richards and colleagues identified genetic variants responsible for decrease in bone mineral density and subsequent exposure to osteoporosis and its related fractures. The researchers found two single nucleotide polymorphisms (SNPs) related to bone mineral density. Further examination revealed that the presence of the two genetic risk alleles was related to higher risk of osteoporosis. In other words, the researchers found that two gene variants significant to two proteins in the body are responsible for increased risk for osteoporosis and its related fractures (Cohen & Roe, 2000).

Menopausal status is another risk factor. Entering menopause before the age of 45 (early menopause) leads to estrogen deficiency. Estrogen deficiency is the most important single non-

genetic risk factors for osteoporosis (Cohen & Roe, 2000). Early menopause may set in following removal of the ovaries through surgical procedures, and abnormal absence of menstruation (prolonged amenorrhea) in young women. Geller and Derman (2001) reported that only a third of AA and Hispanic women were aware that postmenopausal status increases the risk for osteoporosis, while less than a third indicated that they were aware that long-term use of a steroid would increase risk of osteoporosis (Geller & Derman, 2001).

Racial background is a significant risk factor for osteoporosis. In particular, women of Caucasian and Asian ancestry are at a significantly higher risk of osteoporosis than their African and Hispanic counterparts. However, AA and Hispanic women also have significant risk for osteoporosis, with one study (Geller & Derman, 2001) indicating that AA women are at higher risk than their Hispanic counterparts. However, Wilkins and Goldfeder (2004) appeared to reject these observations about AA women being at higher risk. The authors argued that osteoporosis screening among older AA women was unjustifiably low (Wilkins & Goldfeder, 2004). The authors argued that among all ethnic groups, there is always a decrease in bone mineral density as age increases in both men and women. Despite this reality, preventive and treatment efforts were focused on particular ethnic groups, Caucasians and Asians (Wilkins & Goldfeder, 2004). In any case, the American College of Preventive Medicine (ACPM) recommended that adult patients aged over 50 should be assessed for osteoporosis risk factors, while all women aged 65 or higher should be screened using BMD testing (Lim, Hoeksema, & Sherin, 2009).

Age is an essential risk factor for fractures of the hip. While people age (especially as women pass menopause), their bone mass declines, increasing chances of fractures. Aging-associated declines in neuromuscular functioning combines with the loss of bones or weakening

of bones to increase the risk of fracture as women pass menopause and men advance in age (Cummings & Melton, 2002; National Osteoporosis Foundation, 2010). The presence of risk factors leads to weak bones, and when the weakened bones are overloaded by daily living activities and/or falls, they fracture (National Osteoporosis Foundation, 2010).

Negative dietary practices have been cited as risk factors for osteoporosis. First, high intake of alcohol is harmful to bone health. The International Osteoporosis Foundation (IOF) describes high intake of alcohol as the intake exceeding two standard units of alcohol each day (International Osteoporosis Foundation, 2012). High intake of alcohol significantly increases fracture risks, especially hip fracture. Further, excessive intake of alcohol is believed to produce direct detrimental effect on cells responsible for the formation of bones, as well as on the hormones responsible for the metabolism of calcium. Furthermore, chronic, heavy consumption of alcohol is related to low intake of food, which affects the amount of calcium, vitamin D, and protein in the body. Poor nutritional status has adverse effects on the health of a weight-bearing skeleton. As a result, risk for fall is higher, which may cause fractures, and risk for fall is also a direct effect of excessive drinking (International Osteoporosis Foundation, 2012).

Excess phosphorous is thought to hinder bone mineral accrual because it leads to elevation of levels of serum parathyroid hormones. Further, high protein, sodium, and caffeine intake increases urinary excretion of calcium, which leads to decrease in bone mass (Anderson, Rondano, & Holmes, 1996). However, Cohen and Roe (2000) reported that increased sodium or salt intake is not a significant risk factor for osteoporosis, and therefore reducing salt intake from 9g to 6g each day would be insignificant in the prevention of osteoporosis.

Carbonated beverages or soft drinks such as cola drinks could have adverse effects on bone health. There are explanations that the phosphorous and the caffeine content contained in soft drinks such as cola soft drinks may negatively affect the metabolism of calcium. However, these observations have not been confirmed in experimental studies (International Osteoporosis Foundation, 2012). Wyshak (2000) had teenage girls in an observational study and it was found that high consumption of carbonated soft drinks related to increased rates of fracture. Another study by McGartland, Robson and Murray (2003) that also had adolescents demonstrated that high consumption of beverages is associated with decreased body mineral density. Wahba and colleagues, in a cross-sectional study design on osteoporosis knowledge, found that most girls in the study who believed they would develop osteoporosis in the future attributed it to the high intake of soft drinks (Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). However, as of 2012 there was insufficient evidence that carbonated soft drinks have a negative effect on bone health (International Osteoporosis Foundation, 2012).

Weight-loss diets and eating disorders are risk factors for osteoporosis. Very low body weight causes lower development of peak bone mass among the young population and increased loss of bone and fragility risks among the old population. In a study to examine body mass index as a risk factor for fracture. De Laet, Kanis, and Oden (2005) found that the hip fracture risk in people with body mass index of  $20\text{kg/m}^2$  was almost twice that of individuals with a body mass index of  $25\text{kg/m}^2$ . This finding indicates that being underweight is a risk factor for osteoporosis. Another aspect of negative dietary practice is lactose maldigestion and intolerance (Jackson & Savaiano, 2001). Lactose maldigestion occurs when an individual is unable to digest the lactose they have taken. The inability to digest all lactose results from deficiency in the enzyme lactase,

which breaks down lactose into simple sugars that can be absorbed by the body. In most cases, lactose maldigestion results in lactose intolerance. Lactose intolerance varies with ethnicity. In the United States, Asian-Americans have a prevalence of 100%; AAs 75%, Native Americans 100%, Hispanics 53%, and Caucasians 6-22%, the lowest (Jackson & Savaiano, 2001).

### ***Diagnosis of Osteoporosis***

The key to the prevention and treatment of osteoporosis is early diagnosis (Miller, et al., 2005; Smith & Shoukri, 2000). The availability of effective osteoporosis diagnosis tools presents women with an opportunity to initiate or maintain preventive behaviors for osteoporosis (Singer, 2006). Diagnosis involves physical examination, bone density test, FRAX® score, and laboratory tests (Estok, Sedlak, Doheny, & Hall, 2009; Lim, Hoeksema, & Sherin, 2009; Marshall, Johnell, & Wedel, 1996; National Osteoporosis Foundation, 2012; Smith & Shoukri, 2000). Studies by Jackson and Savaiano (2001) and Wilkins and Goldfeder (2004) found that among AA women, osteoporosis screening is significantly low but the authors did not provide explanation of the findings.

### ***Prevention and Treatment of Osteoporosis***

The health and economic costs of osteoporosis treatment make it necessary that special attention is given to the means through which osteoporosis can be prevented and treated (Anderson, Rondano, & Holmes, 1996; Ioannidis, et al., 2009; Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). Osteoporosis preventing behaviors can prevent and delay deterioration of bones (Estok, Sedlak, Doheny, & Hall, 2009). Prevention of osteoporosis should start during the childhood years and continue throughout the entire lifespan (Anderson, Rondano,

& Holmes, 1996; National Institutes of Health, 2012). Preventive measures are important given that the world's population is aging (Cummings & Melton, 2002).

Physical activity has been found to have a bearing on the maintenance of bones, stimulation of bone formation, accumulation of minerals, and strengthening of muscles (Borer, 2005). The bone mass responds to the mass placed on an organism's skeleton. Therefore, physical activity improves balance, which precedes a reduction in the overall risk for fall and hence reduced fractures (Borer, 2005). Lack of physical activity leads to the loss of muscle mass, which is an indication that the bone is needed. As such, the bone will be eventually eliminated (Edmonds, 2009). Despite this, more than half of AA women do not take part in the required amount of physical activity (Centers for Disease Control and Prevention, 2011). A study by Wallace, Boxall, and Riddick (2004) found that women were more willing to adopt preventive diet intake than preventive exercise. Regular physical activity helps in strengthening bone and muscle, according to the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 2011). As people age, there is need to protect their bones, joints, and muscles because these support an individual's body and help them move, in addition to enabling them to carry out their daily activities effectively. It has been demonstrated that physical activity slows the loss of bone density as an individual advances in age. Individuals who engage in moderate-intensity, low-impact physical activities for about 120 to 300 minutes per week have reduced risks for hip fracture (Centers for Disease Control and Prevention, 2011).

Lack of physical activity is a great risk factor for fracture. Women have, according to Ransdell, Vener & Sell (2004), identified various barriers to physical activity, including fear of safety, multiplicity of roles expected of them, threat of embarrassment, lack of competent

instructors, time constraints, fear of pain, overweight status, lack of encouragement from family, poverty, older age, single parenthood, lack of access to facilities, and cost. However, noting that it was unclear whether exercise helped in the increase of peak bone mass in childhood, adolescence, or young adulthood, Borer (2005) conducted a study to determine the effect of exercise on adolescent girls and postmenopausal women. Using healthy Caucasian girls as a reference population, Borer (2005) reported that exercise increases the width and mineral content of bones of adolescent girls, especially for those girls who begin exercises before puberty (Borer, 2005). For this to be achieved, it is necessary to ensure that exercises are conducted in volumes and at intensities comparable to athletic training as well as caloric and calcium intakes as accompaniments (Borer, 2005). Similarly, Wahba and colleagues reported that girls acquire up to 90% of peak bone mass by the time they attain the age of 13 (Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). Borer (2005) noted that the benefits of exercise after menopause are heavily dependant on dietary calcium intake. Physical activity in postmenopausal women leads to the stimulation of increase in the diameter of the bones, which diminishes the risk of fracture because physical activity mechanically counteracts bone thinning and increases the porosity of the bones. The conclusion to be drawn from Borer (2005) is that for optimal skeletal health and hence prevention of osteoporosis, maximizing peak bone mass during the early growing years and later in life should be emphasized.

Calcium helps in the prevention of osteoporosis and bone disease because it is a key building block of bone tissue. The skeleton is home to 99% of the body's calcium reservoirs. The calcium in bones also regulates levels of calcium in the blood and thus maintains the health of the nerves and muscles. Large amounts of calcium are needed during teen years because it is

during this time that the skeleton experiences rapid growth. As people advance in age, the body becomes less able to absorb calcium, explaining why elders need large amounts. Calcium can be obtained from the diet. Milk and other dairy products are among the key sources of calcium. Additionally, there are some calcium-fortified foods such as breads, mineral water, cereals, and fruit juices that are also good sources of calcium. Table 1 shows recommended daily calcium intakes.

TABLE 1. Recommended daily calcium uptake (World Health Organization, 2004)

<b>Infants and Children</b>	<b>Calcium (mg/day)</b>
0-6 months	300-400
7-12 months	400
1-3 years	500
4-6 years	600
7-9 years	700
<b>Adolescents</b>	<b>Calcium (mg/day)</b>
10-18 years	1300
<b>Women</b>	<b>Calcium (mg/day)</b>
19 years to menopause	1000
Post-menopause	1300
During pregnancy (last trimester)	1200
Lactation	1000
<b>Men</b>	<b>Calcium (mg/day)</b>
19-65 years	1000
65+ years	1300

Source: WHO. (2004).

Vitamin D helps in the development and maintenance of bone in two ways. First, vitamin D assists absorption of calcium, and second, it assures that the renewal and mineralization of bone tissues occurs correctly. Vitamin D is obtained from sunlight or from food. The dietary vitamin D can be vitamin D3 or closely related vitamin D2, while the kind of vitamin D made on the skin from sunlight is known as vitamin D3. Vitamin D can be made on the skin when the skin is in contact with ultraviolet B rays. Among children and adults, a 10-15-minute exposure to

sunlight daily is sufficient for the formation of vitamin D. There are foods and dietary supplements that have vitamin D, although foods with vitamin D are rare. They include oily fish, eggs, liver, mackerel, fortified cereals, margarine, and dairy foods. Vitamin D levels in food are shown in Table 2.

TABLE 2. Approximated vitamin D levels in selected foods (World Health Organization, 2004)

<b>Food</b>	<b>mcg per serving</b>	<b>IU per serving</b>	<b>RNI* (for ages 51-65 years)</b>
Cod liver oil**, 1 tbsp	23.1	924	231
Salmon, grilled, 100g	7.1	284	71
Mackerel, grilled, 100g	8.8	352	88
Tuna, canned in brine, 100g	3.6	144	36
Sardines, canned in brine, 100g	4.6	184	46
Margarine, fortified, 20g	1.6	62	16
Bran Flakes***, average serving, 30g	1.3	52	13
Egg, hen, average size, 50g	0.9	36	9
** Fish liver oils, including cod and halibut liver, have vitamin A in small amounts, and this can be toxic if excessive amounts are consumed.			
***Bran Flakes is an example of breakfast cereal fortified with vitamin D			

Given that individuals will get vitamin D from the sun at varying levels, the recommended vitamin D is just an approximation. The recommendations vary with age. For people aged below 50 years, pregnant women, and lactating women, the recommended amount is 200 international units (IU)/day, or 5g/day. For people aged over 50-65, the recommended amount is 400IU/day (or 10g/day). Further, individuals aged over 65 should take 600IU/day or 15g/day (International Osteoporosis Foundation, 2012). The recommended vitamin D intake per age and other aspects is shown in table 3.

TABLE 3. Recommended vitamin D intake (World Health Organization, 2004)

<b>Age Group</b>	<b>RNI* (IU/d)</b>	<b>RNI (mcg/d)</b>
0-9 years	200	5
10-18 years	200	5
19-50 years	200	5
51-65 years	400	10
65+ years	600	15
Pregnancy	200	5
Lactation	200	5
* RNI (this is the recommended nutrient intake)		

Treatment of osteoporosis is aimed at preventing fractures and reducing bone loss. Therefore, osteoporosis medicine is meant to prevent broken bones. Several effective medications have received approval for use in the prevention and treatment of osteoporosis, including Bisphosphonates (BP), Salmon Calcitonin, Denosumab, and Selective estrogen receptor modulators (SERM). They should be used in accordance with an individual's needs and recommended lifestyle (Black, et al., 1996; Blau & Hoehns, 2003; Delmas, et al., 2002; Cohen, et al., 1999; Harris, et al., 1999; McClung, et al., 1998; McClung, et al., 2001; McClung, et al., 2006; International Osteoporosis Foundation, 2012; Papapoulos, Quandt, Liberman, Hochberg, & Thompson, 2005).

The current prevention and treatment have been criticized for being biased against AA women. Wilkins and Goldfeder (2004) expressed concerns that despite the fact that AA women were at a significant risk of osteoporosis, they were left out during screening for osteoporosis without any substantial reasons. Wilkins and Goldfeder (2004) conducted a retrospective study involving review of medical records to demonstrate that bone mineral density and body mass index, the key risk factors for osteoporosis, were decreasing at roughly the same rate among AA

women and their Caucasian counterparts. AA women had been discriminated against during screening. As a result, development of preventive and treatment measures for osteoporosis have tended to rely heavily on studies using postmenopausal Caucasian women only. Physicians have held a false belief that AA women are protected from osteoporosis. This implies that AA women have been at a disadvantage as far as prevention and treatment measures are concerned.

Therefore, conducting a study using AA women should be a way to address the concern raised by Wilkins and Goldfeder (2004).

### ***Theoretical Framework***

A theory refers to a set of concepts, definitions, and propositions that describe or predict events or situations by illustrating the relationships between variables (Turner, Hunt, DiBrezzo, & Jones, 2004). Theories generate questions on why, what, and how. In health, theories can be used to predict behaviors. The proposed study is based on the HBM. HBM is a conceptual framework used to comprehend health behavior and possible reasons for non-compliance with recommended health action (Turner, Hunt, DiBrezzo, & Jones, 2004). HBM is an individual level theory and explains the reason and under what conditions individuals take preventive actions (Estok, Sedlak, Doheny, & Hall, 2009).

The HBM is the most-used theory in health education programs and promotion of healthy living. HBM was developed in the 1950s to provide an explanation for the failure of the U. S. Public Health Service programs, with tuberculosis programs being on the focus. The original HBM model held that health behavior is determined by individual beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Stretcher & Rosenstock, 1997). In light of this original underlying assumption, HBM helps in determining whether individuals are

susceptible to a disease, and if so, theorizes whether the benefits they attach to the prevention of the disease are influential to their readiness to act. HBM has seven constructs which are used individually or together to explain health behavior.

**Perceived seriousness.** This construct addresses an individual's belief concerning the seriousness and severity of an illness. The perception of seriousness has its basis in the medical information provided. Additionally, the belief about the seriousness of a disease may result from the individual's belief about the difficulties that the illness in question may present to the individual, or the general effects of the disease on the individual's life. These influence the individual's perception of the seriousness of the illness (Stretcher & Rosenstock, 1997).

**Perceived susceptibility.** A person's moves to adopt preventive behaviors are heavily influenced by the person's perceived risk of getting the illness. People who feel they are at higher risk of developing a disease highly engage in preventive behaviors that are aimed at decreasing the perceived risk or susceptibility. Basically, perceived susceptibility motivates individuals to adopt all kinds of preventive measures, including vaccinations, condoms, sunscreen, and any other kind of prevention. One would expect all people who believe they are susceptible to an illness to engage in preventive measures. However, instances occur when people at risk of getting a disease do not take preventive measures because they think they are at a lower risk or because of other reasons. Therefore, perception of decreased susceptibility is associated with unhealthy behaviors. A combination of the theoretical constructs of perceived seriousness and perceived susceptibility result in perceived threat. That is, if people perceive themselves as susceptible to a serious disease, they tend to perceive themselves as being at risk. In such situations, people will basically change behavior (Stretcher & Rosenstock, 1997).

**Perceived benefits.** These refer to an individual's idea of the usefulness or value of a new behavior intended to reduce the risk of getting a new illness. Basically, individuals tend to adopt new behaviors if they perceive the new behaviors as being capable of reducing their risk of developing a particular disease. Perceived benefits help in influencing an individual to engage in secondary prevention such as screenings for diseases. Therefore, for people to adopt healthy behaviors, they have to be aware that such behaviors are beneficial; they have to know the benefits attached to those behaviors (Stretcher & Rosenstock, 1997).

**Perceived barriers.** People will basically experience difficulties in adopting new behaviors change does not occur smoothly. As such, perceived barriers refer to individuals' perceptions about the barriers they will face in adopting behavioral changes intended to prevent developing a disease. Perceived barriers are the most significant determinants of behavioral change. For a person to adopt new behaviors, that person must be confident that the new behavior has important benefits that outweigh the results of maintaining the current behavior. This way, the concerned person will be determined to overcome the perceived barriers and engage in the new healthy or preventive behavior. Examples of barriers involved in adopting new behaviors are the difficulties involved when someone has to learn and develop a new habit or behavior, and fear of giving up some things one has been used to in order to perform activities associated with the new behavior (Stretcher & Rosenstock, 1997).

**Modifying variables.** Modifying variables refer to an individual's personal factors that determine whether the individual will adopt a particular behavior. They are demographic variables such as age and gender, and socio-psychological variables such as personality and social

class. Other modifying factors include variables such as culture, level of education, skill, past experiences, motivation, ethnicity, and knowledge (Stretcher & Rosenstock, 1997).

**Cues to action.** Cues to action have been found to influence behavior. They include events, people, or things that influence people to engage in new habits or behaviors. Cues to action may include family member illness, knowledge of a person with an illness, reports in the media, mass media campaigns, advice received from other people, postcards from health care providers as reminders, or warnings from health agencies found on the packaging of some products such as cigarettes and alcoholic drinks (Stretcher & Rosenstock, 1997)

**Self-efficacy.** This is the self-belief that one possesses an ability needed to accomplish a task (Insel & Roth, 2010; Stretcher & Rosenstock, 1997). People will most likely make attempts to do things they think they can manage to do. For instance, although a person may be aware that adopting a particular behavior is beneficial to them, they may not try that behavior if they think that they lack the ability to do it (Stretcher & Rosenstock, 1997). The diagrammatic representation of the revised HBM model is shown in Figure 3.

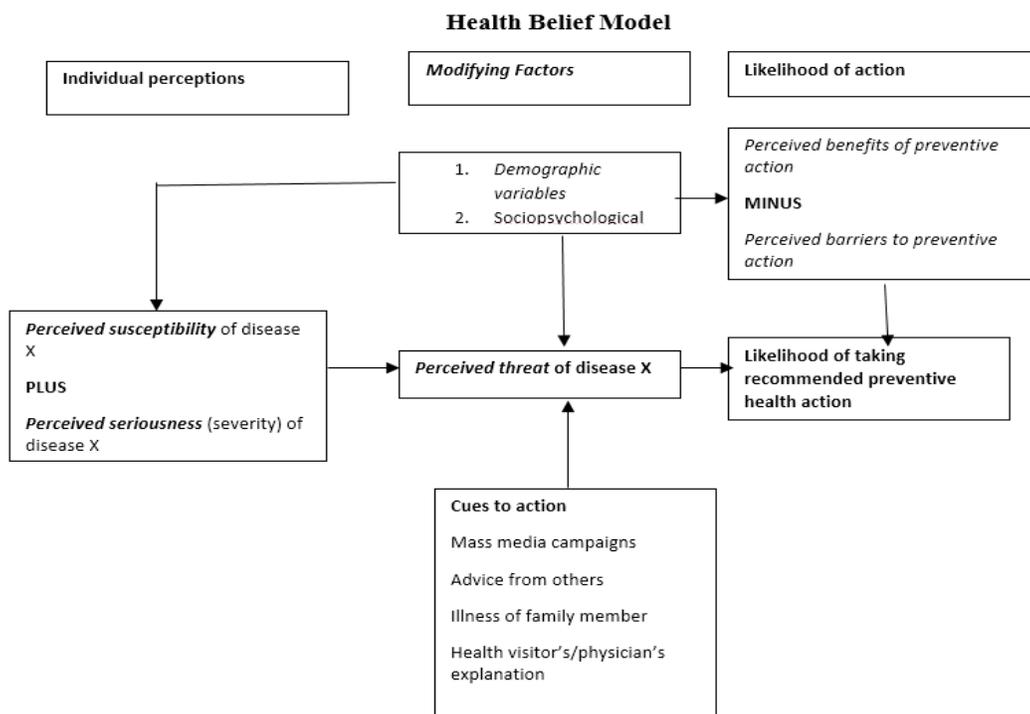


FIGURE 3. Revised Health Belief Model (Stretcher & Rosenstock, 1997)

Figure 4 gives a diagram of HBM with the constructs of interest to the present study. For the study, the italicized constructs described in relation to AA women. They have been italicized to indicate that they are the focus of the study.

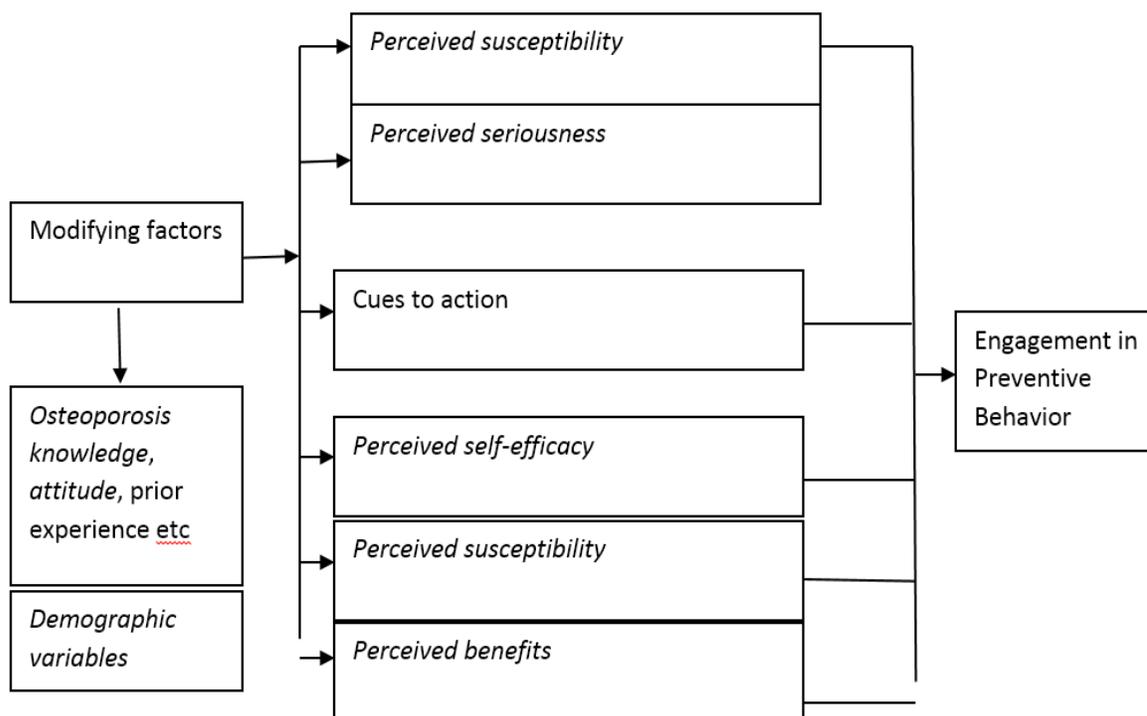


FIGURE 4. HBM with variables examined in this study

***Application of the revised HBM on osteoporosis knowledge, beliefs, and behaviors***

Hazavehei, Taghdisi, and Saidi (2007) perceived that the susceptibility construct has no correlation with adherence to exercise. Further, perceived susceptibility is correlated with the intake of calcium among postmenopausal women and as such can change calcium intake behavior positively, although this is not the case among college students. It has been documented that the majority of women believe that only the elderly are susceptible to osteoporosis. Given that Caucasian women have been said to have a higher incidence of osteoporosis than any other ethnicity in the United States, it highly possible that other ethnicities such as AA women would view themselves as not being susceptible to osteoporosis (Johnson, McLeod, Kennedy, & McLeod, 2008). The HBM holds that individuals who do not perceive themselves as susceptible to an illness are not much concerned about preventive measures. Women who feel that they are

not at risk will view themselves as unsusceptible to osteoporosis. For instance, Chang, et al. (2007) reported that women who belonged to families with osteoporosis history, especially with a first degree relative, perceived themselves as having higher susceptibility to the condition compared to those women without osteoporotic history in their family (Chang, Hong & Yang, 2007).

There has been mixed evidence to demonstrate the relationship between perceived severity and physical activity and adherence to exercise programs. The lack of evidence linking severity to physical activity has been helpful for explaining why people would not comply with prevention and treatment programs. Through this construct, it has been established that people would not adhere to prevention because they think they are not susceptible to severity because, according to them, osteoporosis is a mild condition. One study found that 50% of the women viewed osteoporosis as a minor health issue, and 53% believed that osteoporosis could be cured. Through the use of HBM, the health care system can influence people to adopt healthy behaviors by increasing their understanding of the severity of osteoporosis, that is, by increasing their perception of themselves as being susceptible to severity once they suffer from osteoporosis. The perceived severity can be enhanced through emphasis on negative outcomes related to osteoporosis, including emotional suffering, physical pain, fractures, and death (Turner, Hunt, DiBrezzo, & Jones, 2004).

The perceived benefits construct is positively correlated with physical activity. Perceived barriers refer to belief in how an action would cost materially and psychologically. Further, cues to action have to do with knowledge about a person with osteoporosis, discussion with doctors, and media reports, which make an individual take steps to engage in osteoporosis preventing

behaviors. The other construct is health motivation. In a study to assess the relationship between HBM variables and preventive behaviors for osteoporosis, Estok and colleagues found that health motivation can significantly predict exercise, which is an osteoporosis preventive behavior (Estok, Sedlak, Doheny, & Hall, 2009).

Self-efficacy consists of exercise self-efficacy and exercise barriers, which are the most important predictors of whether an individual engages in osteoporosis preventing behaviors. Among some populations such as Latinos, people with disabilities, and overweight persons, younger and older adult, and women, self-efficacy has a positive correlation with physical activity. Self-efficacy has been found to be the most important predictor of calcium intake (Wallace, 2002).

### ***Osteoporosis among African-American Women***

Osteoporosis incidence is distributed differently among ethnicities (Jackson & Savaiano, 2001; Kessenich, 2000). Among AA women, the incidence of osteoporotic fractures is half that of their Caucasian counterparts. It is argued that AA women have a higher body mineral density as they begin their menopause. Additionally, AA women have lower rates of bone loss during their postmenopausal period. These explanations are used to demonstrate why there is decreased incidence of osteoporosis and osteoporotic fractures for AA women. Despite this, AA women have significant chances of developing osteoporosis (National Institutes of Health, 2012). As AA women advance in age, their hip fracture risk doubles after every estimated 7-year period, despite the perceptions that AA women are at a lower risk for osteoporosis (National Institutes of Health, 2012). The rate of hip fracture among AAs aged over 70 years has been increasing exponentially, pointing to possible underestimation of the risk of osteoporosis among the AA

population. AA women with osteoporotic fractures experience higher disability and lower chances of survival (Jackson & Savaiano, 2001).

The risk factors for osteoporosis among this population are the same as those for Caucasians (Kessenich, 2000). Further, the AA population has some diseases that can increase the risk for osteoporosis, such as sickle cell anemia and lupus. Furthermore, in terms of prevention and treatment, it is held that AA women consume 50% less calcium than the recommended amount. Low intake of calcium is a risk, given that calcium is powerful in the building of bone mass and prevention of bone loss (Wallace, Boxall, & Riddick, 2004). It has been established that intolerance of lactose may hinder sufficient intake of calcium. Individuals who have lactose intolerance tend not to eat dairy products such as milk and yet these are useful sources of calcium. Given that approximately 75% of all AAs are lactose intolerant, it is safe to conclude that they are at risk for osteoporosis (National Institutes of Health, 2012).

Among AA women, osteoporosis has received underscreening, underrecognition and undertreatment (Jackson & Savaiano, 2001; Wilkins & Goldfeder, 2004). Studies have found that osteoporosis screening among AAs is low (Miller, et al., 2005). Wilkins and Goldfeder (2004) conducted a study at a hospital primarily frequented by AAs to examine screening practices and low bone density frequency in the AA population of older women. The authors examined medical records of 252 women for risk of osteoporosis. The women had been patients at Barnes-Jewish Hospital for at least six months and had seen a physician for a minimum of three months. All women were aged over 53 years, indicating that they were possibly postmenopausal. Racial distribution of the women as follows: AA 85.2%; Caucasian 14.0%; and Other 0.8%. The examination of the medical records was intended to determine the kinds of

diagnosis and screening done. On the list were diagnoses of osteoporosis, prior screening of osteoporosis, prior screening of breast cancer, and the use of vitamin D, estrogen, and calcium. Further, 128 women were evaluated for osteoporosis risk factors, and their BMD measured (Wilkins & Goldfeder, 2004).

The findings demonstrated that osteoporosis screening had been conducted among 11.5% of the women. The hospital from which the study was conducted is primarily frequented by AA women. Therefore, the percentage of osteoporosis screening cases is abnormally low because of the racial background of the patients. This is especially low when compared with screenings done for breast cancer. Again, 44.5% had their bone density examined. It was found that 40.4% of the AA women and 53.3% of the Caucasian women had abnormally low bone mineral density, with frequency increasing as age advanced and body mass index went down. The difference for the two racial groups was not statistically significant, implying that the two groups were equally vulnerable to osteoporosis. However, the study was not designed to demonstrate statistical significance, a fact that the authors have acknowledged. The findings led the authors to conclude that the AA women were significantly at a risk for osteoporosis. The authors advised against using race as a way to determine who should be screened for osteoporosis (Wilkins & Goldfeder, 2004). Miller and colleagues reported similar findings a year later (Miller, et al., 2005).

Miller and colleagues conducted a study to determine if physicians screened osteoporosis differently for postmenopausal AA and Caucasian women at equal risk for osteoporosis (Miller, et al., 2005). To achieve this aim, the study used both AA and Caucasian women who were all at risk of osteoporosis. The study found that fewer AA women were asked to take an osteoporosis scan using DXA scan. Further, the study found that physicians were less likely to talk about

considering osteoporosis in medical records as well as recommending calcium and vitamin D supplements for the AA women who visited internal medicine clinics. Generally, the study revealed significant differences between AA and Caucasian women in screening, prevention and treatment, with AA women being at a disadvantage (Miller, et al., 2005).

### ***Osteoporosis Knowledge***

A number of studies on the osteoporotic knowledge and beliefs among postmenopausal women in various countries and populations have been conducted (Doheny, Sedlak, Estok, & Zeller, 2007; Edmonds, 2009; Gemalmaz & Oge, 2008; Larkey, Day, Houtkooper, & Renger, 2003; Sedlak, Doheny, Estok, Zeller, & Winchell, 2007; Unson, Fortinsky, Prestwood, & Reisine, 2005). Studies have examined osteoporotic knowledge, factors associated with osteoporotic knowledge, osteoporotic knowledge and preventive strategies, and the possible correlation between osteoporotic knowledge and health-related behaviors (Werner, 2005). Generally, osteoporosis knowledge among women is low (Doheny, Sedlak, Estok, & Zeller, 2007). Following an extensive review of osteoporotic knowledge literature, Werner (2005) identified two key weaknesses with most of the studies. Werner (2005) found that most of the studies did not rely on theoretical frameworks. This is an indication that data analysis and interpretation for those studies were severely compromised. The other weakness is that most of the studies suffered from methodological flaws. In the present review, the author attempts to identify weaknesses and strengths that characterize most of the studies reviewed in this chapter. Werner (2005) reported that healthy and diagnosed women were poorly informed about osteoporosis. However, educational programs resulted in an increase in knowledge levels but no significant improvements in behavioral issues related to osteoporosis. This section reviews

literature on osteoporotic knowledge among women. The section addresses studies in various countries and in the United States in particular, with special emphasis on those investigating osteoporotic knowledge and beliefs among AA women.

Acknowledging the critical role appropriate osteoporotic awareness and behavior plays in the prevention of osteoporosis in postmenopausal women, Eslamian, Jamshidi, and Kanani (2007) designed a cross-sectional study to assess knowledge, attitude and behavior of women regarding osteoporosis. In the study, 390 premenopausal and menopausal women who visited Shariati hospital clinics completed a questionnaire. The scored questionnaire data were further analyzed to assess knowledge, attitude and behavior of women regarding osteoporosis and to compare by  $X^2$  test in the three groups. The researchers found that 15-30% of women could not appropriately define osteoporosis. Further, the study found that education significantly affected women's osteoporotic knowledge. However, education was found to have no significant effect on women's behavior and attitude toward osteoporosis. Further, the study found that age was associated with osteoporotic knowledge but had no effect on attitudes and behavior of women regarding osteoporosis (Eslamian, Jamshidi, & Kanani, 2007).

In another study conducted in Australia using focus groups and interviews from Iranian women as participants, Baheiraei and colleagues (2006) reported that there was a wide misunderstanding of osteoporosis, with women confusing osteoporosis with joint complications and arthritis. For instance, the participants demonstrated that they had insufficient knowledge of the risk factors for osteoporosis. For example, a participant indicated that she wanted to know if the disease could cause pain or was it just something like cancer. Nevertheless, a few of the respondents were aware of the risk factors such as physical inactivity, hormonal changes, and

premature menopause. With a lack of sufficient knowledge of risk factors for osteoporosis, some participants did not seem to take preventive actions seriously. The study should be credited for linking the difficulties involved in the prevention and treatment of osteoporosis to the insufficient osteoporotic knowledge among women.

Gemalmaz and Oge (2008) conducted a research study to assess the awareness, perception, information sources, and knowledge of osteoporosis among rural Turkish women. The study also sought to identify factors affecting their knowledge, with a view of organizing education programs for the target population. The study involved 768 women aged between 40 and 70 randomly selected among those who visited the General Practitioners in three chief care centers. The women were interviewed by trained nurses using structured questionnaires. The data collection tool, the structured questionnaire, had three parts. The first part of the tool collected demographic information including age, education, smoking history, family history of osteoporosis, menopausal status, screening behavior for osteoporosis, and osteoporotic drugs used. This information was necessary because it helped in grouping the study participants on the basis of their age and educational status. The questionnaire's second part collected data on osteoporotic awareness, future risk, perception of future osteoporosis risk, and osteoporotic knowledge sources. The third part of the structured questionnaire used in this study assessed the participants' osteoporotic knowledge, using a 20-item list of questions that the researchers developed after a comprehensive review of osteoporotic knowledge literature. Eleven questions assessed general information while the remaining nine questions assessed knowledge on osteoporotic risk factors. The question items in part three consisted of three options: true, false, and do not know. The authors explained that *do not know* was used to put guessing in check. The

analysis of the results included awarding 1 for every correct response and 0 for every incorrect response and *do not know* response. Further analysis involved descriptive statistical analyses including means, SDs, and percentages, which were used to describe the research population and primary variables of the study. Further, Chi-square test was used in age and educational levels for the purpose of showing factors determining osteoporotic awareness, perception, and knowledge sources. Further statistical analyses included a one-way analysis of variance (ANOVA) to calculate the difference of knowledge scores among groups. Furthermore, correlation analysis was conducted to determine the relationship between age and level of education and knowledge of osteoporosis.

The study, the first of its kind in Turkey, found that women who had heard of osteoporosis were the young and educated, implying that age and education determined osteoporosis knowledge among Turkish women in the rural areas included in this study. In particular, the study found that 60.8% of the women who took part in the study had heard of osteoporosis. The researchers further reported that only 44.9% of the participants defined osteoporosis correctly (Gemalmaz & Oge, 2008). A similar study by Ungan and Tumer (2008) found that almost 90% of the 270 women who completed questionnaires thought they were aware of osteoporosis, but the proportion of women aware of osteoporosis reported by Gemalmaz & Oge (2008) is very low. However, Gemalmaz and Oge (2008) attribute their findings to the low education status of the Turkish rural women. This may be a valid explanation given that the women studied by Ungan and Tumer (2008) were all from Ankara and therefore would be most likely educated. This indicates that education powerfully determines the extent to which women are aware of osteoporosis (Gemalmaz & Oge, 2008). This finding is consistent

with that of Eslamian, Jamshidi, and Kanani (2007), who also found that education significantly affected women's osteoporotic knowledge among Iranian women in Tehran. It is therefore safe to observe that higher education would lead to high knowledge of osteoporosis. In the study, women scored an average of 5.52 of the possible score of 20, indicating that osteoporosis knowledge was generally low (especially for the risk factors osteoporosis consequences) for Turkish rural women (Gemalmaz & Oge, 2008). The finding is consistent with that of Eslamian, Jamshidi, & Kanani (2007), who found that the knowledge of osteoporosis among women in Tehran was generally low and that their behavior and attitude were wanting. These findings underline the importance of creating osteoporotic knowledge among less educated, older women.

Larkey, Day, Houtkooper and Renger (2003) conducted a study to inform the development of an appropriate osteoporosis prevention program. The study aimed to examine the prevailing osteoporotic knowledge and behavior among women aged between 25 and 55 years old in Maricopa County, Arizona, and to evaluate factors segmenting the population in terms of age and ethnicity. Telephone interviews were conducted with 200 women selected through random-digit dialing selection. The findings demonstrated that women were aware that there was need to consume more calcium. However, the findings demonstrated that women had inadequate knowledge of the kinds of exercises that they needed to adopt. The study did not find any significant difference in knowledge of the prevention of osteoporosis in the light of menopause status, implying that whether or not a woman was at menopause did not significantly determine the level of osteoporotic knowledge. Additional findings from the study found that Hispanics were aware of fewer aspects of dietary and physical activity issues compared to non-Hispanics. However, findings indicated that Hispanic women were more aware of the relationship between

weight and the risk for osteoporosis. Hispanic women and postmenopausal women had similar chances of osteoporosis risk, which the study determined to be high. In particular, Hispanic women were found to have a low level of exercise and low use of hormone replacement therapy (HRT); while on their part, postmenopausal women reported high rates of tobacco intake, lower intake of calcium, and lower physical activity (Larkey, Day, Houtkooper, & Renger, 2003).

The study by Larkey and colleagues indicated that, generally, Hispanic women and postmenopausal women are at a higher risk for osteoporosis because of poor knowledge of how to prevent the condition. Relevant to the present study is the finding that postmenopausal women are at a high risk of osteoporosis because poor knowledge limits their preventive capabilities. However, the study relies heavily on Hispanic women rather than AA women. The authors concluded that osteoporosis information should be designed along age and cultural differences. This conclusion is in line with other studies reviewed here, such as Gemalmaz and Oge (2008) and Eslamian, Jamshidi, and Kanani (2007), which concluded that age and level of education were positively correlated with osteoporotic knowledge and as such these variables should inform preventive campaigns. The findings imply that postmenopausal women have low osteoporotic knowledge, putting them at high osteoporotic risk. Using these findings, it can be speculated that AA women are different from Hispanics because osteoporotic knowledge and behavior appear to change across cultures. This makes it important to study osteoporotic knowledge among AA postmenopausal women.

In another study aimed at examining factors that determine osteoporotic knowledge (Ailinger, Braun, Lasus, & Whitt, 2005), 255 women were assessed using the Facts of the Osteoporosis Quiz. The study found that age was positively related to osteoporosis knowledge

while education did not have positive correlation with osteoporosis knowledge. Generally, the osteoporosis knowledge of the respondents was inadequate, with differences recorded on different ethnic groups (Ailinger, Braun, Lasus, & Whitt, 2005).

In a study using AA, non-Hispanic White and Hispanic women in the US, Unson et al. (2003) sought to determine how beliefs about medication influenced selection and adherence to treatment. The study conveniently recruited women with an average age of 74.8 years from low socioeconomic areas. The study found that those who adhered to treatment did so because they knew it would be dangerous not to adhere. Additionally, the study found that participants' adherence to medication was correlated with their knowledge of the beneficial effects of medication and the belief that medicines are basically harmless. The study found those women who thought that fractures would not be serious and those who thought they would not have fractures did not accept treatment (Unson, et al., 2003). Other factors that were found to be influential in the choice of treatment were the side effects of a given treatment and price. The implication of these findings are that women's knowledge and beliefs about osteoporosis determine whether they will choose treatment or not, and the kind of treatment they will choose. They need to be knowledgeable about the serious consequences of failure to take medications and the beneficial effects of treatment. Again, they should be made aware of the side effects of each kind of treatment and other aspects such as pricing. Given that the study had women from low socio-economic background, the importance of pricing in their decision making on the kind of treatment to choose may be influenced by their economic status (Unson, et al., 2003). This may not be so for women in high socioeconomic backgrounds. This is a clear indication that women should be appropriately informed about osteoporosis to empower them to make informed

decisions. It may not be advisable to generalize these findings to all AA women given that the participants were obtained through a non-random method: convenient sampling.

Geller and Derman (2001) conducted a study to evaluate osteoporotic beliefs, attitudes and knowledge of osteoporosis risk factors among AA and Hispanic women. The study was carried out as a prospective cross-sectional needs and risk assessment among AA and Hispanic women. Data were collected using a survey tool designed to collect data on the participants' knowledge of osteoporotic risk factors, behaviors, beliefs, and attitudes. The behaviors assessed included smoking, drinking, eating habits, physical exercises, vitamins and calcium intake. Further, the data collection questionnaire collected data on challenges faced by risk reduction efforts. Further, the researchers sought to document the sources of information that the women in the study had relied on. Data were collected from a total of 206 women aged over 18 years, with 20% of them aged over 50. Background information demonstrated that AA women were more formally educated than their Hispanic counterparts. Further, AA women were found to have been unmarried or widowed, with the chances being six times more for each case than for the Hispanic women. Further, AA women appeared to have a higher chance of having medical insurance (Geller & Derman, 2001).

The study found that 70% of the respondents knew what osteoporosis is, with the remaining 30% indicating that they did not know what osteoporosis is. These results were obtained following a multiple choice question. However, more than one third of the participants had not heard anything about osteoporosis, while 57% had just heard something about the condition. Regarding the sources of information, television took the lead with 77%, while the doctor became second with 66%. The other sources of information included newspapers and

magazines, which were cited by 64%. However, most of the women preferred getting the information from doctors. This demonstrates that the health care system has failed to respond to the needs of women because most of the women had cited television as the primary source of information and yet they preferred receiving that information from doctors. The source of information for the two races was the basically the same. In terms of attitudes, the study reported that AA and Hispanic women were more concerned about developing a heart disease, breast cancer, and diabetes, than osteoporosis.

Wahba and associates (2010) conducted a cross-sectional study in which they assessed osteoporosis knowledge among 494 Egyptian young women aged 16 to 24. The study sought to examine the osteoporosis knowledge, beliefs, and behaviors in light of osteoporosis risk factors and osteoporosis preventing behaviors, particularly adequate calcium intake and physical activity. The study reported 88.1% of the girls had heard of osteoporosis while 48% defined the condition correctly. The girls chose televisions as the main source of osteoporosis knowledge (with 34%) with mothers and relatives second (with 27.1%). Further, 22.5% of the girls believed that they were susceptible to osteoporosis. The findings, in addition, showed that 59.6% of the participants perceived osteoporosis as a more serious health issue than heart disease and breast cancer. Slightly half of the participants (59.1%) demonstrated that they were aware that physical activity was beneficial in the prevention of osteoporosis. Despite this, only 42.9% of the participants regularly participated in some kind of a sporting event. The majority of the participants cited lack of time as the primary reason why they were not taking part in exercise. The other reasons cited were lack of venues or facilities, dislike for activities, and health issues

(Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). Finally, the findings demonstrated that the students had poor calcium and osteoporosis knowledge.

Similar to the study by Wahba and colleagues, Edmonds (2009) conducted a study among 792 college students in the University of Central Arkansas (UCA) to assess their level of osteoporosis knowledge and examination of how HBM variables related to osteoporosis preventing behavior. Unlike Wahba and colleagues' participants, college students in Edmonds (2009) study perceived minimal barriers to physical activity and calcium. Further, the findings demonstrated that most students did not perceive themselves as susceptible to osteoporosis or that osteoporosis would affect them significantly. According to HBM, low susceptibility and low perception that osteoporosis is serious imply that individuals will be less concerned about preventive behaviors, namely physical activity and calcium intake. Although the benefits of the physical exercise and calcium intake outweighed the perceived barriers to exercise and calcium intake, the perception that osteoporosis is not serious and that the students are not prone to the condition would negatively affect any preventive measures. This underlines the importance of developing prevention programs among college students in the United States. It is not easy to determine osteoporosis knowledge among AA students who took part in the study by Edmonds (2009). This is because although the author gives the number of AA students as 209 (26.4%), the reporting of the findings is not done per ethnicity. This makes it difficult to determine osteoporosis knowledge among AA women. Again, the author does not clarify which among the 209 students were female and male. However, this should not be seen as a weakness because the study was to examine osteoporosis knowledge and the relationship between HBM variables and osteoporosis preventing behaviors among college students at UCA but not specifically AA

students. Nevertheless, the study leaves a lot unknown concerning osteoporosis knowledge and the relationship among preventive behaviors and variables of HBM.

Unson, Fortinsky, Prestwood, and Reisine (2005) conducted a study to determine the impact of socioeconomic status, osteoporosis and HBM variables on the use of hormone therapy and other medications for osteoporosis among older AA women aged over 60 years. The study found that 47% of the participants were, or had been, users of hormone therapy; while 11% used other medications for osteoporosis. Perceived benefits of hormone therapy, hysterectomy, and family history of cancer enhanced the possibility of ever using hormone therapy. Further perceived susceptibility and osteoporosis discussion with physicians improved the odds of ever using other medications for treating osteoporosis. Further, the study found that socioeconomic status heavily influenced osteoporosis knowledge (Unson, Fortinsky, Prestwood, & Reisine, 2005). Basically, it can be observed from these findings that perceptions of being at risk or susceptible to osteoporosis and discussions about osteoporosis with health care providers increased the chance of using other medications for osteoporosis. This is an indication that among AA women, preventive measures can be aimed at increasing perception of susceptibility and encouraging doctors to discuss osteoporosis with AA women before the occurrence of fractures. The findings on perceived susceptibility are consistent with those of Sedlak et al. (2007). Sedlak and colleagues (2007) designed a study to examine the effect of BMD information gained through DXA scan on osteoporosis preventing behavior among postmenopausal women. The study sample was 203 women aged 50-65. The study used general knowledge and HBM variables as mediating variables. The results of this experimental study demonstrated that personal knowledge about bone mineral density that the women gained

following DXA screening enhanced the women's perception of susceptibility to osteoporosis, and subsequently they improved their calcium intake and osteoporosis preventing medications (Sedlak, Doheny, Estok, Zeller, & Winchell, 2007). The two studies clearly demonstrate that enhancing perceptions of susceptibility is essential in influencing women to engage in osteoporotic preventive behaviors.

### ***Gap in the Literature***

The studies reviewed in this chapter have heavily used study samples consisting of ethnicities other than AA women. In particular, most of the studies relied heavily on Caucasian women. It is interesting to note that even for the studies with AA women, the aim was to find out why this population was being under screened for osteoporosis, but not to measure their osteoporosis knowledge, beliefs, and behaviors. The few studies on osteoporosis knowledge that have used some AA women did not provide comprehensive conclusions concerning osteoporosis in this population, maybe because osteoporosis knowledge among AA was not among their primary aims, or maybe because they thought this population was not at risk for osteoporosis.

The reason that can be used to explain the negligence of AA women's osteoporotic studies is that AA women are thought to be at a lower risk of developing osteoporosis because they have higher bone mineral density and bone mass, and that their bone loss is considerably lower. As a result, AA women have been neglected in studies on osteoporotic knowledge, beliefs, and behaviors. Because these studies are used to develop osteoporosis prevention programs or interventions, the implication is that AA women have no effective osteoporosis intervention programs and yet they are at a significant risk for osteoporosis. Again, once they develop osteoporosis and osteoporotic fractures, AA women are at a higher risk of morbidity and

mortality. Therefore, it is necessary to measure osteoporosis knowledge among postmenopausal AA women so as to inform intervention or prevention efforts. Studies of AA women will make it possible to develop effective and fruitful osteoporosis preventive programs targeting AA women. The proposed study therefore measures osteoporotic knowledge, beliefs, and behaviors among postmenopausal AA women so as to inform formulation of effective osteoporosis prevention programs among this population. The next chapter describes methods and instruments used to conduct the study.

### ***What the Study Adds***

It has been demonstrated that there is a gap in literature on AA women's knowledge, attitudes, and beliefs about osteoporosis. This study provided a description of the level of bone health promotion behaviors including calcium intake and physical activity. This study also identifies and describes barriers that have prevented AA women from engaging in bone health promotion activities.

### **CHAPTER III: METHODOLOGY**

This chapter provides a description of the research methods. These include the research design, setting, study participants, and data collection instruments. Additionally, the chapter describes the procedures for how the study conducted, described data management and analysis methods, and showed how ethical issues were addressed during the study.

#### ***Purpose***

The purpose of this study was to describe postmenopausal AA women's knowledge, beliefs, and behaviors about osteoporosis, using the HBM as a study framework.

#### **Specific Aims:**

1. To describe postmenopausal AA women's knowledge, beliefs, and attitudes about osteoporosis.
2. To describe postmenopausal AA women's bone health promotion behaviors of calcium intake and bone health promoting physical activity.
3. To describe postmenopausal AA women's barriers to engaging in bone health promotion activities.
4. To examine the relationships between postmenopausal AA women's age, education, and number of months post menopause and osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities.

#### ***Research Design***

A cross-sectional descriptive survey was utilized to answer the specific aims and additional questions. To determine the number of participants needed to thoroughly analyze the data, a power analysis was conducted.

## Setting

Study participants were recruited from the Baltimore-Washington area. After consenting to participate, participants received questionnaires to complete immediately. However, participants were allowed to fill the questionnaires at their own will. The area is in the Washington –Arlington–Alexandria, District of Columbia (DC) – Virginia (VA) – Maryland (MD) – West Virginia (WV) Metropolitan Statistical Area, also referred to as the Washington DC Metropolitan Area. The area consists of 20 counties in the District of Columbia (DC), Virginia (VA), Maryland (MD), and West Virginia (WV) (US2010, 2010). The main cities in this area are Reston, VA; Arlington, VA, Alexandria, VA; and Washington, DC. The total population of this area as of the 2010 census was 4,377,008. Among this number, 2,050, 848 (46.9%) were non-Hispanic white; 1,282,438 (29.3%) were non-Hispanic Black; 588, 262 (13.4%) were Hispanic; 422, 800 were Asian; while 32,660 (0.8%) belonged to other races (USCB, 2011). The study was primarily focused in the Washington area. As per the 2011 estimates, the population of the District of Columbia was 619, 020 persons. Of these, black persons constituted 50.7% of the district's population. Narrowing down to the target population of this study, the area had 22.1% of its population aged over 55 years. Further, the females made up 52.7% of the population. For persons aged over 18 years, females were 53.4% while for those aged over 65 years, women made up 60.0% of this population. These observations led to a conclusion that possibly women made up more than 50% of the population, including the AA women population aged over 55 years (US Census Bureau, 2011). This area was selected for sample recruitment because a recent survey by an organization dedicated to planning churches in the Baltimore and Washington area identified 274 churches that were started in the area between

2005 and 2010 (Johnson, 2011). This indicated there were sufficient churches to approach for sample recruitment. From this number, one large AA church was approached to obtain 153 AA postmenopausal women over age 55 years. The church was selected because it had a large AA population with sufficient numbers of participants needed for the study. The selected church was contacted, approval was obtained, and data were collected over two months. The rationale for targeting a sample size of 153 was based upon power analysis to answer the study aims.

### *Sampling*

**Description of participants.** Participants for the study were limited to postmenopausal AA women (ages 55+years), sampled from one large AA church in Baltimore-Washington area. A signed written consent form, signed by an informed participant, was a prerequisite for receiving a questionnaire.

**Inclusion Criteria:** According to the National Institutes of Health (2012), the average age at which women have their last period is 51 years old. Proposed Staging Reproductive Aging Workshop (STRAW) reported that menopausal transition (or perimenopause) has an early stage and a late stage. If 12 consecutive months (one year) pass without menses, a woman enters postmenopausal phase. Postmenopausal women are those women who are between 24 and 36 months after their last menstrual period. Early postmenopause occurs during the first four years following the menopausal transition. The next period is called later postmenopausal and continues until demise (Woods, et al., 2008). For the purposes of the study, the onset of menopause was determined to be at 55 years of age. To assure women were postmenopausal, the inclusion criterion for age was 55+ years. Each participant had to self-identify as an AA woman, postmenopause, age 55 years or older. Because most women age 55 years and older are

postmenopausal, hysterectomized and oophorectomized women were included. Only English speakers were included who were able to read and write. Participants were willing to participate.

**Exclusion Criteria:** Women were excluded if they did not self-identify as AA, were still menstruating, were under 55 years old, or were non-English speakers or unable to read and write in English.

**Sample size.** One hundred fifty three AA postmenopausal women over age 55 years from one large AA churches were participants. The church was selected as a result of its large AA congregation. The church was contacted, approval was obtained, and data was collected over 2 months.

**Power analysis for correlational analyses.** The effect size was based on the correlations observed in a study by Edmonds (2009). Edmonds found small to moderate correlations between physical activity and perceived barriers to physical activity ( $r = .28$ ), calcium intake and health motivation ( $r = .20$ ), and calcium intake and physical activity ( $r = .20$ ). As such, these correlations were used to calculate an a priori power analysis using G\* Power 3.1.

For tests of association using bivariate correlations, a small correlation between the variables of interest was considered meaningful (Cohen, 1988). To detect a small-moderate correlation ( $r = .20$ ), a sample of 153 analyzable subjects would provide 80% power to discover that the correlation was significantly different from no correlation (i.e., that the correlation would be zero) at the .05 level.

For tests of association using bivariate correlations, a small correlation between the variables of interest was considered meaningful. To detect a small-moderate correlation ( $r = .28$ ), a sample of 77 analyzable subjects would provide 80% power to discover that the correlation

was significantly different from no correlation (i.e. that the correlation would be zero) at the .05 level.

### ***Recruitment Methods and Consenting Process***

The Principal Investigator (PI) identified 153 postmenopausal AA women from one large AA churches who met the inclusion criteria. A survey script was used to recruit the participants of the study. This was read in church by the researcher. The survey script is in Appendix A. The consent form in Appendix B was signed willingly and only after the participant felt well informed on the study. The consent form contained information about a \$10 gift card from Starbucks to thank the participants.

The PI read the survey (recruitment) script [Appendix A]. It explained the purpose of the study, listed inclusion and exclusion criteria, and explained what participation entailed. Volunteers were invited to remain after the women's group ended, at which time the PI provided the consent form to volunteers. All were given an opportunity to ask questions, and were told that declining to participate would have no negative effect. Those who wished to proceed signed the consent form and handed it to the PI, who then provided a questionnaire booklet.

### ***Procedures Involved in Human Research***

Upon obtaining IRB approval from The University of Arizona, the PI sought permission from the selected church officials to attend women's meetings which normally take place on the church premises. The church was selected non-randomly by selecting a large AA church that had a high proportion of AA women congregants. This was done between October-December 2013. Having gained permission from the church, the PI attended various church meetings. Once present in the women's meetings, the PI introduced herself and explained that she was only

interested in postmenopausal women identifying as AA. The researcher explained to the participants about postmenopausal state and osteoporosis in AA women. Information about the benefits of participation and the research topic was presented at this point. The PI announced that each volunteer would get a \$10 Starbucks gift card. The PI explained to the participants about human subject protection and assured them that their private information including their identity would be kept confidential in a separate password protected computer file only accessible by the PI and the PI's Advisor and that the data collected would be used for research purposes only. The confidentiality of information shared during the research was emphasized and those participating in the research were enlisted during the recruitment exercise. The PI informed the participants that their contact information would be collected separately from the questionnaire booklet using the demographic form, and as such would not appear on the questionnaire booklet. All data were reported in the aggregate to protect confidentiality. Contact information included name, address, email address, and phone numbers. The researcher ensured the inclusion criteria were met. Postmenopausal women were between 24 and 36 months after their last menstrual period. This was ensured by asking the women to fill in the last date of their normal menstrual period. Those with menses were excluded from the study. AA women not included in the study were asked to excuse themselves so that those postmenopausal AA women filling out the questionnaire would not feel as though their information was not confidential. During recruitment, participants were known to have taken part in the study. However, they were informed that their information was confidential and would be used only for research purposes. They were sufficiently informed about the study before being requested to sign a consent form. The signing of the consent forms was immediately followed by the distribution of the questionnaires. The questionnaires were

distributed among the sampled participants who took about 45 minutes to complete. Following the completion of the questionnaire by participants at a certain meeting, the data were collected so that the PI went home with the completed questionnaires and the separate demographic form. The PI collected the completed questionnaire booklet and reviewed for completeness. This made it possible for the PI to identify the missing data; that is, the items not responded to. The PI was seated at the back of the church after the service so that participants could come over and speak with her on their way out for further clarification if needed. The PI also gave out her contact information for future communication if needed. The PI was aware that there could be missing data, especially from item non-response. To encourage completion of the items the PI explained to participants the importance of answering all questions if possible. Items that were not answered were pointed out to the participant who was asked if she meant to leave the question unanswered. If she meant to answer the question but just overlooked it, she would have the opportunity to fill in the missing answer. If the participant(s) meant not to answer the question, the non-responded item would be treated as missed data. The participants filled out the questionnaire booklet given to them. This was, however, done in phases to prevent PI survey fatigue. The information collected was stored for the entire duration of the study, 6 months. The questionnaire booklets were stored in a locked file in the PI's residence.

Upon completion of the questionnaire, the participant was compensated to thank her for her contribution to the study. A \$10 Starbucks' gift card was offered to participants to show appreciation; not to be coercive but enough to provide incentive to participate.

### ***Instruments***

Five study instruments were utilized to collect data on the study variables. The following is a description of those instruments.

#### **Osteoporosis Health Belief Scale (OHBS)**

Several studies have used OHBS to assess osteoporosis beliefs. (Edmonds, 2009; Ford, Bass, Zhao, Bai, & Zhao, 2011). Developed by Kim and colleagues (1991), OHBS, a 42-item instrument, is based on the Health Belief Model. OHBS basically examines beliefs related to exercise and calcium intake using seven subscales including susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers to exercise, barriers to calcium intake, and health motivation (Edmonds, 2009; Ford, Bass, Zhao, Bai, & Zhao, 2011). *Susceptibility* subscale measures the perceived risk of an individual that they will develop osteoporosis. Questions on susceptibility are concerned with assessing the individual's perceptions of two risk factors: body build and family history; and the chance that they will develop osteoporosis (Ford, Bass, Zhao, Bai, & Zhao, 2011). *Seriousness* examines the person's perceived threat that osteoporosis presents to the individual's ability to complete daily tasks, physical health, and social status. Further, seriousness tends to determine how the individual will differently perceive or feel about herself, the perceived seriousness of osteoporosis, and fear of being osteoporotic, possibly becoming disabled, and financial expenses. Benefits of exercise and calcium intake are designed to assess the perceived efficacy of specific behaviors in the prevention of osteoporosis. Questions on exercise address the ability of exercise to prevent osteoporosis, the impact of regular exercise on bone health, and the individual's feelings about exercise in the prevention of osteoporosis.

Questions on calcium intake address the perception that sufficient intake of calcium reduces the risk of osteoporosis and broken bones (Ford, Bass, Zhao, Bai, & Zhao, 2011).

Barriers to exercise and calcium intake focus on the negative aspects of preventive behaviors for osteoporosis. Questions on mentality and physical ability to engage in regular exercises, time and facilities for exercise, and family discouragement are used to assess barriers to exercise. Barriers to calcium intake are assessed using questions focused on the cost, preference for, cholesterol content of diets, ability to change dietary habits, and digestive response to calcium intake. The *health motivation* scale assesses an individual's tendency to engage in healthy behaviors. In this subscale, individuals are expected to rate their diet, desire for new information on health, importance of being healthy, practice of regular health checkups, early diagnosis of health issues, and adhering to recommendations (Ford, Bass, Zhao, Bai, & Zhao, 2011).

Each subscale has six items scored using a 5-point Likert scale range, from *strongly disagree* awarded 1, to *strongly agree*, awarded 5. Therefore, each subscale has a possible minimum of 6 and possible maximum of 30. This is an indication that the minimum score will be 42 while the maximum will be 210 for the whole OHBS. For the items of each of the subscales, refer to Appendix D. OHBS is a reliable tool with a reliability of 0.90 for the entire instrument and between 0.52 and 0.84 for the subscales. The sample studied to get these reliable estimates were AA senior's ages 60 to 93 years recruited from four senior centers and one large senior residential apartment complex. A total of 150 seniors were included in the study (Ford, Bass, Zhao, Bai, & Zhao, 2011). The HBM helped in establishing the concurrent validity of the instrument.

Cronbach's alpha was used to determine the internal consistency of the OHBS subscales in this study. The Cronbach's alpha for each subscale was as follows: susceptibility = .96; seriousness = .60; exercise barriers = .66; and health motivation = .59. The Cronbach's alpha value for the overall OHBS scale was .92. These alpha values are similar to those found in previous research. It should be noted that the Cronbach's alpha for the benefits of exercise, benefits of calcium intake, and calcium intake barriers subscales could not be computed due to a lack of variability in the data.

#### Osteoporosis Knowledge Test (OKT)

The Osteoporosis Knowledge Test basically measures osteoporosis knowledge. It is a 24-item tool consisting of two subscales, namely, OKT Exercise, which consists of 16 items, and OKT Calcium, which is made up of 17 items. The two subscales share nine common items which measure an individual's knowledge of the overall risk factors for osteoporosis (Edmonds, 2009). Subjects rate these items as *More Likely*, *Less Likely*, *Neutral*, and *Don't Know*. Some examples of the characteristics are race, gender, menopause, exercises, diet, and use of a steroid. The other items are concerned with the knowledge of exercise as a preventive behavior for osteoporosis, sources of calcium and requirements. The questions take the form of multiple choice questions. For items ranging from 1-9, *Neutral* and *Don't Know* responses are considered to be incorrect while, for the items ranging from 10-24, only *Don't Know* is viewed as incorrect. Therefore, OKT Exercise subscale had scores ranging from a minimum of 0 to a maximum of 16, while the scores for OKT calcium range from a minimum of 0 to 17. The reliability for OKT Calcium is 0.72 while that of OKT exercise is 0.69 (Edmonds, 2009). Higher scores on this tool show that

the individual is highly knowledgeable about osteoporosis and therefore may engage in preventive behaviors.

Cronbach's alpha was used to determine the internal consistency of the OKT subscales. The Cronbach's alpha for each subscale was as follows: OKT calcium = .88; OKT exercise = .41; and OKT total = .55. The Cronbach's alpha value for the OKT exercise subscale was lower than reported in previous research, while the Cronbach's alpha values for the OKT calcium subscale and the OKT total scale were similar to those found in previous research.

#### Osteoporosis Self-Efficacy Scale (OSES)

Self-efficacy defines a person's belief in one's ability to complete a given task in a successful manner (Insel & Roth, 2010). The Osteoporosis Self-Efficacy Scale is a 12-item instrument consisting of two subscales, namely, Osteoporosis self-efficacy exercise (items 1-6) and Osteoporosis self-efficacy calcium scale (items 7-12). OSES relies on perceived susceptibility and seriousness, perceived barriers and benefits, health motivation, and self-confidence in a person to undertake required osteoporosis preventive behaviors, as a way of predicting health behavior that may possibly occur (Ford, Bass, Zhao, Bai, & Zhao, 2011). The self-efficacy for exercise, measured by the use of six items, measures an individual's confidence at various levels of an exercise program including as they begin a new program of exercise, as they change habits of an exercise, putting in appropriate effort in the exercise, completion of difficult exercises, time involved, and the individual's compliance with the recommended exercises (Ford, Bass, Zhao, Bai, & Zhao, 2011). The original version of OSES required that participants place a mark along a line connecting *Not at all confident* and *Very confident* points. Scoring was done by obtaining the distance between the left anchor and the participant's mark in

millimeters. Each question has a range of 0-100 millimeters. To get the score for the self-efficacy for exercise subscale, an addition of the scores obtained for the six items is obtained and then divided by six. The highest possible score is 100. According to Edmonds (2009), this original format appears to be complicated and may confuse most of the participants. As such, Edmonds (2009) modified the tool to use new responses including *strongly disagree*, *disagree*, *neutral*, *agree*, and *strongly agree*, while the questions remained the same. Similarly, the proposed study used the version used by Edmonds (2009). The reliability of OSES is high, at .90 (Edmonds, 2009). Higher scores on the self-efficacy scale imply that the participant believes in one's ability to successfully complete exercise programs.

Cronbach's alpha was used to determine the internal consistency of the overall OSES scales; as the subscales were not used in this study. The Cronbach's alpha was .96, which is similar to values reported in the literature.

#### Osteoporosis Attitude Knowledge Test (OAKT)

Testing the attitude of patients with osteoporosis can avail an important insight into their behavior and possible barriers to effective management of the disease. For instance, studies show that some patients with fragility fracture have discontinued medication after the fracture is healed, thinking that osteoporosis is cured as well. Osteoporosis Attitude Knowledge Test is a standardized instrument used to assess knowledge, attitudes, behaviors, or perceptions of osteoporosis. The instrument is applied before an intervention to identify learning needs and at the end of an intervention to evaluate changes in attitudes and behaviors. The instrument for assessing knowledge and attitude consists of 20 questions which have social demographic characteristics. Twelve of these questions are about knowledge of osteoporosis, Questions 13 to

16 are concerned with attitude towards osteoporosis and the remaining 4 questions test the perception and practice in prevention of the disease (Osman, 2013). Assessment is carried out by awarding each correct response a score of 1 and 0 for wrong or don't know answer. The test is susceptible to cultural barriers because questions asked are socio-demographic in nature.

#### Osteoporosis Preventing Behaviors Survey (OPBS)

The Osteoporosis Preventing Behavior Survey, a 39-item instrument, is designed to assess osteoporosis preventing behaviors. The behaviors are about activities/exercises, dietary intake of calcium, and a number of other risk factors including use of alcohol, smoking, hormonal therapy use, use of non-hormonal therapy and the other medication with an effect on bone density (Doheny, Sedlak, Estok, & Zeller, 2007). The reliability for OPBS physical activity is 0.67 with a test-retest reliability of 0.90. Higher scores on this tool show that the individual are aware of osteoporosis preventive behaviors (Edmonds, 2009).

In the present study, Cronbach's alpha was used to determine the internal consistency of the OPBS subscales used in this study. The Cronbach's alpha for each subscale was as follows: OPBS using diet = .10 and OPBS using exercise = .75. The Cronbach's alpha value for the OPBS exercise subscale was similar to those found in previous research. However, the Cronbach's alpha value for these OPBS using diet subscale was much lower than those found in previous research.

#### ***Survey Script and Consent Form***

The Survey Script is a statement read by the PI identifying her and the institution she is affiliated with and a brief explanation of the nature of the study. The consent form contained the

signature of the participant and what they were agreeing to. It also contained information on the amount of compensation being provided for taking part in the study.

### ***Socio-Demographic Questions***

Socio-demographic items included in this self-report descriptive survey were name, address, email address, phone number, age, gender, race/ethnicity, years of education, age of menarche, age at menopause, religion, marital status, housing, and living arrangement. The study used the version of the instrument used by Estok and colleagues (2009) who measured osteoporosis behavior in postmenopausal women, the same population targeted by this study. The reason why the Edmonds (2009) version was not used in this study is that Edmonds (2009) modified the tool to match the population studied, that is, college students. According to Estok et al. (2009), the instrument is reliable and its content validity has been ascertained. Scoring higher on this tool shows that the individual is at lower risk of osteoporosis, while scoring lower shows that the individual may be at higher risk of osteoporosis.

### ***Data Management and Analysis***

**Data management plan.** After data collection, the researcher entered all data on a spreadsheet. Data were double entered to assure accuracy. Data were cleaned by checking for outliers. The researcher was concerned about the missing data. As a result, the missing values from the filled in questionnaires were imputed with the mean value of the variable to which the item(s) not responded to belong(s). The mean of the variable was obtained from the non-missing data for that variable. This method of managing missing data through substitution of the missing value with the mean of available values for that variable is called mean substitution. Data were entered using participant number only as the identifier. A separate list of participant names and

contact information with participant number for cross-reference was stored in a computer file that was password protected and only accessible by the PI and the PI's Dissertation Advisor.

**Data analyses.** The sample was described using descriptive statistics and measures of central tendency, including the mean, standard deviation, range, and frequencies and percentages where relevant. The demographic variables described were age, years of education, age of menarche, age at menopause, number of months post menopause, religion, marital status, housing, and living arrangement.

Aim #1: This specific aim was to describe postmenopausal AA women's knowledge, beliefs, and attitudes about Osteoporosis. This aim was answered by data collected using the Osteoporosis Knowledge Test (OKT) and the Osteoporosis Attitude Knowledge Test (OAKT). The key variables for this aim were (a) knowledge for exercise (8 items), (b) knowledge for calcium intake (8 items), and (c) overall knowledge for risk factors as measured by the OKT (16 items) and (d) the total number of items answered correctly on the OAKT (20 items). Basically, knowledge of calcium intake was defined by participants' knowledge of whether calcium intake prevents osteoporosis and the knowledge of a diet containing calcium. The OKT and the OAKT have questions determining respondents' knowledge of risk factors for osteoporosis. The specific osteoporosis knowledge variables assessed were calculated and scored as follows: (a) Total Osteoporosis Knowledge (Total # of all osteoporosis knowledge items answered correctly), (b) Osteoporosis Exercise Knowledge (Total # of exercise knowledge items answered correctly), (c) Osteoporosis Calcium Knowledge (Total # of calcium knowledge items answered correctly), and (d) Score on the Osteoporosis Attitude Knowledge Test (OAKT; Total # of all osteoporosis items

answered correctly. The range, mean and standard deviation were determined for each variable. Higher scores indicated greater knowledge.

Aim #2: The second research objective was to describe postmenopausal AA women's bone health promotion behaviors of calcium intake and bone health promoting physical activity. To achieve this objective focus was on the *dietary intake of calcium*, and *engagement in physical activity/exercise* as measured by the Osteoporosis Preventing Behavior Survey (OPBS), which is a seven item survey. The dietary intake of calcium involved examining the extent to which AA women consumed calcium-rich foods such as milk. The participants responded to questions to establish how they were engaging themselves in the intake of calcium through their diet, which enhances the health of bones and prevents osteoporosis. Engagement in physical activity was defined by examining how the AA took part in physical exercise programs. The variable involved whether the AA women were carrying out physical exercise activities that would enhance bone health and hence prevent osteoporosis. For calcium intake, participants' responses were summed across four items to arrive at a total score such that higher scores indicated a greater consumption of calcium. For engagement in physical activity, participants' responses were summed across three items to arrive at a total score such that higher scores indicated more frequent physical activity.

Aim #3: The third research objective was to describe postmenopausal AA women's barriers to engaging in bone health promotion activities. The Osteoporosis Health Belief Scale (OHBS) and the Osteoporosis Self-Efficacy Scale (OSES) were used to measure the barriers to engaging in bone health promotion behaviors. The seven OHBS subscales were used for this aim; the subscales include: (a) perceived susceptibility, (b) perceived seriousness, (c) perceived

benefits for exercise, (d) perceived benefits for calcium intake, (d) perceived barriers to exercise, (e) perceived barriers to calcium intake, and (f) health motivation. The perceived susceptibility score was calculated by summing responses across six items. A higher score denotes greater perceived susceptibility to osteoporosis. The perceived seriousness score was calculated by summing responses across six items; higher scores indicated greater perception that osteoporosis is a serious disease. The perceived benefits for exercise score was calculated by summing responses across six items, higher scores indicating a more positive perception of the benefits of exercise. The perceived benefits for calcium intake was calculated by summing responses across six items, higher scores indicating a more positive perception of the benefits of calcium intake. The perceived barriers to exercise score was calculated by summing responses across six items, higher scores indicating more perceived barriers to exercise. The perceived barriers to calcium intake score was calculated by summing responses across five items, higher scores indicating more perceived barriers to exercise calcium intake. The perceived health motivation score was calculated by summing across 5 items; higher scores indicated more motivation to engage in behaviors that enhance health.

In addition, the Osteoporosis Self-Efficacy Scale (OSES) was used to measure the barriers to engaging in bone health promotion behaviors. Lack of self-efficacy can be a barrier. The OSES score was calculated by summing across 12 items; higher scores indicated greater self-efficacy for engaging in behaviors to maintain bone health.

Aim #4: The purpose of this aim was to examine relationships between postmenopausal AA women's age, education, and number of months post menopause and osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities. More

specifically, the researcher examined the relationship among three demographic variables (age, education, and number of months post menopause) and the dependent variables, which were osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities. The first set of dependent variables assessed were the OHBS subscales: (a) perceived susceptibility to osteoporosis, (b) perceived seriousness of osteoporosis, (c) perceived barriers to calcium intake, (d) perceived barriers to exercise, (e) perceived benefits of calcium intake, (f) perceived benefits of exercise, and (g) health motivation. The second set of dependent variables assessed were for osteoporosis knowledge. The specific osteoporosis knowledge variables assessed included: (a) Total Osteoporosis Knowledge (Total # of knowledge Items answered correctly), (b) Osteoporosis Exercise Knowledge (Total # of exercise knowledge Items answered correctly), (c) Osteoporosis Calcium Knowledge (Total # of calcium knowledge items answered correctly), and (d) Score on the Osteoporosis Attitude Knowledge Test (OAKT; Total # of items answered correctly). The third set of dependent variables assessed was osteoporosis prevention behaviors. The specific osteoporosis prevention variables assessed included the following subscales from the Osteoporosis Preventing Behaviors Survey: (a) Osteoporosis Preventing Behaviors With Food, and (b) Osteoporosis Preventing Behaviors With Exercise. The final dependent variable assessed was osteoporosis self-efficacy and attitudes as measured by the Osteoporosis Self-Efficacy Scale (OSES). Pearson correlations were used to assess data for Aim 4 (Polit & Beck, 2009; Trochim, 2006).

### ***Ethical Considerations***

The study received IRB approval from The University of Arizona. The church was selected conveniently. The church was selected non-randomly by picking one large AA church

that were easier to reach and easily accessible. However, the PI also made attempt to ensure that the selected samples were representative of the entire population. This was done during the October-December 2013. The PI approached the church and sought permission to attend women's meetings at the church premises. Postmenopausal AA women were asked to volunteer for the study during the PI's presentation to the group. They were told that the study had as its primary purpose the assessment of the level of osteoporosis knowledge, beliefs and behaviors in postmenopausal AA women. Secondary to this purpose, the author told them that she hoped to determine how the HBM theoretical constructs correlate with osteoporosis preventive behavior, especially calcium intake and physical activity/exercise. They were told that they had a choice to participate or not to participate in the study. The researcher informed the participants that those who volunteered would receive a Starbuck's gift card as an appreciation but not to coerce them to participate. Those who volunteered were given the informed consents form that they signed. Volunteers completed the questionnaire instrument while the researcher was with the group. The PI then scanned the questionnaires as they were returned to ensure that they were completed.

### *Summary*

This chapter has described the study design, the setting, and the methods and tools that were used to sample participants, and to collect and analyze the data. This cross-sectional design study measured osteoporosis knowledge on 153 postmenopausal AA women sampled from a large AA church in the Baltimore-Washington area through purposive sampling. A 45 minute questionnaire instrument consisting of five tools was used to collect data. The researcher was sensitive to ethical issues, especially informed consent and protection of privacy.

## CHAPTER IV: RESULTS PRESENTATION

The purpose of this study was to describe postmenopausal AA women's knowledge, beliefs, and behaviors about osteoporosis.

Results are presented in this chapter and include a description of the sample and results of the specific aims.

### Sample Description

The sample was comprised of 153 postmenopausal women. Descriptive statistics and measures of central tendency were calculated for current age in years, years of education, age at menarche, age at menopause (12 months post menstrual period), and number of months post menopause (see Table 4).

TABLE 4. Descriptive Statistics for Age, Years of Education, Age of Menarche, Age at Menopause, and Number of Months Post Menopause (N = 153)

Variable	Range	Mean	<i>SD</i>	Median	Mode
Current age in years	55-72	60.84	5.44	60.84	60.00
Years of Education	12-16	14.35	1.59	14.00	14.00
Age of Menarche	9-15	11.86	1.55	12.00	10.00
Age at Menopause (12 months post menstrual period)	41-66	48.67	3.82	48.00	46.00
Number of months post menopause	0-312	147.84	75.20	144.00	168.00

Frequencies and percentages were used to describe all other participant demographics (see Table 5). All the respondents were female and AA; none of the respondents had a history of osteoporosis in their family.

TABLE 5. Frequencies and Percentages for Participants' Characteristics (N=153)

Variable	<i>n</i>	%
Religious Affiliation		
Christian	143	93.5
Muslim	10	6.5
Marital Status		
Divorced	50	32.7
Married	26	17.0
Separated	27	17.6
Single	28	18.3
Widowed	22	14.4
Respondents' Housemates		
Alone	8	5.2
With a friend	11	7.2
With relative or family	134	87.6
Respondents' House Type		
Multifamily home	37	24.2
Single family home	57	37.3
Townhouse/Condo	59	38.6
Respondents' Home Ownership		
House that I own	45	29.4
Rental house	108	70.6

### **Aim 1**

Aim #1. This specific aim was to describe postmenopausal AA women's knowledge, beliefs, and attitudes about osteoporosis. This aim was answered by data collected using the Osteoporosis Knowledge Test (OKT), the Osteoporosis Attitude Knowledge Test (OAKT), and the Osteoporosis Health Belief Scale (OHBS).

The specific osteoporosis knowledge variables assessed were calculated and scored as follows: (a) Total Osteoporosis Knowledge (Total # of all osteoporosis knowledge items answered correctly), (b) Osteoporosis Exercise Knowledge (Total # of exercise knowledge items answered correctly), (c) Osteoporosis Calcium Knowledge (Total # of calcium knowledge items answered correctly), and (d) Score on the Osteoporosis Attitude Knowledge Test (OAKT; Total # of all osteoporosis items answered correctly). For data analysis, the range, mean and standard deviation were determined for each variable. See Table 6.

Total scores were created for the items on the Osteoporosis Knowledge Test (OKT) and the Osteoporosis Attitude Knowledge Test (OAKT) such that higher scores indicate greater knowledge about preventing osteoporosis. First, a score was calculated for the total number of items from the OKT answered correctly. A score was calculated for the total number of exercise items from the OKT answered correctly; higher scores reflect greater knowledge of how to prevent osteoporosis with exercise. A score was calculated for the total number of calcium items from the OKT that each participant answered correctly; higher scores reflect greater knowledge of how to prevent osteoporosis with calcium intake. Finally, a score was calculated for the total number of items from the OAKT answered correctly; higher scores reflect greater knowledge of how to prevent osteoporosis (see Table 6).

TABLE 6. Descriptive Statistics for The Osteoporosis Knowledge Test (OKT) and The Osteoporosis Attitude Knowledge Test (OAKT, N = 153)

Scale	Possible Range	Actual Range	Mean	<i>SD</i>
Osteoporosis Knowledge Test				
OKT Total # of Items Correct	0-16	2-6	4.00	1.24
OKT Total # of Exercise Items Correct	0-8	2-7	4.00	1.15
OKT Total # of Calcium Items Correct	0-8	0-6	3.00	2.26
Osteoporosis Attitude Knowledge Test (OAKT)	0-20	10-12	10.94	0.71

Five of the seven OHBS subscales were also used for this aim; the subscales include: (a) perceived susceptibility, (b) perceived seriousness, (c) perceived benefits for exercise, (d) perceived benefits for calcium intake, and (e) health motivation. The perceived susceptibility score was calculated by summing responses across six items, a higher score denoting greater perceived susceptibility to osteoporosis. The perceived seriousness score was calculated by summing responses across six items; higher scores indicated greater perception that osteoporosis is a serious disease. The perceived benefits for exercise score was calculated by summing responses across six items, higher scores indicate a more positive perception of the benefits of exercise. The perceived benefits for calcium intake was calculated by summing responses across six items, higher scores indicate a more positive perception of the benefits of calcium intake. The perceived barriers to exercise score was calculated by summing responses across six items, higher scores indicate more perceived barriers to exercise. The perceived barriers to calcium intake score was calculated by summing responses across five items, higher scores indicate more

perceived barriers to exercise calcium intake. The perceived health motivation score was calculated by summing across 5 items; higher scores indicated more motivation to engage in behaviors that enhance health. The range, mean, and standard deviation were determined for each subscale (see Table 7).

TABLE 7. Descriptive Statistics for the OHBS Subscales (N = 153)

OHBS Subscale	Possible Range	Actual Range	Mean	<i>SD</i>
Susceptibility	6-30	13-23	18.19	3.84
Seriousness	6-30	24-30	26.16	1.65
Exercise Benefits	6-30	29-30	29.46	.50
Calcium Benefits	6-30	30-30	30.00	.00
Health Motivation	6-30	17-23	20.00	1.79

## Aim 2

Aim #2 was to describe postmenopausal AA women's bone health promotion behaviors of calcium intake and bone health promoting physical activity. The OPBS subscales of dietary intake of calcium and engagement in physical activity/exercise were utilized to determine the bone health promotion variables. For diet, participants' responses were summed across four items to arrive at a total score such that higher scores indicated a greater consumption of calcium. For engagement in physical activity, participants' responses were summed across three items to arrive at a total score such that higher scores indicated more frequent physical activity. See details in Table 8.

TABLE 8. Descriptive Statistics for the Osteoporosis Preventing Behaviors Survey

(OPBS, N = 153)

Scale	Possible Range	Actual Range	Mean	<i>SD</i>
OPBS_Using Diet	4-24	5-15	9.85	1.50
OPBS_Using Exercise	3-19	3-18	8.76	5.21

### Aim 3

Aim #3 was to describe postmenopausal AA women's barriers to engaging in bone health promotion behaviors. The Osteoporosis Health Belief Scale (OHBS) and the Osteoporosis Self-Efficacy Scale (OSES) were used to measure the barriers to engaging in bone health promotion behaviors.

Two of the seven OHBS subscales were used for this aim; the subscales include: (a) perceived barriers to exercise and (b) perceived barriers to calcium intake. The perceived barriers to exercise score was calculated by summing responses across six items, higher scores indicating more perceived barriers to exercise. The perceived barriers to calcium intake score was calculated by summing responses across five items, higher scores indicating more perceived barriers to exercise calcium intake. The range, mean, and standard deviation were determined for each subscale. See details in Table 9.

TABLE 9. Descriptive Statistics for the OHBS Barriers Subscales (N = 153)

OHBS Barriers Subscale	Possible Range	Actual Range	Mean	<i>SD</i>
Exercise Barriers	6-30	14-22	17.62	2.09
Calcium Intake Barriers	6-30	13-15	13.62	.60

In addition, the Osteoporosis Self-Efficacy Scale (OSES), which is a 12-item instrument, was used to measure the barriers to engaging in bone health promotion behaviors. Lack of self-efficacy can be a barrier. The descriptive statistics for the OSES total score can be found in Table 10.

TABLE 10. Descriptive Statistics for the Osteoporosis Self-Efficacy Scale (OSES, N = 153)

Scale	Possible Range	Actual Range	Mean	<i>SD</i>
OSES Total Score	12-72	44-58	49.88	5.19

#### **Aim 4**

Aim #4: The purpose of this aim was to examine relationships between AA women's age, education, and number of months post menopause and osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities. The relationship between three demographic variables (age, number of months post-menopause, and education) and the dependent variables, which were osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities, were examined. The first set of dependent variables assessed were the OHBS subscales: (a) perceived susceptibility to osteoporosis, (b) perceived seriousness of osteoporosis, (c) perceived barriers to calcium intake, (d) perceived barriers to exercise, (e) perceived benefits of calcium intake, (f) perceived benefits of exercise, and (g) health motivation. The second set of dependent variables assessed was osteoporosis knowledge. The specific osteoporosis knowledge variables assessed included: (a) Total Osteoporosis Knowledge (Total # of knowledge Items answered correctly), (b) Osteoporosis Exercise Knowledge (Total # of exercise knowledge Items answered correctly), (c) Osteoporosis Calcium Knowledge (Total # of calcium knowledge items answered correctly), and (d) Score on



*Note.* <sup>a, b</sup> indicate the correlation cannot be computed because at least one of the variables is constant.

### Correlations between the OAKT, the OKT, and the Demographic Variables

Correlations between Table 12 presents the correlations between the OKT subscales and the OAKT total score with age, education, and number of months post menopause. No significant correlations were found.

TABLE 12. Correlations Between the OKT Subscales, the OAKT Total Score, and Age, Years of Education, and Number of Months Post Menopause (N =153)

		OKT Total # of Items Correct	OKT Total # of Exercise Items Correct	OKT Total # of Calcium Items Correct	OAKT Total # of items Correct
Age	<i>r</i>	.132	-.012	-.098	-.071
	<i>p</i>	.105	.878	.230	.386
	<i>N</i>	153	153	153	153
Education	<i>r</i>	-.018	-.103	-.061	.016
	<i>p</i>	.822	.205	.451	.841
	<i>N</i>	153	153	153	153
Number of months post menopause	<i>r</i>	.058	-.020	-.119	-.026
	<i>p</i>	.475	.810	.142	.753
	<i>N</i>	153	153	153	153

### Correlations between the OPBS and the Demographic Variables

The third set of dependent variables assessed was osteoporosis prevention behaviors. The specific osteoporosis prevention variables assessed included the following subscales from the

Osteoporosis Preventing Behaviors Survey (OPBS): (a) Osteoporosis Preventing Behaviors With Food, and (b) Osteoporosis Preventing Behaviors With Exercise.

Correlations between the OPBS subscales and age, years of education, and number of months post menopause. Correlations between the OPBS subscales and age, education, and number of months post menopause are detailed in Table 13. There was a statistically significant negative correlation between age and OPBS\_Using Exercise ( $r = -.205, p = .011$ ). An increase in age was associated with a decrease in osteoporosis prevention involving exercise and physical activity. Note that number of months post menopause was significantly negatively correlated with OPBS\_Using Exercise ( $r = -.170, p = .036$ ). As the number of months post menopause increased, the exercise behaviors associated with osteoporosis prevention decreased. See Table 13 for details.

TABLE 13. Correlations Between the OPBS Subscales and Age, Years of Education, and Number of Months Post Menopause (N=153)

		OPBS_Using Diet	OPBS_Using Exercise
Age (yrs)	<i>r</i>	-.020	-.205*
	<i>p</i>	.803	.011
	<i>N</i>	153	153
Education	<i>r</i>	.032	-.047
	<i>p</i>	.692	.564
	<i>N</i>	153	153
Number of months post menopause	<i>r</i>	.022	-.170*
	<i>p</i>	.784	.036
	<i>N</i>	153	153

*Note.* \* indicates the correlation is significant at the .05 level (2-tailed).

### **Correlation between the OSES and the Demographic Variables.**

Correlations between the OSES and age, education and number of years post menopause. See Table 14 for details. There were no statistically significant correlations found.

TABLE 14. Correlation Between the OSES and Age, Years of Education, and Number of Months Post Menopause (N=153)

		OSES Total Score
Age (yrs)	<i>r</i>	.009
	<i>p</i>	.910
	<i>N</i>	153
Education	<i>r</i>	-.100
	<i>p</i>	.219
	<i>N</i>	153
Number of months post menopause	<i>r</i>	.017
	<i>p</i>	.832
	<i>N</i>	153

### Summary

The analysis for Aim 4 revealed two statistically significant correlations. There was a statistically significant negative correlation between age and OPBS\_Using Exercise ( $r = -.205$ ,  $p = .011$ ). An increase age was associated with a decrease in Osteoporosis prevention involving exercise and physical activity. The correlation between number of months post menopause and OPBS\_Using Exercise was statistically significant. More specifically, number of months post menopause was negatively and significantly correlated with OPBS\_Using Exercise ( $r = -.170$ ,  $p = .036$ ); as the number of months post menopause increased, the exercise behaviors associated with osteoporosis prevention decreased.

## **CHAPTER V: DISCUSSION**

Discussion of the findings is presented in this chapter, starting with the sample and followed by specific aims. Study strengths and limitations are discussed, followed by the significance to nursing and other health care providers. Finally, conclusions are drawn and suggestions are made about needs for future research.

### **Discussion of the Sample**

The sample of 153 postmenopausal AA women who participated in this study were well-educated, with an average of 14.6 years of education. Other researchers indicated their participants were also well educated and had at least a high school education or more (Eslamian, Jamshidi, & Kanani, 2007).

The samples in previous studies of osteoporosis knowledge were often from ethnicities other than AA women. The research aim in previous studies on this topic, even in studies that included AA women, was to determine why this population was not being screened for osteoporosis, and osteoporosis knowledge was generally not measured in previous research studies. A study conducted by Ungan and Tumer (2008) among women in Turkey highlighted that education level can determine the extent to which a woman is aware of osteoporosis. This finding is also consistent with the work of Eslamian, et al. (2007). Eslamian et al. (2007) found that education significantly affected women's osteoporotic knowledge among Iranian women in Tehran. Because many studies report high education levels among participants, it is possible that women who have more years of education are more willing to participate. The use of well-educated women may somewhat skew the results and limit generalizability to less educated women.

The present study focused on postmenopausal AA women only and results indicate these women have some knowledge about osteoporosis as indicated by answering 4 out of 16 questions about osteoporosis correctly. Therefore, the knowledge they have may help them in engaging in behaviors that may help lower their risk of developing the disease. This contradicts the findings from a study of Hispanic women who had a higher risk of osteoporosis. In their study, Larkey, Day, Houtkooper, and Renger (2003) found that Hispanic postmenopausal women are at a higher risk for osteoporosis because of poor knowledge about how to prevent the condition. The differences in Hispanic and AA women's behaviors and osteoporosis knowledge can possibly be attributed to cultural beliefs.

In the present study, average age of menopause was age 48.67 years. This is earlier than the reported norm of 51.4 years for White women in the U.S. population (The North American Menopause Society, 2010). Because there is a rapid increase in bone loss as women negotiate the menopausal transition, postmenopausal women need to have knowledge of osteoporosis and its risk factors. Wahba and associates (2010) conducted a cross-sectional study assessing osteoporosis knowledge among 494 Egyptian young women aged 16 to 24 years. Results indicated that 88.1% of these girls had knowledge about osteoporosis. As many as 48% of these young women defined this condition accurately. In the present study, women answered more than half of the osteoporosis knowledge questions correctly, with a mean of 10.94. This suggests that the young Egyptian women aged 16 to 24 had greater knowledge than the postmenopausal women aged 60.4 years.

The majority of the women (93.5%) in the present study reported their religious affiliation to be Christian, and this was expected, as recruitment occurred at one large Christian

church in the Baltimore-Washington area. It is interesting to note that only 17% ( $n = 26$ ) were married, with the remainder of the sample reporting they were divorced, separated, single, or widowed. This is interesting, because only 5.2% ( $n = 8$ ) lived alone. The majority lived with a relative or family (87.6%;  $n = 134$ ). It is apparent that in this sample, marital status did not affect living with relatives or family. In research carried out by Geller and Derman (2001) to evaluate osteoporotic beliefs, attitudes, and knowledge of osteoporosis risk factors among AA and Hispanic women, it was reported that most AA women were unmarried or widowed, with the chances being six times greater than for the Hispanic women. The findings of the present study are consistent with Geller and Derman's findings with regard to the majority of AA women being unmarried. However, Geller and Derman did not report with whom the women lived, so that comparison cannot be made with participants in the present study.

Although participants in the present study were not asked about income, the fact that most were renters (70.6%;  $n = 108$ ) may suggest a lower socio-economic status; living with relatives or family might also suggest being from lower socio-economic strata. Alternatively, it may mean that in this particular population, older women are more comfortable living with family or friends, rather than living alone. In future studies, it would be prudent to seek information about economic status in order to know if that can affect engaging in health promotion behaviors.

### **Aim 1**

Aim #1: To describe postmenopausal AA women's knowledge, beliefs, and attitudes about osteoporosis.

Women in the present study had less osteoporosis knowledge compared to the women in a study by Gemalmaz and Oge. In the present study, the Osteoporosis Exercise Knowledge questions were administered and indicate that participants in the present study answered an average of 4 questions (50%) correctly. Participants appear to have less knowledge about calcium, as they only answered 37.5% of the Osteoporosis Calcium Knowledge questions correctly. Lastly, the score on the Osteoporosis Attitude Knowledge Test was tabulated and on average, participants answered 10.94 (55%) questions correctly in the questionnaire.

Gemalmaz and Oge (2008) assessed awareness, perception, information sources, and knowledge of osteoporosis among 768 rural Turkish women between the age of 40 and 70 years. The results indicated 60.8% of women knew about osteoporosis, while only 44.9% defined the condition accurately.

A similar study conducted by Ungan and Tumer (2008) found a high score of 90% for knowledge of osteoporosis among 270 women. However, Gemalmaz and his colleague (2008) believed the low scores in their sample were attributable to the study being conducted in a rural Turkish area where women are not highly educated. Ungan and Tumer (2008) conducted their study in Ankara, an urban setting, where most women were better educated. From the analysis in the present study, participants had greater knowledge about osteoporosis overall; they had less knowledge about preventing osteoporosis. Women answered over 50% of the items measuring general osteoporosis knowledge correctly in comparison to the items assessing knowledge of

how to prevent osteoporosis with diet and calcium intake. This is a somewhat paradoxical finding and needs further investigation.

Low calcium and lack of physical activity or exercise were second on the list of risk factors for osteoporosis according to the *International Osteoporosis Foundation, 2012* reports. The current study results indicate participants have a little knowledge about the role of exercise in osteoporosis prevention. Women in the present study had slight knowledge of exercise benefits and did not fully understand the benefits of exercise for preventing osteoporosis.

Higher calcium intake in postmenopausal women reduces risk of getting osteoporosis, because calcium intake is a health promotion behavior that helps strengthen the bones (American College of Sports Medicine, 2004). A study conducted among women between ages 16 to 24 years demonstrated that students had poor calcium and osteoporosis knowledge (Wahba, El-Shaheed, Tawheed, Mekkawy, & Arrafa, 2010). Although these individuals were considerably younger than women in the present study, the study demonstrated that the role of calcium in osteoporosis prevention is not widely known among teens and early adults. The women in the present study and Wahba et al's study had about the same level of knowledge regarding the role of calcium in osteoporosis prevention. This suggests that women do not necessarily acquire more knowledge as they age.

Women in the present study lacked knowledge of the benefits of calcium in preventing osteoporosis compared to the women in the study by Wahba et al. (2010). In fact, they knew less about the role of calcium intake in osteoporosis than the role of exercise in osteoporosis knowledge. The women in the current study only answered 3 or 37.5% of the calcium knowledge questions correctly. This contrasts with their knowledge of the role of exercise in osteoporosis

prevention (they answered 50% or 4 of these questions correctly). It would seem that education efforts need to concentrate on informing AA postmenopausal women that exercise not only benefits their overall health but can aid in osteoporosis prevention as well. The correct answer to several items on the measures of knowledge about foods high in calcium is a dairy food. This may not be relevant to AA women, since 75% are lactose intolerant and wouldn't eat those foods.

Approximately half of the AA women in the present study believe they are susceptible to osteoporosis. This may be related to their postmenopausal status, or it could be attributed to their education level. In another related study, Wahba and colleagues (2010) found that most females who believed they would develop osteoporosis in the future attributed it to the high intake of soft drinks rather than low calcium intake or exercise participation.

For the most part, women in the present study understood the seriousness of osteoporosis. This may indicate that educational programs that target postmenopausal women have achieved this educational goal; however, the next step would be to better educate AA women to understand their own susceptibility.

Women in the present study appear to be highly motivated about their health. It is evident they believe osteoporosis is a serious disease and have knowledge of exercise and calcium benefits to their overall health, but less knowledge about the role of these bone health promotion behaviors related to osteoporosis acquisition. Barriers to engaging in these bone health promoting activities may play a key role.

According to previous research, osteoporosis incidence is distributed differently among ethnic groups (Jackson & Savaiano, 2001; Kessenich, 2000). Jackson and Savaiano's (2001) study highlighted that AA women's incidence of osteoporotic fractures is half that of their

Caucasian counterparts. They further reported that AA women have a higher body mineral density as they enter their menopause transition. The belief that AA women are not at risk of developing bone fractures may have contributed to an increase in the number of osteoporotic cases in these women. According to similar research conducted by Wilkins and Goldfeder (2004), many AA women do not get screened for osteoporosis because both patient and provider believe they have low risk of developing osteoporosis. Other researchers found, however, that AA women were at risk for developing osteoporosis (Cauley et al., 2008; Miller et al., 2005).

### **Aim 2**

Aim #2: To describe postmenopausal AA women's bone health promotion behaviors of calcium intake and bone health promoting physical activity.

The score on the OPBS using diet subscale indicates women in the present study do not regularly use diet to prevent osteoporosis. This is a strong indication that participants in the present study were not regularly using a calcium rich diet and that there is need for improvement. This information concurs with data collected from a similar study that concluded a majority of AA women are lactose intolerant and cannot take dairy products including milk. This poses a risk to their intake of calcium. About 75% of AAs are intolerant to lactose; hence they consume an insufficient supply of calcium that is beneficial to bone health (National Institutes of Health, 2012). Similar research by Jackson and Savaiano (2001) indicated that in the United States, Asian-Americans have a lactose intolerance prevalence of 100%; AAs 75%, Native Americans 100%, Hispanics 53%, and Caucasians 6-22%, the lowest. It would seem important for AA women to be educated about alternate food sources of calcium in their diet, but also about the ready source of calcium supplements as a useful way to meet calcium needs.

Approximately half of the sample in the present study demonstrated recurrent physical activity. At least present study participants engaged more in exercise for osteoporosis prevention than in adhering to a calcium rich diet. Even though the participants identified barriers to physical activity engagement, it was their main approach to osteoporosis prevention. This may be because many AA women do not take dairy products, the primary source of calcium in the diet, possibly because of lactose intolerance. It may also be due to cultural norms that exclude dairy products from the diet.

### **Aim 3**

Aim #3: To describe postmenopausal AA women's barriers to engaging in bone health promotion activities.

The possible range of scores for barriers to exercise was 6 -30 and the actual range of scores was 14-22 in the present study. An average score of 25 - 30 would indicate high barriers to exercising. The average score for barriers to exercise in this study was 17.62, indicating that participants experience a moderate number of barriers in their life that limit exercise. A similar study identified barriers to physical activity, including fear for safety, multiplicity of roles that affords little time to exercise, threat of embarrassment related to agility, speed, strength, lack of competent instructors, time constraints, fear of pain, overweight status, lack of encouragement from family, poverty, older age, single parenthood, lack of access to facilities, and cost (Ransdell, Vener & Sell, 2004). Ransdell et al.'s study concurred with the data collected from the present study as it also highlighted barriers to exercising among postmenopausal women.

The calcium intake barriers score had a possible range of 6-30 and an actual range of 13-15; a mean score of six indicates low calcium intake barriers while 30 indicates numerous

calcium intake barriers. The average calcium intake barriers score for the sample in the present study was 13.62, which demonstrates AA women above the age 55 years have few barriers for calcium intake. Due to the lack of calcium intake barriers, the participants can likely access calcium without difficulty. Women experienced fewer barriers to calcium intake as compared to barriers to physical activity in the present study. This may be that it is easy to take a calcium tablet; it takes little effort or time; and calcium is readily available in tablets or in foods. Alternatively, financial resources could be a potential barrier to taking calcium supplements or even eating calcium rich foods.

Women in the present study had a general knowledge of osteoporosis since they scored 10.94 out of a possible 20, an indication they believe this disease exists and they know about the prevention measures. In relation to barriers, the women in this study revealed they had more barriers to exercising and fewer barriers to calcium intake. Women do not face numerous challenges to calcium intake. Physical activity may be difficult to attain since these women are postmenopausal and need to ensure the areas of exercise are secure and affordable. It is contradictory that the participants in the current study used exercise more than calcium for osteoporosis prevention but had more barriers to exercise than to calcium intake. This can be attributed to the possibility that some participants' regularly consumed calcium supplements rather than calcium rich foods due to lactose intolerance.

Women must also be sure that exercise advice they obtain is safe and indicated to prevent osteoporosis, meaning that it is weight bearing. In the present study, this had an effect on behavior and attitudes toward osteoporosis as women believed they are vulnerable to osteoporosis and had some knowledge of the benefit of both calcium and physical exercise in

bone health promotion. Prevention of osteoporosis begins early in the life of a woman. The key prevention measure is to have healthy bones through intake of calcium and exercising.

According to Borer, physical activity has a bearing on the maintenance of bones, stimulation of bone formation, accumulation of minerals, and strengthening of muscles (Borer, 2005).

#### **Aim 4**

Aim #4: To examine the relationships between postmenopausal AA women's age, education, number of month's post menopause and osteoporosis knowledge, beliefs, attitudes, and barriers to engaging in bone health promotion activities.

There were no statistically significant correlations between the main study variables and years of education. This may be as a result of not being enough variability in the level of education. This finding is inconsistent with that of previous research. A study of women who visited Shariati hospital clinics highlighted that education significantly correlated with higher osteoporotic knowledge, although educational level did not correlate with behavior and attitude toward this disease (Eslamian, Jamshidi, & Kanani, 2007). Participants in the present study had more than a high school education but they had less knowledge of osteoporosis. It might be that, in this population, the current belief that AA women have a lower incidence of osteoporosis serves as a mediator variable to them learning about it. This should be investigated in future studies, as it could influence educational approaches to this group.

Both age and number of years post menopause were significantly negatively correlated with use of physical activity to prevent osteoporosis. This was expected, as both variables consider time or aging and are not easily extricated from each other. Number of months post menopause can be considered equal to aging across time; to discriminate the variables, some

other measure might be important. At the present time, no such measure is available. The results in this present study indicated there was a statistically significant negative correlation between age and OPBS Using Exercise. This means that as women aged, they engaged in less osteoporosis prevention using exercise and physical activity. Also, number of months post menopause was negatively and significantly correlated with OPBS Using Exercise. As the number of months women in the present study were post menopause, they engaged in less osteoporosis prevention involving exercise and physical activity.

### **Strengths of the Study**

The present study has a number of strengths. The foremost strength is that it is the first study of AA postmenopausal women and their knowledge, beliefs and attitudes toward osteoporosis. Further, the study elucidated AA women's bone health promotion behaviors as well as their barriers to these behaviors. Heretofore, AA women have rarely been described, possibly due to the perception that they are less vulnerable to the disease. Another strength of the study was to describe the relationship of age, education and number of months postmenopause to women's knowledge, beliefs, and attitudes. It is important to note the value of describing a sample of postmenopausal AA women recruited from churches in an urban setting. Future studies can contrast findings of postmenopausal AA women in rural settings to determine if place is a factor in the dependent variables of interest.

### **Limitations of the Study**

The correct answer to several items on the measures of knowledge about foods high in calcium is a dairy food. This may not be relevant to AA women, since 75% are lactose intolerant

and wouldn't eat those foods (National Institutes of Health, 2012).

This study was limited by the use of only one large church where most congregants were mostly AA. Results would have been more generalizable had a random sampling technique been employed. However, such an approach was less feasible given the researcher's limited resources, time, and energy. Future study of this population could include sampling strategies that employ random selection techniques. In addition, future studies could include all churchgoers versus women who do not attend church as a way to better describe the knowledge, beliefs and attitudes of postmenopausal AA women in the United States.

According to data released by the USDHHS (2000), osteoporosis affects AA women from all the states in the US. However, this survey was only limited to a church in the Baltimore-Washington area, which demonstrates the results may not generalize to all AA women in the United States. Certainly, results are unlikely to represent rural women's experiences, but they also may not represent women from other geographic regions. Future studies would be more comprehensive should they include women from several other ethnic groups. However, it is notable that the study of AA postmenopausal women and their osteoporosis knowledge, beliefs and attitudes is rare. This study contributes important knowledge to the science of osteoporosis knowledge, beliefs and attitudes.

Socioeconomic status, such as income levels or income sufficient to meet health care needs, was not assessed in the present study. With whom the participants lived and that they rent rather than own their homes could be considered proxies for income. However, this may assume information not intended by the participants. Therefore, future studies of this population should

include an assessment of socioeconomic status to better understand and or describe if it affects women's knowledge and attitudes in engaging in bone health promotion activities.

### **Conclusion**

This aim of this study was to describe the knowledge, beliefs, attitudes and bone health promotion behaviors in postmenopausal AA women from the Baltimore-Washington area.

Women in the present study identified some susceptibility to osteoporosis but were less knowledgeable about the use of calcium intake and exercise to prevent the disease. Further, as women aged, they were less likely to engage in physical activity for osteoporosis prevention; similarly, a greater number of months post menopause was correlated with less use of physical activity for osteoporosis prevention.

### **Significance of the Study to Nursing**

Nurses have a significant role in educating postmenopausal women about osteoporosis in ways that bolster their knowledge and provide important information about the role of calcium intake and physical activity in osteoporosis prevention. This study identified that postmenopausal AA women have knowledge about the role of physical activity in improving health but less knowledge about its role in osteoporosis prevention. This knowledge deficit must be addressed, and nurses and other health care providers are in a perfect position to do that. This study is essential to nursing because it educates the nurses on vital aspects and essential data on osteoporosis.

The current study can be utilized by nurses and all care providers to provide a description of AA women's knowledge, beliefs, and attitudes and to point out that aging women are less likely to engage in physical activity for osteoporosis prevention. By elucidating the

important role that physical activity plays in osteoporosis prevention, these providers can encourage AA women to continue including physical activity in their lives as gaining knowledge is a first step toward behavior change.

The study will be of help to health care providers who will need to develop osteoporosis intervention programs targeting postmenopausal AA women in the future. In addition, this study also indicates that as the number of months post menopause increased, the exercise behaviors associated with osteoporosis prevention decreased. This is an indication that women at this age have to be educated on the importance of exercising at this stage in their life.

### **Suggestions for Future Research**

This study was focused in the Baltimore-Washington area only but should be expanded to rural areas and other geographic regions to better describe the population of postmenopausal AA women. This study highlighted barriers to exercise and calcium among AA women aged 55 and older. It would be important in future research to include younger AA women to see if knowledge, beliefs, and attitudes change across the age spectrum in AA women.

APPENDIX A  
SURVEY SCRIPT

## SURVEY SCRIPT

I am a graduate student in the College of Nursing at The University of Arizona. I am here to conduct a research study that will assess your knowledge, attitudes, and beliefs of osteoporosis. I am looking for postmenopausal African American women aged 55+ years to complete a onetime set of surveys that will be presented during one of your church meetings.

The process will last approximately 45 minutes. Compensation will be offered to participants to show appreciation. In addition, the information provided will be used in articles that might be published.

I will be seated at the back of the church after the service. Please come over and speak to me on your way out for further clarification. I will also be taking and giving out my contact information for future communication.

Your participation will be warmly appreciated.

Thank you.

APPENDIX B

CONSENT

T502a – Consent Form

APPROVED BY UNIVERSITY OF AZ IRB.  
 THIS STAMP MUST APPEAR ON ALL  
 DOCUMENTS USED TO CONSENT SUBJECTS.  
 DATE: 10/28/13

1  
2  
3  
4

## The University of Arizona Consent to Participate in Research

**Study Title:** Osteoporosis Knowledge, Beliefs, And Bone Promotion Behaviors Of Postmenopausal African American Women.

**Principal Investigator:** Grace Akinpetide, MBA, APRN, MSN, FNP-BC, PhDc, RN

5

6 **This is a consent form for research participation.** It contains important information about  
7 this study and what to expect if you decide to participate. Please consider the information  
8 carefully. Feel free to discuss the study with your friends and family and to ask questions  
9 before making your decision whether or not to participate.

10 **1. Why is this study being done?**

11

12 To describe postmenopausal African American women's attitudes, knowledge, and beliefs  
13 about osteoporosis.

14

15 **2. How many people will take part in this study?**

16

17 An estimated 153 postmenopausal African American women.

18

19 **3. How long will I be in the study?**

20

21 35-45 minutes to fill the questionnaires.

22

23 **4. What risks, side effects or discomforts can I expect from being in the study?**

24

25 There are no risks associated with the study.

26

27 **5. What benefits can I expect from being in the study?**

28

29 The main benefit of this study is that the participants will learn about osteoporosis, the risk  
30 factors, and preventive measures from the study. This may improve their quality of life.

31

32 Furthermore, the results of the planned study may help health care providers who wish to  
33 develop osteoporosis intervention programs targeting postmenopausal African American  
34 women.

35 **6. Will my study-related information be kept confidential?**

36  
37 The information provided in this study will be confidential and treated as such. The following  
38 groups may review your records, but that does not mean that your information will be  
39 released publicly (as applicable to the research):

- 40 • Office for Human Research Protections or other federal, state, or international  
41 regulatory agencies
- 42 • The University of Arizona Institutional Review Board or Office of Responsible  
43 Research Practices

44  
45 **7. What are my rights if I take part in this study?**

46  
47 If you choose to participate in the study, you may discontinue participation at any time  
48 without penalty or loss of benefits. By signing this form, you do not give up any personal  
49 legal rights you may have as a participant in this study.

50  
51  
52 **8. Who can answer my questions about the study?**

53  
54 For questions, concerns, or complaints about the study you may contact:  
55 The principal investigator; Grace Akinpetide MBA, APRN, MSN, FNP-BC, PhDc, RN.  
56 Contact; (301) 367 0564 or email her at [gracea@email.arizona.edu](mailto:gracea@email.arizona.edu).

57  
58 For questions about your rights as a participant in this study or to discuss other concerns or  
59 complaints with someone who is not part of the research team, you may contact the Human  
60 Subjects Protection Program at 520-626-6721 or online at <http://orcr.arizona.edu/hspp>.

61  
62  
63 **Signing the consent form**

64  
65 I have read (or someone has read to me) this form, and I am aware that I am being asked to  
66 participate in a research study. I have had the opportunity to ask questions and have had them  
67 answered to my satisfaction. I voluntarily agree to participate in this study.

68  
69 I am not giving up any legal rights by signing this form. I will be given a copy of this form.

70

\_\_\_\_\_  
Printed name of subject

\_\_\_\_\_  
Signature of subject

\_\_\_\_\_  
Date and time AM/PM

\_\_\_\_\_  
Printed name of person authorized to consent for subject

\_\_\_\_\_  
Signature of person authorized to consent for subject

(when applicable)	(when applicable)
Relationship to the subject	Date and time <span style="float: right;">AM/PM</span>

71  
72  
73  
74  
75  
76  
77  
78  
79

**Investigator/Research Staff**

I have explained the research to the participant or the participant's representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or to the participant's representative.

Printed name of person obtaining consent	Signature of person obtaining consent
	Date and time <span style="float: right;">AM/PM</span>

80  
81

APPENDIX C

DEMOGRAPHIC SURVEY SAMPLE

## DEMOGRAPHIC SURVEY SAMPLE

Please answer all the questions.

1. Name:
2. Address:
3. Email:
4. Phone:
5. Date of Birth -----(month)/-----(day)/-----(year)
6. Circle your gender Female/Male
7. Your Race/Ethnic Group (please check one)
  - ----- African American
  - -----Other
8. Years of Education
  - ----- High school graduate
  - -----1-2 years of college
  - ----- 3 or more years of college
9. Age of menarche (menses) ----- years old
10. Age at menopause (12 months post menstrual period) ----- years old
11. Your Religion
  - -----Christian
  - -----Muslim
  - ----- Other
12. Your Marital Status
  - ----- Single
  - ----- Married
  - ----- Separated
  - ----- Divorced
  - -----Widowed
13. Who do you stay with
  - -----Alone
  - -----With relative or family
  - -----With a friend
  - -----In a home for the elderly
14. I stay in a
  - -----Townhouse/Condo
  - ----- Single family home
  - -----Multifamily home
  - -----Other
15. I stay in
  - ----- a rental house
  - ----- a house that I own
  - ----- a house my family owns

APPENDIX D

OSTEOPOROSIS HEALTH BELIEF SCALE (OHBS) SAMPLE



9. My feelings about myself would change if I got osteoporosis **SD D N A SA**
10. It would be very costly if I got osteoporosis **SD D N A SA**
11. When I think about osteoporosis I get depressed **SD D N A SA**
12. It would be very serious if I got osteoporosis **SD D N A SA**
13. Regular exercise prevents problems that would happen from osteoporosis  
**SD D N A SA**
14. I feel better when I exercise to prevent osteoporosis **SD D N A SA**
15. Regular exercise helps build strong bones **SD D N A SA**
16. Exercising to prevent osteoporosis improves the way my body looks  
**SD D N A SA**
17. Regular exercise cuts down on chances of broken bones **SD D N A SA**
18. I feel good about myself when I exercise to prevent osteoporosis **SD D N A SA**

For the following 6 questions, "taking in enough calcium" means taking enough calcium by eating calcium rich foods and/or taking calcium supplements.

19. Taking in enough calcium prevents problems from osteoporosis **SD D N A SA**
20. I have lots to gain from taking calcium to prevent osteoporosis **SD D N A SA**
21. Taking in enough calcium prevents painful osteoporosis **SD D N A SA**
22. I would not worry as much about osteoporosis if I took in calcium **SD D N A SA**
23. Taking in enough calcium reduces your chance of broken bones **SD D N A SA**
24. I feel good about myself when I take in enough calcium to prevent osteoporosis.  
**SD D N A SA**

- |   |                    |
|---|--------------------|
| 25. I feel like I am not strong enough to exercise regularly                            | <b>SD D N A SA</b> |
| 26. I have no place where I can exercise  | <b>SD D N A SA</b> |
| 27. My spouse or family discourages me from exercising                                  | <b>SD D N A SA</b> |
| 28. Exercising regularly would mean starting new habit hard which is hard for you to do | <b>SD D N A SA</b> |
| 29. Exercising regularly makes me uncomfortable   | <b>SD D N A SA</b> |
| 30. Exercising regularly upsets my every day routine                                    | <b>SD D N A SA</b> |
| 31. Calcium rich foods cost too much  | <b>SD D N A SA</b> |
| 32. Calcium rich foods do not agree with you  | <b>SD D N A SA</b> |
| 33. I do not like calcium rich foods  | <b>SD D N A SA</b> |
| 34. Eating calcium rich foods means changing your diet which is hard for me to do       | <b>SD D N A SA</b> |
| 35. In order to eat more calcium rich foods I have to give up other foods that I like   | <b>SD D N A SA</b> |
| 36. Calcium rich foods have too much cholesterol  | <b>SD D N A SA</b> |
| 37. I eat a well-balance diet   | <b>SD D N A SA</b> |
| 38. I look for new health information   | <b>SD D N A SA</b> |
| 39. Keeping healthy is very important to me   | <b>SD D N A SA</b> |
| 40. I try to discover health problems early   | <b>SD D N A SA</b> |
| 41. I have a regular check-up even when I am not sick                                   | <b>SD D N A SA</b> |
| 42. I follow recommendations to keep healthy  | <b>SD D N A SA</b> |

APPENDIX E

OSTEOPOROSIS KNOWLEDGE TEST (OKT) SAMPLE

### OSTEOPOROSIS KNOWLEDGE TEST (OKT) SAMPLE

Below is a list of things which may or may not affect a person's chance of getting osteoporosis.

After you read each statement, think about if the person is:

MORE LIKELY TO GET OSTEOPOROSIS, or

LESS LIKELY TO GET OSTEOPOROSIS, or

IT HAS NOTHING TO DO WITH (NEUTRAL) GETTING OSTEOPOROSIS, or

YOU DON'T KNOW.

When you read each statement, circle one of the 4 choices for your answer.

**ML**= MORE LIKELY

**LL**= LESS LIKELY

**NT**= NEUTRAL

**DK**=DON'T KNOW

- |  |    |    |    |    |
|--|----|----|----|----|
| 1. Eating a diet <u>LOW</u> in milk products                 | ML | LL | NT | DK |
| 2. Being menopausal; "change of life"                        | ML | LL | NT | DK |
| 3. Having big bones  | ML | LL | NT | DK |
| 4. Eating a diet high in dark green leafy vegetables         | ML | LL | NT | DK |
| 5. Having a grandmother or mother who has osteoporosis       | ML | LL | NT | DK |
| 6. Being a white woman with fair skin                        | ML | LL | NT | DK |
| 7. Having ovaries surgically removed                         | ML | LL | NT | DK |
| 8. Taking cortisone (steroids e.g. prednisone) for long time | ML | LL | NT | DK |
| 9. Exercising on a regular basis                             | ML | LL | NT | DK |

For the next group of questions, choose one answer from the 4 choices. Be sure to choose only one answer. If you think there are more than one answer, choose the best answer. If you are not sure, circle D.

10. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?
- A. Swimming
  - B. Walking briskly
  - C. Doing kitchen chores, such as washing dishes or cooking
  - D. Don't know
11. Which of the following exercises is the best way to reduce a person's chances of getting osteoporosis?
- A. Bicycling
  - B. Yoga
  - C. Housecleaning
  - D. Don't know
12. How many times a week do you think a person should exercise to strengthen the bones?
- A. 1 day a week
  - B. 2 days a week
  - C. 3 or more days a week
  - D. Don't know
13. What is the LEAST AMOUNT OF TIME a person should exercise on each occasion to strengthen the bones?
- A. Less than 15 minutes
  - B. 20 to 30 minutes
  - C. More than 45 minutes
  - D. Don't know

14. Exercise makes bones strong, but it must be hard enough to make breathing:

- A. Just a little faster
- B. So fast that talking is not possible
- C. Much faster, but talking is possible
- D. Don't know

15. Which of the following exercises is the best way to reduce a person's chances of getting osteoporosis?

- A. Jogging or running for exercise
- B. Golfing using golf cart
- C. Gardening
- D. Don't know

16. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?

- A. Bowling
- B. Doing laundry
- C. Aerobic dancing
- D. Don't know

Calcium is one of the nutrients our body needs to keep bones strong

17. Which of these is a good source of calcium?

- A. Apple
- B. Cheese
- C. Cucumber
- D. Don't know

18. Which of these is a good source of calcium?

- A. Watermelon
- B. Corn
- C. Canned Sardines
- D. Don't know

19. Which of these is a good source of calcium?

- A. Chicken
- B. Broccoli
- C. Grapes
- D. Don't know

20. Which of these is a good source of calcium?

- A. Yogurt
- B. Strawberries
- C. Cabbage
- D. Don't know

21. Which of these is a good source of calcium?

- A. Ice cream
- B. Grape fruit
- C. Radishes
- D. Don't Know

22. Which of the following is the recommended amount of calcium intake for an adult?

- A. 100mg-300mg daily
- B. 400mg-600mg daily
- C. 800mg or more
- D. Don't Know

23. How much milk must an adult drink to meet the recommended amount of calcium?

- A. ½ glass daily
- B. 1 glass daily
- C. 2 or more glasses daily
- D. Don't Know

24. Which of the following is the best reason for taking a calcium supplement?

- A. If a person skips breakfast
- B. If a person does not get enough calcium from diet
- C. If a person is over 45 years old
- D. Don't know

APPENDIX F

OSTEOPOROSIS SELF-EFFICACY SCALE (OSES) SAMPLE

### SELF-EFFICACY SCALE (OSES) SAMPLE

We are interested in learning how confident you feel about doing the following activities.

Everyone has different experiences which will make each person more or less confident in doing the following things. Thus, there is no right or wrong answers. In this questionnaire, EXERCISE means activities such as walking, golfing, biking, aerobic dancing.

After reading each statement, circle if you **STRONGLY DISAGREE (SD)**, **DISAGREE (D)**, **NEUTRAL (N)**, **AGREE (A)**, or **STRONGLY AGREE (SA)** with the statement.

It is important that you answer according to your actual confidence and not according to how confident you think you should be. We need the answers that best explain your confidence.

**If it were recommended that I do any of the following THIS WEEK, I am confident or certain that**

**I could:**

- |   |           |          |          |          |           |
|---|-----------|----------|----------|----------|-----------|
| 1. Begin a new or different exercise program        | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 2. Change exercise habits                           | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 3. Put forth the effort required to exercise        | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 4. Do exercises even if they are difficult          | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 5. Exercise for appropriate length of time          | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 6. Do the type of exercise that I am supposed to do | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |

**If it were recommended that I do any of the following THIS WEEK, I am confident or certain that**

**I could:**

- |   |           |          |          |          |           |
|---|-----------|----------|----------|----------|-----------|
| 7. Increase calcium intake                                  | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 8. Change my diet to include more calcium foods             | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 9. Eat calcium rich foods as often as I am supposed to do   |           |          |          |          |           |
|   | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 10. Select appropriate foods to increase my calcium intake  |           |          |          |          |           |
|   | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 11. Stick to diet which gives an adequate amount of calcium |           |          |          |          |           |
|   | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |
| 12. Obtain foods that give an adequate amount of calcium    |           |          |          |          |           |
|   | <b>SD</b> | <b>D</b> | <b>N</b> | <b>A</b> | <b>SA</b> |

APPENDIX G

OSTEOPOROSIS ATTITUDE KNOWLEDGE TEST (OAKT) SAMPLE

## OSTEOPOROSIS ATTITUDE KNOWLEDGE TEST (OAKT) SAMPLE

Please answer each of the following questions with True, False or Don't Know.

1. Osteoporosis leads to an increased risk of bone fractures.  
Don't know  True  False
2. Osteoporosis usually causes symptoms (e.g. pain) before fractures  
occur. Don't know  True  False
3. Having a higher peak bone mass at the end of childhood gives **no**  
Don't know  True  False   
protection against the development of osteoporosis in later life.
4. Osteoporosis is more common in men.  True  False   
Don't know
5. Cigarette smoking can contribute to osteoporosis.  True  False   
Don't know
6. White women are at highest risk of fracture as compared to other races.  True  False   
Don't know
7. A fall is just as important as low bone strength in causing fractures.  True  False   
Don't know
8. By age 80, the majority of women have osteoporosis.  True  False   
Don't know
9. From age 50, most women can expect at least one fracture before they  True  False   
Don't know   
die.
10. Any type of physical activity is beneficial for osteoporosis.  True  False   
Don't know
11. It is easy to tell whether I am at risk of osteoporosis by my clinical risk  True  False   
Don't know   
factors.

12. Family history of osteoporosis strongly predisposes a person to  
Don't know  
osteoporosis.  True  False

Attitude towards disease

13. An adequate calcium intake can be achieved from two glasses of  
Don't know  
milk a day.  True  False

14. Sardines and broccoli are good sources of calcium for people who  
Don't know  
cannot take dairy products.  True  False

15. Calcium supplements alone can prevent bone loss.  
Don't know  True  False

16. Alcohol in moderation has little effect on osteoporosis.  
Don't know  True  False

Perception towards disease

17. A high salt intake is a risk factor for osteoporosis.  
Don't know  True  False

18. There is a small amount of bone loss in the ten years following  
Don't know  
the onset of menopause.  True  False

19. Hormone therapy prevents further bone loss at any age after menopause.  
Don't know  True  False

20. There are no effective treatments for osteoporosis available in America.  
Don't know  True  False

APPENDIX H

OSTEOPOROSIS PREVENTING BEHAVIORS SURVEY (OPBS) SAMPLE

## OSTEOPOROSIS PREVENTING BEHAVIORS SURVEY (OPBS) SAMPLE

1. How many glasses (8 ounces) of milk do you drink during an average week?
  - a. NONE PER WEEK
  - b. ONE PER WEEK
  - c. TWO PER WEEK
  - d. THREE PER WEEK
  - e. FOUR PER WEEK
  - f. FIVE PER WEEK
  - g. SIX PER WEEK
  - h. ONE PER DAY
  - i. TWO PER DAY
  - j. THREE PER DAY
  - k. OTHER, PLEASE SPECIFY  
\_\_\_\_\_
  
2. How many eight-ounce servings of yogurt do you eat during an average week?
  - a. NONE PER WEEK
  - b. ONE PER WEEK
  - c. TWO PER WEEK
  - d. THREE PER WEEK
  - e. FOUR PER WEEK
  - f. FIVE PER WEEK
  - g. SIX PER WEEK
  - h. ONE PER DAY
  - i. TWO PER DAY
  - j. THREE PER DAY
  - k. OTHER, PLEASE SPECIFY  
\_\_\_\_\_
  
3. How many (1) ounce servings of cheese do you eat during an average week?
  - a. NONE PER WEEK
  - b. ONE PER WEEK
  - c. TWO PER WEEK
  - d. THREE PER WEEK
  - e. FOUR PER WEEK
  - f. FIVE PER WEEK
  - g. SIX PER WEEK
  - h. ONE PER DAY
  - i. TWO PER DAY
  - j. THREE PER DAY
  - k. OTHER, PLEASE SPECIFY  
\_\_\_\_\_

4. Do you take a calcium supplement?
  - a. NO
  - b. YES  
If yes, name of product\_\_\_\_\_ Amount taken each day\_\_\_\_\_
  
5. How many times a week do you participate in weight bearing exercise such as a walking program, jogging and/or aerobic dancing?
  - a. LESS THAN 10 MINUTES PER WEEK
  - b. 10 TO 15 MINUTES, 1 TO 2 TIMES PER WEEK
  - c. 10 TO 15 MINUTES, 3 TO 4 TIMES PER WEEK
  - d. 10 TO 15 MINUTES, 5 TO 7 TIMES PER WEEK
  - e. 20 TO 30 MINUTES, 1 TO 2 TIMES PER WEEK
  - f. 20 TO 30 MINUTES, 3 TO 4 TIMES PER WEEK
  - g. 20 TO 30 MINUTES, 5 TO 7 TIMES PER WEEK
  - h. MORE THAN 30 MINUTES PER DAY
  
6. How many times a week do you participate in non-weight bearing exercises such as swimming or biking?
  - a. LESS THAN 10 MINUTES PER WEEK
  - b. 10 TO 15 MINUTES, 1 TO 2 TIMES PER WEEK
  - c. 10 TO 15 MINUTES, 3 TO 4 TIMES PER WEEK
  - d. 10 TO 15 MINUTES, 5 TO 7 TIMES PER WEEK
  - e. 20 TO 30 MINUTES, 1 TO 2 TIMES PER WEEK
  - f. 20 TO 30 MINUTES, 3 TO 4 TIMES PER WEEK
  - g. 20 TO 30 MINUTES, 5 TO 7 TIMES PER WEEK
  - h. MORE THAN 30 MINUTES PER DAY

Please record how much physical activity you did in the last **SEVEN** DAYS. Please place your physical activity into one of the two categories: Moderate Physical Activity or Vigorous Physical Activity.

- Record only the time you were active. Do not count breaks or rest periods.
- You can record more than one activity. If you do, please write down the number of minutes you were active for each activity separately.
- List the activity that you did when you were active.
- Please mark the box if you were not physically active in the past seven (7) days.
  - I was not physically active in the past seven (7) days.

### **Moderate Activity**

Types of moderate activities include walking briskly, mowing the lawn with a non-motorized push mower, dancing, swimming at a leisurely pace, partaking in water aerobics, or bicycling on level terrain for at least 30 minutes.

### **Vigorous Activity**

Types of vigorous activities include jogging, high-impact aerobic dancing, swimming continuous laps at a moderate pace, bicycling uphill, high energy sports (e.g., basketball, soccer, running, singles tennis, fast dancing, or similar activities) for 20 or more minutes per occasion.

	<b>Moderate Activity Type</b>	<b>Minutes of moderate activity</b>	<b>Vigorous Activity Type</b>	<b>Minutes of Vigorous Activity</b>
<b>Sunday</b>				
<b>Monday</b>				
<b>Tuesday</b>				
<b>Wednesday</b>				
<b>Thursday</b>				
<b>Friday</b>				
<b>Saturday</b>				

Compared to your physical activity over the past 3 months, was last week's physical activity more, less, or about the same?

- More
- Less
- About the Same

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