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Effect of Knowledge of Bone Mineral Density on Osteoporosis Prevention Behaviors Among Older Minority Women

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**Effect of Knowledge of Bone Mineral Density on Osteoporosis Prevention
Behaviors among Older Minority Women**

Lisa Kenyon Pesce

B.A., Central Connecticut State University, 1997

A Thesis

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Masters of Public Health Thesis

Effect of Knowledge of Bone Mineral Density on Osteoporosis Prevention Behaviors
among Older Minority Women

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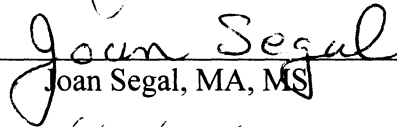
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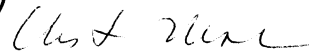
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ABSTRACT

Objective: To investigate the role of knowledge of bone mineral density (BMD) in determining osteoporosis prevention/treatment behavior. **Methods:** 120 Black and Hispanic women over 60 had a hip BMD. A physician or nurse explained DXA results and asked women to take report to a primary care provider. Seven months later 66 completed a follow-up telephone questionnaire. **Results:** 37% had BMD scores that met criteria for osteopenia and 7.7% for osteoporosis (41% Black, 64% Hispanic). More women at risk for osteoporotic fractures (72%) compared to those with normal BMD (50%) took results to physicians. 10% reported receiving treatment from physician; all reported taking recommended treatment at follow-up. None of the osteoporotic participants and 15.4% osteopenic participants received a prescription. Individual logistic regression models found older women (OR, 1.076; $p=.06$) and those with more severe diagnosis (OR, 2.224; $p=.07$) were marginally associated with taking results to physicians. Women who rated screening information (OR 5.4, $p=.02$) better and with a better diagnosis (OR 1.88, $p=.05$) were more likely to receive treatment from physician. Black women (OR, .219, $p=.04$) and those previously taking preventative treatments (OR 6.380, $p=.01$) were more likely to adopt prevention behaviors. **Conclusion:** Most complied with consulting physician about results, and with physician's recommendations when given. However, findings suggest a missed opportunity to treat minority women, even with BMD report showing low bone mass. Women with osteopenia or osteoporosis were no more likely to be treated, than women with normal BMD ($p=.837$). These data suggest a need for education about osteoporosis treatments for older minority women and physicians who treat them.

INTRODUCTION

An estimated 44 million Americans, 68% of whom are women, are at risk of developing osteoporosis (NOF 2000). In the United States about 1.5 million fractures occur each year as a result of osteoporosis, costing the economy approximately \$14 billion dollars (Riggs and Melton 1995; Freedman, Kaplan et al. 2000; NIH 2000). On average, 24% of hip fracture patients over age 50 will die in the year following their fracture and one-fourth of fracture patients who were ambulatory prior to hip fracture will require some type of long-term care (2000; NIH 2000).

Osteoporosis is often referred to as the silent disease because bone loss occurs without symptoms and may not be detected until a fracture occurs. Osteoporosis can result in height loss, severe back pain, deformity, or impairment of a person's ability to walk, disability, and even death (NOF 2000). Caucasian and Asian women are at the highest risk of developing osteoporosis. However, Black and Hispanic women are also at significant risk (Aloia, Vaswani et al. 1996; Luckey, Wallenstein et al. 1996; 2000; NIH 2000; NIH 2003). Currently, dual energy X-ray absorptiometry (DXA) is the best single predictor of hip fractures(1994). The Medicare Bone Mass Measurement Coverage Standardization Act became effective July 1, 1998 and covers 80% of BMD testing for Medicare patients with physician referral.

Osteoporosis Among Minority Women

The population of older minority women continues to grow rapidly (Aloia, Vaswani et al. 1996; Sedlak, Doheny et al. 2000). As the number of older Black and Hispanic women in the United States increases, so will the prevalence of osteoporosis among these women. Studies have shown that Black women have similar patterns of

bone loss as white women in the femur and spine before menopause. However, after menopause there is an accelerated loss of bone in the total skeleton. Black women have a higher bone mass to begin with but have slower rates of trabecular bone loss. Therefore, osteoporosis occurs later in life in Black women (Aloia, Vaswani et al. 1996).

Approximately 300,000 Black women have been diagnosed with osteoporosis and 80 to 95% of fractures among Black women over 64 years are due to osteoporosis (NIH 2000). Furthermore, several studies have shown that Black women are more likely to die following a hip fracture than Caucasian women (Aloia, Vaswani et al. 1996; NIH 2000).

Studies have shown that Latino women are at a significant risk for osteoporosis. One important risk factor is that they consume less calcium than the recommended amount (NIH 2003). The NHANES data show that among the Mexican American women over 50 years of age, 36-49% have lost significant amounts of bone and that about 13-16% have been diagnosed with osteoporosis. Currently, there are not enough data to determine fracture incidence among other Latino populations, such as Puerto Rican women. However, as this population continues to age, we can assume that diseases like osteoporosis will become more prevalent (NIH 2003). Thus prevention of fracture is important in these populations.

Osteoporosis Prevention

Prevention is the best defense against osteoporosis (Riggs and Melton 1992; NOF 2000). Prevention behaviors have been identified by the World Health Organization, National Institutes of Health, National Osteoporosis Foundation, and are well documented in the literature. The modifiable risk factors for osteoporosis included

inadequate calcium and vitamin D, lack of exercise, smoking, and excessive alcohol intake.

Osteoporosis Medications. Several anti-resorptive agents/medications such as Alendronate (Fosomax), Calcitonin (Miacalcin), Didronel and Raloxifene, a selective estrogen receptor modulator, are prescribed for the prevention or treatment of osteoporosis. At the time the screening program was conducted, Estrogen Replacement Therapy (ERT) was also prescribed as a preventive medication.

Estrogen deficiency plays a major role in bone loss that occurs after menopause. Case control and cohort studies have demonstrated that women who take long-term ERT have less than half the number of hip fractures and fewer spine and wrist fractures than those women never on hormones (NOF 2000). However, recent findings of the Women's Health Initiative (WHI), a large prospective clinical trial, showed that women on hormone replacement therapy (HRT) had increased risk for cardiovascular disease, pulmonary embolism and stroke (Writing Group for the Women's Health Initiative Investigators 2002). Women on ERT, that is estrogen replacement without progestin, had increased risk for stroke. Both HRT and ERT reduced risk of hip fracture (Writing Group for the Women's Health Initiative Investigators 2002).

Lifestyle Changes. Dietary changes include incorporating foods high in calcium as a preventive measure. The recommended amount of calcium intake for women 65 and older is 1500 mg of calcium with a vitamin D supplement (1994). They also need to know which types of calcium are beneficial in preventing bone loss in older women (NOF 2000). Weight bearing and resistance exercise has also shown to be beneficial on bone health (Grisso, Kelsey et al. 1994; O'Connell 1999; Vincent and Braith 2002).

Healthy lifestyle choices also include moderation in alcohol use and not smoking. Both of these, especially smoking, have been shown to increase bone loss.

Early Detection – Bone Mineral Density Testing (BMD). There are three diagnostic categories of a BMD test: normal, osteopenia (beginning stages of bone loss), or osteoporosis. More recently there has been some controversy around the diagnosing/labeling of osteoporosis and osteopenia and the clinical use of bone densitometry measurements (Bates, Black et al. 2002; Cummings, Bates et al. 2002). Standards of which to diagnosis someone with osteoporosis have become more complex then simply relying on WHO t-score standards (Bates, Black et al. 2002). S. Cummings, et al. suggests that it is more sensible to focus on risk of fracture based on a combination factors that may put women at a high risk versus solely relying on these diagnostic labels attained by a t-score (Bates, Black et al. 2002; Cummings, Bates et al. 2002). The patient's age, personal history of fracture, and weight should be accounted for when diagnosing a person's risk for fracture.

Psychosocial Factors

Knowledge of Osteoporosis and Its Prevention. The lack of knowledge about osteoporosis prevents a woman from determining her risks for osteoporosis and the preventive actions she should be taking (Ribeiro, Blakeley et al. 2000). A survey to assess the knowledge, beliefs, and behaviors of African American and Hispanic women about osteoporosis found that the women did not practice preventive behaviors because they did not know about them (Geller and Derman 2001). These behaviors include a lack of physical activity, inadequate calcium intake, smoking, and long-term steroid use. This study also found that women had viewed themselves at less risk of developing

osteoporosis compared to other diseases such as heart disease or diabetes (Geller and Derman 2001). This survey was administered to women over the age of 18 with 80% of the women being less than 50 years of age. We suspect that women over 65 would be more vulnerable than the survey population because they did not practice these preventative behaviors over a longer period of time.

Another difficulty in getting women to adopt osteoporosis-preventive behaviors is that many people do not know they are losing bone until a fracture has occurred. This disease does not have visible symptoms and therefore, a bone density screening is essential. Previous studies have shown that knowledge of one's BMD diagnosis have led to an appreciation of the negative impact of falls on lifestyle and the importance of hormone replacement therapy in preventing fractures (Lydick, Martin et al. 1996; Marci, Anderson et al. 2000). Knowledge of one's risk of a disease can lead to behaviors that will reduce risk (Lydick, Martin et al. 1996; Pressman, Forsyth et al. 2001). However, despite evidence that knowledge of one's DXA results can lead to adoption of prevention and treatment behaviors, there is evidence that healthcare professionals do prescribe treatment for women, especially minority women, with a low BMD (Freedman, Kaplan et al. 2000; Fitt, Mitchell et al. 2001; Neuner, McCarthy et al. 2003).

Attitudes towards ERT. Estrogen deficiency plays a major role in bone loss that occurs after the time of menopause. However, many women choose not to take estrogen because of side effects, which include breast tenderness, menstrual bleeding, and bloating, among others (Clinkingbeard, Minton et al. 1999). One study among Black women reported that the lack of ERT use was related to lack of physician recommendation (McNagny and Jacobson 1997). Several studies determined that at the

time of this screening awareness of osteoporosis, its diagnosis, prevention, and treatment was unacceptably low among physicians and among the general population (Anderson, Caplan et al. 1999; Dawson-Hughes 2000; Feldstein, Elmer et al. 2003). Studies have shown that Black women were less likely than white women to be offered or take HRT (Brown, Perez-Stable et al. 1999; Harris, Cook et al. 1999). However, since these publications, there has been evidence to suggest that awareness of fracture risk both among the general population and the physicians who treat them has increased.

A possible reason for the lack of physicians recommending HRT to patients with osteopenia or osteoporosis may be that HRT has been conventionally used as a preventive medication rather than a treatment for those with low bone density (Cole, Palushock et al. 1999). Few studies have been conducted on bone loss, risk of fracture, and managing osteoporosis in older Black and Hispanic women, thus validated prevention and treatment strategies are not available. In addition, few Black or Hispanic women have participated in HRT studies. Hence, physicians are uncertain about the risks and benefits of HRT among non-whites (Nicholson, Brown et al. 1999; Ganesan, Teklehaimanot et al. 2000). Recently, studies have demonstrated multiple medications that prevent bone loss and decrease fracture incidence in postmenopausal women. These medications are estrogen, alendronate, calcitonin, raloxifene, and risedronate (Cole, Palushock et al. 1999; Freedman, Kaplan et al. 2000; NIH 2000). However, none of these studies have included Black or Hispanic women. Another possible reason for the hesitation in prescribing HRT is that compliance with this medication is typically low (Jones, Francis et al. 1982).

Health Care System – Perceptions. Another barrier to changing a person's health behaviors is a mistrust of the healthcare system, especially among minorities. A history of exclusion from the medical care system and the infamous Tuskegee experiments has led to a distrust of the medical and healthcare system (Zhan, Cloutterbuck et al. 1998). Yet, physicians still have a powerful influence over most people. Older Black women consider medical doctors to be the preferred and most believable source of health information (Gollop 1997). Health care providers play a major role in helping women make decisions about hormone replacement therapy use (Clinkingbeard, Minton et al. 1999). However, there is a question of whether or not there is a missed opportunity to treat and prevent osteoporosis in minority women.

Economic factors. As previously mentioned Medicare only covers 80% of a BMD test, and that has to be with a physician's referral every two years. Most BMD tests can be quite costly, ranging from \$250 to \$500 depending on the site and type of machine used. Even with 80% coverage, this added expense for low-income persons can be a barrier to increasing awareness of a person's risk for osteoporosis. In addition, medications that are typically prescribed for osteoporosis prevention and treatment are not covered under Medicare, thus adding an additional barrier for economically disadvantaged older minority women.

The Study

It is difficult for most people to adopt new health behaviors and refrain from unhealthy ones. Schwarzer (2000) noted that the likelihood of a person changing a behavior or refraining from one is dependent on whether one sees himself or herself at risk for a disease, one is aware a change in behavior would reduce that risk, and one is

capable of changing and maintaining that new behavior (Schwarzer and Renner 2000). The lack of a women's knowledge about osteoporosis is a barrier to her realizing her personal risks and well as what preventive actions she should be taking (Ribeiro, Blakeley et al. 2000). Health educational programs can increase knowledge of a disease, but may not always change the behavior of a person (Sedlak, Doheny et al. 2000). This study hypothesizes that the combination of an educational program about osteoporosis along with an individual bone mineral density test would facilitate the adoption of beliefs and behaviors related to prevention of osteoporosis. Knowledge about a person's risk for developing osteoporosis, and ways she can prevent or treat it can be an empowering tool. Yet being able to then provide that same person with an actual test score that measures her personal risk may spark that person to change her behavior.

The purpose of this study is to evaluate an educational screening program that sought to increase knowledge of osteoporosis prevalence and prevention among older minority women. The main object of the educational screening program was to increase awareness about osteoporosis and thus encourage the adoption of preventive bone health behaviors. The purpose of conducting a follow-up interview was to explore whether or not having knowledge of one's bone density test results promoted a change in behavior and whether those behaviors were self-sustainable, and to better understand the role of physicians in those changes of behavior.

The main hypothesis of this study is that knowledge of one's bone mineral density (BMD) would increase osteoporosis prevention/treatment behaviors in Black and Hispanic women. The study evaluates two outcomes of the program: first, if women took the results of their screening tests to their physicians; and second, if the women adopted

or increased their osteoporosis prevention behaviors. We also examined if the screening results influenced their physicians to put the women on appropriate treatment.

We further hypothesized that compared to women with normal bone mineral densities, women who are at higher risk for osteoporosis, i.e., those who had a diagnosis of osteopenia or osteoporosis, who are older, have more co-morbidities, would be more likely to take test results to their physicians, be prescribed anti-resorptive medications, and adopt prevention behavior, such as adequate calcium intake, exercise, and decreasing risk behaviors like smoking. We used SES and number of co-morbidities as covariates.

METHODS

Sample

The sample for this study is comprised of participants of an osteoporosis education and screening program funded by a grant from the North Central Area Agency on Aging. Over the course of a year from 1998 -1999, 13 educational community talks on osteoporosis were conducted, reaching 539 individuals, most of whom were minority women. Either a nurse or doctor gave these educational talks at one of the following locations: senior housing, senior center, or church in Hartford, CT. After each talk, participants were invited to sign up for BMD testing.

One hundred-twenty Black and Hispanic women over 60 years of age signed up to receive a free hip BMD measurement at The University of Connecticut Center on Aging. The center arranged with the Dial-a-Ride service to transport the women to the testing site. At the testing site, participants completed a brief health history questionnaire asking them about current and past medical problems and medication use. (Table 1)

Seven months later, a follow-up telephone questionnaire was completed by phone. (Table 2) This follow-up was designed to evaluate their levels of satisfaction with the osteoporosis screening program, to assess what women did with their BMD results, and to determine whether they were taking osteoporosis medications (Table 2). We reached 66 of the 120 women at the follow-up time point. The majority of the women who were not reached could not be contacted due to non-working or erroneous telephone numbers. Eighty-two percent of the women we were unable to contact were Hispanic. Friends or family members of these women informed us that they were currently residing in Puerto Rico and a return date was unknown. Results are given for the 66 women reached at follow-up.

Measures

Dependent measures: The study had three dependent measures: 1) whether or not women took test results to physician, 2) whether or not the physician prescribed osteoporosis medications or prevention advice, and 3) whether or not women adopted and/or maintained preventive behaviors. These dichotomized variables were coded as yes or no. Questions on physician response to BMD results included: “Have you and your doctor talked about your bone density test results?”, “After showing your test results, did your doctor ask you to take calcium?”, “Did your doctor ask you to do more exercise?” We asked more detailed questions about usage of anti-resorptive agents. They included, “Did your doctor ask you to go on estrogen or other medications for osteoporosis?”, “Are you currently on estrogen for treatment or prevention of osteoporosis?”, “If no please tell me whether you are: a. very likely, b. likely, c. neither likely nor unlikely, d. not likely or e. not likely at all to take estrogen in the next 6

months.”, “If unlikely, May we know the reason why you are unlikely to take estrogen?”, and “Are you on any type of treatment for osteoporosis? If yes, what type?”

Independent Measures

Socio-demographic characteristics: Age, race, income, education, supplemental insurance, and place of residency were collected by self-report. Age was treated as a continuous variable. Self-identified race was collected as a dichotomized variable, Black (yes or no) and Hispanic (yes or no). We obtained median household income by Zip code from the 1990 census, and treated this variable as categorical with the following range \$10,220 - \$66,337. Years of education obtained was a categorical variable: less than high school education, completed high school education, some college or college education. The variable, supplemental insurance, was treated as a dichotomized variable: “do you have medical insurance in addition to Medicare, yes or no?” Place of residency was collected as dichotomized variables, rent or own coded as yes (1) or no (0)

Diagnosis of Osteoporosis (BMD results): Each woman had a hip BMD by DXA. At the end of the test, a nurse or physician explained the DXA results to each woman based on World Health Organization (WHO) standard (1994). Based on WHO standards, normal bone is diagnosed with a t-score's greater the <-1.0 , osteopenia is defined as having a $t\text{-score} = <-1.0 > -2.5$ and osteoporosis is a $t\text{-score} = <-2.5$. The participants received two copies of the results and were encouraged to take one to their physicians. We treated the variable as categorical by diagnosis: normal, osteopenia, or osteoporosis.

History of Fracture: Participants were asked at the screening visit whether or not they had a history of previous fractures. These questions were treated as dichotomized variables, yes or no. They were also asked the type of fracture, if they said yes.

Osteoporosis Prevention Medication Use: At the screening visit we asked participants if they were currently taking any medications or vitamins that have an effect on preventing bone loss. These questions were treated as dichotomized variables by yes or no. Medications and vitamins considered preventative of bone at the time of the screening included Estrogen, Calcium, Vitamin D, Flouride, Thiazide, Calcitonin/Miacalcin, Alendronate/Fosamax, and Didronel/Etidronate.

Medications that increase bone health risk: We also asked women if they were currently taking any medications that have an affect on increasing risk of bone loss. All medication use questions were treated as dichotomized variables. These medications included thyroid medications, corticosteroids, insulin, and anticonvulsant medications.

Screening Satisfaction: At follow-up, participants were asked to rate how satisfied they were with their experience at the screening. Questions included satisfaction with transportation, the bone density test, the medical staff that explained results, and informational material they received. These variables were treated as categorical (very satisfied, satisfied, neither, dissatisfied, very dissatisfied).

Data Analysis Procedures

Logistic or linear regression analysis was conducted for each variable, one at a time, to determine if independent variables test for significant associations with the dependent variables.

We tested three logistic regression models with the following as dependent variables: 1) whether or not women took results to physician, 2) whether or not physician recommended treatment, and 3) whether or not women changed osteoporosis prevention behaviors. The independent variables that were used in the first logistic regression model were: age at time of screening (Age) and the result of their bone density (Coded Diagnosis). Rating of information received at the screening (Info), rating of the bone density test (Test), and use of Vitamin D at the time of the screening (Vitamin D) were used in the second logistic regression model. The variables used in the third model were race (Race), use of Calcium at the time of the screening (Calcium), and use of bone loss prevention medications at the time of the screening (Rxprev).

RESULTS

Results are given for the 66 women who completed the follow-up questionnaire.

Socio-Demographic Characteristics

The mean age of the women at follow-up was 72.7 ± 7.2 . Eighty-three percent of the women were Black and 17% were Hispanic. Half of the women did not complete high school and 49% completed high school. Of those who had completed a high school education, 3.1% had some college education. Black women reported a higher education level attained vs. Hispanic women (56% vs. 18% completed high school, respectively). (Table 3) A little over half of the women (59%) reported having some form of supplemental insurance. We based the mean income on zip code data from the 1990 census, because many refused to report their household income. The mean household income was \$28,000. Overall, the only demographic group differences we found between Black and Hispanic women we screened were in the highest level of education attained.

Diagnosis of Osteoporosis (BMD results):

Based on WHO standards, 36.9% of the women had BMD scores that met criteria for osteopenia (t-score= $\leq -1.0 > -2.5$); and 7.7% met criteria for osteoporosis (t-score= ≤ -2.5). (Figure 1) Forty-one percent of the Black women and 64% of the Hispanic women had BMD measurements of either osteopenia or osteoporosis. Of those diagnosed with osteoporosis, 5.6% were Black women and 18.2% were Hispanic women. Prior to screening, only one woman reported having been diagnosed with osteoporosis.

History of Fracture

Seventy-six percent of the women reported having no previous fractures at the time of the screening. Eight of the 10 women with previous fractures were black and two were Hispanic. Three of the Black women fractured their arms, two fractured their spine, two fractured their hips, and one fractured her forearm. Sites fractured of the two Hispanic women include the hip and forearm.

Osteoporosis Prevention Medication Use

Fifty-four percent of the 66 women were taking one or more preventative medications or vitamins for bone loss; 43.9% of the women were not taking any preventive medications or vitamins at the time of the screening visit. Of the 66 women, 15.2% were taking Estrogen Replacement Therapy at the time of the screening and 3% were taking other anti-resorptive agents. Forty-one percent of the women were taking Calcium at the time of the screening and 10.6% reported taking vitamin D.

Out of the women who were diagnosed at the screening with osteopenia, only 21% were previously on estrogen replacement therapy and none of the osteoporotic women were taking estrogen at the time of the BMD screening. Of the 10 women who

had a previous fracture only 4 were taking osteoporosis medications at the time of the screening.

Medications that Adversely Affect Bone Health

Twelve percent of the women were taking a medication that put them at an increased risk for bone loss; 86.4% were not taking any of these medications at the screening visit. Of the eight women who were on medications that affect bone loss, four of them were also on some medication or vitamin to prevent bone loss and 4 were not taking any preventative medications.

Physician Consultation

Thirty-nine (59%) of the 66 women took DXA results to their physicians. Four of the five women diagnosed with osteoporosis reported taking their results to their physician. Seventy percent of those women diagnosed with osteopenia and 50% of those with normal results showed the test results to their physicians. It appears that women with osteoporosis or osteopenia were somewhat more likely to take DXA results to their physicians (72% vs. 50%, respectively) ($p=.067$). (Figure 2)

Physician Medication Recommendation

Of the 39 women who took DXA results to their physicians, 10% received a prescription for treatment. However, none of the osteoporotic participants and only 15.4% of the osteopenic participants were prescribed medication for osteoporosis. (Figure 3) Forty-nine percent of the women who went to a physician reported that they were told to initiate calcium supplements or continue taking the amount of calcium they were already taking. Women with osteopenia or osteoporosis were no more likely to be treated than women with normal BMD ($p=.837$) (Figure 3).

Self-reported Prevention Behavior Change

All women who reported receiving a prescription for treatment from their physician reported taking the recommended treatment at the time of the follow-up. All women also reported that they were compliant with the calcium. Thirty-three percent of these women had been diagnosed with osteopenia or osteoporosis at the screening. Only five percent of the women with osteopenia or osteoporosis reported they would consider taking estrogen in the future

Screening Satisfaction

All of the women at follow-up reported being satisfied or very satisfied with the bone density testing service they received. Of the 66 women, 75.8% were satisfied or very satisfied with the medical staff's explanation of their bone density test results. Two of the women were dissatisfied with the explanation and three were indifferent. The two women who were dissatisfied reported not understanding the explanation given by the staff. Of the 66 women, 92.4% were satisfied or very satisfied with the informational materials received about osteoporosis at the time of the screening. One woman reported being dissatisfied with materials and three were indifferent. The one participant that was dissatisfied did not recall receiving informational materials.

Regression Analyses

Took Results to Doctor: We used individual logistic regression models to determine which independent variables were significantly associated with taking results to physicians. Out of all of the independent variables tested, Age and Coded Diagnosis were marginally associated with taking results to physicians. Women who were older, Age [OR= 1.076, CI .99, 1.16 (β = .073, p =.06)] and women with more severe diagnosis,

coded diagnosis [OR= 2.224, CI .92, 5.33 (β = .799, p =.07)], were more likely to take results to their physicians. When variables were put into a model together, neither was significant.

Doctor gave participant prevention advice: Patients who rated the information given at the screening as satisfactory or better (Info=[OR= 5.4, CI 1.2, 23.6 (β = 1.7, p =.02)]), and patients who rated the bone density test itself as satisfactory or better, (Test=[OR= 4.7, CI 1.02, 21.7 (β = 1.6, p =.04)]), were more likely to report physicians giving advice. Patients with a better diagnosis or higher t-scores (T-Score= [OR= 1.88, CI .98, 3.59 (β = .634, p =.05)]) were more likely to report physicians giving advice. Patients who were taking Vitamin D [OR= .111, CI .01, .75 (β = -2.19, p =.02)] at the screening visit reported getting advice from physicians. When we put all of the four variables into a model we found that none was significant. We tried various combinations of pairs of these variables and found that the variable Information received was the only variable that was significant when paired with the other variables.

Patient adopted prevention behaviors at follow-up: Black women were more likely to report adopting prevention behaviors at the follow-up time point (Race=[OR= .219, CI .04, .97 (β = -1.52, p =.046)]). Women who were taking more bone loss prevention medications (RXPrev=[OR= 6.380, CI 1.40, 29.04 (β = 1.853, p =.01)]), such as Calcium [OR= 9.63, CI 1.15, 80.62 (β = 2.26, p =.03)], at the time of the screening were more likely to report adopting or continuing preventive behaviors. When put into a model together, none of the variables was significant.

DISCUSSION

The study provided information on the bone health status of 66 minority women and described the effects of knowledge about one's bone health status on physician consultation and adoption and maintenance of preventive behaviors.

The study found a high proportion of Hispanic (64%) and Black women (41%) that were either osteopenic or osteoporotic. Only one of these women reported having a known previous diagnosis of Osteoporosis. Out of the women who were diagnosed at the screening with osteopenia, only 21% were on estrogen replacement therapy prior to the screening and none of the osteoporotic women were taking estrogen at the time of the BMD screening. Of the 10 women who had a previous fracture only 4 were taking osteoporosis medications at the time of the screening. As the population of older minorities continues to grow, we can only expect so will this population's risk of osteoporosis and fracture. These findings raise several questions and concerns about whether there is a missed opportunity to diagnosis, treat, and implement preventative measures by physicians or if there is misunderstanding among patients who are diagnosed with osteoporosis. It is unknown which of these is the case, but regardless it is imperative that women become more knowledgeable about the risks of bone loss and the severity of a fracture. Our findings emphasize the need for physicians to play a greater role in educating patients on the importance of taking preventative measures on bone loss and fractures.

Did Women Take Results to Physician?

Our study shows that most women adhered to recommendations to take their test results to their physicians. Women who were older and with a more severe diagnosis

took their test results to their physician. Subjects with poorer diagnoses were more likely to take results to their physician compared to women with better results. This suggests that knowing one's bone density can lead to adoption of behaviors to prevent further bone loss. Previous studies have shown that as a person ages, she or he is more inclined to engage in prevention behaviors and adopt good health practices (Gottlieb and Green 1984; Prohaska, Leventhal et al. 1985; Gallant and Dorn 2001). These findings also suggest that as people age, they may feel more susceptible to disease. This perception of vulnerability may initiate the adoption of health prevention behaviors, such as going to their physicians on a regular basis. In addition to age and a more severe diagnosis, we also hypothesized that women who had more co-morbidities and a higher SES would be more likely to take test results to their physicians. However, these variables were not significant.

Did Physicians Recommend Treatment?

Although 85% of women who had a test score of osteopenia or osteoporosis reported taking their results to the doctor, they did not report receiving a prescription for osteoporosis prevention medications. One explanation for this missed opportunity to treat or prevent osteoporosis in minority women is the lack of awareness of osteoporosis, its diagnosis, prevention, and treatment among physicians and among the general population (Anderson, Caplan et al. 1999; Dawson-Hughes 2000). Results from studies using patient populations suggest that Black women were less likely than white women to be offered or to take HRT (Brown, Perez-Stable et al. 1999; Harris, Cook et al. 1999).

This study also found that women with better test results were more likely to have received physician advice than women with poorer test results. One could assume that an

explanation for this unusual result could be that women with poorer bone density were already being treated by physicians prior to the screening and were taking some type of prevention medication, hence not being prescribed anything at the visit post screening. Yet only 17.9% of the women with a diagnosis of osteopenia or osteoporosis reported taking a prevention medication at the time of the initial screening. With such a large number of women reporting not receiving any prescription prevention treatments, but having a low bone density test result, these findings raise the question of why these women failed to receive treatment by their physicians. Gallagher, et al. noted that potential barriers to provide treatment include a lower priority to provide prevention measures on diseases like osteoporosis, where patients may present with more complicated medical conditions, or a lack of knowledge on the physicians part on when it is appropriate to treat and what the appropriate intervention options are for prevention and treatment (Gallagher, Geling et al. 2002). This study also noted that barriers to discussing osteoporosis prevention with their patients include physicians' limited time with patients at visits, a lack of reimbursement for these discussions, and questions about the effectiveness and usefulness of prevention counseling. Potential barriers to prescribing treatment could include the limitations of a managed care organization on the number of prescribed medications given to patients, the lack of reimbursements given to patients by insurance making the medication still unaffordable, and the limited knowledge on patient compliance with these types of medications (Gallagher, Geling et al. 2002).

These findings also may suggest the issue of racial disparities in the treatment of osteoporosis among minorities. Research has shown that among Black and White

patients with the same health condition, Whites are more likely to receive prevention treatment, testing, and diagnosis (Gornick, Eggers et al. 1996; Fiscella, Franks et al. 2000; Mudano, Casebeer et al. 2003; Fiscella and Williams 2004; McGruder, Malarcher et al. 2004). Mudano et al. found that Black women who had a previous hip fracture were less likely to receive care compared to white women with a previous fracture (Mudano, Casebeer et al. 2003). Although older Black and Hispanic patients may present with more urgent medical needs, it seems that there is a missed opportunity to treat and prevent bone loss and fractures among this population.

Our study also found that women who were satisfied with the BMD testing service they received were more likely to receive advice from their physicians. An explanation for this finding may be that those who were satisfied with the information received at the screening were more informed as to what their results meant, which made them more likely to initiate conversations about their test results. This suggests that information received at the screening, if understood by the recipient, could help women prompt their physicians to prescribe preventive treatment.

Did Women Adopt or Maintain Osteoporosis Prevention Behaviors?

The women who had been asked by their physician to take either calcium and vitamin D, or who had been prescribed an anti-resorption agent reported still taking them at the follow-up interview. A possible reason for this finding may be the notion that past behaviors are predictors of future behaviors (Mayne and Earp 2003). Women whose past health care behaviors were preventatively oriented were more likely to adopt new preventative health behaviors (Mayer-Oakes, Atchison et al. 1996). In addition, women

already on preventive medications may have already been aware of the importance of these medications. The osteoporosis screenings may have reinforced these beliefs.

An interesting finding of the study is that Black women were more likely than Hispanic women to adopt or maintain osteoporosis prevention behaviors. This suggests that health education efforts should focus on Hispanic women because they are less likely to adopt these behaviors yet are at higher risk for osteoporosis.

Limitations to Study

This study has several weaknesses. Its main weakness is the potential for recall bias regarding physician recommendations. Another weakness was the lack of follow-up with the Hispanic participants. As such, we were unable to stratify the effects of the health screening by race. The data also focused only on Hispanics of Puerto Rican descent. As there may be differences in bone health among the various Hispanic populations, the data may only apply to Puerto Ricans. Further research on bone loss and fracture incidence and efficacy of treatment in minority populations is needed.

CONCLUSION

Our findings suggest a need for education about osteoporosis treatments for older minority women and physicians who treat them. Our study suggests that health screenings may inform older women of their risks for osteoporosis and help them initiate discussions with their physicians regarding preventive measures. The findings also show the strong influence physicians have on their patients adopting and maintaining appropriate health behaviors. Further research is needed to explore what barriers physicians may have in prescribing prevention advice and treatment options for osteoporosis among minority women they treat, and how to best overcome those barriers.

APPENDIX

Table 1: Screening Visit Questionnaire

| 1. Have you had any of the following conditions? | Frequencies [%] | | |
|--|-----------------|------------|----------|
| | Yes | No | Missing |
| Osteoporosis | 1 [1.5%] | 61 [92.4%] | 4 [6.1%] |
| Renal (Kidney) | 0 [0%] | 63 [95.5%] | 3 [4.5%] |
| Thyroid Disorder | 3 [4.5%] | 60 [90.9%] | 3 [4.5%] |
| | | | |
| 2. Are you currently taking any of the following? | | | |
| | Yes | No | Missing |
| Estrogen | 10 [15.2%] | 54 [81.8%] | 2 [3.0%] |
| Fluoride | 1 [1.5%] | 62 [93.9%] | 3 [4.5%] |
| Thiazide | 2 [3.0%] | 62 [93.9%] | 2 [3.0%] |
| Vitamin D supplements | 7 [10.6%] | 58 [87.9%] | 1 [1.5%] |
| Calcium (dairy or supplements) | 27 [40.9%] | 38 [57.6%] | 1 [1.5%] |
| Parathyroid medication | 0 [0%] | 65 [98.5%] | 1 [1.5%] |
| Thyroid medication | 4 [6.1%] | 61 [92.4%] | 1 [1.5%] |
| Anticonvulsant medication | 0 [0%] | 65 [98.5%] | 1 [1.5%] |
| Corticosteroids | 0 [0%] | 65 [98.5%] | 1 [1.5%] |
| Didronel/Etidronate | 0 [0%] | 65 [98.5%] | 1 [1.5%] |
| Calcitonin/Miacalcin | 0 [0%] | 65 [98.5%] | 1 [1.5%] |
| Alendronate/Fosamax | 1 [1.5%] | 64 [97.0%] | 1 [1.5%] |
| Insulin | 5 [7.6%] | 60 [90.9%] | 1 [1.5%] |
| | | | |
| 3. Which of the following fractures have you ever had? | | | |
| | Yes | No | Missing |
| None | 50 [75.8%] | 14 [21.2%] | 2 [3.0%] |
| Humerus(upper arm) | 3 [4.5%] | 62 [93.9%] | 1 [1.5%] |
| Spine | 2 [3.0%] | 63 [95.5%] | 1 [1.5%] |
| Femur(hip) | 3 [4.5%] | 62 [93.9%] | 1 [1.5%] |
| Forearm(lower arm) | 2 [3.0%] | 63 [95.5%] | 1 [1.5%] |
| Pelvis | 0 [0%] | 65 [98.5%] | 1 [1.5%] |

Table 2: Follow-up Telephone Questionnaire

- 1) Please tell me how satisfied you were with the following services you received.
Choose one from five answers (very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied and very dissatisfied). A. Transportation arrangements to and from the health center; B. Bone density testing; C. Medical person who helped you understand your test results; D. Information materials on osteoporosis that you received after the test.
 - 2) Please answer yes or no? A. Have you and your doctor talked about your bone density test results?; B. After showing your test results, did your doctor ask you to take calcium?; C. Did your doctor ask you to do more exercise?; D. Did your doctor ask you to go on estrogen or other medications for osteoporosis?
 - 3) Please select the item that describes you best: A. I am taking the same amount of calcium or I am taking less or I am taking more calcium compared to what I did before I had the test. B. I am doing more walking (or exercise) or I am doing less or I am doing about the same amount of walking before I had the test.
 - 4) Are you currently on estrogen for treatment or prevention of osteoporosis?
 - 5) If no please tell me whether you are: a. very likely, b. likely, c. neither likely nor unlikely, d. not likely or e. not likely at all to take estrogen in the next 6 months.
 - 6) If unlikely, "May we know the reason why you are unlikely to take estrogen?"
 - 7) Are you on any type of treatment for osteoporosis? If yes, what type?
 - 8) Do you have medical insurance in addition to Medicare?
 - 9) Do you own or rent the house you are presently living in?
 - 10) Did you have a high school diploma? If yes, do you have a college degree?
 - 11) How many people live in the same house with you?
-

Table 3: Demographics (n=66)

| | |
|------------------------|---|
| MEAN AGE | 72.7 \pm 7.2 |
| RACE/ETHNICITY | 83% Black 17% Hispanic |
| EDUCATION | 51% < High School 49% High School 3.1% College |
| SUPPLEMENTAL INSURANCE | 41% No supplemental insurance 59% Supplemental insurance |
| MEAN ZIP CODE INCOME | \$27, 816 \pm 13,547 |

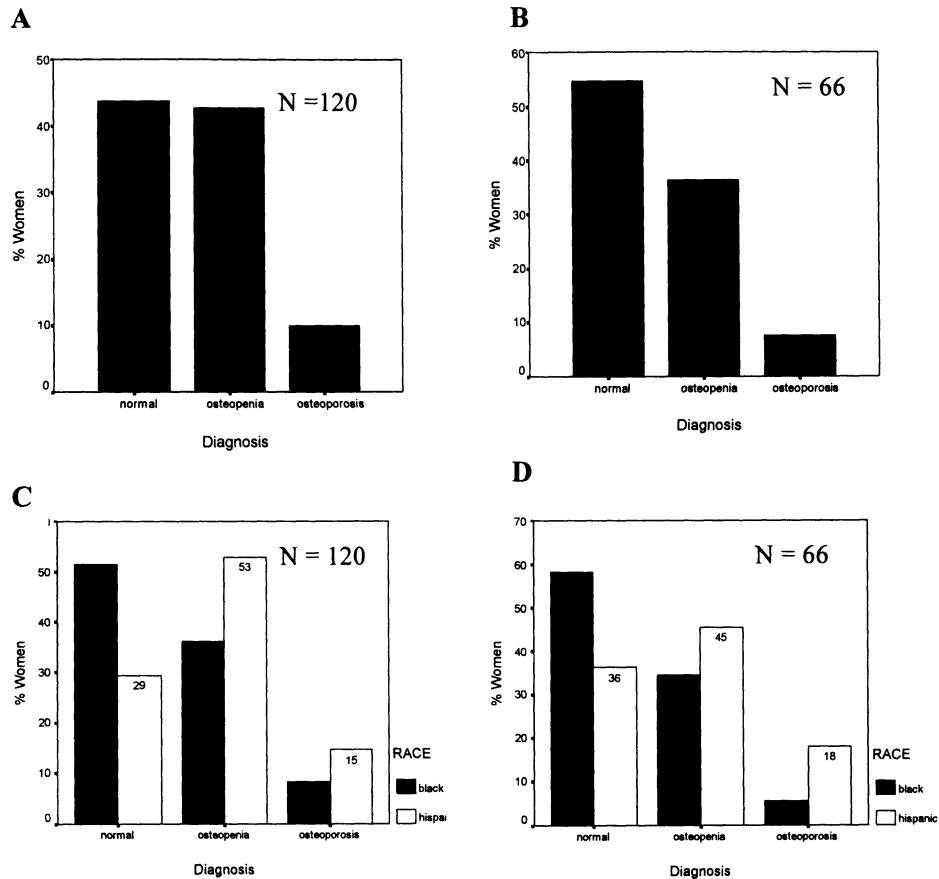


Figure 1. - A. Distribution of WHO categories among all 120 screening participants. B. Distribution of WHO categories among the 66 women who completed the follow-up questionnaire. C. Distribution of WHO categories among the 120 screening participants by race. D. Distribution of WHO categories among 66 women who completed follow-up questionnaire, by race.

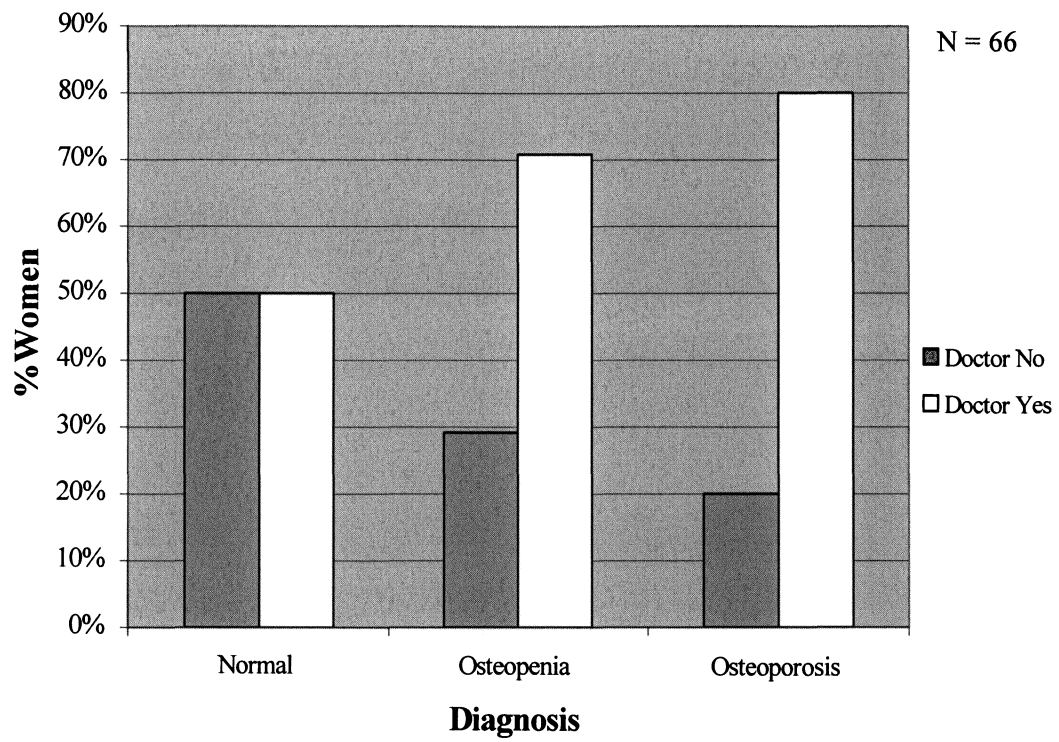


Figure 2. Percentages of women who took results to their physicians by WHO categories.

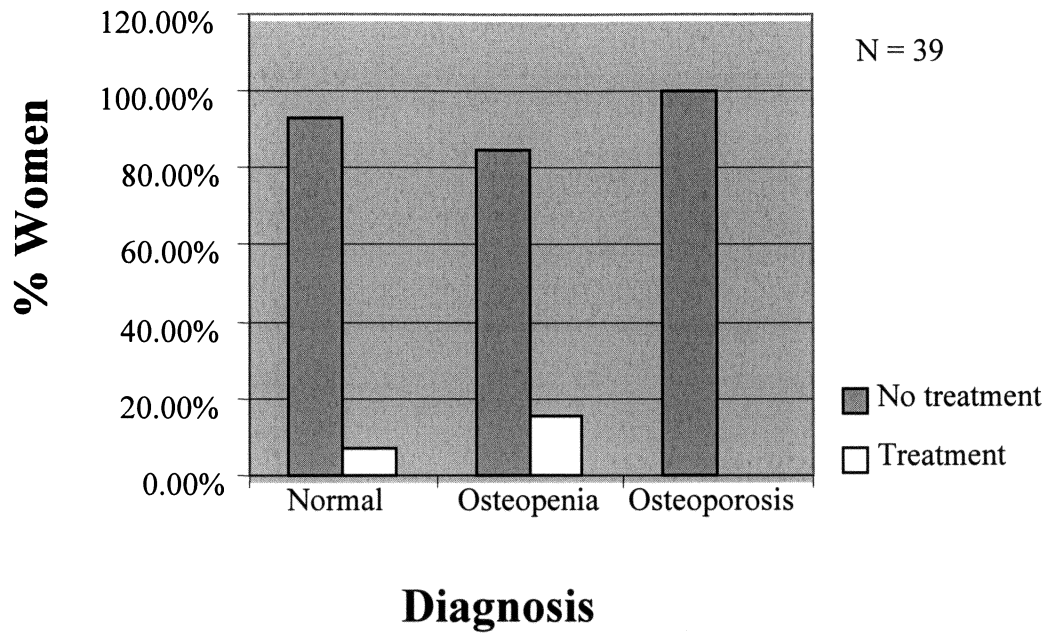


Figure 3. Treatment of 39 women who took results to physician

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