# Impact of a Reimbursement Change on Bone Mineral Density Testing on Quality of Osteoporosis Care in Ontario, Canada.

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**Running Title: Impact of Reimbursement Change on Bone Mineral Density Testing**

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The authors have no conflicts of interest or disclosures.


**Abstract**

Impact of a Reimbursement Change on Bone Mineral Density Testing on Quality of Osteoporosis Care in Ontario, Canada.

**Background:** As of April 1, 2008 the physician reimbursement fee schedule for bone mineral density (BMD) testing using dual-energy X-ray absorptiometry (DXA) in Ontario, Canada was revised, limiting the interval for rescreening in individuals with low risk of osteoporosis.

**Methods:** Data were analyzed from administrative databases on physician billings, hospital discharges and emergency department visits. All reimbursements for dual-energy X-ray absorptiometry (DXA) in Ontario, Canada to assess patterns in BMD testing from April 1, 2002 to March 31, 2011 were included. At risk populations were defined as ≥ 65 years or who experienced a fragility fracture after age 40 years. Joinpoint analyses were used to examine trends.

**Results:** Prior to the policy change the number and rate of DXAs provided to women increased steadily from 433,419 in 2002/03 to 507,658 in 2007/08. After revision of the fee schedule, the number decreased to 422,915 in 2010. Rates in men increased gradually each year before levelling off after 2008. After 2008, the age-adjusted rate of BMD testing dropped in the low risk group of women from 5.7/100 to 1.8/100. A significant decrease was also seen among high risk women (eligible for BMD testing at 65 years) and those with a recent fracture.

**Interpretation:** A change in policy designed to restrict access to BMD testing in low risk women resulted in a reduction in overall BMD testing, including both high and low risk populations, thereby compromising fracture prevention efforts for quality osteoporosis care.


Abstract Word Count: 240


**Key words:** dual-energy X-ray absorptiometry, policy, reimbursement, fracture, osteoporosis

## INTRODUCTION

A bone mineral density test (BMD) using dual energy x-ray absorptiometry (DXA) evaluates the quantity of bone mineral and is used to make a diagnosis of reduced bone mass or osteoporosis, and to provide information that contributes to assessment of fracture risk. Together with other fracture risk factors, information gained from a BMD test may be useful in patient-physician decision making about instituting treatments to prevent bone loss and fracture.[1] Clinical practice guidelines in Canada currently recommend BMD testing in specific at-risk populations, including all men and women 65 years and older and those who experience a fragility fracture after age 40 years.[2,3]

In Ontario, in the absence of major restrictions to BMD testing, a sharp increase in testing rates in much younger women, aged 40–44 years, for whom fracture risk is low, has been documented.[4] In fiscal year 2007, BMD testing in women aged 40–59 years accounted for almost half (approximately 200,000) of all BMD tests performed.[5] While this high rate of testing may indicate concern about osteoporosis when approaching menopause, it also suggests unnecessary testing. In an effort to curb testing, in 2008, changes to the fee schedule for BMD testing were implemented such that the time between follow-up tests for individuals deemed at low risk for osteoporosis or fracture was increased. Restrictions to reimbursement for BMD testing have also been made in the United States, and associated with an overall reduction in testing rates.[6-8] The objectives of this study were to examine the impact of the Canadian policy change not only on overall testing rates, but on patients at low and high risk of fracture. Appropriate testing, ideally, would reduce utilization in low risk women and increase utilization in those at higher risk. Specifically, we examined trends in DXA testing rates overall and in two groups: women at low

risk, and women and men at high risk, who were identified due to advanced age or a recent fracture.

## METHODS

### *Data sources and study populations*

DXA tests were identified from the Ontario Health Insurance Plan (OHIP) claims database, which contains all physician fee-for-service billings in the province.[9,10] To obtain the age and sex of each DXA recipient, the OHIP DXA claims were linked to the Registered Persons Database that contains these demographic data. Eligible DXA claims included those for individuals age 40 years and older performed between fiscal year 2002 (beginning April 1, 2002) and fiscal year 2010 (ending March 31, 2011). The fee code in each claim allowed tests to be categorized as baseline, provided to a low-risk patient, or provided to a high-risk patient.

We also identified two at-risk populations who, according to clinical practice guidelines, should receive DXA tests: persons over the age of 65 who had no recent DXA test and those who had experienced a recent hip, wrist, spine, shoulder or pelvis fracture. To identify hip fractures we used the Canadian Institute for Health Information (CIHI) hospital discharge abstract database, which has been described previously.[10,11] A hip fracture was identified using the International Classification of Diseases (ICD-10) diagnosis codes: S72.0 (“Fracture of neck of femur”), S72.1 (“Per-trochanteric fracture”) and S72.2 (“Subtrochanteric fracture”). To identify wrist, spine, shoulder and pelvis fractures, the National Ambulatory Care Resources (NACRS) database, which includes all emergency department visits, and the OHIP database were used. We first identified all patients who were hospitalized for a wrist fracture, then searched NACRS for wrist fracture patients not hospitalized but seen in the emergency department (ICD-10 diagnosis

code: S52). We additionally searched the OHIP database for 2 physician claims with a diagnosis of wrist fracture dated within 3 months of each other, to identify patients treated in physicians' offices. A similar procedure was followed for spine, shoulder and pelvis fractures, using the following ICD-10 codes: spine S22.0, S22.1, S32.0, S32.7 and S32.8; shoulder S42.2; and pelvis S32.1, S32.3, S42.4, S32.5, S32.7 and S32.8. Individuals were excluded if they had already had a BMD test during the 12 months prior to their fracture or if they died within 12 months following their fracture. Census population estimates supplied by Statistics Canada were used to compute age-adjusted rates. The study was approved by the Research Ethics Board of the Sunnybrook Health Sciences Centre, University of Toronto.

*Definition of Low Risk and High Risk in the Fee Schedule and Policy Changes*

High risk patients may be assessed annually and are defined in the fee code as: at risk for accelerated bone loss; having osteopenia or osteoporosis on a previous DXA test; or with bone loss in excess of 1% per year as demonstrated by previous DXA testing. All other patients are defined as "low risk". From October 1, 1999 to March 31, 2008, DXA testing of patients at low risk was limited to once every 24 months. As of April 1, 2008 the fee schedule allowed DXA tests for low risk patients once every 36 months. A new fee code for a 'baseline' test was also added and individuals were limited to one baseline test in their lifetime.[12]

*Determining population-based rates of DXA testing*

To examine time trends in DXA testing, all physician claims for DXA exams from April 1, 2002 to March 31, 2011 for individuals age 40 years and older were categorized by patient risk level (baseline, low-risk, high-risk) and directly standardized based on census data.

*DXA testing in eligible men and women age ≥ 65 years*

To determine the proportion of eligible seniors who underwent BMD testing after age 65 in each fiscal year, records of adults who were aged 68 to 70 years with no DXA test between age 55 and 65 were selected. Since the OHIP fee schedule allows low risk patients to undergo DXA testing every three years, a minimum three year window was examined. The percentage of individuals who received a DXA test in the three to five years after turning age 65 who were eligible for a DXA test after they turned 65 years old who had in fact been tested was then calculated for each fiscal year.

*DXA testing following recent fracture*

Rates of patients who received a DXA test within six months of a fracture were calculated by sex and type of fracture and standardized by age using census data.

*Joinpoint Analysis*

We used joinpoint regression analysis to identify points where a statistically significant change in the linear slope of the trend line over time occurred as described by Kim and colleagues (2000).[13] In the final model, each joinpoint indicates a statistically significant change in trend, and an annual percentage change is computed for each of those trends by means of a generalised linear model that assumes a Poisson distribution. Joinpoint analyses were performed using the 'Joinpoint' software from the Surveillance Research Program of the US National Cancer Institute.[14]

## RESULTS

*Population-based rates of DXA testing*

The overall number of DXA tests increased from 433,419 in 2002/03 to 507,658 in 2007/08 and then decreased to 422,915 in 2010 in Ontario. For women, the rate of DXA testing was fairly consistent between fiscal year 2002/03 and 2006/07 (see Figure 1). Beginning in 2008/09 there was a decrease in both number of tests and rate. DXA rates in the last fiscal year (2010/11) were lower (10.4/100 women over 40) than in 2002/03 (14.1/100 women over 40); the number of reimbursements for DXA tests in women was 400,880 in fiscal 2002/03 compared to 364,874 in 2010/11. The overall rate of DXA testing in men increased gradually each year before levelling off at around 2/100 men in 2008/09 (Figure 1).

Table 1 shows the number and rate of tests among women, stratified by whether the patient was low or high risk. Joinpoint analyses for the low risk and/or baseline tests found no evidence of a joinpoint in the regression line for men ($p = 0.45$). The slope of the line for men is 0.061 (standard error 0.006, $p < 0.0001$) indicating that rates increased steadily for men. In contrast, for women, from 2002 to 2007 there is no evidence of a change in rates; however, beginning April 1, 2008, rates for low risk testing significantly decreased. We therefore reject the null hypothesis of no joinpoint for women ($p = 0.022$).

*DXA screening in older women and men*

The age-adjusted rate of testing in eligible older men consistently increased from 4.1/100 in 2002/03 to 11.9/100 in 2010/11, but remained much below the rate for women. For eligible senior women, joinpoint analysis demonstrated that the age-adjusted rate increased from

42.8/100 in 2002/03 to 46.9/100 in 2005/06 and decreased each subsequent year. The largest drops were from fiscal 2007/08 to 2008/09 and from 2009/10 to 2010/11.

*DXA testing following recent fracture*

Among individuals with a fracture of the hip, spine, forearm/wrist, shoulder or pelvis, DXA testing rates six month post-fracture increased from fiscal year 2002/03 until 2007/08. Between 2002/03 and 2007/08, testing rates increased by 0.98 per 100 fractures for both sexes. Coincident with changes in reimbursement, in 2008/09, the rates of BMD testing within six months of fracture decreased such that by 2009/10, rates had decreased back to 2006/07 levels (Figure 3). Among those who had a fracture in fiscal year 2009/10, the overall age-sex standardized rate of DXA testing six months after fracture was 13.0 per 100 population (16.1/100 women and 8.0/100 men) compared to 14.6/100 population (18.0/100 women and 9.4/100 men) in 2007. Joinpoint analysis detected an increase in rates for both men and women until 2007; after 2007, the rates plateaued.

We also examined post-fracture BMD testing by fracture type (Figure 4). Individuals who experienced a spine (15.9/100 population) or hip fracture (15.5/100 population) in fiscal year 2009/10 were more likely to be referred for BMD testing within 6 months of fracture than those with a wrist, pelvis or shoulder fracture. Trends in DXA testing six months post-fracture differ by type of fracture until fiscal 2008/09, when rates decrease across all fracture types. There was a marked increase in DXA testing among patients who had hip and wrist fractures from 2002/03 to 2007/08; the increase was pronounced for pelvis and shoulder fractures between 2005/06 and 2007/08 and more gradual for patients with spine fractures between 2002/03 and 2007/08. Between fiscal 2002/03 and 2007/08, rates of testing following hip fracture increased;

thereafter rates fell in both men and women. The rate of increase before 2008 is not statistically different from the rate of decrease afterwards, suggesting that we may return to 2002/03 testing rates by the end of fiscal year 2012/13. Also of note, the rate of DXA testing following hip fracture is significantly higher ($p < 0.0001$) among women than men.

## INTERPRETATION

Our results demonstrate that the Ontario fee schedule change in 2008 has resulted in a decrease of DXA testing rates and a significant decrease in the rate of testing among women over 40, designated as at "low risk". Similarly, the rate of DXA testing among men over 40 appears to have levelled off in recent years. This suggests that the change to the fee schedule in Ontario may have reduced some unnecessary DXA testing, particularly in low risk populations of women.

There is documented inappropriate use of DXA testing in low risk populations. We previously reported that among healthy women referred to a multidisciplinary osteoporosis clinic in Ontario for a baseline DXA test at midlife, more than 90% had normal bone density.[15] Similarly, in a US cohort of 615 women 49 years and older who received a baseline DXA test, Schnatz and colleagues[16] found that 40% did not meet the North American Menopause Society criteria for testing. A recent study of 4957 women, 67 years of age or older, with normal BMD or osteopenia found that osteoporosis is likely to develop in less than 10% during rescreening intervals of approximately 15 years for women with normal bone density or mild osteopenia.[17]

On the other hand, clinical guidelines indicate women over 65 should be tested.[2,3,18-20] Yet in our study, the proportion of eligible older women receiving a DXA test decreased after 2005; this decrease became more pronounced after the 2008 fee schedule change. This suggests

that guidelines for DXA testing in older women are not being followed. In 2010, only 43% of older women in Ontario who become eligible for a DXA were tested. In a recent survey by the Public Health Agency of Canada, only 47% of Canadians aged 65 years and older reported ever having had a DXA test.[21]

When we turn our attention to testing among those with a history of fragility fracture, the effect of the policy change is pronounced. Prior to 2008, rates of BMD testing six months after fragility fracture were increasing. In 2008, rates began to decrease such that in 2009, rates had decreased back to 2006 levels. If this trend continues, we can expect to be back to 2002 rates of testing post-hip fracture in 2012. This indicates under-utilization of DXA testing among those at high risk for future fracture and suggests that the policy change may compromise initiatives from the Ontario Osteoporosis Strategy, a population-based chronic disease management strategy designed to reduce fractures.[22]

Our results highlight unintended consequences of a government policy intended to reduce inappropriate DXA testing in low risk patients. One potential explanation for the reduction is confusion among physicians due to changing knowledge, guidelines and recommendations for BMD testing. For example, the current fee schedule still refers to clinical guidelines from 2002.[23] In addition, the schedule provides no guidance for referral of patient populations, such as those with a recent fracture or those over age 65. Another explanation for the overall reduction may be changing patient perceptions. Patients may not want to consider taking osteoporosis medications[24] or may be concerned about drug safety and effectiveness;[25] they may see DXA tests as irrelevant as a result. Alternately, patients may lack understanding of the link between BMD and fracture risk[24] and therefore under-value DXA tests.

*Limitations*

A limitation of our study is that we could not separate baseline from repeat DXA measurements prior to 2008, which means we could not separate patients being screened from those being monitored. In addition, categorizations of low and high risk are determined by referring physicians; in the administrative data there is no information to verify these designations. This means an unknown amount of misclassification exists in our results.

*Conclusion*

Despite these limitations, our study suggests there was both a positive and a negative effect of the policy change to reduce DXA testing in those at low risk. This suggests that referring physicians applied the reduction in DXA testing across all patient populations, without considering the difference between low and high-risk patients. On the positive side, unnecessary DXA testing in low risk populations was reduced. On the negative side, DXA testing in high-risk populations was reduced, which may compromise the already suboptimal quality of osteoporosis care in Ontario. Future directions involve the development of a standardized requisition for referral to promote appropriate BMD testing.

[Word Count=2483]

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Table 1: Number and standardized rate (per 100) of DXA tests for women in Ontario, 2002/03 to 2010/11

| Year | Baseline[1] | | Low Risk | | High Risk | |
|---|---|---|---|---|---|---|
| | Number | Rate/100 | Number | Rate/100 | Number | Rate/100 |
| 2002/03 | | | 178,325 | 6.31 | 222,555 | 7.78 |
| 2003/04 | | | 161,028 | 5.52 | 230,408 | 7.83 |
| 2004/05 | | | 168,277 | 5.62 | 249,521 | 8.27 |
| 2005/06 | | | 167,821 | 5.47 | 267,710 | 8.67 |
| 2006/07 | | | 175,988 | 5.58 | 269,038 | 8.47 |
| 2007/08 | | | 184,080 | 5.69 | 264,427 | 8.11 |
| 2008/09 | 49,800 | 1.52 | 101,147 | 3.04 | 247,400 | 7.37 |
| 2009/10 | 52,349 | 1.57 | 95,583 | 2.8 | 248,793 | 7.21 |
| 2010/11 | 56,145 | 1.64 | 62,927 | 1.8 | 245,802 | 6.97 |

[1]As of April 1, 2008 the fee schedule for BMD testing was changed and a new fee code for a baseline test was added. Individuals are limited to one baseline test in their lifetime.

Figure 1: Rate of DXA testing (per 100), overall and by sex, 2002/03 to 2010/11, in men and women 40+ years in Ontario, Canada

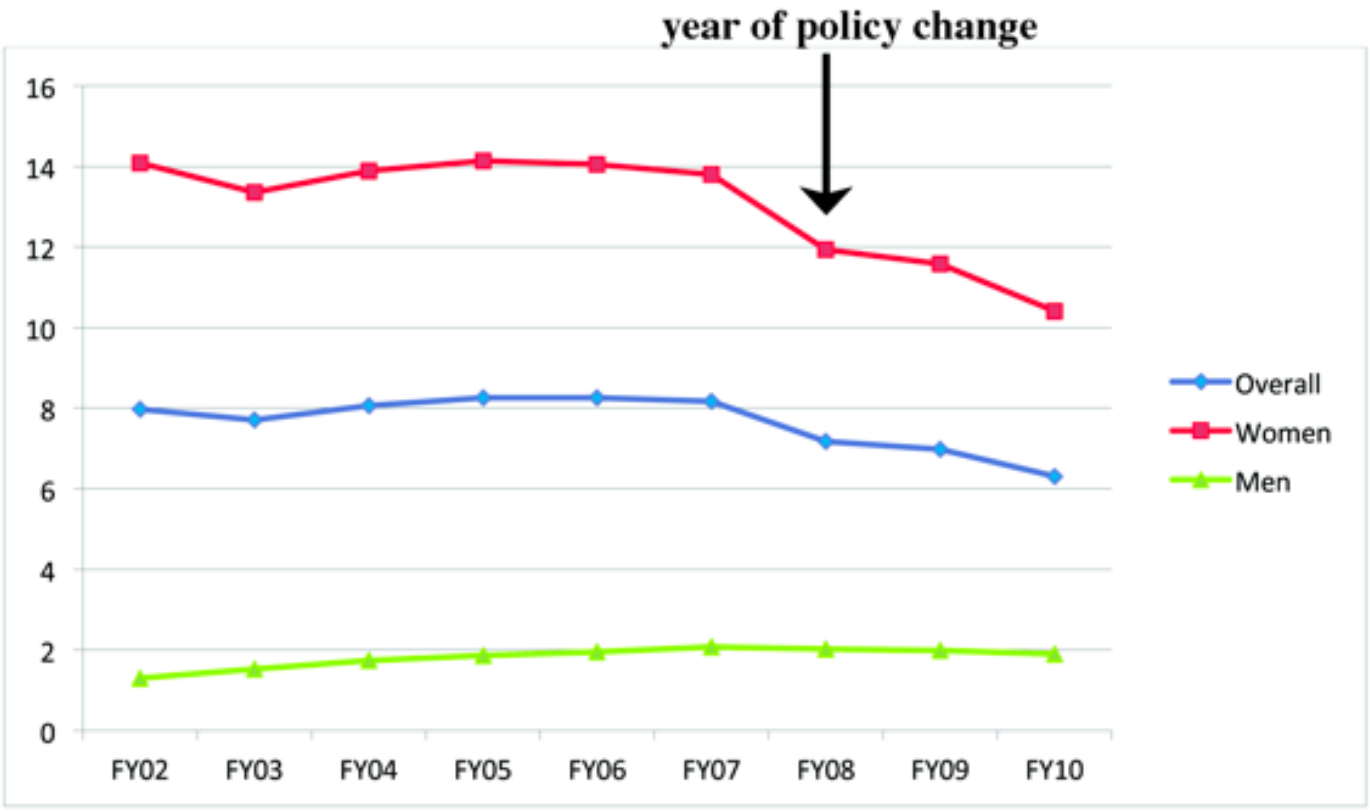

Figure 2: Percent of older women and men age 68 to 70 years, who previously had not been tested, that received a DXA test, 2002/03 to 2010/11 in Ontario, Canada

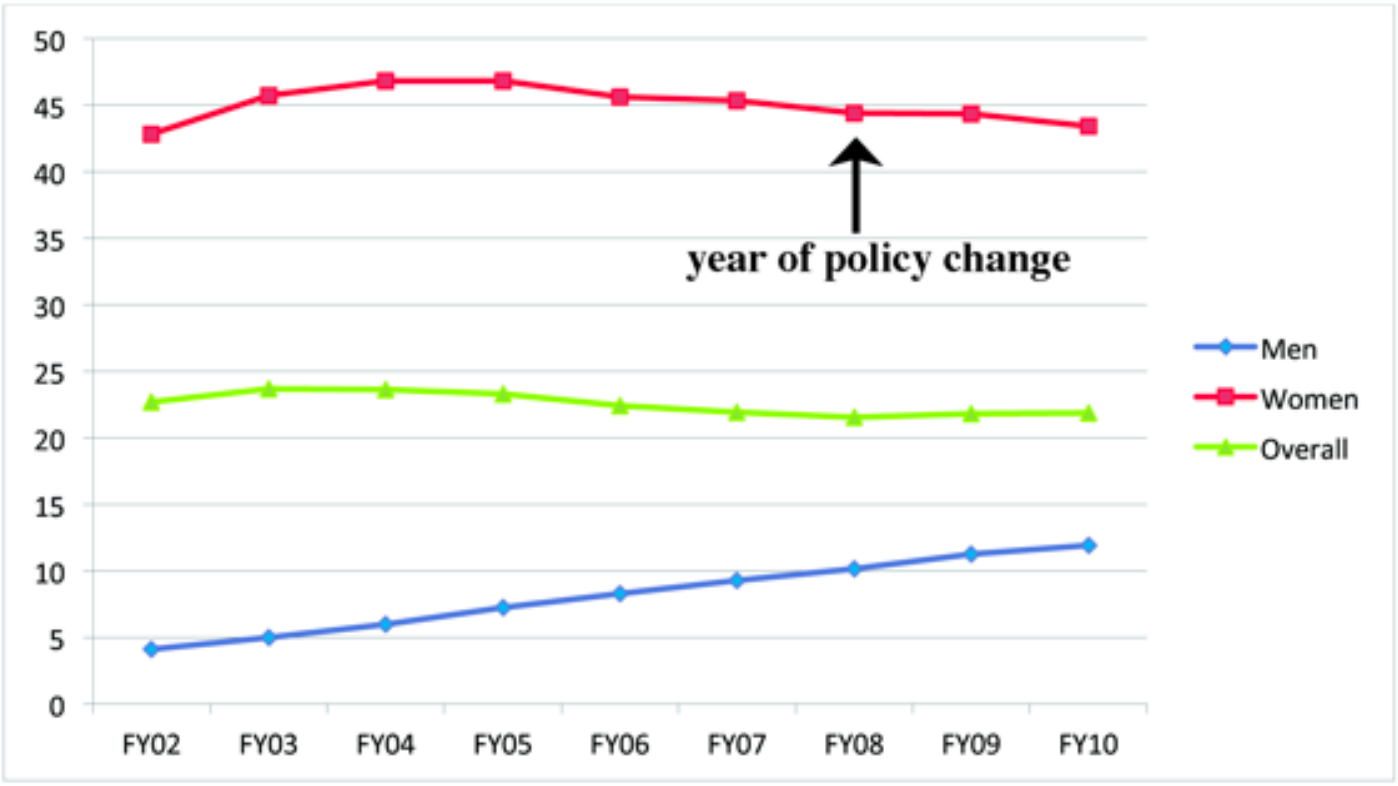

Figure 3: Age-standardized rate (per 100), adults 40 and older, who received a DXA test in the 6 months following a fracture, 2002/03 to 2009/10 in Ontario

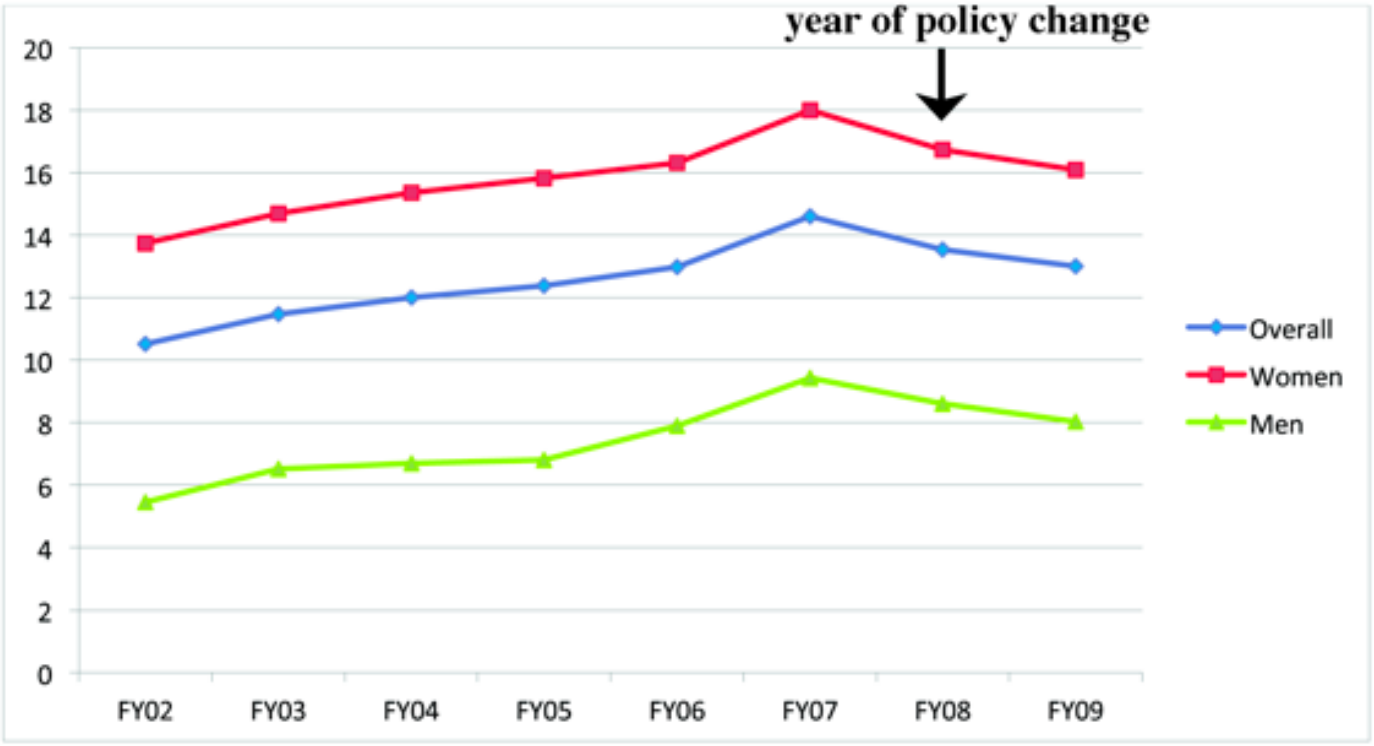

Figure 4: Overall, age-standardized rate (per 100) by fracture type, for adults 40 and older, who received a BMD test in the 6 months following a fracture, 2002/03 to 2009/10 in Ontario