

Ontario Osteoporosis Strategy -Provincial Performance Data for Osteoporosis Management

Technical Report

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Abbreviations

AHRQ	Applied Health Research Questions
BMD	Bone Mineral Densitometry
CAPE	Client Agency Program Enrolment
CCRS	Continuing Care Reporting System (chronic care)
CCRS-LTC	Continuing Care Reporting System – Long-Term Care
СІНІ	Canadian Institute for Health Information
CPDB	Corporate Provider Database
DAD	Discharge Abstract Database
DIN	Drug Identification Number
DXA	Dual-energy X-ray absorptionmetry
ED	Emergency Department
GAPP	Generic Alternative Payment Program
HCD	Home Care Database provided by the OACCAC
HCDMOH	Home Care Database provided by the MOHLTC
ICES	Institute for Clinical Evaluative Sciences
IPDB	ICES Physician Database (comprises information from the OHIP, CPDB and OPHRDC)
LHIN	Local Health Integration Network
LTC	Long Term Care
MNS	Master Numbering System database (maps the institution numbers found in many of
	the databases to the name and type of the institution)
MUHLIC	Ministry of Health and Long Term Care
NACKS	emergency department visits)
NRS	National Rehabilitation Reporting System
ODB	Ontario Drug Benefit database
OHIP	Ontario Health Insurance Plan Claims Database
OACCAC	Ontario Association of CCACs
OMHRS	Ontario Mental Health Reporting System
005	Ontario Osteoporosis Strategy
OPHRDC	Ontario Physician Human Resource Data Centre
RPDB	Registered Persons Database

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Executive Summary

The Ontario Ministry of Health and Long Term Care launched the Ontario Osteoporosis Strategy (OOS), a population-based initiative to improve quality of care for osteoporosis in Ontario, in 2005 and it became a Program in 2011.¹ The Ontario Osteoporosis Strategy represents the vision and coordinated efforts of many groups, including the Ministry of Health and Long-Term Care (MOHLTC), Osteoporosis Canada, health care and research professionals, and numerous other community-based stakeholders.

Ontario Osteoporosis Strategy Mandate²

To reduce morbidity, mortality and costs from osteoporosis fractures using a patient-centred, multidisciplinary approach that is integrated across health care sectors.

A number of performance indicators for osteoporosis management were developed to monitor the Ontario Osteoporosis Strategy from a health system perspective.³ For the purpose of this report, indicators using available administrative data are presented.⁴ Analyses were conducted by the Institute for Clinical Evaluative Sciences (ICES) as part of their Applied Health Research Questions (AHRQ) program.

Evaluation Objectives

- 1) To describe trends over time in fracture rates, bone mineral density (BMD) testing and osteoporosis treatment in Ontario since the launch of the Osteoporosis Program (2005/06 through 2014/15); and,
- 2) To provide data to inform and guide the direction and continued delivery of the Osteoporosis Program.

Report Overview

In this report, we present data on indicators for osteoporosis management and examine differences associated with sex, age, rural/urban residency, Local Health Integration Network (LHIN), and trends across time. The indicators focus on:

¹ Jaglal SB, Hawker GA, Cameron C, Canavan J, Beaton DE, Bogoch E, Jain R, Papaioannou A, ORMEW working group. The Ontario Osteoporosis Strategy: implementation of a population-based osteoporosis action plan in Canada. Osteoporos Int. 2010 Jun;21:903-8.

² Strategic Plan 2013-2016 Ontario Osteoporosis Strategy April 2013

³ Where appropriate, indicators and algorithms were aligned with other national and provincial initiatives on musculoskeletal disorders including: POWER; PHAC's Osteoporosis Surveillance Working Group, Canadian Chronic Disease Surveillance System; and, Pharmaco-Epidemiology Group, ICES

⁴ Data sources include: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan Claims database (OHIP); Ontario Drug Benefit database (ODB) (65 years and older); Registered Persons Database (RPDB); Continuing Care Reporting System LTC (CCRS-LTC); Continuing Care Reporting System (CCRS: chronic care); Corporate Provider Database, Home Care Database (OACCAC and MOH); ICES Physician Database; National Rehabilitation Reporting System (NRS)

- o Rates of fracture
- Trends in BMD testing in the population
- BMD testing in seniors
- BMD testing after a fracture
- \circ $\;$ Diagnosis or drug treatment in seniors following a fracture
- o Adherence to drug treatment in seniors
- $\circ \quad \text{Discharge destination after hip fracture}$
- Cost of hip fracture

This report should replace previous Ontario Osteoporosis Program Status Reports as the results may not be comparable to previous findings due to refinements to case definitions, updated DIN list of osteoporosis medications and treatment adherence definitions, the age categories used, and follow up time periods. The previous report focused on BMD testing and the impact of the OHIP policy change for BMD testing in 2008 and on fracture rates. The current report emphasizes fracture and osteoporosis management among seniors and variability in osteoporosis management by Local Health Integration Network.

Key Findings

Fractures

- The combined age-standardized rate of common osteoporotic type fractures (hip, wrist, shoulder, pelvis and spine) has remained stable over time.
- The standardized rate of hip fracture has decreased but the number of fractures increased, particularly among seniors 80+ years of age and older, as a result of the aging population.
- The overall number of other osteoporotic fractures including wrist, shoulder, pelvis and spine, are also increasing.
- There is no indication of any meaningful trend over time in rates of wrist and shoulder fractures. Rates of pelvis and spine fractures have increased. The increase in the rate of spine fractures may suggest better
- detection.
- Re-fracture rates remained stable but the number of refractures increased 19% between 2005/06 and 2011/12.

BMD Testing

- The overall rates of BMD testing decreased from 10.45/100 people in 2008/09 to 8.12/100 in 2014/15.
- The overall number of low risk tests has decreased 50% since 2008/09.⁵
- The overall number of high-risk tests has remained relatively stable since 2008/09.

A positive trend is that the overall rate of hip fracture has decreased which is the goal of the Ontario Osteoporosis Strategy.

Hip fracture rate in long term care has also been decreasing.

No change in refracture rate over time but highest in 80+ (20%)

The overall rate of BMD testing has decreased driven by a significant reduction in low risk BMD tests.

 $^{^{\}rm 5}$ The fee schedule for BMD testing changed April 1, 2008 .

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- The majority of BMD tests conducted were coded as high risk; high-risk tests represented 68% of all BMD tests conducted in 2014/15.
- 29% of individuals receiving a high risk BMD test in 2012/13 had another test within 2 years.
- The overall number of follow up BMD tests within 2 years decreased slightly from 77,747 tests in 2008/09 to 72,175 tests in 2010/11. The rate of BMD testing for those receiving drug treatment is about 1.5 times higher than for those not taking medication.
- The 2008/09 OHIP fee schedule change initially had a negative impact on the testing rate among individuals who have experienced a fracture, who should be targeted for BMD testing. However, more recently rates have begun to rise again.

The 2008/09 OHIP fee schedule change initially had a negative impact on BMD testing rate among individuals who have had a fracture but more recently testing rates have started to rise in this population.

Fracture and Osteoporosis Management among Seniors

- Overall fracture rates increased dramatically with age (from 47/10,000 in 50-64 year olds to 329/10,000 in 80+ year olds in 2014/15).
- Between 2005/06 and 2014/15 there was a significant increase in the number of fractures in seniors 80 years and older (ranging from an increase of 9% for hip to 79% for spine).
- The highest re-fracture rate is in individuals 80 years of age and older.
- When an individual turns 65 years of age, they are reclassified from low to moderate fracture risk category. Canadian guidelines for osteoporosis recommend they should receive a baseline BMD test. There is a low rate of BMD testing in this population across LHINs (in 2014/15 only 13% of

There continues to be an increase in the number of fractures in seniors 80+ due to the aging population.

72% of seniors who had a hip fracture were neither investigated nor treated for osteoporosis.

- men and 28% of women aged 68-70 had been tested in the past 5 years).
- 72% of seniors who experienced a hip fracture in 2013/14 were neither investigated nor treated for osteoporosis within 6 months of their fracture.

Hip Fracture - Long Term Care (LTC) and Community Populations LTC

- Rates and numbers of <u>hip</u> fractures among those living in LTC decreased between 2005/06 and 2014/15.
- Rates of <u>any</u> fracture among those living in LTC also decreased and the number of fracture remained stable.

<u>Community</u>

- The rate of <u>hip</u> fracture in the community fell between 2005/06 to 2014/15; however the number of hip fractures per year increased from 6,938 to 8,441.
- The rate and number of <u>any</u> fracture in the community both increased between 2005/06 and 2014/15.

Cost of Hip Fracture

• The estimated annual total cost of treatment for a hip fracture in 2013/14 (for all adults 66+) was \$264,000,000. The median cost per episode of care was \$23,677.

• The impact of hip fractures is also significant when comparing estimated costs one-year pre-hip fracture (\$197,000,000) to one-year post-hip fracture (\$352,000,000) for a difference of approximately \$155,000,000.

• Costs were highest in the 80+ age group due to high numbers of hip fracture.

Local Health Integration Networks

- In 2014/15, there was a twofold difference in the age-standardized rate of BMD testing between the LHIN with the higest rate (10.9/100 Toronto Central) and the LHIN with the lowest rate (4.6/100 North West).
- In 2014/15, there was a three-fold difference between high and low rates for standardized BMD testing following a hip fracture (low of 11.9 in Erie St. Clair; high of 38.6 in Toronto Central) and a more than a two-fold difference in standardized testing rates following a wrist fracture (low of 15.1 Erie St. Clair to high of 33.4 Toronto Central).

There is significant variation between LHINs in terms of standardized fracture rates, BMD testing rates, and follow-up after fracture.

- There is more LHIN variation in LTC fracture rates than in community rates.
- There is large LHIN variation in discharge destination following hip fracture. The proportion discharged to inpatient rehabilitation ranged from 14% in the North East LHIN to 55% in the Toronto Central LHIN in 2014/15. This may reflect differences in the availability of rehabilitation beds. Evidence-based guidelines (NICE 2010, SIGN 2009) recommend that patients receive rehabilitation following a hip fracture.
- Rates of new admissions to LTC following a hip fracture varied from 2.6% in the Toronto Central LHIN to 13% in North Simcoe Muskoka in 2014/15.
- There is little variation among the LHINs with respect to the percentage of people already living in LTC who returned to LTC following a hip fracture.

The treatment of hip fracture results in a significant cost to the health care system, approximately \$300,000,000/year

Section 1: Trends in Fracture Rates and Numbers

Indicator: Age-standardized fracture rate (per 10,000) in adults, aged 50 years and older, overall and by fracture type for fractures probably due to osteoporosis (hip; wrist or forearm; ribs, sternum, thoracic or lumbar spine; shoulder or upper arm; and pelvis) (see Appendix A).

Overall Fracture Rates

- There is no evidence of change over time in overall age-standardized rates of fracture (see Figure 1).
- Rates are approximately two times higher in women than men.
- Overall fracture rate was significantly higher in rural versus urban settings in some years (05/06, 06/07, 11/12, 12/13, 14/15).

No change in overall agestandardized fracture rates over time

• Overall fracture rate increases dramatically with age (e.g. from 47/10,000 in 50-64 year olds to 329/10,000 in 80+ year olds in 2014/15.

Figure 1: Age-standardized fracture rates (per 10,000) in adults aged 50 and older, overall and by sex, in Ontario, 2005/06 to 2014/15



Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

Rates and Numbers By Fracture Type

- *Hip* There has been a decrease in the standardized rate of hip fracture for both sexes however, the number of hip fractures is increasing from 7,725 in 2005/06 to 8,242 in 2014/15.
- *Wrist* Rates of wrist fracture are high (wrist fractures are the most common fracture, with 18,353

Rates of hip fracture have decreased but numbers are increasing particularly in the 80+ age group

in 2014/15). There is no indication of any meaningful trend over time in rates overall or by sex for wrist fractures. See Figure 2 and Table 1.

- *Pelvis* Rates increased from 13.5/10,000 in 2005/06 to 16.6 in 2014/15. Numbers also increased from 5,107 in 205/06 to 8,245 in 2014/15.
- *Spine* The rate of spine fractures increased appreciably between 2005/6 and 2014/15 which may suggest better detection.
- *Shoulder* There is no meaningful trend in rate of shoulder fractures. Numbers are increasing.

Figure 2: Age-standardized rate (per 10,000) by fracture type, in adults aged 50 and older, in Ontario, 2005/06 to 2014/15



Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

Table 1: Number of fractures by fracture type among adults aged <u>50 and older</u>,2009/10 to 2014/15

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Wrist	15,574	16,704	16,802	17,148	19,301	18,353
Hip	7,758	7,601	7,600	8,103	8,501	8,242
Shoulder	6,919	7,269	7,455	7,595	8,483	8,225
Pelvis	6,137	6,685	7,215	7,351	8,080	8,245
Spine	5,453	6,026	6,487	6,704	7,345	7,592

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

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Overall numbers of hip, wrist, shoulder, pelvis and spine fractures increased • Between 2005/06 and 2014/15 there was a large increase in the number of fractures in seniors 80 years and older (ranging from a 9% increase in the number of hip fractures to a 79% increase in the number of spinal fractures) (see Figure 3).

Figure 3: Percent increase in number of fractures, by fracture type, overall and by sex, adults <u>80 years of age and older</u> between 2005/06 to 2014/15



Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

Table 2: Overall crude fracture rate (per 10,000), in adults aged 50 and older, in Ontario, 2005/06 to 2014/15

Year	50-64	65-79	80+	80+ (n)	80+ (%)*
2005/06	48.2	104.7	328.3	13,793	38
2006/07	47.7	101.3	325.2	14,358	38
2007/08	53.8	107.7	325.1	14,896	37
2008/09	53.2	105.7	328.8	15,431	37
2009/10	49.6	101.5	324.1	15,673	38
2010/11	51.4	102.5	320.3	16,463	38
2011/12	50.8	101.7	323.0	17,183	39
2012/13	50.6	99.9	327.9	17,623	38
2013/14	57.1	105.5	339.1	18,812	37
2014/15	52.0	100.5	329.3	18,871	38

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

*Percent of all fractures that are in those 80+

Year	50-64	65-79	80+	80+ (n)	80+ (%)*
2005/06	2.6	19.1	116.0	4,873	63
2006/07	2.5	17.5	109.9	4,850	64
2007/08	2.8	18.8	108.1	4,955	63
2008/09	2.7	16.6	107.9	5,062	65
2009/10	2.7	16.2	103.8	5,018	65
2010/11	2.5	15.1	96.5	4,960	65
2011/12	2.5	14.6	92.7	4,931	65
2012/13	2.6	14.3	98.8	5,309	66
2013/14	2.9	15.0	97.8	5,427	64
2014/15	2.7	13.6	92.9	5,324	65

Table 3: Crude rate of <u>hip</u> fractures (per 10,000), in adults aged 50 and older, in Ontario, 2005/06 to 2014/15

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP) *Percent of all fractures that are in those 80+

*Percent of all fractures that are in those 80+

Table 4: Crude rate of <u>wrist</u> fractures (per 10,000), in adults aged 50 and older, in Ontario, 2005/06 to 2014/15

,	,				
Year	50-64	65-79	80+	80+ (n)	80+ (%)*
2005/06	29.5	41.6	67.6	2,841	20
2006/07	28.8	39.8	65.2	2,877	20
2007/08	33.3	44.3	67.8	3,107	19
2008/09	33.1	42.9	65.7	3,081	19
2009/10	29.8	39.9	63.5	3,073	20
2010/11	30.9	40.8	64.6	3,321	20
2011/12	30.1	39.6	63.8	3,394	20
2012/13	30.0	38.7	62.9	3,378	20
2013/14	34.1	41.4	63.6	3,525	18
2014/15	30.2	39	63	3.607	20

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP) *Percent of all fractures that are in those 80+

Re-Fracture Rate within 3 Years

Indicator: The proportion of adults aged 50 and older who have a fracture and then a subsequent fracture within 3 years.⁶

- Refracture rates remained stable but because the number of fractures increased, so did the number of refractures. The number of refractures increased by 19% from 2005/06 (n=4586) to 2011/12 (n=5,443).
- There is no significant difference in rate by income quintile or by urban/rural residency.

⁶ If a person had more than one fracture during a given fiscal year they are included in the denominator more than once.

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- Men have a lower re-fracture rate than women (14.1% in men versus 16.2% in women in 2011/12).
- The highest re-fracture rate occurred in individuals 80 years of age and older (12.7% in 50-64 year olds; 15.2% in 65-79 year olds; 20.3% in 80+ year olds in 2011/12) (see Table 5).

Table 5: Age-standardized rate (per 100) of adults, 50 years and older, who have a fracture and then a second fracture within 3 years, in Ontario, 2005/06 to 20011/12

Year	Rate (per 100)					
	50-64 years	65-79 years	80+ years (n)			
FY05	13.8	15.0	20.2 (1611)			
FY06	12.8	14.9	19.6 (1603)			
FY07	13.5	14.3	19.2 (1651)			
FY08	13.2	15.1	20.0 (1777)			
FY09	12.6	15.1	20.1 (1828)			
FY10	12.7	15.3	19.9 (1893)			
FY11	12.7	15.2	20.3 (2002)			

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

Section 2: Trends in BMD Testing

Indicator: Rate of BMD testing in adults, aged 50 years and older, overall and by type of test (baseline, low risk, high risk)

BMD Testing Overall

- The number of BMD tests dropped significantly following the fee schedule change in 2008/09 but started to increase in 2013/14 and 2014/15 (see Figure 4).
- The overall rate decreased from 10.45/100 in 2008/09 to 8.12/100 in 2014/15.
- There is a twofold difference in the age-standardized BMD testing rate between the LHINs with the highest (10.9/100 Central LHIN) and lowest (4.6/100 North West LHIN) testing rates in 2014/15.
- The majority of BMD tests were provided to women (12.7 tests/100 women, 3.0 tests/100 men in 2014/15).

Figure 4: Overall number of bone mineral density (BMD) tests among adults 50 years and older, in Ontario, 2008/09 to 2014/15



Data Sources: Ontario Health Insurance Plan (OHIP)

BMD Testing by Type of Test

Table 6: Overall Number and Rate (per 100) by type of BMD test (based on OHIP definition⁷) among adults 50+ years in Ontario, 2008/09 to 2014/15

Year	Baseline		Low Risk		High Risk		Total BMD tests
	Number	Rate/100	Number	Rate/100	Number	Rate/100	Number
2008/09	53,606	1.3	103,361	2.6	263,374	6.5	420,341
2009/10	58,459	1.4	98,561	2.4	265,787	6.4	422,807
2010/11	65,921	1.5	69,303	1.6	266,879	6.2	402,103
2011/12	67,030	1.5	48,915	1.1	270,012	6.0	385,957
2012/13	61,412	1.3	44,151	0.9	254,961	5.5	360,524
2013/14	68,256	1.4	45,605	1.0	266,293	5.5	380,154
2014/15	74,076	1.5	51,835	1.1	272,822	5.5	398,733

Data Sources: Ontario Health Insurance Plan (OHIP)

- The overall number of low risk tests has decreased 50% since 2008/09 (see Table 6).
- The overall number of high risk tests has remained relatively stable since 2008/09.
- The majority of BMD tests conducted are coded as high risk; high risk tests represent 68% of all BMD tests conducted in 2014/15.

The OHIP fee schedule change in 2008/09 successfully reduced low risk testing.

The majority of tests are coded as high risk (68% in 2014/15)

BMD Testing in Eligible Seniors

Indicator: Rate (per 100) of 'eligible' seniors (aged 68 to 70) who had a BMD test ('eligible' = seniors 68 to 70 who had not had a BMD test in the five years leading up to their 65th birthday)⁸

- When an individual turns 65 years of age, they are moved from a low to a moderate fracture risk category. Canadian guidelines for osteoporosis recommend they should receive a baseline BMD test.
- The overall BMD testing rate in this population has remained relatively stable over time (see Figure 5).
- BMD testing has been steadily increasing among eligible senior men (7% in 2005/06 to 13% in 2014/15) although rates of testing remain low.

There is a low rate of BMD testing in eligible seniors across all LHINs

⁷ 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. Low risk BMD tests (i.e. patient is not a high risk patient) are limited to once every 36 months. High-risk tests (e.g. at risk for accelerated bone loss, with diagnosed osteopenia or osteoporosis or with bone loss in excess of 1% per year based on previous BMD testing) are limited to one test every 12 months unless prior authorization is obtained

⁽http://www.health.gov.on.ca/english/providers/program/ohip/bulletins/4000/bul4470a.pdf accessed June 21, 2010) ⁸ Percent of people aged 68-70 at the start of each fiscal year who had not been tested in the five years leading up to their 65th birthday. For this cohort (i.e., those who had not been tested) we looked to see if they had been tested by the time they turned age 68-70.

- BMD testing in senior women decreased from 47% in 2005/06 to 38% in 2014/15.
- 87% of 'eligible' senior men and 62% of senior women remained untested in 2014/15.
- All LHINs had low testing rates in this population.

Figure 5: Percent of eligible seniors (68 to 70), who previously had not been tested, that received a BMD test, 2005/06 to 2014/15 in Ontario



Data Sources: Ontario Health Insurance Plan (OHIP)





Data Source: Ontario Health Insurance Plan (OHIP)

Repeat BMD Testing following a High Risk Test

Indicator: Rate (per 100) of BMD testing among adults 50 years and older who have a high-risk BMD test followed by a second test within 24 months. The analysis was repeated, limiting it to individuals aged 66 years or older at the time of their test, in order to stratify people based on whether they had filled a prescription for an osteoporosis medication in the year prior to the BMD test.

Adults 50 years and older

- Overall 29% of those with a high-risk test received another test within 2 years (2012/13).
- Women have significantly higher rates of follow-up.
- The overall number of follow up BMD tests within 2 years decreased slightly from 77,747 tests in 2008/09 to 72,175 tests in 2010/11
- Since 2009/10, the highest follow-up rate for men occurred in the in the 50-59 age group.
- Since 2008/09, the highest follow-up rate for women occurred in the 70-79 age group.
- There is variation by LHIN with the highest rates of follow up testing in Hamilton Niagara Haldimand Brant, Central West, Mississauga Halton, Toronto Central and Central LHINs.

Adults 66 years and older (including data on osteoporosis treatment)

- 38% of individuals taking osteoporosis medication received a follow up test within 2 years (2012/13).
- The rate of BMD testing for those on treatment is about 1.5 times higher than for those not on treatment (see Table 7).

Table 7: Overall rate (per 100) of BMD testing for adults 66 years or older within 2 years of a high-risk BMD in Ontario, 2008/09 to 2012/13

Year	Follow-up BMD testing rate <u>not</u> on treatment (rate per 100)	Follow-up BMD testing rate on treatment (rate per 100)
2008/09	23.2	38.7
2009/10	22.9	38.8
2010/11	22.0	37.1
2011/12	22.2	36.6
2012/13	24.3	37.7

Data Source: Ontario Health Insurance Plan (OHIP)

BMD Testing Following Fracture

Indicator: Proportion of adults, aged 50 years and older, who had a fracture that is possibly due to osteoporosis and received a BMD test within 12 months of their fracture, overall and by fracture type.⁹

⁹ Individuals were excluded if they had a BMD test in the 12 months before their fracture. It is appropriate for some fracture patients to be prescribed osteoporosis medications in the absence of a BMD test based on type of fracture (e.g. hip) and other risk factors (e.g. age).

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- Individuals who experienced a fracture should receive a BMD test. The 2008/09 OHIP fee schedule change initially had a negative impact on the testing rate among these individuals who have experienced a fracture but more recently testing rates have started to rise (see Figure 6).¹⁰
- The highest BMD testing rate following fracture is in the 60-69 age group across all fracture types.
- The older age groups (80+) have consistently lower rates.
- Age standardized rates are highest in the wrist and lowest in the pelvis and hip. Rates for BMD after hip fracture get worse with age.
- There was a more than a two-fold difference in 2014/15 between the lowest and highest standardized BMD testing rates following fracture by LHIN (rates ranged from 14.5% in the South East LHIN to 31.7% in the Waterloo Wellington LHIN).
- The majority of BMD tests in this fracture population were coded as high risk, which is appropriate.

Figure 7: Age-standardized rate (per 100), adults 50 and older, who received a BMD test in the <u>12 months</u> following any fracture, 2005/06 to 2013/14 in Ontario



Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

¹⁰ If individual was already on treatment before the fracture, a new BMD test may not be ordered.

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Figure 8: Age-standardized rate (per 100), adults 50 and older, who received a BMD test in the <u>12 months</u> following a <u>hip</u> fracture, 2005/06 to 2013/14 in Ontario

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

• Overall rates of BMD testing following hip fracture dropped after the OHIP policy change in 2008 but have increased since 2011/12.



Figure 9: Age-standardized rate (per 100), adults 50 and older, who received a BMD test in the <u>12 months</u> following a <u>wrist</u> fracture, 2005/06 to 2013/14 in Ontario

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP)

- BMD rates following wrist fracture dropped after the OHIP policy change in 2008 but have increased 2011/12.
- There is significant variation by LHIN, with a three-fold difference between highest and lowest rates for standardized BMD testing following a hip fracture (from a low of 11.9% in the Erie St. Clair LHIN to a high of 38.6% in the Toronto Central LHIN, 2014/15) and a more than a two-fold difference in the standardized testing rates following a wrist fracture (from a low of 15.1% in the Erie St. Clair LHIN to a high of 33.4% in the Toronto Central LHIN, 2014/15).

Section 3: Follow up and Treatment after Fracture in Seniors

Indicator: Rates (per 100) of identification (using BMD testing) and/or treatment (medication) of osteoporosis in adults age 66 and older who have had a hip or wrist fracture and were not already taking osteoporosis medication¹¹, in the 6 months following their fracture. Data show the percentage of fractures that were not followed by either a BMD test or a prescription for osteoporosis medication (i.e., no BMD, no drug).

BMD Testing and Treatment Following Hip Fracture

- 71.6% of this high risk population were not investigated or treated for osteoporosis within 6 months of their hip fracture (2013/14) (see Figure 10).
- 74.4% of adults 85 years and older were neither investigated nor treated 6 months after a hip fracture in 2013/14.

Figure 10: Percent of adults 66 and older, who <u>did not receive a BMD test OR treatment</u> in the 6 months following a hip fracture, 2005/06 to 2013/14 in Ontario



Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP), Ontario Drug Benefit Program (ODB)

¹¹ Seniors are excluded if they had already received a BMD test within 12 months of their fracture or were already taking medication. People need to be at least 66 years old when they have their fracture, because we needed a one-year look-back period to see if they were already taking prescription medication for osteoporosis.

BMD Testing and Treatment Following Wrist Fracture

30

20

10

0

FY05

FY06

FY07

FY08

FY09

• 75.1% of this high risk population were not investigated or treated for osteoporosis within 6 months of their wrist fracture (2013/14).



Figure 11: Percent of adults 66 and older, who <u>did not receive a BMD test OR treatment</u> in the 6 months following a wrist fracture in Ontario, 2005/06 to 2013/14

FY10

FY11

FY12

FY13

BMD Testing and Treatment Following <u>Hip</u> Fracture for Adults 66+ by Location of Residence

Indicator: Hip fracture outcomes for adults 66 years and older at the time of the fracture¹² stratified by 3 cohorts: (1) in LTC or chronic care both prior to and after their hip fracture; (2) in community at time of fracture and discharged to LTC; and, (3) in community before and after hip fracture

• Treatment outcome – proportion not treated (osteoporosis medication) or tested (BMD test) within 6 months after discharge

Overall

Data Sources: Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD); National Ambulatory Care Reporting System (NACRS); Ontario Health Insurance Plan (OHIP), Ontario Drug Benefit Program (ODB)

¹² Individuals were included if they lived for at least 7 days after discharge so that their discharge destination could be determined. Individuals were excluded if they filled a prescription for an osteoporosis medication during the one-year period prior to admission or if they did not live for 6 months after discharge.

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Figure 12: Percent of hip fracture patients aged 66 and older who were <u>neither tested nor</u> <u>treated</u> within 6 months after discharge, by discharge destination, 2005/06 to 2013/14

Data sources: Discharge Abstract Database (DAD), National Ambulatory Care Reporting System database (NACRS), Ontario Health Insurance Plan Claims database (OHIP), Registered Persons Database, Ontario Drug Benefit Plan Database, Continuing Care Reporting System

Section 4: Treatment Persistence

Indicator: Rate (per 100) of adults, 66 years and older, in each fiscal year, who were initiated on pharmacological treatment for osteoporosis during the year and were still taking their medication 1 year later^{13,14}

- In 2014/15, there were 2,138,776 people living in Ontario who are over the age of 65. Of these 14.9% were on treatment (i.e., filled at least one prescription for an osteoporosis medication). Of this subgroup, 11.7% filled a new prescription (they had not filled a prescription during the previous year) and were included in this analysis.
- There is no difference in persistence by age (see Figure 13) or sex.
- The overall number of individuals 66+ getting new prescriptions decreased each year (27,313 in 2005/06 to 19,632 in 2014/15).
- In 2010 treatment adherence was below 50% however, this has now increased and remains consistent at about 50%.

Figure 13: Crude rates (per 100), adults 66 and older who filled a new prescription in a fiscal year and were still on treatment one year after filling their first prescription, 2005/06 to 2014/15 in Ontario



Data Source: Ontario Drug Benefit Program (ODB)

¹³ Some OP medications are taken only once a week, once a month or once per year (for this drug once they take it once they are automatically considered to be on the drug for a full year). Adjustments have been made in the programming to account for these different dosing patterns.

¹⁴ People were examined if they filled a new prescription at any time during a given fiscal year. The first prescription filled during the year was called the 'index prescription' and it was said to be 'new' if the person had not filled a prescription for any of the osteoporosis medications in the year prior to the index date. People were followed for one year past the index date to see if they persisted in filling prescriptions for the next year. Look back period is 12 months prior to index date.

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Section 5: Hip Fracture and Long-Term Care

Indicator: Hip fracture outcomes for adults 66 years and older at the time of the fracture, stratified into 2 cohorts: (1) in LTC or chronic care prior to their hip fracture; (2) living in the community at the time of fracture

- Fracture rates, stratified by place of residence prior to the fracture
- Discharge destination after hip fracture, stratified by place of residence prior to the fracture

Fracture Rates in LTC and Community

- Hip fracture rates decreased from 2.3% in 2005/06 to 1.9% among those living in LTC and remained relatively stable in the community 2014/15 (see Figure 14 and Table 8).
- Rates of any fracture decreased from 4% in 2005/06 to 3.6% in LTC in 2014/15 (see Table 8).

Figure 14: <u>Hip</u> Fracture rates (per 10,000) in Ontario LTC and Community 66+, 2005/06 to 2013/14



Data Source: Ontario Health Insurance Plan (OHIP), CIHI Discharge Abstract Database (DAD), National Ambulatory Care Reporting System database (NACRS), Continuing Care Reporting System, Ontario Drug Database

LTC (see Table 8)

- Rates and number of hip fracture in LTC decreased between 2005/06 and 2014/15.
- Rates of <u>any</u> fracture in LTC also decreased and numbers of any fracture have remained stable.

Community (see Table 8)

- The rate of <u>hip</u> fractures among older adults living in the community fell between 2005/06 to 2014/15; however the number of hip fractures increased from 6,938 to 8,441.
- The rate and number of <u>any</u> fracture among older adults living in the community both increased between 2005/06 and 2014/15.

	Any Fr	acture	Hip Fracture					
Year	Community	LTC	Community	LTC				
	Rate (#)	Rate (#)	Rate (#)	Rate (#)				
2005/06	160.0 (22,267)	394.8 (2567)	49.9 (6938)	227.3 (1478)				
2006/07	158.3 (22,560)	393.1 (2632)	49.6 (7069)	226.1 (1514)				
2007/08	164.3 (23,880)	394.6 (2711)	49.7 (7227)	225.9 (1552)				
2008/09	164.6 (24,399)	396.6 (2750)	48.8 (7225)	217.5 (1508)				
2009/10	161.3 (24,450)	380.6 (2661)	48.3 (7330)	208.7 (1459)				
2010/11	162.2 (25,656)	381.6 (2714)	47.4 (7491)	202.8 (1442)				
2011/12	162.9 (26,482)	373.7 (2637)	46.6 (7568)	199.1 (1405)				
2012/13	162.9 (27,235)	362.5 (2572)	47.6 (7965)	193.9 (1376)				
2013/14	169.6 (29,751)	367.4 (2613)	48.9 (8571)	195.3 (1389)				
2014/15	162.4 (29,812)	354.9 (2558)	46.0 (8441)	185.6 (1338)				

Table 8: Fracture rate (per 10,000) and number for adults 66 years or older by residence(either community or LTC) in Ontario, 2005/06 to 2014/15

Data Source: Ontario Health Insurance Plan (OHIP), CIHI Discharge Abstract Database (DAD), National Ambulatory Care Reporting System database (NACRS), Continuing Care Reporting System

- The increase in <u>hip</u> fracture numbers that are evident in the overall provincial data are likely the result of fractures occurring in seniors living in the community.
- The number of <u>any</u> fracture has increased in the community but not in LTC.
- There is more LHIN-to-LHIN variation in LTC fracture rates than in fracture rates for older adults living in the community.

Discharge Destination following Hip Fracture ¹⁵

- There is large LHIN-to-LHIN variation in discharge destination following a hip fracture. The proportion going into inpatient rehabilitation varied from 14% in the North East LHIN to 55% in the Toronto Central LHIN. Complex Continuing Care (CCC) admissions ranged from 7% in the North West LHIN to 24% in the Hamilton Niagara Haldimand Brant LHIN. This may be due to differences in the availability of rehabilitation beds by LHIN. Evidence-based guidelines (NICE 2010, SIGN 2009)^{16,17}recommend that patients receive rehabilitation following a hip fracture.
- New LTC admission rates (i.e., admissions to LTC for those who were not already living in LTC at the time of their fracture) following a hip fracture varied from 2.6% among residents of the Toronto Central LHIN to 13% in North Simcoe Muskoka.
- There is little variation among the LHINs with respect to the percentage of older adults living in LTC at the time of their fracture who returned to LTC following their hip fracture.

¹⁵ LHIN is based on patient's location of residence

¹⁶ https://www.nice.org.uk/guidance/conditions-and-diseases/diabetes-and-other-endocrinal--nutritional-andmetabolic-conditions/osteoporosis

¹⁷ <u>https://www.guidelines.co.uk/sign/osteoporosis</u>

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Section 6: Cost of Hip Fracture¹⁸

- The impact of hip fractures on health system utilization and cost is significant.
- The total cost of treatment for all hip fractures occurring in 2013/14 (in adults aged 66+) was estimated to be \$263,910,860. The median cost per single episode of care was \$23,677.
- The impact of hip fractures is also significant if total costs incurred one-year pre-fracture (\$196,777,214) are compared with total costs incurred one year post-fracture (\$352,300,811) a difference of \$155,523,597 which is expected to be largely due to the impact of the hip fracture.
- Costs were highest in the 80+ age group because of the higher numbers of hip fracture in that age group.

Table 9: Cost estimates associated with hip fractures in adults 66 years or olderin Ontario, 2013/14

	1 Year Prior		Cost of Treatment		1 Year Post Discharge		Post-Pre Change	
Age	Cost	Median	Cost	Median	Cost	Median	Cost	Median
66-79	\$54,011,201	\$5,298	\$72,839,372	\$21,416	\$84,249,689	\$13,701	\$30,238,488	\$3,286
80+	\$142,766,013	\$8,349	\$191,071,487	\$24,588	\$268,051,122	\$30,445	\$125,285,109	\$10,142
Overall	\$196,777,214	\$7,288	\$263,910,860	\$23,677	\$352,300,811	\$24,889	\$155,523,597	\$7,230

Data Source: Ontario Health Insurance Plan (OHIP), CIHI Discharge Abstract Database (DAD), National Ambulatory Care Reporting System database (NACRS), Registered Persons Database, Ontario Drug Benefit Plan Database, Client Agency Program Enrolment (CAPE) database, National Rehabilitation Reporting System (NRS) database

¹⁸ Study population was individuals aged 66 years or older at the time of their hip fracture who were discharged from their hip fracture episode of care (including inpatient rehabilitation, if any) between April 1, 2013 and March 31, 2014. Only the first hip fracture was included for those who had more than one hip fracture. Total costs were calculated for the hip fracture episode of care, and for the 1-year period prior to admission and the 1-year period after discharge.

Section 7: Local Health Integration Network (LHIN) Data

Local Health Integration Network (LHIN)	Overall standardized fracture rates (per 10,000) aged 50+ years (2014/15) ¹⁹	Standardized Hip fracture rates (per 10,000) aged 50+ years (2014/15) ¹⁷	Percent of eligible seniors, aged 68-70 years, who <u>did</u> <u>not</u> receive a BMD test (2014/15) ²⁰	Percent of adults 50+ who <u>did not</u> receive a BMD test in the 12 months following a fracture (2014/15) ²¹	Percent of BMD testing, aged 50+ years, within 24 months of a high risk BMD test (2012/13) ¹⁸	Percent of adults 66+ years who <u>did not</u> have either a BMD test OR treatment in the 6 months following a fracture (2013/14) ¹⁹	Percent of adults 66+ years who <u>did not</u> receive a BMD test OR treatment in the 6 months following a <u>hip</u> <u>fracture</u> (2013/14) ¹⁹
Erie St. Clair	102.87	20.94*	83.56*	84.72*	23.17*	81.13*	74.3
South West	107.8*	21.58*	81.85*	81.24*	21.13*	78.63*	81.8*
Waterloo Wellington	97.85	18.75*	79.24	68.31*	24.43*	64.75*	56.4*
Hamilton Niagara Haldimand Brant	112*	17.23	79.05	79.67	35.49*	73.23	70.8
Central West	82.93*	13.38*	79.44	79.16	32.66*	72.45	69.2
Mississauga Halton	92.6*	12.97*	79.54	78.39	32.67*	70.09	58.1*
Toronto Central	101.12	16.65	80.01	69.20	31.87*	67.12*	60.2*
Central	92.18*	14.12*	75.64*	74.04*	31.81*	70.24	63.5
Central East	93.26*	18.08*	77.69*	76.0	23.46*	74.03	71.3
South East	107.78*	18.57	77.25*	85.46*	28.47	79.52*	78.7
Champlain	109.26*	15.12*	77.22*	81.92*	18.62*	75.92	75.9
North Simcoe Muskoka	101.79	20.57*	78.91	76.66	26.68	73.29	72.4
North East	104.91*	14.48*	84.55*	80.17	20.25*	73.91	69.8
North West	114.63*	16.37	86.73*	83.04	23.92*	76.96	80.1
PROVINCIAL AVERAGE	99.6	16.56	79.4	78.1	28.8	73.63	71.60

Table 10: Indicator Data Presented by LHIN

Legend: Green = statistically better than average **Red = statistically worse than average** White = average

¹⁹ For more details see Section 1: Trends in Fracture Rates and Numbers (pages 9-13)

²⁰ For more details can Section 2. Trends in RMD Testing (nages 11.-20)

Overall standardized fracture rates (per 10,000 population) in adults aged 50 and older by Local Health Integration Network (LHIN), 2014/15



Standardized hip fracture rates (per 10,000), aged 50+ years, by Local Health Integration Network, in Ontario, 2014/15



Percent of eligible* seniors, aged 68-70 years, who <u>did not</u> receive a bone mineral density (BMD) test, by Local Health Integration Network, in Ontario, 2014/15



Percent of adults aged 50+ years, who <u>did not</u> receive a bone mineral density (BMD) test in the 12 months following a fracture by Local Health Integration Network, in Ontario, 2014/15



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Percent of bone mineral density (BMD) testing, aged 50+ years, within 24 months of a high-risk BMD test by Local Health Integration Network, in Ontario, 2012/13



Percent of adults 66+ years, who <u>did not</u> receive a bone mineral density (BMD) test OR treatment in the 6 months following a fracture by Local Health Integration Network, in Ontario, 2013/14



Percent of adults 66+ years, who <u>did not</u> receive a bone mineral density (BMD) test OR treatment in the 6 months following a <u>hip fracture</u> by Local Health Integration Network, in Ontario, 2013/14



Appendix A: Ontario Osteoporosis Strategy Performance Indicators and Definitions

Fracture Rates	Definition			
a) Fracture rates: Age-standardized fracture rate (per	Data sources: NACRS (ED visits and same day surgery),			
10,000) in adults, aged 50 years and older, overall and by	CIHI-DAD (inpatient), OHIP (physician claims), population			
fracture type for fractures probably due to osteoporosis	denominator databases (see below)			
• Hip				
Wrist or forearm	<i>Denominator:</i> from RPDB population files each year ¹			
 Ribs, sternum, thoracic or lumbar spine 				
Shoulder or upper arm	Numerator:			
Pelvis	Case definitions based on PHAC (see Table below)			
	If a person is seen more than once in a physician			
	office, the ED and/or hospital within 13 weeks (91			
	days) for the same type of fracture, we will assume			
	these are due to the same fracture (to avoid double			
	Counting)			
	OHIP record must be followed by at least one			
	additional OHIP record dated within 91 days of the			
	first record			
	 If someone has more than 1 fracture they will 			
	contribute more than once to the rate (i.e. If someone			
	has more than one event in which they break a bone,			
	the person is in the numerator more than once).			
	However, if someone has more than one fracture			
	treated at the same time, it is counted only once in the			
	overall rate but counted separately in the rates by			
	type of fracture.)			
b) Subsequent fracture: Proportion (per 100) of adults aged	Data sources: NACRS (ED visits and same day surgery),			
50 and older who have a fracture and then a subsequent	CIHI-DAD (inpatient), OHIP (physician claims), population			
fracture within 3 years	denominator databases (see below)			
	Denominator:			
	 Excluded anyone who did not live for the full 3 years 			
	after discharge from their index fracture:			
	 If someone had more than one fracture during a given 			
	fiscal year, they are included in the denominator more			
	than once			
	• Excluded anyone who became ineligible for OHIP in			
	the 3 years post index fracture			
	Numerator			
	People in the denominator who had another fracture			
	within 3 years after their discharge from their original			
	within 5 years after their discharge from their ofiginal			

¹ RPDB: everyone in this file has a valid IKN; valid sex; valid Ontario residence code; excluded those aged <50 and <105 on October 1 of the fiscal year; excluded individuals not eligible for OHIP coverage at any time during the fiscal year

	 fracture Look forward for a second fracture starts after discharge from the original episode of care If someone had more than one fracture recurrence following index fracture, only count one recurrence This indicator was measured only up to FY 2011/12 since 3 years of follow up data are required
Follow-up after Fracture	
Rates (per 100) of identification (receipt of a BMD test) and/or treatment (medication) of osteoporosis within 12 months of the fracture, in adults age 66 and older who have had a fracture and were not already taking osteoporosis medication. The indicator rate is expressed as no follow-up: the rate of fractures followed neither by identification (BMD) nor treatment (medication) This indicator is reported for individuals who had a hip fracture and for individuals who had a wrist fracture.	 Data sources: OHIP, ODB, CIHI-DAD, and NACRS Denominator - Excluded: People who were not at least 66 years old at the time of their admission fracture (noting that the fracture might have been treated in the ED or in a doctor's office) (due to the need for 1 year of look-back in the ODB database) Those who have already had a BMD test within 12 months before their fracture Those who filled a prescription for osteoporosis medication in the 12 months before their fracture People who died within 12 months after the fracture discharge Anyone who was already taking one of the nonosteoporosis drugs indicative of another bone disease in the year prior to their fracture Anyone whose final discharge date is > September 30, 2014 (not enough data for a one year follow-up) Only the first fracture for a person in a given fiscal year was included Numerator: Anyone aged 66 years and older at the time of their fracture, who <u>neither</u> had a bone mineral density test <u>nor</u> filled a prescription for one of the drugs used to treat osteoporosis, any time between the date of their fracture (the admission date for the fracture) and 12 months after discharge following their fracture.
BMD Testing	
<i>Trends in BMD testing:</i> Rate (per 100) of BMD testing in adults, aged 50 years and older, overall and by type of test (baseline, low risk, high risk)	 Data sources: OHIP Denominator: From the RPDB population files for each year (population denominator) Numerator: Everyone who received a BMD test during the year Each person is counted only once in a given year. If there is more than one OHIP record for the same person in the same year, they were classified

according to the highest risk that is indicated by their
tests (i.e. if they had a low risk and high risk test in the
same year they were classified based on the high risk
test).

BMD OHIP Fee Schedule^{23,24}

Baseline Test X145 - one site X146 - two or more sites

Second test - low risk patient X152 - one site X153 - two or more sites

Subsequent test - low risk patient X142 - one site X148 - two or more sites

Subsequent test - high risk patient X149 - one site X155 - two or more sites

Definition of Codes for Dual-energy X-ray Absorptiometry (DXA) Testing

- *Baseline:* one baseline test in person's lifetime
- *Low-risk:* a patient who is not a high risk patient limited to once every 36 months for first 'low risk' test and every 60 months for subsequent tests
- *High-risk:*
 - at risk for accelerated bone loss (in the absence of other risk factors, patient age is deemed not to place a patient at high risk for accelerated bone loss);
 - with osteopenia or osteoporosis on any previous BMD testing; or
 - with bone loss in excess of 1% per year (as demonstrated by previous BMD testing) are limited to one test every 12 months unless prior authorization is obtained

Current recommendations by the Ontario Health Technology Advisory Committee (OHTAC) do not support the need for low risk individuals to be tested more often than every three to five years after baseline and at later intervals of seven to ten years when previous testing has shown a rate of bone loss of less than 1%. High risk patients (determined by the

²³ Changes to the OHIP fee schedule that may have influenced testing rates and patterns:

⁽http://www.health.gov.on.ca/english/providers/program/ohip/bulletins/4000/bulletin_4000_mn.html accessed June 21, 2010):

a) As of October 1, 1999, BMD screening of low risk patients for osteoporosis, previously allowed annually, was limited to once in any 24-month period. High-risk patients continued to receive unrestricted access to medically necessary testing. (www.health.gov.on.ca/english/providers/program/ohip/bulletins/4000/bul4346.html accessed June 10, 2010) b) 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 once every 36 months. High-risk patients (of line in the fee code as 1. at risk for accelerated bone loss (in the absence of other risk factors, patient age is deemed not to place a patient at high risk for accelerated bone loss); 2. with osteopenia or osteoporosis on any previous BMD testing; or 3. with bone loss in excess of 1% per year as demonstrated by previous BMD testing) are limited to one test every 12 months unless prior authorization is obtained (http://www.health.gov.on.ca/english/providers/program/ohip/bulletins/4000/bul4470a.pdf accessed June 21, 2010)

physician) will continue to receive annual access. (http	://www.health.gov.on.ca/en/public/publications/ohip/bone.aspx)
BMD testing in 'eligible' seniors: Rate (per 100) of	Data sources: OHIP, RPDB, 2006 census
('eligible' = seniors 68 to 70) who had a BMD test ('eligible' = seniors 68 to 71 who had not had at least a baseline BMD test between the ages of 60 and 65)	Current OHIP guidelines allow people who are not at high risk to receive one BMD test each 3 years. When someone turns 65 they are moved from low to moderate risk for osteoporosis and should receive a baseline BMD if they have not already had one.
	The indicator examines people who are between the ages of 68 and 71 as of the "indicator" date and who have not already been tested between the ages of 60 and 65. These people should all have had a BMD test between the time they turned 65 and the "indicator" date.
	Denominator:
	 People who were between the ages of 68 and 71 on the "indicator date" (i.e. April 1 of the fiscal year) Denominator from RPDB for each year
	 Exclusions: Anyone who already had a BMD test between the date of their 60th birthday and one day before the date of their 65th birthday. These people already had at least one baseline test, and therefore do not necessarily require another test when they turn 65. Thus, the denominator is everyone who is aged 68-71 at the start of the fiscal year (April 1) and who should have had a BMD test after turning 65 (because they had not had one prior to turning 65).
	 Numerator: Everyone in the denominator who received a BMD test any time between the date of their 65th birthday and the start of the fiscal year in question.
	 Unless they die, a given person will appear in the analyses for up to 3 years: the year they are 68, the year they are 69, and the year they are 71. If they have a BMD test when they are 69, they will <i>not</i> be in the <u>denominator</u> when they are 68, but they will be in the denominator when they are 69 and again when they are 71.
BMD assessment within one year of fracture:	Data sources: OHIP, NACRS (ED visits and same day surgery),
Proportion of adults, aged 50 years and older, who	CIHI–DAD (inpatient), ODB
nave a fracture that is possibly due to osteoporosis and receive a BMD test within 12 months of their	Denominator:
fracture, overall, by fracture type and by type of BMD test (baseline, second, low risk, high risk)	A fracture during a given fiscal year. Use only the first fracture during the year for each person.
	Exclusions:
	• Exclude those who have already had a BMD test within 12

	months before their admission
	• Exclude those who died within 12 months after the fracture
	For 2013/14, we retained only those fractures with a final
	discharge date on or before September 30, 2014, due to
	unavailability of follow-up data for later fractures.
	b) One denominator for each fracture type (each year)
	1. Hip fracture
	2. Fracture of the pelvis
	3. Fracture of the shoulder
	4. Fracture of the spine
	5. Fracture of the wrist
	Lise the first fracture of a given type for a given person in a given
	fiscal year
	Numerator:
	• Everyone who underwent a BMD test any time between the
	date of fracture (the admission date for the fracture) and 1
	year after discharge following fracture (overall and by type
	of BMD test)
Follow up testing after high risk BMD test: Rate (per	Data sources: OHIP, NACRS (ED visits), CIHI (inpatient and same
100) of BMD testing, adults 50 and older, who have	day surgery), ODB
an high-risk BMD test followed by a second test	
within 24 months	Denominator
a) Overall, by age, by sex and by type of referring	a) Anyone who received a high risk BiviD test, by year (2008/09 -
b) for those aged 66+ by whether or not they were	fractures occurring in EV 2012/13 or earlier
on treatment in the year prior to the BMD test	
······································	For two-year follow-up, excluded anyone who did not live for
	two years after the date of their first high-risk BMD test in a
	given year.
	b) Same as a), but restricted to people aged 66+ at the time of
	their first high risk BMD test in a given fiscal year.
	Exclude people who filled a prescription for a non-osteoporosis
	medication in the year prior to their index date (the date of their
	Numerator:
	People who had a follow-up BMD test within 24 months
	• Do not consider follow-up tests that are within 30 days of
	the index test (these were assumed to be due to some
	problem with initial test)
Treatment Persistence	
Proportion of adults, 66 years and older in each fiscal	Data source: ODB
year, who were newly initiated on prescription drug	
treatment for osteoporosis during the year and were	Denominator:

still taking their medication a year later	 For each year between 2005/06 to 2014/15 (new use considered up to January 31, 2015), identified people who: Filled a prescription for an osteoporosis medication during that fiscal year Were at least 66 years old <u>at the time they filled the prescription</u> (in order to allow a one-year look-back period) Had not filled a prescription in the 12 months prior to their first prescription during the year Exclude anyone who died within 1 year after the date of their first prescription in the year Exclude anyone who had already filled a prescription for an osteoporosis medication in the year prior to the prescription date. Numerator: Everyone who took their medication continuously for one year Based on detailed algorithms for drugs taken daily, weekly, monthly, drugs with a 90-day cycle, yearly injections and semi-annually (i.e. Denosumab) Measured by the total days of drug coverage before experiencing a maximum gap of 60 days without drug coverage. Apply same overlap and censoring as described above Conduct sensitivity analysis using a 120 day gap without drug coverage to identify discontinuation.
Hip Fracture and Long Term Care	
Hip Fracture and Long Term Care To describe time trends in incidence of hip fracture in LTC residents	 Data sources: Population denominator files, ODB, OHIP, CCRS, CCRS-LTC, MNS, DAD, SDS, ED, RPDB Denominator: Population denominator files and the following databases to determine who was in LTC: ODB, OHIP, CCRS, CCRS-LTC. The MNS was used to differentiate between chronic care and long term care residents. People were assigned to the LTC or community group based on their history in the 1-year period prior to the start of the fiscal year. People were identified as being in LTC based on a flag in the ODB or a fee code and institution number in an OHIP billing. Individuals who were aged 66 years and older on April 1st of the fiscal year and alive.

	• Hip fractures were identified using the algorithm described above.
Cost of Hip Fracture	
 Health care utilization cost of hip fracture in adults 66+ at the time of their fracture (one-year look ahead and one-year look back) 1) The cost post discharge vs. the cost pre admission (this excludes the cost of treating the hip fracture). Look at how many health services they used after the hip was treated vs. what they used prior to the fracture. Post-discharge costs include rehabilitation. Included all costs in the costing macro. 2) The cost of the episode of care for the hip fracture including hospital and inpatient rehabilitation. 	 Data sources: Costs are based on all health care utilization including CIHI-DAD, NACRS (SDS, ED, renal dialysis and cancer care clinics), ODB, OHIP, CAPE, NRS, CCRS, CCRS-LTC, OMHRS, HCD, IPDB, GAPP Decision Support Systems (to identify the funding model used to pay primary care physicians) Denominator: People with a hip fracture in the most recent year of data (CIHI-DAD) Discharges were excluded if the patient was discharged to an inpatient rehabilitation program but the discharge date from rehabilitation was missing; if the total length of stay for the hip fracture episode of care was greater than 365 days; if the patient was not discharged alive from the inpatient component of the episode of care; or if the individual was not aged 66 years or older at the time of their hip fracture (allowing a 1-year look-back for prescription drug use in the ODB)
	 For 1 – included all health care costs For 2 – costs associated with the hip fracture inpatient and robabilitation opicede of care
	 Costs are stratified based on LTC residence
Population Denominators	
Population denominators	 RPDB (age, sex, place of residence (LHIN)) LHIN population files Contact files: OHIP, ODB, CIHI inpatient DAD, NACRS, CCRS, CCRS-LTC, NRS, HCD, OMHRS) CAPE The Postal Code Conversion File Plus (PCCF+)²⁵, version 5E, was used to assign income quintile and rural flag to postal codes Definition of an urban area is an area with a population of at least 1,000 and a density of 400 or more people per square kilometre. All territory outside an urban area is defined as rural area.

²⁵ PCCF+ Version 5E User's Guide. Russell Wilkins, Health Information and Research Division, Ottawa, July 2001, Catalogue no. 82F0086-XDB.