Trends in Glucocorticoid-Induced Osteoporosis Management Among Seniors in Ontario, 1996-2012

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Background

Glucocorticoids (GC)

- Potent anti-inflammatory and immunosuppressive drugs
- Commonly used to treat many inflammatory conditions
  - Rheumatoid arthritis, inflammatory bowel disease, chronic lung disease
- Used by approximately:
  - 1% of adults age ≥ 20 years
  - 3.6% of Canadian women age ≥ 60 years
- Chronic oral GC therapy is the leading cause of secondary osteoporosis

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Background

GC-Induced Osteoporosis

- Bone loss occurs rapidly at approximately 6-12% in the first year
- Fracture risk increases within 3 months of GC therapy
- Individuals on GC therapy are almost twice as likely to fracture
- Fracture is associated with high morbidity and mortality among seniors

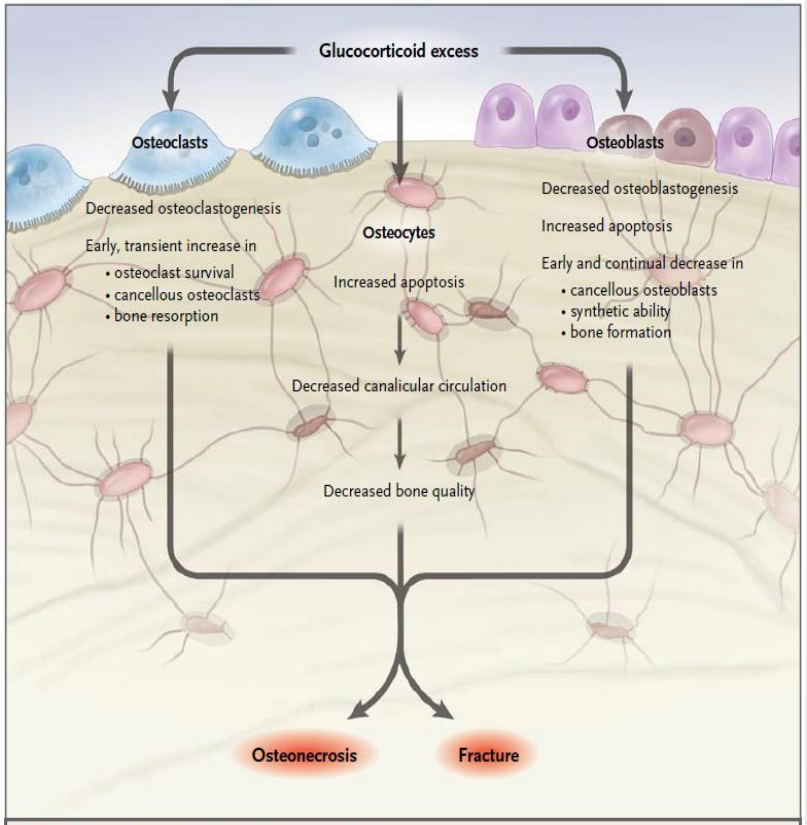

Figure 1. Direct Effects of Glucocorticoids on Bone Cells.
Shown are the adverse skeletal changes that result from an excess of glucocorticoids and lead to osteoporosis and osteonecrosis. The brown, condensed cells are apoptotic osteoblasts and osteocytes. Apoptotic osteocytes disrupt the osteocyte–lacunar–canalicular network.

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Background

- As a result, all patients initiating chronic GC therapy are indicated for:
  1. Bone mineral density (BMD) testing, and/or
  2. Osteoporosis treatment

Canadian Osteoporosis Guidelines	1996	2002	2006	2010
Indications for Osteoporosis Management				
Prior Fracture	Yes	Yes	Yes	Yes
GC Dose and Duration*	> 3 months (any dose)	≥ 7.5 mg/day for > 3 months		
Management Guideline				
BMD Testing	Yes	Yes	Yes	Yes
1st Line Therapy	• Estrogen	• Bisphosphonate	• Bisphosphonate • Teriparatide	• Bisphosphonate • Teriparatide
2nd Line Therapy	• Bisphosphonate			• Calcitonin

*Glucocorticoid doses given as prednisone equivalent

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Study Objective

- To examine osteoporosis management (BMD test, treatment) among community-dwelling patients treated with chronic oral GCs by sex and over time

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Methods

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Data Sources

- Healthcare utilization and administrative claims (medical and pharmacy) data in Ontario from January 1996 to March 2013

Database	Description	Dates Available
Canadian Institutes of Health Information – Discharge Abstract Database **(CIHI-DAD)**	inpatient hospital admissions records	Apr 1988 – Mar 2013
National Ambulatory Care Reporting System **(NACRS)**	ambulatory care services including emergency department visits, outpatient clinics, and day surgeries	Jul 2000 – Mar 2013
Ontario Drug Benefit **(ODB)**	drugs dispensed in community pharmacies and long-term care facilities to all seniors (age 65+) and individuals on social assistance programs in Ontario	Apr 1990 – Sept 2013
Ontario Health Insurance Plan **(OHIP)**	outpatient physician services and procedures, and laboratory services for all Ontario residents	Jul 1991 – Mar 2013
Ontario Registered Persons Database **(RPDB)**	demographic information for all Ontario residents insured for services covered by OHIP	Apr 1990 – Jun 2013

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Patients

Eligibility

- All OHIP eligible seniors (age 66+)
- Oral GC prescription between Jan 1, 1996 and Mar 31, 2013

Exclusions

- Long-term care residents
- History of malignancy other than skin, renal disease, organ transplant, Paget's disease, osteomalacia
- Death within 6 months of index date

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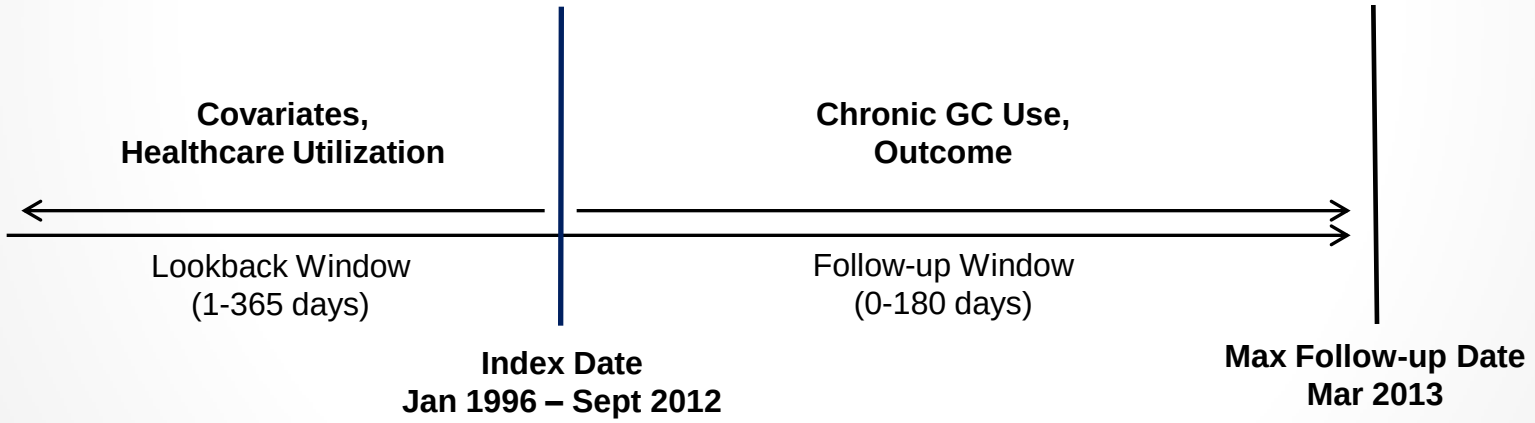
Study Design

- Chronic oral GC users were identified using the following criteria:
  1. ≥ 450 mg prednisone equivalent and
  2. ≥ 2 prescriptions dispensed

  over a 6-month period



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Study Outcome

(GC-Induced Osteoporosis Management)

- Within 6 months of index date:
  - BMD test (sensitivity=98%; specificity=93%)
  - Osteoporosis treatment
    - Bisphosphonate, calcitonin, denosumab, raloxifene, teriparatide

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Data Analysis

- Descriptive statistics were summarized for chronic oral GC users
- Osteoporosis management was examined as a binomial outcome (yes/no), by year
- Stratified by sex

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Results

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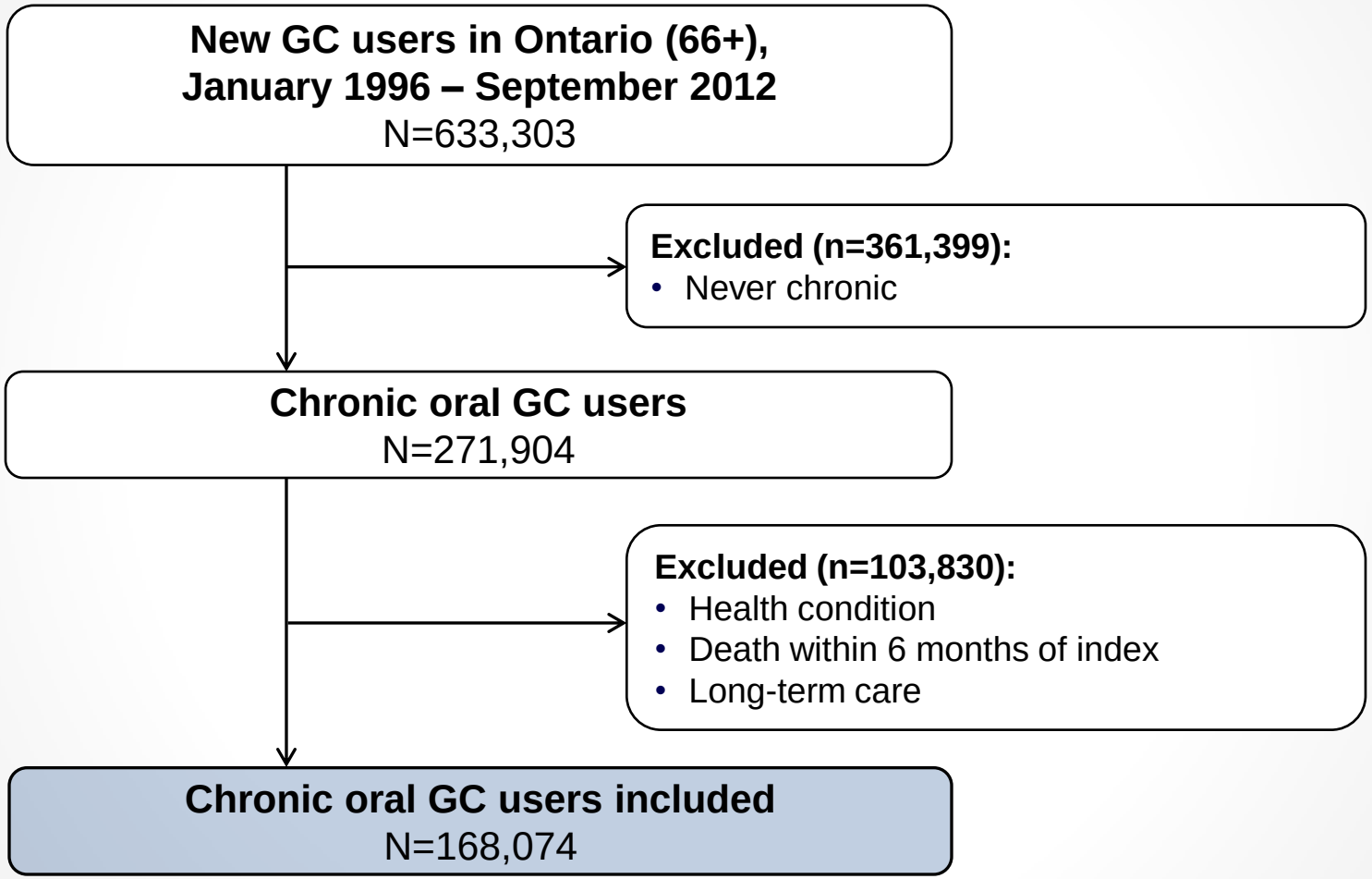
Study Flow Diagram



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Chronic Oral GC Users

Chronic GC users, N=168,074

Characteristic	Women N=95,975	Men N=72,099
Age, mean (SD)	75.1 (6.61)	74.6 (6.25)
GC Exposure*		
450 - < 675 mg prednisone equivalent	21.8%	21.6%
675 - < 900 mg prednisone equivalent	12.7%	13.2%
≥ 900 mg prednisone equivalent	65.5%	65.3%
# Oral GC Prescriptions, mean (SD)*	3.9 (3.11)	3.7 (2.60)

*Within 6 months of index date

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Chronic Oral GC Users

Overall GC-induced osteoporosis management, 1996-2012

Osteoporosis Management*	Women N=95,975	Men N=72,099
BMD Test	13.0%	6.8%
Osteoporosis Treatment	30.0%	11.7%
BMD Test and/or Osteoporosis Treatment	35.8%	15.2%

*Within 6 months of index date

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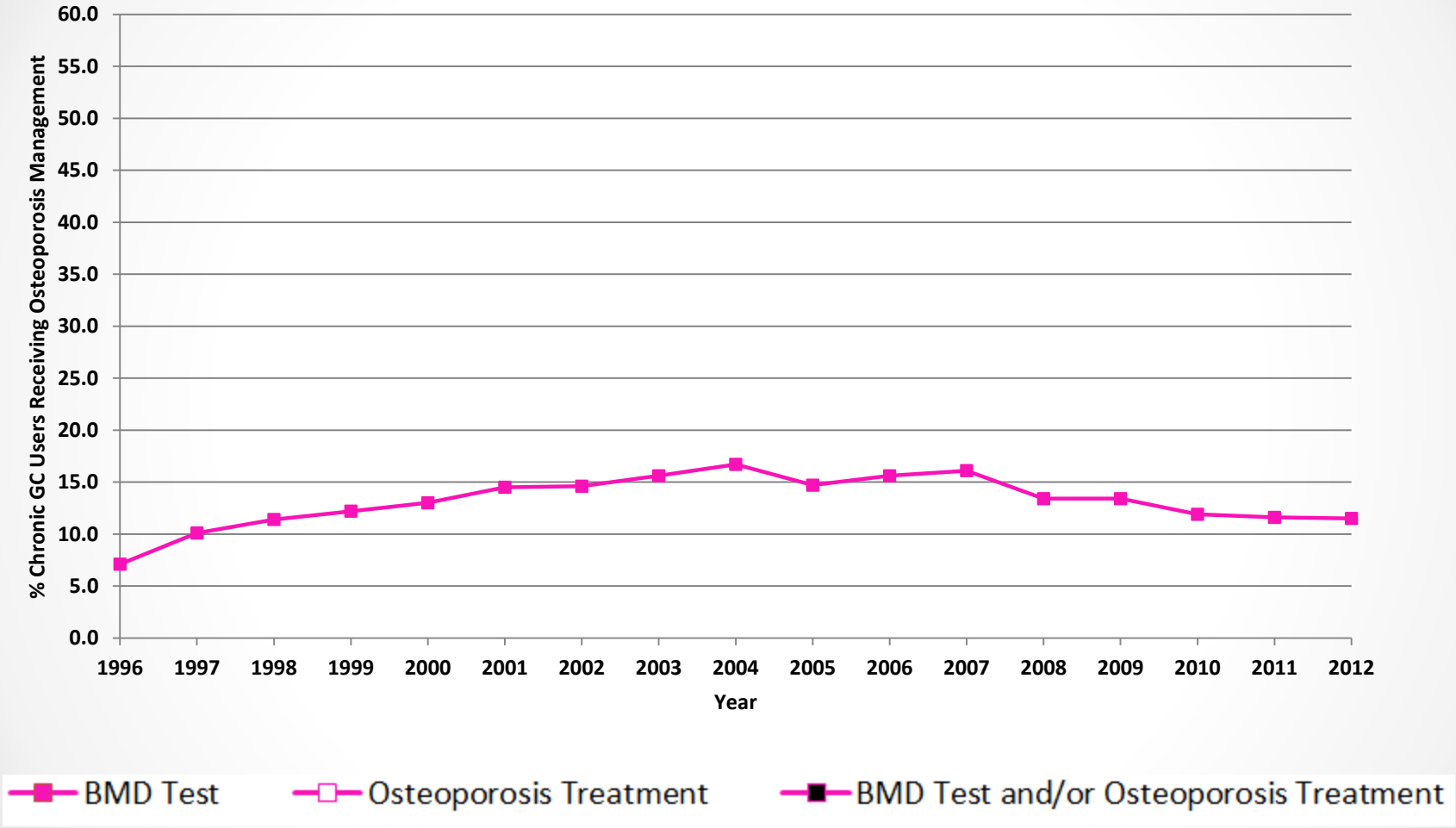
Trends - Women



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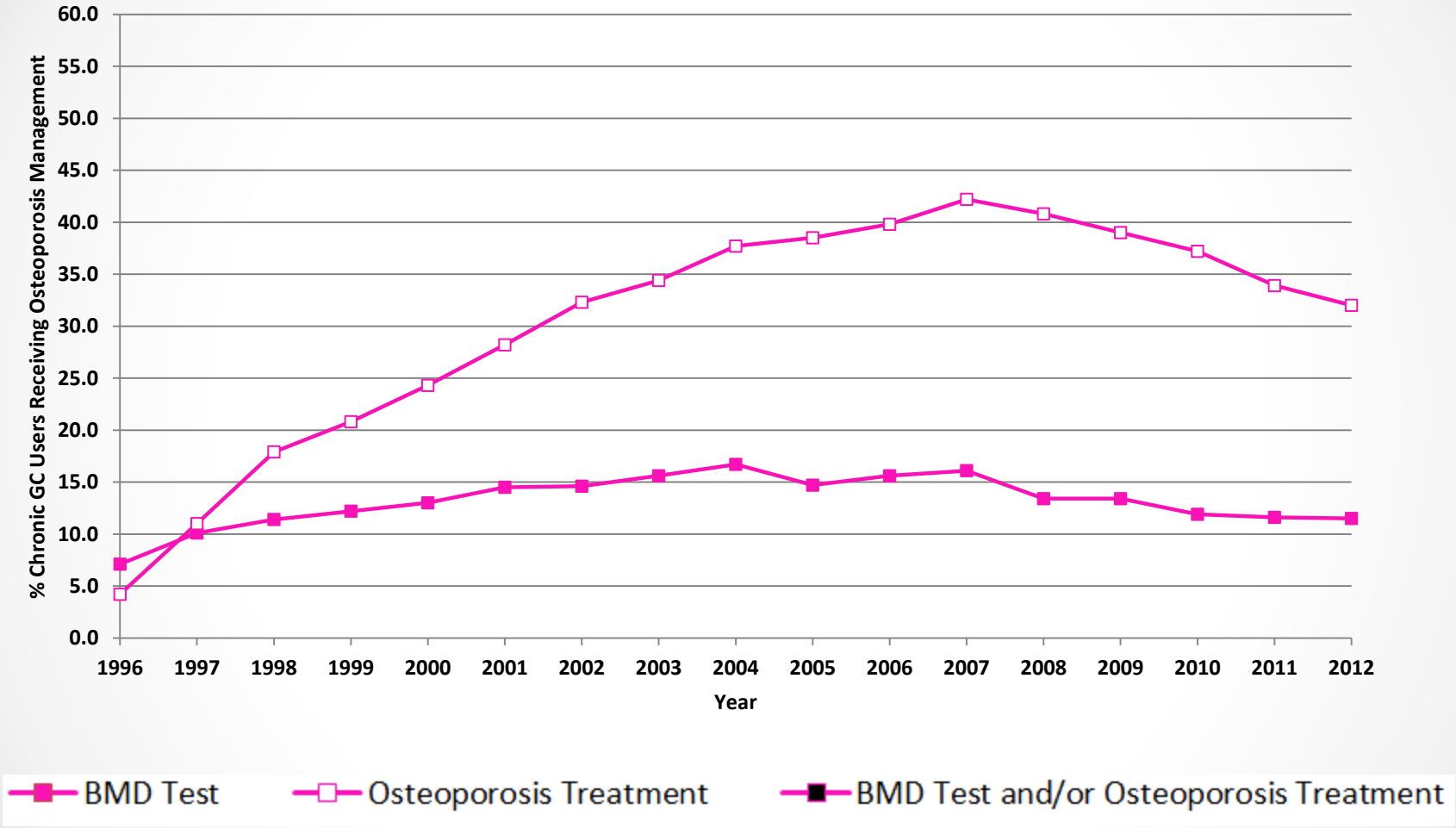
Trends - Women



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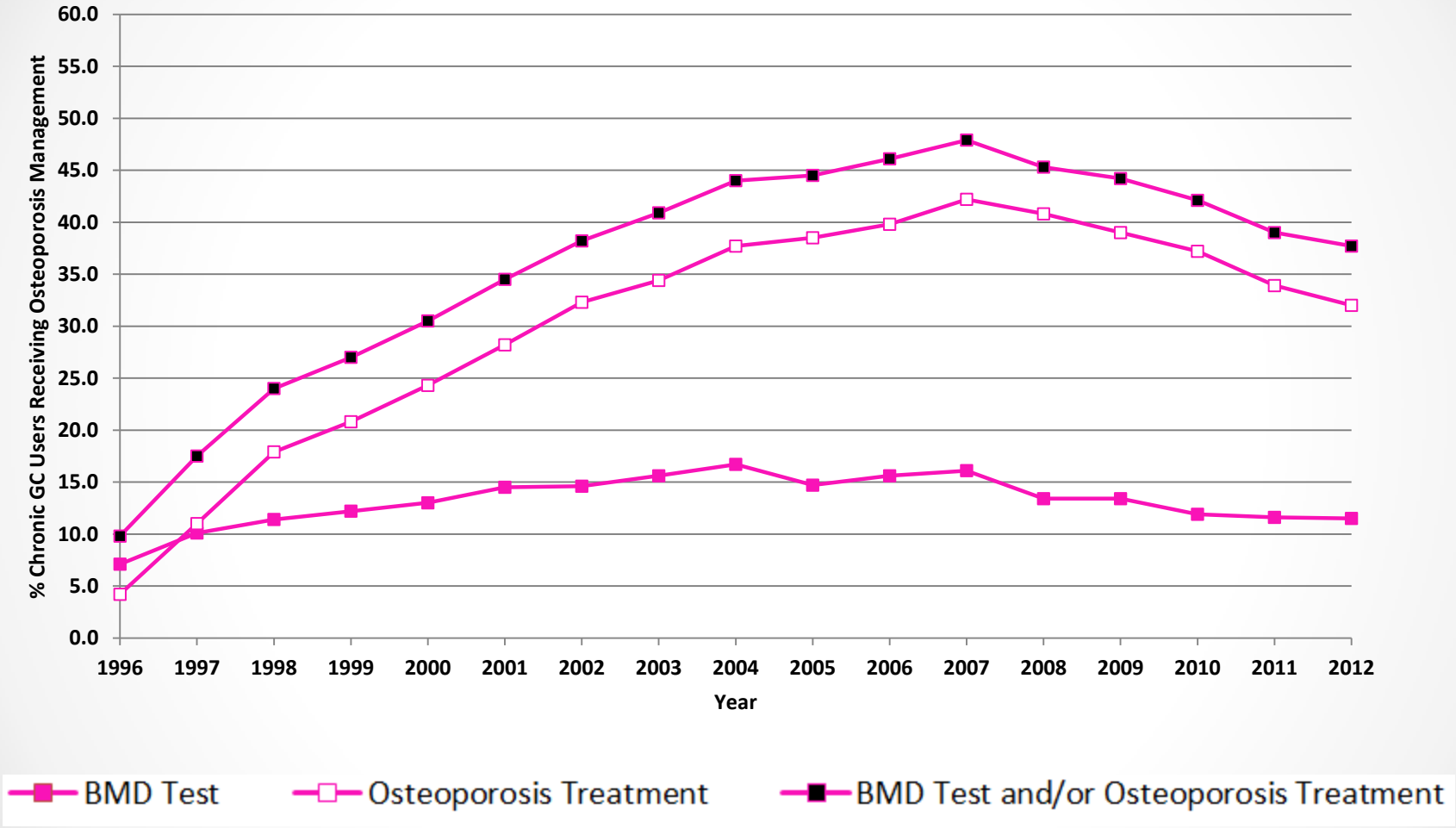
Trends - Women



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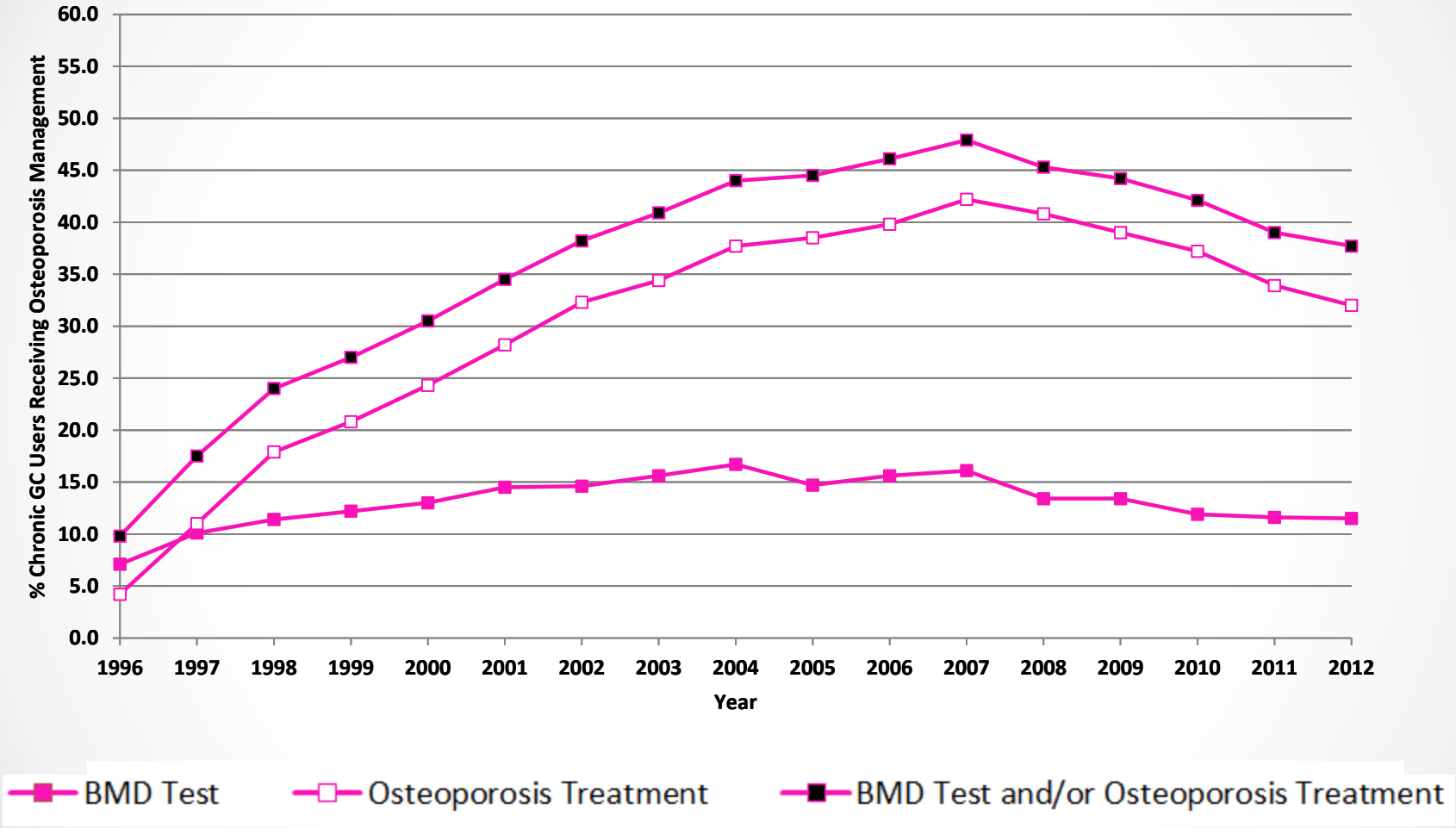
Trends - Women



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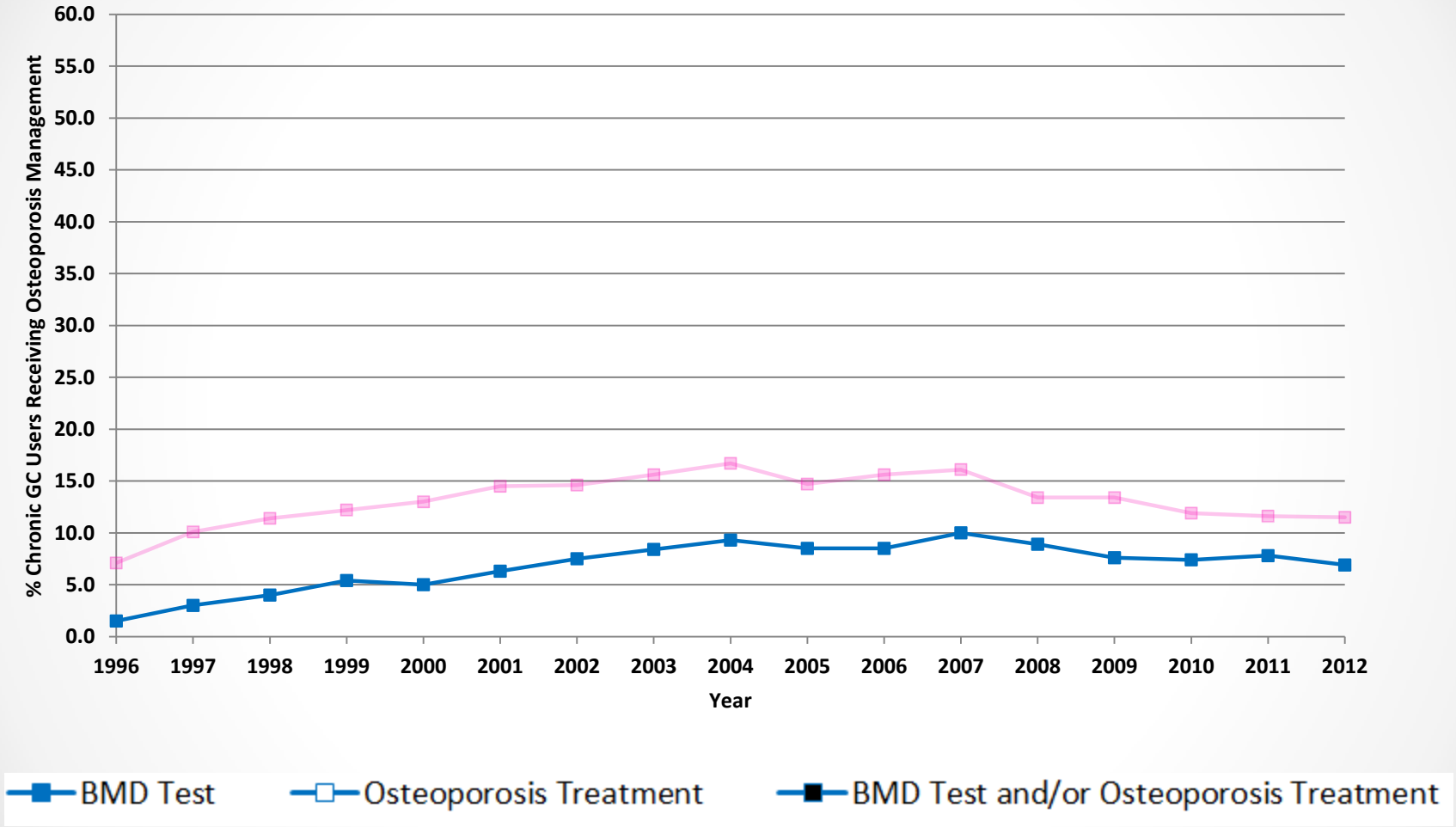
Trends - Men



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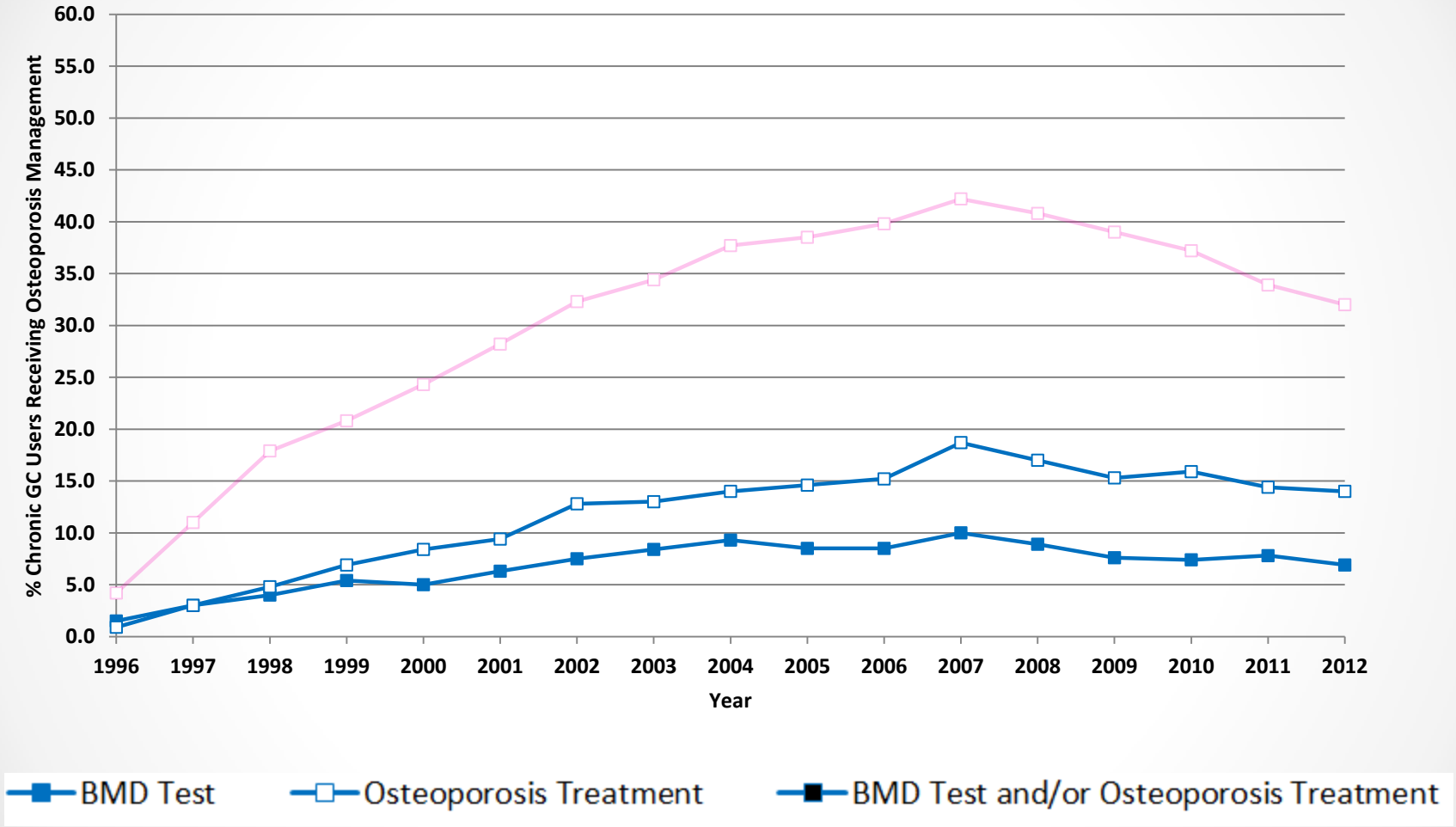
Trends - Men



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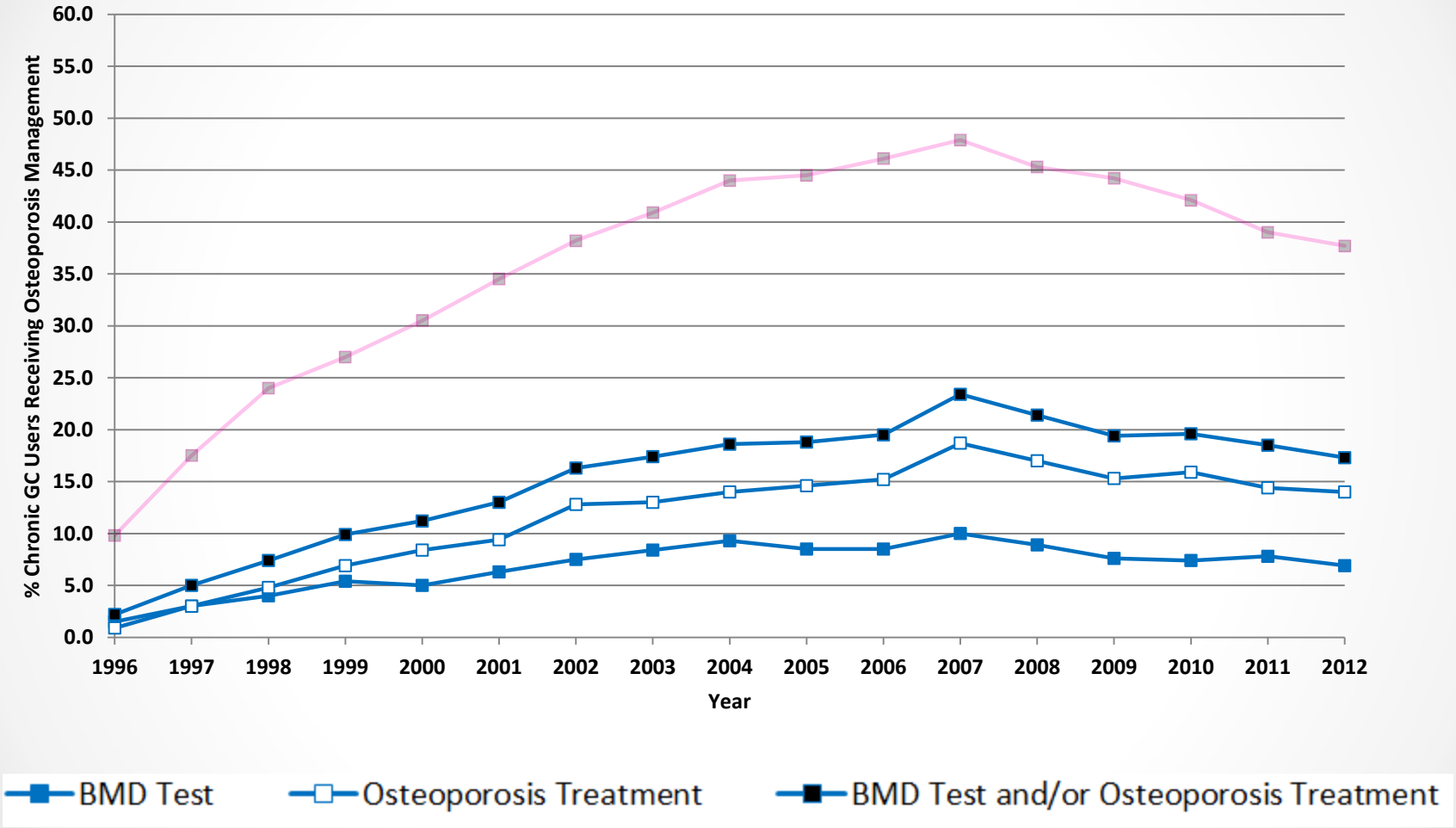
Trends - Men



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Discussion

- GC-induced osteoporosis management improved significantly over time yet remain low, particularly among men
  - Men: Increased from 2% (1996) to a high of 23% (2007)
  - Women: Increased from 10% (1996) to a high of 48% (2007)

- Low management rates and treatment disparity between gender are consistent with:
  - Studies examining post-fracture care
  - Other studies examining GC-induced osteoporosis management

- Missed opportunity for fracture prevention among patients requiring chronic oral GC therapy

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Limitations

- Drugs dispensed in hospital are not captured by the Ontario Drug Benefit (ODB) database and thus are not included in our analysis

- Ontario public drug claims data are limited to patients ≥ 65 years, thus we are unable to comment on GC-induced osteoporosis management in younger patients

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Next Steps

- Sensitivity analyses:
  - Include estrogen therapy as eligible osteoporosis pharmacotherapy
  - Define chronic GC therapy as: i) ≥ 675 mg and ii) ≥ 900 mg prednisone equivalent
- Other questions:
  - Identify predictors of GC-induced osteoporosis management
  - Identify specific clinical areas where management is suboptimal
- Future research:
  - Determine if low rates represent true mismanagement
  - Develop targeted interventions to reduce fracture-related morbidity associated with GC-induced osteoporosis

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Thank you for listening

Questions?

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Drug	5mg Prednisone Equivalent
Betamethasone	0.60
Budesonide	1.125
Cortisone Acetate	25
Dexamethasone	0.75
Hydrocortisone	20
Methylprednisolone	4
Prednisolone	5
Prednisone	5
Triamcinolone	4

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Osteoporosis Drug Access in Ontario

Province	Bisphosphonates						Calcitonin	SERMs	Teriparatide (PTH)	Denosumab
	Etidronate	Alendronate		Risedronate		Zoledronic Acid		Raloxifene		
	Didrocal® Generics available	Fosamax® Generics available	Fosavance®	Actonel® Generics available	Actonel DR™	Aclasta®	Miacalcin® Generics available	Evista®	Forteo®	Prolia®
ON*	**Open Access**	**Open Access**	**Open Access**	**Open Access**	**Open Access**	**Restricted Access**	**Not Accessible**	**Restricted Access**	**Not Accessible**	**Restricted Access**

*Adapted from Osteoporosis Canada and in conformity with the ODB formulary

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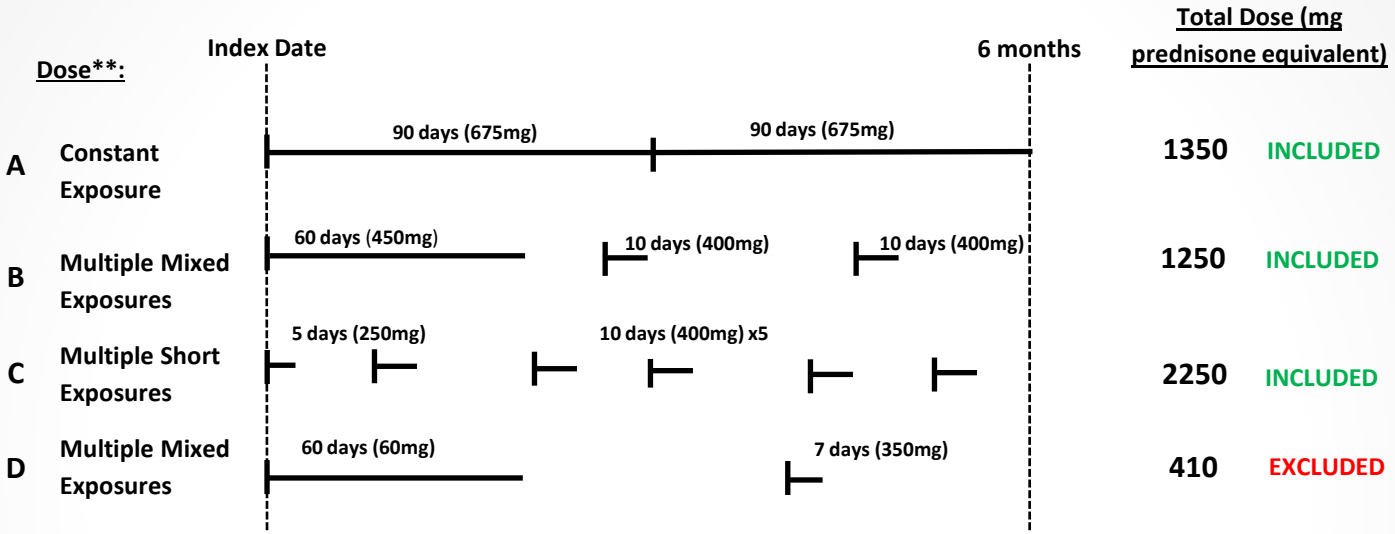
Chronic GC User Profiles



Patient A – Constant Exposure: frequent refilling (30-100 pills), generally at maintenance doses geared towards disease management. Commonly seen in patients with active rheumatoid arthritis, polymyalgia rheumatica, and chronic asthma or COPD.

Patient B – **Multiple Mixed Exposures**: e.g., initial exposure ≥2 months in length indicated at time of disease diagnosis (e.g., inflammatory bowel disease). Future short- or medium-term courses may be aimed at disease/remission management.

Patient C – **Multiple Short Exposures**: frequent short courses of 10-14 days in length indicative of COPD exacerbations. Therapy administered in high doses and result in high cumulative exposure, despite short duration of therapy.

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