



December 2009

Proton Pump Inhibitor Use in Seniors: An Analysis Focusing on Drug Claims, 2001 to 2008

Introduction

Acid-related diseases of the gastrointestinal system affect an estimated 29% of Canadian adults.¹ A broad range of drug and non-drug interventions are used to prevent and treat these conditions. Two commonly used drug classes are proton pump inhibitors (PPIs) and histamine-2 receptor antagonists (H2RAs).

The first PPI approved for use in Canada was omeprazole in 1989, followed by lansoprazole (1995), pantoprazole (1997) esomeprazole (2001) and rabeprazole (2002). H2RAs such as ranitidine, cimetidine and famotidine were introduced in Canada about a decade prior to the first PPI. There has been a continual shift to the use of PPIs from H2RAs since PPIs were introduced.

PPIs and H2RAs are used to treat conditions such as gastroesophageal reflux disease (GERD), reflux esophagitis and peptic ulcer disease (PUD). They are also used for the eradication of *Helicobacter pylori* and to prevent and treat ulceration caused by medications such as non-steroidal anti-inflammatory drugs (NSAIDs).² PPIs have shown improved efficacy over H2RAs for resolving symptoms of these conditions, including the maintenance and prevention of relapse.²⁻⁶

PPIs are generally considered to be safe medications with few adverse effects.⁷⁻⁹ However, there have been increasing concerns regarding adverse effects associated with long-term and high-dose PPI use, including enteric infections such as *Clostridium difficile*, community-acquired pneumonia and an increased risk of osteoporosis-related hip fractures.⁸⁻¹¹ A recent study reported an increased risk of osteoporosis-related fractures when PPIs were taken continuously for seven years or more.¹¹ Guidelines recommend that long-term maintenance therapy for conditions such as GERD be given at the lowest dose and frequency sufficient to control the patient's symptoms.³

In 2007, Canadians spent an estimated \$1.4 billion on prescription acid-reducing drugs, with seniors accounting for about half of this total.¹² Expenditures on acid-reducing drugs in 2007 accounted for 7.4% of total spending on prescription drugs.¹² The overall spending on this drug class almost doubled between 1998 and 2007, when

adjusted for inflation.¹² Using drug claims data from the National Prescription Drug Utilization Information System (NPDUIS) Database, it is estimated that roughly 90% of prescription expenditures for acid-reducing drugs are for PPIs. Increases in PPI use have been reported in other countries, and some studies have suggested that PPIs may be overused.^{13–15}

The purpose of this analysis is to look at trends in the use of PPIs in seniors (defined in this analysis as people 65 or older) between 2001–2002 and 2007–2008, using drug claims data from public drug programs in Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and Prince Edward Island. The analysis will compare PPI use and expenditures to that of H2RAs and break down PPI use by age and sex. The analysis will also explore the influence PPI dosages and length of therapy may be having on the overall trend in PPI use.

Methods

Drugs of Interest

PPIs and H2RAs were identified by the drug identification numbers (DINs) assigned by Health Canada, and by the World Health Organization Anatomical Therapeutic Chemical classification codes A02BC—PPIs and A02BA—H2RAs. All dosage forms and strengths of these chemicals available in Canada during the study period were included. The PPIs included in this study were omeprazole, pantoprazole, lansoprazole, esomeprazole and rabeprazole. Omeprazole, pantoprazole and lansoprazole were available in Canada throughout the study period. Esomeprazole was first available in August 2001, while rabeprazole was first available in April 2002. The H2RAs included were cimetidine, ranitidine, famotidine and nizatidine. These chemicals were all available in Canada throughout the study period.

Omeprazole was the first PPI with a generic version, initially available in Canada in January 2004. Generic versions of pantoprazole and rabeprazole followed, first available in April and November 2007, respectively. The first generic version of lansoprazole was not available until June 2009, after the end of the study period. As of August 2009, there were no generic versions of esomeprazole on the market in Canada.

It should be noted that two of the H2RAs, ranitidine and famotidine, could be purchased without a prescription in Canada during the study period. Famotidine 10 mg was available without a prescription, or “over the counter,” throughout the study period, while the 20 mg strength was available beginning in February 2007. Ranitidine 75 mg was available without a prescription throughout the study period, while the 150 mg strength was available beginning in February 2007. The NPDUIS Database does not contain information on drugs purchased without a prescription. As a result, the rate of H2RA use reported in this analysis may be lower than the actual rate of use among the study population. However, without further analysis, it is unclear to what degree, if any, the rate is understated.

NPDUIS Database

The drug claims data used in this analysis comes from the NPDUIS Database, as submitted by the Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and P.E.I. provincial public drug programs. The NPDUIS Database houses pan-Canadian information related to public program formularies, drug claims, policies and population statistics. It was designed to provide information that supports accurate, timely and comparative analytic and reporting requirements for the establishment of sound pharmaceutical policies and the effective management of Canada's public drug benefit programs.

The NPDUIS Database includes

- Claims accepted by public drug programs, either for reimbursement or toward a deductible.ⁱ Claims are included regardless of whether or not the patient actually used the drugs.

The NPDUIS Database does not include information regarding

- Prescriptions that were written but never dispensed;
- Prescriptions that were dispensed but for which the associated drug costs were not submitted to, or not accepted by, the public drug programs; or
- Diagnoses or conditions for which prescriptions were written.

Calculation of Average Daily Dose

Average daily dose (ADD) was calculated for PPIs at the chemical level. The dispensed dose for each claim was calculated as the quantity dispensed (assumed to be measured in the number of tablets or capsules) multiplied by the strength of the product. Claims with quantities of either zero or greater than 365 tablets were excluded (less than 0.1% of all claims). The expected duration of each claim was then calculated as the difference between its service date and the service date of the next claim for the same patient and chemical. Each patient's last claim for each chemical, as well as cases where the difference between two adjacent claims for the same patient and chemical was greater than 365 days, was excluded (9.6% of all claims). It should be noted that using the number of days between claims as an estimate of treatment duration can overstate this duration when a patient stops and then restarts therapy. This can, in turn, underestimate the ADD used during the treatment duration. Although excluding claims with no subsequent claim within 365 days reduces this potential effect, it is recognized that this method can lead to an underestimation of ADD.

i. In Manitoba and Saskatchewan, this includes accepted claims for people who are eligible for coverage under a provincial drug program but who have not submitted an application and, therefore, do not have a defined deductible.

Claim level dose and duration were then summed at the fiscal year and chemical level. Average daily dose for each fiscal year and chemical was calculated as the total dose divided by the total duration. Because duration was calculated across years in some cases, average daily dose for 2007–2008 was not reported, as duration could not be calculated in the same fashion (there was no “next” year to draw claims from). Claims from 2007–2008 were used to calculate duration for claims from 2006–2007, where applicable.

For this study, average daily dose was further categorized into low daily dose, medium daily dose and high daily dose. Low daily dose was defined as an ADD of less than or equal to 0.5 times the defined daily dose (DDD),ⁱⁱ medium daily dose was an ADD greater than 0.5 times and less than 1.5 times the DDD and high daily dose was an ADD greater than or equal to 1.5 times the DDD.

Data Comparability

Age-Standardization

Provincial rates were age-standardized using a direct method of standardization based on the October 1, 2007, Canadian senior population. The age groups used for standardization were 65 to 74, 75 to 84 and 85 and older.ⁱⁱⁱ

Drug Plan Comparison

Although public drug coverage is available to seniors (people 65 and older) in all six provinces included in the analysis, each of the drug plans is designed differently. These differences may impact drug utilization within the plans and, in turn, the claims submitted to the NPDUIS Database. One of the major differences is that Alberta, Saskatchewan, New Brunswick, Nova Scotia and P.E.I. all have drug plans designed specifically for seniors (though some seniors may be covered under other provincial plans, offered to residents of all ages), whereas seniors in Manitoba are covered under a universal drug plan, offered to residents of all ages. Prior to July 1, 2007, seniors in Saskatchewan were also covered under a drug plan offered to residents of all ages. There are also other differences, such as how much a senior is required to pay for drugs through premiums, deductibles or co-payments. Seniors not covered by the publicly funded drug plan may have private drug plan coverage or pay out of pocket.

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- ii. Defined daily doses (DDDs) are assigned by the World Health Organization in its Anatomical Therapeutic Chemical Classification system and are the assumed average dose per day for a drug’s main indication in adults. The PPI DDDs are omeprazole 20 mg, lansoprazole 30 mg, pantoprazole 40 mg, rabeprazole 20 mg and esomeprazole 30 mg.
 - iii. Population data comes from Statistics Canada, Demography Division, Special Tabulation, June 2009.¹⁶ The population estimates for 2001–2002 to 2005–2006 are considered final, while interim population estimates were used for 2006–2007 to 2007–2008.

Common to all six provinces, seniors covered by provincial workers' compensation boards or federal drug programs are not eligible for coverage under provincial drug programs. Federal drug programs include those delivered by the following:

- The Canadian Forces;
- The Correctional Service of Canada;
- First Nations, Inuit and Aboriginal Health;
- The Royal Canadian Mounted Police; and
- Veterans Affairs Canada.

Further information about public drug programs in Canada can be found in the *NPDUIS Database Plan Information Document*, available at www.cihi.ca/drugs.

Formulary Comparison

Differences in the coverage of drugs on provincial formularies can also lead to differences in drug utilization and are identified to provide context when conducting interprovincial comparisons. This comparison describes the formulary coverage of PPIs as of March 31, 2008, the end of the study period.

Overall, there were some differences in the coverage of PPIs across the six provinces, with chemicals being listed as full, limited or restricted benefits. In general, PPI coverage for the initial treatment of conditions such as GERD and peptic ulcer disease varies from 8 to 12 weeks. Maintenance therapy may also be covered, although sometimes at a lower dose. Long-term coverage is provided for conditions such as Barrett's esophagitis, erosive esophagitis and Zollinger-Ellison Syndrome.

Omeprazole and rabeprazole are covered as full benefits in Alberta. In Nova Scotia and P.E.I., full coverage of these two chemicals is provided for doses up to 20 mg per day. A physician must submit a patient-specific request to obtain coverage for higher doses of these chemicals. In the other three provinces, a physician must submit a patient-specific request to obtain coverage, and coverage is restricted to a term varying from 8 weeks to 12 weeks. In New Brunswick and Saskatchewan, coverage is restricted to those patients not responding or experiencing unusual reactions to a trial of H2RAs. In New Brunswick, prescriptions written by gastroenterologists do not require a written request.

Lansoprazole and pantoprazole are covered as restricted benefits in all provinces except Alberta, where they are listed as full benefits. In provinces where these chemicals are covered as restricted benefits, a physician must submit a patient-specific request to obtain coverage, and coverage is restricted to a term varying from 8 weeks to 12 weeks. In New Brunswick and Saskatchewan, coverage is restricted to those patients not responding or experiencing unusual reactions to a trial of H2RAs. In Nova Scotia and P.E.I., coverage is restricted to those patients who do not tolerate omeprazole and rabeprazole or to patients whose treatment with these chemicals was ineffective. In New Brunswick, prescriptions written by gastroenterologists do not require a written request.

Analysis in Brief

Taking health information further

Esomeprazole is not covered in Alberta, New Brunswick, Nova Scotia and P.E.I.; however, it is a restricted benefit in Manitoba and Saskatchewan.

Beginning in 2006, PPIs were covered as restricted benefits in Manitoba. Prior to that time, they were covered as limited benefits. Although both limited and restricted benefits are only covered for patients who meet defined criteria, restricted benefits require that patients/prescribers seek approval of the drug program before making a claim, whereas limited benefits can be automatically approved at the time of claim. Manitoba's change in formulary coverage may have been a contributing factor to the decline in its PPI use in the last two years of the study period.

In Nova Scotia and P.E.I., full coverage of omeprazole and rabeprazole for doses up to 20 mg per day began in 2008. Prior to that year, they were covered as restricted benefits. These 2008 changes in coverage for omeprazole and rabeprazole may have been a contributing factor to the increase in PPI use seen in these two provinces in 2007–2008. A similar change also occurred in New Brunswick in 2008, but not until after the end of the study period.

Although PPIs were covered as restricted benefits in Saskatchewan throughout the study period, in July 2004 there was a change to the maximum cost per unit (that is, tablet or capsule) that the drug program would cover. Although this change does not appear to have significantly affected the overall rate of PPI use in Saskatchewan, it may have impacted use at the chemical level, as well as overall PPI costs in the province. However, further analysis is required to assess any impact this policy change might have had.

Alberta's full formulary coverage of four PPIs may play a role in its higher rate of PPI use. Without further analysis, it is unclear what effect, if any, this and other differences in coverage may have on PPI use across the provinces. Several other factors can influence drug utilization, such as the health of the population, prescribing patterns and the availability of non-prescription and non-drug therapies. Given the differences in use in provinces with similar coverage, factors other than formulary differences are likely contributing to provincial variation.

Definitions

1. **Claimants:** refers to seniors with at least one claim accepted by public drug programs, either for reimbursement or toward a deductible.^{iv}
2. **PPI users:** refers to seniors with at least one claim for a PPI product during a given year.
3. **H2RA users:** refers to seniors with at least one claim for an H2RA product during a given year.
4. **Chronic PPI users:** refers to seniors with at least three claims for a PPI in a given year and with at least 180 days' supply.
5. **Chronic NSAID users:** refers to seniors with at least three claims for an NSAID in a given year and with at least 180 days' supply.

Limitations

Since the NPDUIS Database does not contain information regarding diagnoses or the conditions for which prescriptions were written, the treatment indication cannot be confirmed.

Pan-Canadian claims-level data for those younger than 65 was unavailable for this study. However, using NPDUIS Database data from Saskatchewan and Manitoba, the rate of PPI use among those younger than 65 was found to be 4.8%, less than a third of the rate among seniors in those two provinces (16.4%).

Profile of Seniors With Drug Claims

In 2007–2008, there were 367,033 seniors (people 65 or older) living in Alberta, 150,589 in Saskatchewan, 164,506 in Manitoba, 111,474 in New Brunswick, 141,815 in Nova Scotia and 20,715 in P.E.I.¹⁶

The proportion of seniors who had drug claims accepted by the public drug programs in these provinces varied from 57.0% in New Brunswick to 89.5% in Manitoba (see the appendix). The lower percentages in New Brunswick (57.0%) and Nova Scotia (67.9%) are likely related to plan design. Seniors not covered by the publicly funded drug plan may have a private drug plan or pay out of pocket. It should be noted that the total population figures included seniors who were not eligible for provincial coverage, such as those covered under federal drug plans. It should also be noted that, whereas total population figures are meant to reflect the population at a single point in time, claimant population figures reflect the number of people who made claims throughout a given year.

iv. In Manitoba and Saskatchewan, this includes seniors with accepted claims who are eligible for coverage under a provincial drug program but have not submitted an application and, therefore, do not have a defined deductible.

There is variation in the age distribution of senior claimant populations of the six provinces. Saskatchewan has the highest proportion of claimants older than 85, at 16.3%, while Alberta has the smallest proportion of claimants older than 85, at 12.6% (see the appendix).

Analysis

Overview of PPI Claim Trends

The following analysis examines trends in the use of PPIs in seniors (people 65 or older) covered by public drug programs in Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and P.E.I. between 2001–2002 and 2007–2008. The analysis will compare PPI use and expenditures to that of H2RAs and break down PPI use by age and sex. The analysis will also explore the influence PPI dosages and length of therapy may be having on the overall trend in PPI use.

PPI Expenditures

Total drug program expenditures on PPIs based on paid claims in five provinces^v increased at an average annual rate of 8.9% over the study period, from \$41.8 million in 2001–2002, to \$69.8 million in 2007–2008. These expenditures accounted for 7.6% of total drug program expenditures in 2001–2002 and 7.3% of total drug program expenditures in 2007–2008 (Table 1).

Pantoprazole accounted for the highest proportion of drug program PPI expenditure in 2007–2008 (34.9%), followed by omeprazole (27.9%), lansoprazole (20.8%), rabeprazole (15.4%) and esomeprazole (1.1%).

v. These figures do not include P.E.I., as data for that province is not available prior to 2004–2005.

Table 1 Public Drug Program Expenditure on PPIs Used by Seniors,* by Chemical, 2007–2008

Chemical	Drug Program Expenditure (\$ Millions)	Percent of Total Drug Program Expenditure	Percent of Total Drug Program PPI Expenditures
Pantoprazole	24.3	2.6	34.9
Omeprazole	19.5	2.0	27.9
Lansoprazole	14.5	1.5	20.8
Rabeprazole	10.7	1.1	15.4
Esomeprazole	0.8	0.1	1.1
Total	69.8	7.3	100.0

Note

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

During the study period, the average annual PPI expenditure per senior claimant decreased by 7.6%, from \$462 in 2001–2002, to \$427 in 2007–2008. In 2007–2008, lansoprazole accounted for the highest per claimant PPI expenditure (\$536), followed by pantoprazole (\$508), omeprazole (\$333), esomeprazole (\$301) and rabeprazole (\$275).

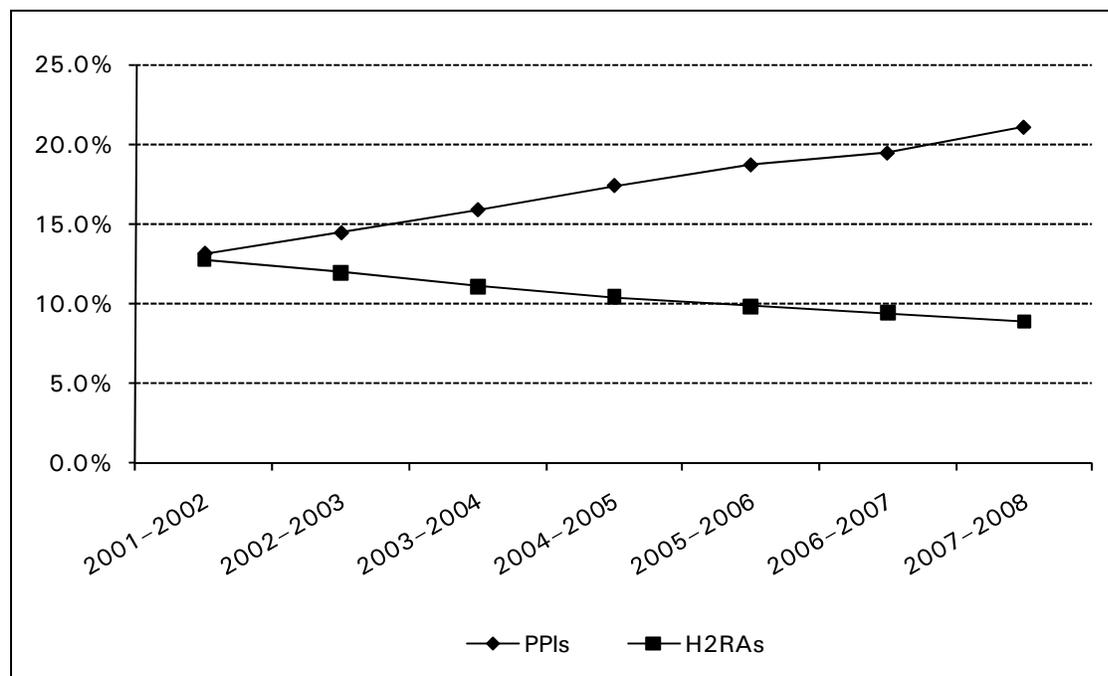
The decline in PPI expenditure per claimant appears to be due, at least in part, to the introduction of a generic version of omeprazole in 2004. Omeprazole was the only chemical for which expenditure per claimant decreased during the study period. Several factors may have contributed to the differences in cost per claimant between the PPIs, including prescribing patterns (for example, dosage and duration of therapy), differences in price, availability of generics and differences in formulary listings.

PPI Utilization

The age–sex standardized rate of PPI use across the five provinces increased from 13.1% in 2001–2002, to 21.1% in 2007–2008, increasing at an average annual rate of 8.2% over the study period (Figure 1). The increase in PPI use coincided with a decrease in the age–sex standardized rate of H2RA use, a class of drugs introduced prior to PPIs and used in many of the same conditions. H2RA use fell from 12.7% in 2001–2002, to 8.8% in 2007–2008.^{vi}

vi. It should be noted that two of the H2RAs, ranitidine and famotidine, could also be purchased without a prescription in Canada during the study period. (For more detail, see the Drugs of Interest section of this Analysis in Brief.)

Figure 1 Age–Sex Standardized Rates of PPI and H2RA Use Among Senior Claimants on Public Drug Programs in Select Provinces,* by Drug Class, 2001–2002 to 2007–2008



Note

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

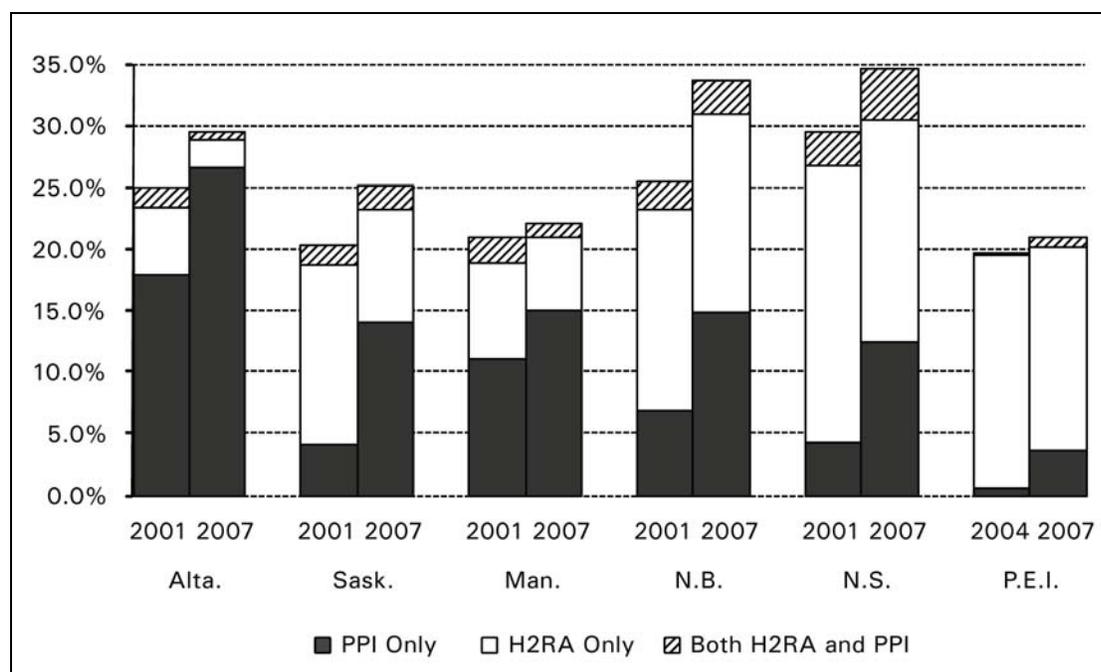
The changes in rates of use of both PPIs and H2RAs appear to be due in part to patients switching from H2RAs to PPIs. Of the H2RA users in 2002–2003 who were still using a prescription drug for an acid-related disorder in 2007–2008, 51.8% had switched to a PPI, while of the PPI users in 2002–2003 who were still using a prescription drug for an acid-related disorder in 2007–2008, only 8.3% had switched to an H2RA.

Switches were determined by comparing a patient’s utilization in the first and last years of the study period. This method does not account for any short-term or temporary switches that may occur during the study period. The percentage of seniors with claims for both PPIs and H2RAs in the same year (Figure 2) may provide some insight on the frequency of short-term switches.

Figure 2 shows the age–sex standardized rate of senior claimants using PPIs, H2RAs and both drugs, by province. The figure shows rates of use in 2001–2002 and 2007–2008 for all provinces except P.E.I., where rates in 2004–2005 and 2007–2008 are

shown. In all six provinces, the rate of PPI use increased over the time period, while the rate of H2RA use decreased. The proportion of senior claimants using both drugs in the same year remained relatively stable in all six provinces. Although there is some variation in the proportion of senior claimants on either a PPI or an H2RA across provinces, the variation is much less than that observed in the rates of use of either of the drug classes individually. The differences in the rates of PPI and H2RA use across provinces may be due in part to differences in formulary coverage.

Figure 2 Age–Sex Standardized Rate of PPI and H2RA Use Among Senior Claimants on Public Drug Programs in Select Provinces,* by Province, 2001–2002 and 2007–2008



Note

* The six provinces submitting claims data to the NPDUIS Database as of March 2009.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

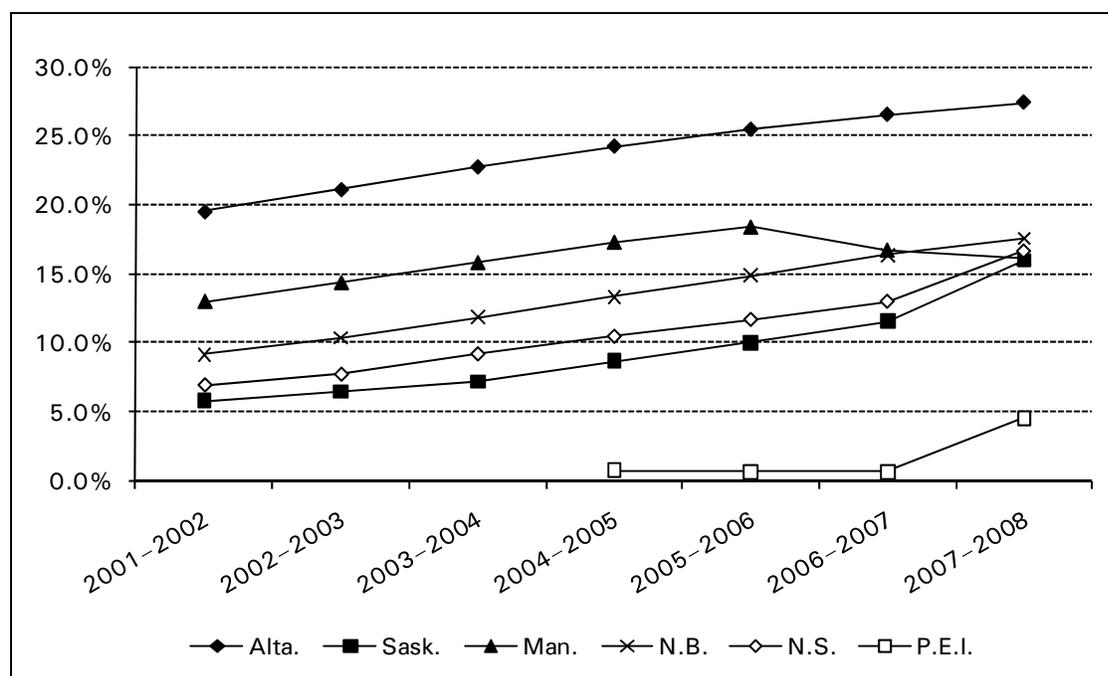
The age–sex standardized rate of PPI use increased in each of the five provinces with data for 2001–2002 and 2007–2008 (Figure 3). The age–sex standardized rate of PPI use in P.E.I. also increased between 2004–2005 and 2007–2008. In 2001–2002, the age–sex standardized rate of PPI use among seniors varied from 5.8% in Saskatchewan to 19.5% in Alberta. In 2007–2008, the rate varied from 4.5% in P.E.I. to 27.4% in Alberta.

The age–sex standardized rate of PPI use among senior claimants increased in every year of the study period in all provinces except Manitoba and P.E.I. In Manitoba, PPI use declined in the last two years of the study period following a change to the formulary

listing of PPIs in 2006.^{vii} In P.E.I., the rate of PPI use remained relatively stable between 2004–2005 and 2006–2007, and then increased sharply in 2007–2008. This increase followed the change to full formulary coverage for certain doses of omeprazole and rabeprazole.

For the remainder of the analysis, P.E.I. data will be excluded from all aggregate analyses (that is, analyses not at the provincial level) including years prior to 2004–2005, as its data was not available for those years.

Figure 3 Age–Sex Standardized Rate of PPI Use Among Seniors on Public Drug Programs in Select Provinces,* by Province, 2001–2002 to 2007–2008



Note

* The six provinces submitting claims data to the NPDUIS Database as of March 2009.

Source

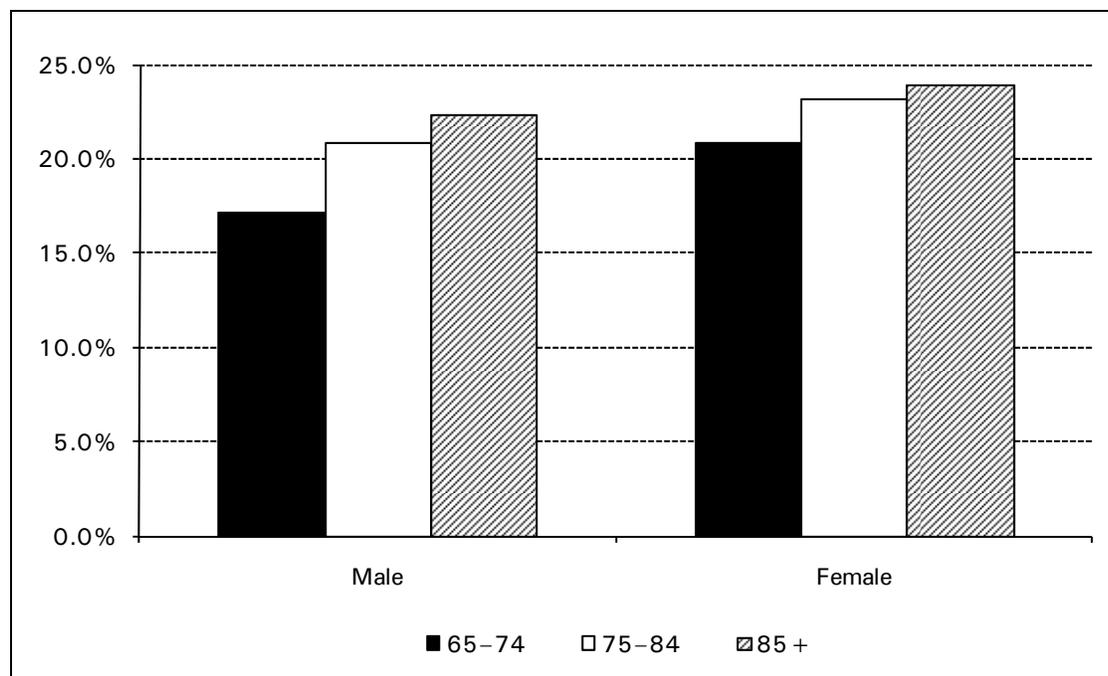
National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

PPI Claim Trends: Age and Sex

PPI use was highest among females and older seniors (Figure 4). In 2007–2008, the rate of PPI use among female seniors was 22.2%, compared with 19.0% among male claimants. Among both male and female seniors, the lowest rate of PPI use was among those between age 65 and 74 (17.2% in males and 20.9% in females), and the highest rate was found in those 85 and older (22.3% in males and 23.9% in females).

vii. For more detail, see the Formulary Comparison section of this Analysis in Brief.

Figure 4 Percentage Rate of PPI Use Among Senior Claimants on Public Drug Programs in Select Provinces,* by Age Group and Sex, 2007–2008



Note

* The six provinces submitting claims data to the NPDUIS Database as of March 2009.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

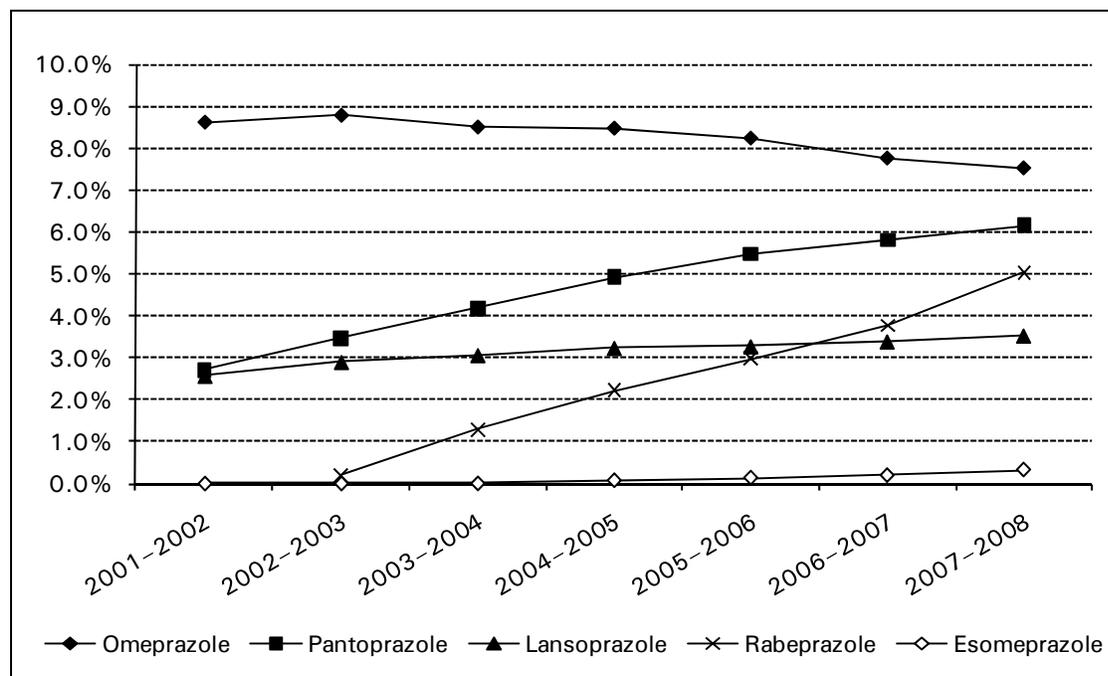
PPI Claim Trends: Chemical

Omeprazole had the highest rate of use among the five PPIs every year between 2001–2002 and 2007–2008 (Figure 5). In 2007–2008, the omeprazole rate of use was 7.6%, followed by pantoprazole at 6.2%. Esomeprazole had the lowest rate of use, at less than 0.3% in each year during the study period.

The rates of use of all PPIs, with the exception of omeprazole, increased during the study period. The rate of omeprazole use decreased in the last five years of the study period, at an average annual rate of 3.1% per year. The average annual rate of growth in use was highest for rabeprazole (92.6%), followed by pantoprazole (12.2%).^{viii}

viii. This excludes esomeprazole, which, as previously mentioned, had a rate of use of less than 0.3% in each year during the study period.

Figure 5 Age–Sex Standardized Rate of PPI Use Among Senior Claimants on Public Drug Programs in Select Provinces,* by Chemical, 2001–2002† to 2007–2008



Notes

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

† Rabeprazole was not available in Canada until 2002–2003.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

PPI Claim Trends: Average Daily Dose

The standard PPI dosages most commonly used are consistent with the DDD assigned by the World Health Organization in its Anatomical Therapeutic Chemical classification system (Table 2). The DDD is the assumed average dose per day for a drug’s main indication in adults. Maintenance PPI therapy for the primary or secondary prevention of disease is usually recommended to be prescribed at half the standard dose. Doubling the dose of PPI (“double-dose”) therapy is generally recommended for patients who have severe disease symptoms despite taking standard once-daily PPI therapy.³

As noted previously, concerns have emerged regarding potential adverse effects associated with high-dose PPI therapy. Studies have also reported that double-dose PPI therapy is commonly used for the initial management of conditions such as GERD and peptic ulcer disease.¹⁷ A recent report concluded that initial therapy with double-dose PPIs did not reduce gastrointestinal-related resource utilization.¹⁷

By examining trends of the ADD, it is possible to gain some insight into how PPIs are being used in the six provinces. The ADD of omeprazole, pantoprazole, lansoprazole and rabeprazole used by seniors on public drug programs remained relatively stable during the study period (Table 2). ADD could not be calculated for 2007–2008 due to the method that was used. For more information on the calculation of average daily dose, see the Methods section of this analysis.

Table 2 Average Daily Dose of PPIs Used by Senior Claimants on Public Drug Programs in Select Provinces,* by Chemical, 2001–2002 to 2006–2007

Chemical	Defined Daily Dose (mg)	2001–2002 [†]	2002–2003	2003–2004	2004–2005	2005–2006	2006–2007
Omeprazole	20 mg	19.1	19.5	20.0	20.3	20.6	20.9
Pantoprazole	40 mg	35.7	36.6	37.6	38.4	39.2	39.9
Lansoprazole	30 mg	25.5	26.2	27.0	27.5	28.0	28.5
Rabeprazole	20 mg	N/A	12.8	13.5	14.5	15.1	15.7

Notes

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

† Rabeprazole was not available in Canada until 2002–2003.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

It should be noted that several factors may impact the PPI ADD. As noted above, variations in prescribing patterns may be a factor. Patient adherence to PPI therapy may also impact the ADD, as patients may stop the drug or decrease their dosage if symptoms are not present. Without further information on these factors, it is not possible to measure what impact they might have had on trends in average daily dose.

To gain further insight into PPI dosage trends, patient ADDs were further categorized into low daily dose, medium daily dose and high daily dose. As noted previously, low daily dose is an ADD less than or equal to 0.5 times the DDD,^{ix} medium daily dose is an ADD greater than 0.5 times and less than 1.5 times the DDD and high daily dose is an ADD greater than or equal to 1.5 times the DDD.

Seniors who are high daily dose users are likely on double-dose therapy for at least part of the time they are taking PPIs, while those who are low daily dose users are likely on half-dose therapy for at least part of the time they are taking PPIs. Seniors who are medium daily dose users are likely on a standard dose most of the time.

ix. PPI DDDs are omeprazole 20 mg, pantoprazole 40 mg, lansoprazole 30 mg, rabeprazole 20 mg and esomeprazole 30 mg.

The proportions of seniors on low, medium and high daily doses remained relatively stable between 2001–2002 and 2006–2007. The majority of seniors used a medium daily dose, with the proportion increasing slightly from 76.7% to 78.9% over the time period. The proportion of senior claimants who used a low daily dose decreased slightly during the study period, from 13.6% in 2001–2002, to 10.3% in 2006–2007. The proportion of seniors who used a high daily dose increased slightly from 9.7% to 10.8%.

Table 3 Percentage Rate of Senior PPI Users on Public Drug Programs in Select Provinces* Using Low, Medium or High Daily Doses of PPIs, 2001–2002 to 2006–2007

Daily Dose	2001–2002†	2002–2003	2003–2004	2004–2005	2005–2006	2006–2007
Low Daily Dose	13.6	12.3	11.8	11.4	11.0	10.3
Medium Daily Dose	76.7	77.7	78.2	78.4	78.5	78.9
High Daily Dose	9.7	10.1	10.0	10.2	10.4	10.8

Notes

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

† Rabeprazole was not available in Canada until 2002–2003.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

PPI Claim Trends: Chronic PPI Use

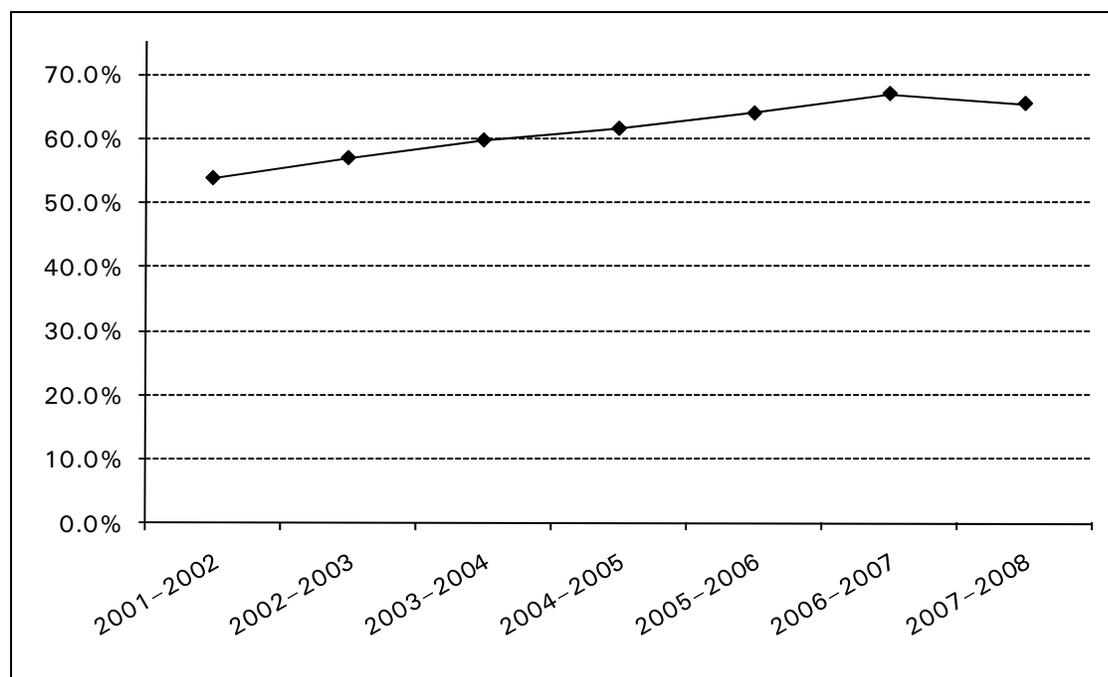
The duration of PPI therapy is in large part dependent on the condition being treated and the patient response to therapy. The initial treatment of conditions such as GERD and peptic ulcer disease is usually for a period of 8 to 12 weeks. Longer courses of therapy are used in some cases to prevent or minimize the recurrence of disease symptoms. Long-term PPI therapy is also used for conditions such as Barrett’s esophagitis, erosive esophagitis and Zollinger-Ellison Syndrome. However, concerns have emerged regarding the impact of long-term PPI use.^{10, 11} Examining the chronic use of PPIs in seniors provides insight as to the impact long-term use may have in influencing trends in overall PPI use.

Chronic PPI use is defined in this analysis as seniors with at least three PPI claims, accounting for a total dispensed quantity of at least 180 tablets or capsules, in a given year. Figure 6 shows the percentage rate of senior PPI users who were considered chronic users between 2001–2002 and 2007–2008. This rate steadily increased between 2001–2002 (53.9%) and 2006–2007 (66.9%), with a slight decrease in 2007–2008 (65.4%).

The extent of chronic PPI use among seniors was investigated further by looking at seniors with chronic use for three and five consecutive years, as well as for the entire study period. Of all senior PPI users with a PPI claim at least three years prior to the end of the study period, 36.1% were chronic users for at least three consecutive years between 2001–2002 and 2007–2008. The rate fell among seniors with a PPI claim at

least five years prior to the end of the study period, with 25.1% using PPIs chronically for at least five consecutive years. Among seniors who were PPI users in 2001–2002, 19.8% were chronic PPI users throughout the entire study period.

Figure 6 Percentage Rate of Chronic PPI Use Among Senior PPI Users on Public Drug Programs in Select Provinces,* 2001–2002 to 2007–2008



Note

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

PPI and H2RA Use in Chronic Users of NSAIDs

NSAIDs are commonly prescribed to treat various conditions in seniors, including arthritis and chronic pain. Studies have shown that NSAIDs are associated with an increased incidence of gastrointestinal (GI) adverse effects, such as dyspepsia, gastric and duodenal ulcers and GI bleeds.^{18, 19} PPIs and H2RAs have been shown to be effective in preventing and treating these adverse effects.^{2, 19–21} However, a recent review of comparative studies concluded that PPIs are more effective than H2RAs in reducing the risk of gastric and duodenal ulcers in patients on NSAIDs.²¹

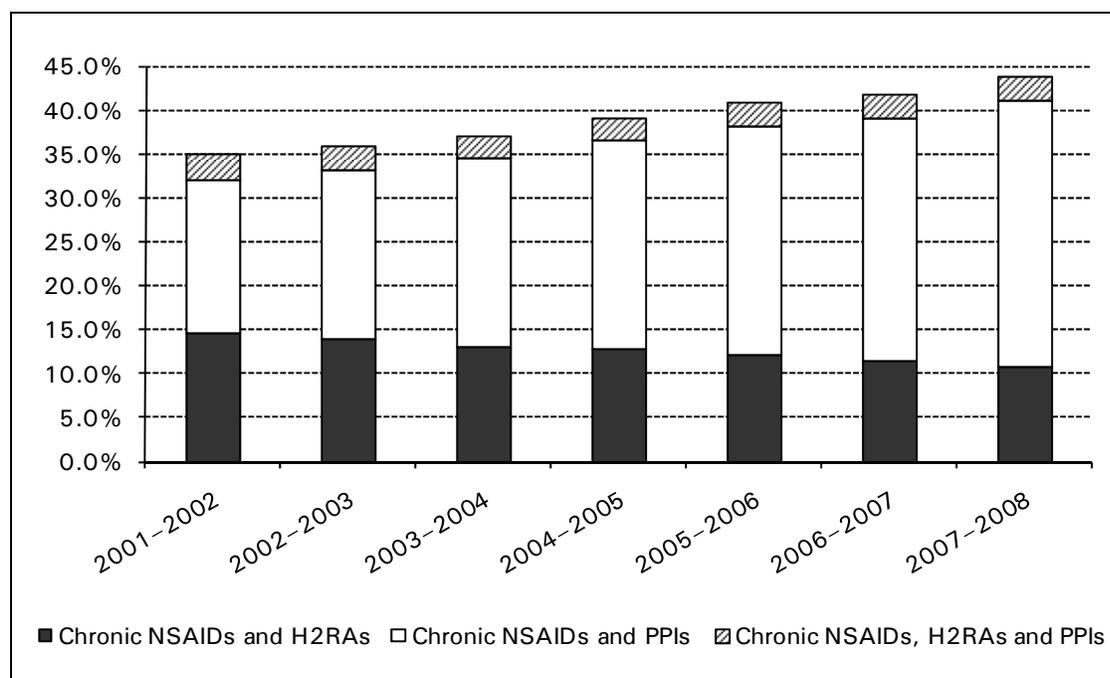
Figure 7 shows the rate of use of PPIs and H2RAs among seniors who were chronic users of NSAIDs, between 2001–2002 and 2007–2008. Chronic NSAID users in this analysis are defined as seniors with at least three NSAID claims in a year and with at least 180 days' supply. Overall, the use of GI medications (either PPI or H2RA) among

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chronic NSAID users increased from 34.8% in 2001–2002, to 43.7% in 2007–2008. During this time period, among chronic NSAID users, the concurrent use of NSAIDs and PPIs increased from 17.4% to 30.2%, while the concurrent use of NSAIDs and H2RAs decreased from 14.5% to 10.8%. A small percentage of chronic NSAID users (less than 3.0%) had claims for both PPIs and H2RAs in each year.

Figure 7 Percentage Rate of PPI and H2RA Use Among Senior Chronic NSAID Users on Public Drug Programs, in Select Provinces,* 2001–2002 to 2007–2008



Note

* Five provinces submitting claims data to the NPDUIS Database as of March 2009: Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Source

National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

Conclusion

Acid-related diseases of the gastrointestinal system affect an estimated 29% of Canadian adults.¹ PPIs are commonly used for the treatment of acid-related disorders such as gastroesophageal reflux disease, reflux esophagitis and peptic ulcer disease.

In 2007, Canadians spent an estimated \$1.4 billion on prescription acid-reducing drugs, with about half of this total spent by seniors.¹² The overall spending on this drug class almost doubled between 1998 and 2007, adjusted for inflation.¹² It is estimated that roughly 90% of prescription expenditures on acid-reducing drugs are for PPIs. While PPIs are generally considered to be safe medications, concerns have emerged regarding the effect of long-term and high-dose PPI use on people's health.⁷⁻¹¹

This analysis of NPDUIS Database data from Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and P.E.I. examines trends in the use of PPIs in seniors between 2001–2002 and 2007–2008.

The age–sex standardized rate of PPI use among seniors on public drug programs increased from 13.1% in 2001–2002, to 21.1% in 2007–2008. In the same time period, total drug program expenditures for PPIs increased from \$41.8 million to \$69.8 million, accounting for 7.3% of total drug program expenditures.

The average daily dose of PPIs used by seniors on public drug programs remained relatively stable during the study period. In 2006–2007, 78.9% of senior claimants used an average daily dose within the standard dosage range, while 10.8% used a dose greater than 1.5 times the defined daily dose.

The chronic use of PPIs increased from 53.9% of seniors with PPI claims in 2001–2002, to 65.4% of seniors with PPI claims in 2007–2008.

PPI use among chronic users of NSAIDs increased from 17.4% in 2001–2002, to 30.2% in 2007–2008.

Further analysis is needed to understand the cause of the observed trends in PPI use among seniors, including variations in use between provinces. The inclusion of diagnosis and outcome data would support further study of PPI use in the elderly population and its impact on patient outcomes.

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Please note that the analyses and conclusions in this document do not necessarily reflect those of the individuals or organizations mentioned above.

About CIHI

The Canadian Institute for Health Information (CIHI) collects and analyzes information on health and health care in Canada and makes it publicly available. Canada's federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI's goal: to provide timely, accurate and comparable information. CIHI's data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

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Appendix: Distribution of Total Senior Population^x and Senior Claimants on Public Drug Programs in Select Provinces,^{xi} by Age, 2007–2008

Alberta

Group	Senior Population (n = 367,033)	Senior Claimants (n = 328,280)
Male	44.9%	44.4%
Female	55.1%	55.6%
65–74	53.3%	52.7%
75–84	34.1%	35.3%
85 +	12.6%	12.0%

Saskatchewan

Group	Senior Population (n = 150,589)	Senior Claimants (n = 135,111)
Male	43.7%	42.1%
Female	56.3%	57.9%
65–74	47.4%	45.4%
75–84	36.2%	37.0%
85 +	16.3%	17.6%

Manitoba

Group	Senior Population (n = 164,506)	Senior Claimants (n = 147,315)
Male	42.9%	41.7%
Female	57.1%	58.3%
65–74	48.8%	47.1%
75–84	35.7%	36.5%
85 +	15.5%	16.5%

New Brunswick

Group	Senior Population (n = 111,474)	Senior Claimants (n = 63,518)
Male	43.6%	38.3%
Female	56.4%	61.7%
65–74	52.8%	46.5%
75–84	33.5%	36.3%
85 +	13.7%	17.2%

x. Population data comes from Statistics Canada, Demography Division, Special Tabulation, June 2009.

xi. The six provinces submitting claims data to the NPDUIS Database as of March 2009.

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Nova Scotia

Group	Senior Population (n = 141,815)	Senior Claimants (n = 96,307)
Male	43.4%	38.5%
Female	56.6%	61.5%
65-74	53.3%	49.0%
75-84	32.9%	34.8%
85 +	13.8%	16.1%

Prince Edward Island

Group	Senior Population (n = 20,715)	Senior Claimants (n = 17,179)
Male	44.0%	41.9%
Female	56.0%	58.1%
65-74	53.7%	51.7%
75-84	32.6%	34.5%
85 +	13.7%	13.7%

Canada: Standard Population

Group	Senior Population (n = 4,472,086)	Senior Claimants (N/A)
Male	43.9%	N/A
Female	56.1%	N/A
65-74	52.6%	N/A
75-84	34.7%	N/A
85 +	12.7%	N/A

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