RESEARCH PAPER

Income-Based Drug Coverage in British Columbia: The Impact on Private and Public Expenditures

Un régime d'assurance-médicaments fondé sur le revenu en Colombie-Britannique : Incidence sur les dépenses privées et publiques

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Abstract

Background and Objectives: In May 2003, the government of British Columbia adopted income-based pharmacare, replacing an age-based program. Stated policy goals included the reduction and reallocation of government spending. It was also hoped that income-based deductibles would increase consumer price sensitivity in decision-making. This analysis measured policy impacts on private and public expenditure and on expenditure drivers.

Methods: We employed a longitudinal research design using PharmaNet records of every prescription dispensed in the province from January 1996 to December 2004. Expenditure dynamics were analyzed using non-stochastic decompositions of trends. Analyses were stratified by five age categories and five socio-economic quintiles. The effect of the policy on expenditure trends and their sources was assessed using time series analysis. Additional analyses, using equivalent methods, were conducted using market-level data to compare per capita expenditure in British Columbia to the Canadian average over the period 1998–2004.
Results: The BC Ministry of Health was successful in reducing the public share of drug expenditure through the introduction of seniors' co-payments in 2002 and then income-based pharmacare in 2003. The policy change did not have major effects on aggregate expenditure trends in the province. While several statistically significant changes in expenditure dynamics occurred during the period of study, only an increase in seasonal "stockpiling" of medicines by seniors can reasonably be attributed to the policy changes.
Discussion: The lack of large and differential policy impacts on drug expenditure and utilization rates across age and income groups suggests that changes in the BC PharmaCare Program were designed in a manner that ensured continued access to medicines for the populations previously served by the drug plan (e.g., senior citizens). It also indicates that the policy did not significantly increase access to medicines by populations that might have been better served under the new policy (e.g., non-seniors). Finally, although it was hoped that income-based pharmacare might increase consumer cost consciousness, changes in the relative cost of certain drugs purchased following the policy change appear to have stemmed from other policies directly targeting the expenditure impact of therapeutic choices.

Résumé

Contexte et objectifs : En mai 2003, le gouvernement de la Colombie-Britannique a instauré un régime d'assurance-médicaments fondé sur le revenu pour remplacer un régime fondé sur l'âge. Parmi les objectifs de politique visés, citons la réduction et la réaffectation des dépenses du gouvernement. On espérait également que les franchises fondées sur le revenu contribueraient à sensibiliser les consommateurs aux coûts quand ils prennent des décisions. Cette analyse a mesuré l'incidence de ces politiques sur les dépenses privées et publiques et sur les facteurs influençant les dépenses.
Méthodes : Nous avons utilisé une conception de recherche longitudinale et avons puisé dans PharmaNet pour recueillir des données sur toutes les ordonnances distribuées dans la province entre janvier 1996 et décembre 2004. Nous avons analysé la dynamique des dépenses à l'aide de décompositions non-stochastiques des tendances. Nous avons ensuite classé les analyses en cinq groupes d'âge et en cinq quintiles socio-

économiques. Puis, nous avons examiné l'effet de la politique sur les tendances dans les dépenses et leurs sources à l'aide d'une analyse des séries chronologiques. Nous avons effectué des analyses supplémentaires en utilisant des méthodes équivalentes et des données du marché pour comparer les dépenses par tête en Colombie-Britannique à la moyenne canadienne pour la période allant de 1998 à 2004.
Résultats : Le ministère de la Santé de la C.-B. a réussi à réduire la portion publique des dépenses en médicaments en instaurant des quotes-parts pour les aînés en 2002 et un régime d'assurance-médicaments fondé sur le revenu en 2003. Le changement de politique n'a pas eu d'incidence significative sur l'ensemble des dépenses encourues dans la province. Bien qu'il se soit produit plusieurs changements statistiquement importants dans la dynamique des dépenses pendant la période visée par l'étude, seule une augmentation de la constitution saisonnière de réserves de médicaments par les aînés peut raisonnablement être attribuée aux changements apportés aux politiques.
Discussion : L'absence d'une incidence importante et variée des politiques sur les dépenses en médicaments et les taux d'utilisation chez les différents groupes d'âge et niveaux de revenu suggère que les changements apportés au régime d'assurance-médicaments de la C.-B. ont été conçus de manière à assurer un accès continu aux médicaments pour les populations antérieurement visées par le régime (par ex., les aînés). Cela indique aussi que la politique n'a pas augmenté l'accès aux médicaments de manière significative pour les populations qui auraient peut-être été mieux servies par la nouvelle politique (par ex., les non-aînés). Enfin, bien qu'on espérait qu'une assurance-médicaments fondée sur le revenu sensibiliserait davantage les consommateurs aux coûts, les changements dans le coût relatif de certains médicaments achetés après le changement de politique semblent découler d'autres politiques qui visent directement l'incidence financière des choix de traitement.

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Through a sequence of two policy reforms, the BC PharmaCare Program recently underwent a major transformation. BC PharmaCare circa 2001 could be characterized as a "mixed pharmacare model," involving relatively comprehensive coverage for social assistance recipients and seniors, and fixed-deductible coverage for "catastrophic" drug costs for all others. In January 2002, the BC Ministry of Health introduced new co-payments under the seniors' drug program in an effort to meet budgetary targets for government spending on prescription drugs. Then, in May 2003, the fixed-deductible "catastrophic" program and the seniors' program were combined into a new, income-based drug plan called Fair PharmaCare. Deductibles and co-payments under Fair PharmaCare would be based on income, regardless of age. Primary goals of the Fair PharmaCare policy were to meet budgetary targets while reallocating subsidies across age and income. It was also hoped that

deductibles would encourage patients to consider the cost of their medicines. Details of the policy change and the policy objectives that motivated it are provided in the accompanying paper (Morgan and Coombes, page 92).

This paper contains empirical findings concerning the impact of the policy change on expenditure trends and their sources. We examine trends in drug expenditures from 1996 to 2004. Using empirical methods developed to measure impact of changes in drug utilization, pricing and product selections, we investigate whether the policy changes in 2002 and 2003 affected specific expenditure dynamics for populations in different age and income groups. We present findings from age- and income-stratified analyses of administrative data for all drug claims in BC and from an overall, market-level analysis of data, which together allow comparison of expenditure trends in BC and Canada. The research was funded through a peer-reviewed operating grant from the Canadian Institutes of Health Research. Data were provided by the BC Ministry of Health and analyzed at the UBC Centre for Health Services and Policy Research. All investigations were approved by the Behavioural Research Ethics Board at the University of British Columbia.

Data

The primary data sources for this analysis (and the accompanying papers in this issue of *Healthcare Policy*) are administrative data files for the province of British Columbia. The study cohort contains all residents eligible for provincially administered, universal public health insurance (4.1 million in 2004). This excludes only those residents covered under federal health insurance programs, i.e., registered First Nations, Royal Canadian Mounted Police and veterans (~4% of the population). The period of study is from 1996 to 2004, inclusive. Data on prescription drug utilization and expenditure are drawn from BC PharmaNet, a prescription monitoring and payment information system. Law requires that every prescription dispensed in British Columbia be recorded in PharmaNet, regardless of recipient or payer. PharmaNet claims information extracted for this study included a patient identification number, drug identification number, date of dispensation, drug quantity dispensed, total drug cost and amount paid by BC PharmaCare.

Prescription data were linked to the BC Linked Health Database to obtain demographic and socio-economic information. Data were also (anonymously) linked to Fair PharmaCare registration files to determine household income (registered beneficiaries of Fair PharmaCare are assigned to income groups to administer the program's income-based deductibles and co-insurance). Income information could also be estimated for individuals enrolled under other assistance programs for which incomes must be below known thresholds (e.g., social assistance). Combined use of Fair PharmaCare registration and other income-based program data allowed us to

obtain income estimates for 78% of all households in BC – 95% of senior households and 73% of non-senior households. No household-specific information about incomes could be obtained for other individuals.

Had data been available on factors that might influence the decision not to register for Fair PharmaCare – such as employment, access to private insurance or ethno-cultural background – it might have been possible to conjecture the incomes of non-registrants from the research data set. Such information was not available and, as a result, certain aspects of this analysis had to rely on ecological (area-defined) definitions of income. These estimates of income were constructed using the average household income in a resident's neighbourhood as recorded in the 2001 Census. More than 7,000 "neighbourhoods" (Census Dissemination Areas comprising 400 to 700 persons) are ranked according to average household income and then stratified into 10 groups (income deciles). Each household is assigned to the income decile of its neighbourhood.

Using neighbourhood-defined variables ignores income variations within neighbourhood and therefore "averages out" some of the income-related effects of the policy. To test the impact of this form of "ecological bias," both household-specific data and neighbourhood-defined data were used for seniors when studying financial equity (Hanley et al. 2006). Findings were not significantly altered by changes in the definitions of household incomes used. Thus, to study the policy impact on registered and non-registered residents across general socio-economic categories, neighbourhood-defined data are used unless otherwise stated. Given the nature of results found, potential biases are expected to be small.

Methods

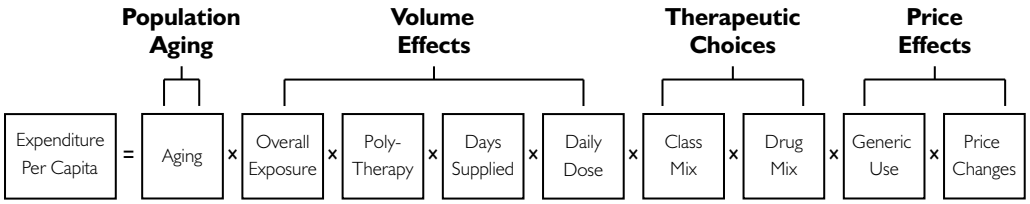
For populations stratified by age and income, drug expenditure trends were studied along with the specific utilization and pricing dynamics that contribute to changes in spending over time. Changes in per capita expenditure within a specific population subgroup were disaggregated into nine expenditure drivers using index theoretic methods (Morgan 2005a). As illustrated in Figure 1, the nine specific expenditure drivers can be summarized into four categories: Population Aging, Volume Effects, Therapeutic Choices, and Price Effects.

Population aging

As a population ages, average needs for prescription drug treatment increase. The calculation of expenditure trends and expenditure drivers within income groups was therefore stratified by five age categories – 0 to 19, 20 to 44, 45 to 64, 65 to 84 and over 85 years of age. (This produced 55 age/income strata for the empirical analyses: five age groups stratified by 10 income deciles plus an "all incomes" group.) The effect

of *aging* within any income group is the change in per capita expenditure averaged across the entire income group that results from changes in the shares of the income group's population that fall into each age category. Age-specific levels of expenditure are held constant for this calculation, which is tantamount to direct age-standardization. All other expenditure drivers are therefore age-adjusted – measured on an age-specific basis before aggregating to the age-adjusted population average.

FIGURE 1. Framework for computing causes of drug expenditure trends



Volume effects

Volume effects are expenditure drivers that relate to the sheer volume of drug therapy used by a population. The first of these factors is the share of the population that uses one or more prescription of any kind—*overall exposure*. Expenditure per person so "exposed" to any drug therapy is determined, in part, by the number of different drug treatments that such patients receive in a given period – *poly-therapy*. We used Anatomic Therapeutic Chemical (ATC) classification codes to define 64 mutually exclusive therapeutic categories that a patient might be exposed to in any given quarter-year (World Health Organization Collaborating Centre for Drug Statistics Methodology 2004). The volume-related expenditure per patient using medicines is further defined by the number of days of therapy that they are prescribed for each drug type they receive – *days of specific drugs* – and by the physical quantity of drug they receive per day of such treatment – *daily unit quantity*. These latter two measures would capture changes in duration or intensity of treatment, which may be affected by trends towards chronic disease management with pharmaceuticals.

Therapeutic choices

After having adjusted for the volume of therapy provided (including duration and intensity), the average expenditure per patient treated from each of the 64 therapeutic categories is influenced by therapeutic choices. These are decisions concerning which classes of drug to prescribe within a given therapeutic category – *mix of drug classes*

– and which particular drug to select within a given drug class – *mix of specific drugs*. Using the World Health Organization's classification system, there are 248 mutually exclusive drug classes from which treatments could be selected. An example of decisions concerning the mix of drug classes includes the choice between calcium channel blockers or beta-blockers for the treatment of hypertension. Mix of specific drugs concerns selection of specific types of drug to use within a drug class, such as simvastatin or atorvastatin from the class of statins used to treat high cholesterol.

Price effects

The final category of expenditure drivers includes the two factors that affect only the price of specific drugs selected. This includes the choice between brand name and generic versions of a drug – *generic drug use*. Increased use of generic drugs typically reduces the average price of drugs used. Therefore, generic drug use will usually be a negative expenditure driver, or an "expenditure saver." Once particular products (drug, form, dose and manufacturer) are selected, expenditures are ultimately determined by changes in the retail prices charged for them – *price changes*.

Testing for policy change

Time series analyses were conducted to detect differences in the trend for the total change in expenditure, volume effects, therapeutic choices and price effects at 2002Q1 and 2003Q2. This analysis was done using a standard linear regression model, with stepwise specification of the autoregressive terms in the error variables (SAS System for Windows Version 8). The model estimated for all age and income groups of the population took the following form:

$$t_1 = \alpha + \beta_1 Q_1 + \beta_2 Q_2 + \beta_3 Q_3 + \beta_4 t + \beta_5 t^2 + \delta_1 CoPay + \delta_2 (CoPay \times t) + \gamma_1 \text{Fair} + \gamma_2 (Fair \times t) + \varepsilon$$

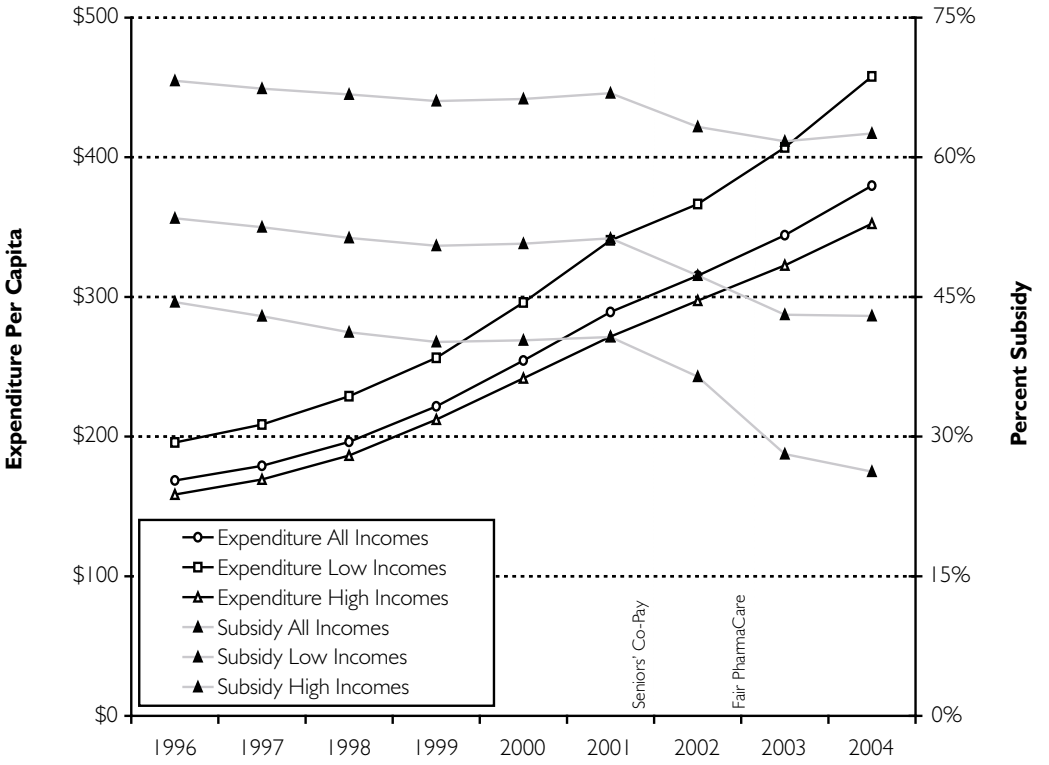
Here, I is the index studied: total change, volume effects, therapeutic choices and price effects. The Q_q variables are dummy variables for quarterly observations (q=1, 2, 3), t is the time period, *CoPay* is a dummy variable equal to 1 on 2002Q1 and thereafter, and *Fair* is a dummy variable equal to 1 on 2003Q2 and thereafter. There were 36 quarterly observations in each regression, with 12 observations post 2002Q1 (*CoPay*) and seven observations post 2003Q2 (*Fair*).

Findings

Figure 2 illustrates the age-adjusted trends in per capita expenditure and percentage of drug expenditures subsidized by BC PharmaCare. Results are shown for the BC pop-

ulation as a whole, for those in the lowest income decile and for those in the highest income decile. Over the period of analysis, individuals with lower incomes have higher drug expenditure than those with higher incomes. While consistent with existing evidence on income-related gradients in health and healthcare use (Roos and Mustard 1997; Roos et al. 2005), we believe that this finding reflects very high drug expenditures among the poorest neighbourhoods in British Columbia, rather than a general SES gradient. Our accompanying analyses on income percentiles show extraordinarily high expenditure per capita in the very lowest income percentiles, but much lower expenditure per capita for all other income deciles; the analysis using income percentiles shows an SES gradient that is positive for most of the income distribution (see Hanley et al. 2006). In addition to differences in expenditure levels, Figure 2 also shows that lower-income individuals have a greater proportion of their drug expenditures subsidized by BC PharmaCare. This is true before and after the policy change.

FIGURE 2. Age-adjusted expenditure per capita and public subsidy, overall and for highest and lowest income deciles, 1996–2004



The trends illustrated in Figure 2 demonstrate that drug expenditures had been growing at a slightly increasing rate from 1996 to 2001. A regression analyses on expenditure trends revealed that the coefficient on t^2 (time squared) was small but statistically significant and positive. While the policy changes in 2002 and 2003 do not appear to have had a major impact on spending levels, trends in annual expenditure per capita slowed slightly (details below).

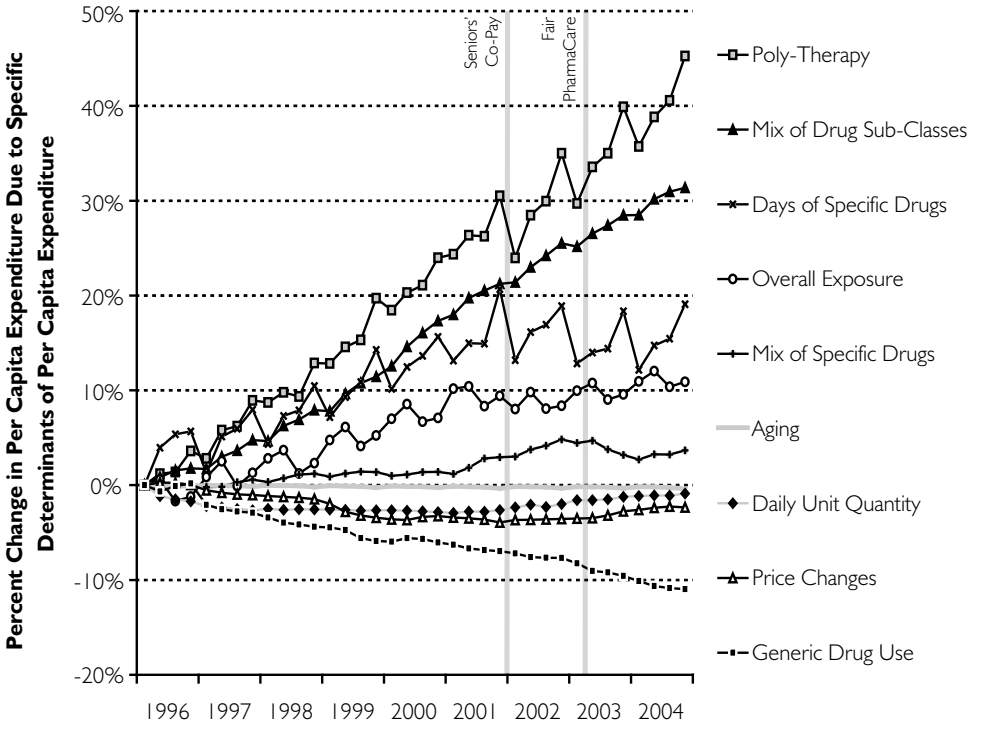
The policy changes had a more dramatic impact on the average level of public subsidy for drugs. Lower-income individuals experienced a 4% reduction in the share of drug expenditures paid by BC PharmaCare in 2002 (from 67% to 63%) and a 1% reduction in 2003. Those with highest incomes experienced 5% and 8% reductions, respectively (with public subsidy falling from 41% of expenditures in 2001, to 36% in 2002, and to 28% in 2003). A detailed analysis of the change in distribution of private and public drug expenditures is provided in the accompanying paper (Hanley et al. 2006). [Note: The results in Figure 2 differ slightly from those reported in our accompanying paper due to the difference in cohort definitions and analysis. Here, we use direct standardization to report age-adjusted expenditure and subsidies, whereas our accompanying study reports results stratified by age but equivalized for household size. We also use individual-level data here, without imposing pre-policy residency requirements; the accompanying analysis assesses financial impacts upon households that satisfied a pre- and post-policy residency requirement.]

Causes of expenditure trends

Thirty-three analyses of the causes of drug spending over time were computed: one analysis for seniors' trends, one for non-seniors' trends, and one for all ages, repeated for all incomes combined and then separately for each of the income deciles. To summarize findings, Figure 3 and Figure 4 illustrate determinants of expenditure among seniors of all income levels and among non-seniors of all income levels. Appendix 1 contains a sample of findings stratified by age and income. Importantly, the figures in Appendix 1 indicate that while the relative impact of expenditure-drivers differs across age groups, trends are remarkably similar across income strata.

At first glance, trends illustrated in Figure 3 and Figure 4 indicate that the policy changes in 2002 and 2003 did not have any major impacts on specific determinants of drug spending. Visually, the most apparent policy impact is on seasonal trends among the elderly. Some utilization-related determinants of spending – e.g., *overall exposure*, *poly-therapy* and *days of specific drugs* – exhibit cyclicality that has long been influenced by seasonality of illness and the annual deductibles applied by drug insurance plans. BC PharmaCare policy changes appear to have affected the latter dynamic. Spikes in drug purchases by seniors towards the end of the calendar year appear to have increased significantly following the 2002 policy change. It is likely that patients began

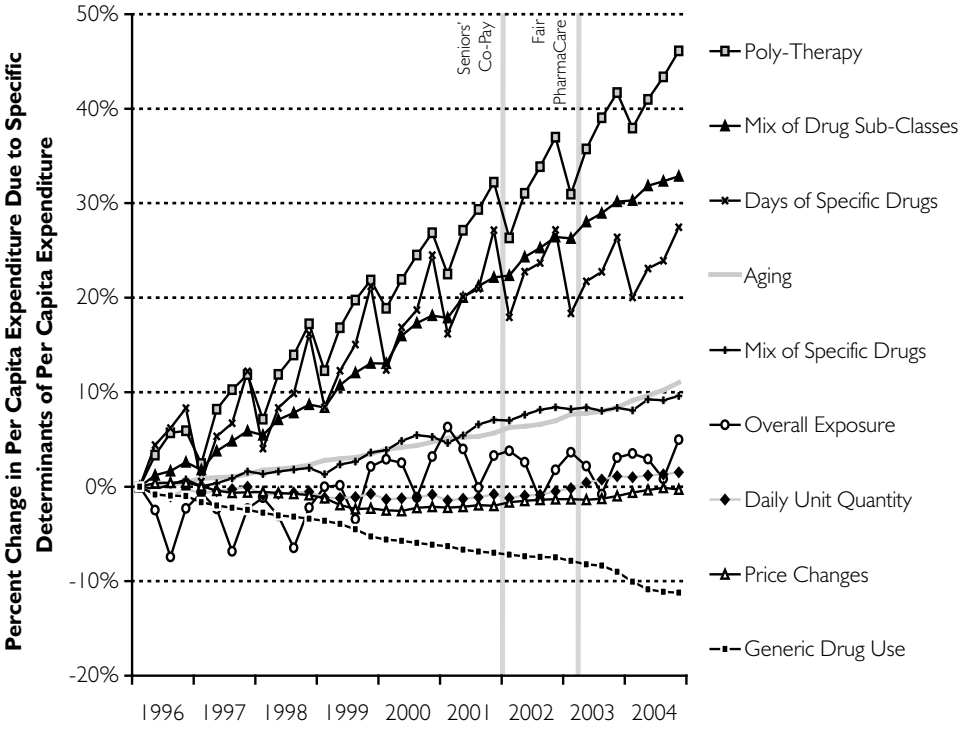
FIGURE 3. Causes of drug expenditure trends, seniors of all income levels, 1996–2004



"stockpiling" medicines because of annual deductibles that apply under the co-payment policy of 2002 and the income-based Fair PharmaCare policy of 2003. (Statistical analysis below tests for overall impact on trends in drug consumption.)

The seasonal patterns in drug utilization and expenditure dynamics make it difficult to identify other policy impacts visually, particularly those that may involve subtle changes in trends or levels. Yet, a few changes in trend at or near the dates of the policy changes can be seen in Figure 3 and Figure 4 (and in Appendix 1). Specifically, after increasing steadily from 1996, growth in days of specific drugs appears to have slowed in 2002 for both seniors and non-seniors. Growth in overall exposure to therapy also appears to have slowed in 2002. In 2004, there appears to have been an increase in *generic drug use*, particularly among non-seniors. Finally, following rapid growth in 2001 to 2002, the expenditure impact of changes in the *mix of specific drugs* used by seniors appears to have declined in the last two quarters of 2003 and first quarter of 2004. While the rate of expenditure escalation due to changes in the mix of specific drugs declined for non-seniors at the same time, the change was not as pronounced as it was for seniors.

FIGURE 4. Causes of drug expenditure trends, non-seniors of all income levels, 1996–2004



Time Series Analysis

Statistical analyses of expenditure dynamics were computed for 20 population subgroups: two broadly defined age groupings (seniors and non-seniors) stratified by 10 income deciles. Time series analyses can confirm some of the findings that are visually detectable in Figure 3 and Figure 4. Table 1 lists regression results for seniors stratified by income deciles and for non-seniors stratified by income deciles. The table provides coefficient estimates only for those policy-specific coefficients that were statistically significant at significance $p = 0.05$. One finding was consistently detected across all 20 of the regression analyses reported: total expenditure trends slowed slightly following 2002 for all age and income groups; and, for every age and income group, slower growth in volume effects was detected.

Another statistically significant finding that emerges is the reduction in the rate of expenditure growth due to therapeutic choices that followed the introduction of Fair PharmaCare. This finding was found to be statistically significant for all income deciles of seniors. A reduction in the expenditure impact of therapeutic choices was also detected in the post–Fair PharmaCare period for five of the 10 income deciles for

TABLE 1. Statistically significant changes in quarterly growth rates detected in time-series regression analysis

		SENIORS				NON-SENIORS			
		"Co-pay"		"Fair PharmaCare"		"Co-pay"		"Fair PharmaCare"	
		δ_1 Level	δ_2 Slope	γ_1 Level	γ_2 Slope	δ_1 Level	δ_2 Slope	γ_1 Level	γ_2 Slope
SES1	Total Change	–0.1173				–0.1216	–0.0405		
	Volume Effects	–0.1261				–0.0599	–0.0369		
	Choices			–0.0156	–0.0096	–0.0121			
	Price Effects								–0.0052
SES2	Total Change	–0.1145	–0.0202	–0.0681	–0.0268	–0.1495	–0.0338		
	Volume Effects	–0.0950	–0.0209				–0.0421		
	Choices	–0.0095	–0.0033	–0.0130	–0.0124				–0.0114
	Price Effects								–0.0050
SES3	Total Change	–0.1036		–0.0838			–0.0347		
	Volume Effects	–0.1085	–0.0204				–0.0417		
	Choices			–0.0151	–0.0084	–0.0290			–0.0170
	Price Effects								–0.0052
SES4	Total Change	–0.1004	–0.0139	–0.0729	–0.0279	–0.1173			
	Volume Effects	–0.1079					–0.0364		
	Choices		–0.0057		–0.0125				–0.0094
	Price Effects								
SES5	Total Change	–0.0884	–0.0133	–0.0729	–0.0227	–0.1036	–0.0230		
	Volume Effects	–0.1045				–0.0726	–0.0323		
	Choices			–0.0117	–0.0118		–0.0090		
	Price Effects						0.0042		–0.0055
SES6	Total Change	–0.0907	–0.0255				–0.0364		
	Volume Effects	–0.1005					–0.0351		
	Choices			–0.0072	–0.0091		–0.0100		
	Price Effects								–0.0054
SES7	Total Change	–0.1217	–0.0226				–0.0295		
	Volume Effects	–0.1120					–0.0357		
	Choices				–0.0105		–0.0081		
	Price Effects								–0.0041
SES8	Total Change	–0.1206		–0.0820			–0.0342		
	Volume Effects	–0.1166					–0.0358		
	Choices			–0.0173	–0.0139		–0.0044		–0.0059
	Price Effects					0.0072			–0.0045
SES9	Total Change	–0.0855					–0.0329		
	Volume Effects	–0.0857	–0.0223			–0.0543	–0.0284		
	Choices				–0.0170	0.0253	–0.0115		
	Price Effects								–0.0045
SES10	Total Change	–0.1178		–0.0809	–0.0229	–0.0745	–0.0207		
	Volume Effects	–0.0935	–0.0175				–0.0258		
	Choices				–0.0121				–0.0064
	Price Effects								–0.0038

Note: Only results significant at $p = 0.05$ are reported.

non-seniors. Moreover, this reduction was not concentrated among wealthy or poor income groups. Finally, among non-seniors, there was a statistically significant decline in price effects following the 2003 implementation of Fair PharmaCare. This was found for nine of the 10 income deciles.

Exploring the Statistically Significant Results

Volume effects

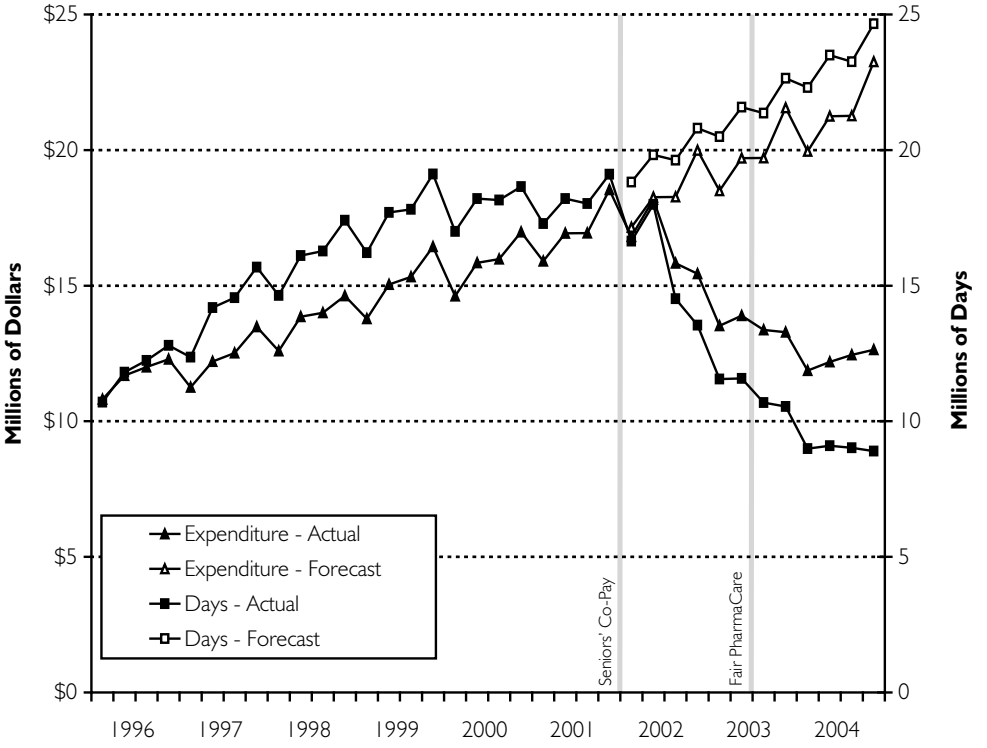
Time series analysis consistently indicated that the rate of drug expenditure growth slowed in British Columbia following 2002Q1, and that this trend was at least partially attributable to slower growth in the volume of drugs purchased. This finding was consistent across all age and income groups, suggesting that it was a sectorwide phenomenon and not the result of the implementation of the seniors' co-payment in 2002 or income-based pharmacare in 2003. One would expect age- and income-based policy changes to have different effects on households of different ages and incomes. So, slower growth in drug utilization observed in this study must have stemmed from overarching trends in the province rather than the age- and income-targeted policy changes.

Potential explanations of the downturn in utilization include the reduction in the use of hormone replacement therapy (HRT) that followed the early termination of the Women's Health Initiative study of HRT in 2002 (Writing Group for the Women's Health Initiative 2002). The study of preventative use of HRT among 16,000 healthy post-menopausal women was halted because of concerns that HRT (specifically, estrogen plus progestin) increased the risk of breast cancer and heart disease. The immediate impact of this finding was to reduce the use of HRT. Evidence of this can be found in the BC data. Figure 5 illustrates the actual and predicted trends in the days supplied and expenditure on estrogens, progestogens and combinations of estrogens and progestogens for British Columbians from 1996 to 2004. The decline in use of these medicines relative to trend occurred across all income categories and represented an annual reduction in spending (relative to trend) of over $30 million in BC.

There is further evidence that slower utilization and expenditure growth during the period 2002 to 2004 was the result of sectorwide trends beyond the influence of Fair PharmaCare. For example, IMS Health Inc. reports that annual growth in global sales for pharmaceuticals declined from a recent peak of 13% in 2001 to 9% in 2002, 10% in 2003 and 8% in 2004 (IMS 2006). Similarly, IMS Health Canada, Inc. data show that prescription drug sales growth in Canada slowed from an average of 14.3% per year from 1996 to 2001 to 13% in 2002, 9.5% in 2003 and 9.8% in 2004 (IMS Canada 2006).

Figure 6 illustrates per capita expenditure trends (IMS Health Canada, Inc.) on

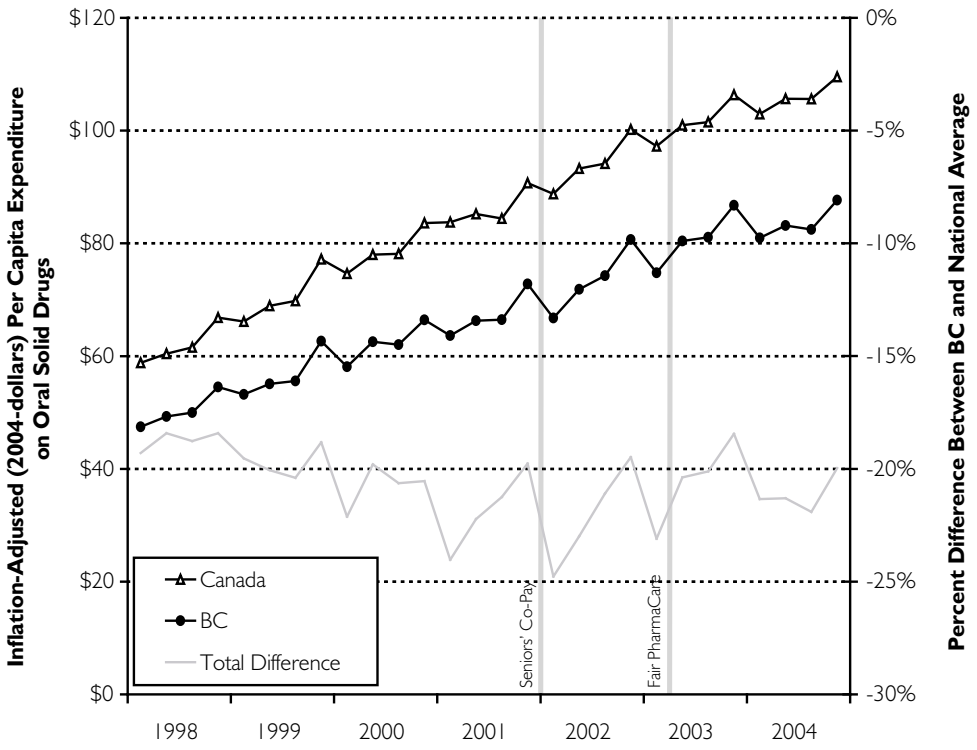
FIGURE 5. Actual and predicted trends in days supplied and expenditure on estrogens, progestogens and combinations of estrogens and progestogens, British Columbia, 1996–2004



oral solid prescription drugs in British Columbia and Canada. Expenditure per capita on oral solid drugs (which account for more than 80% of the total prescription drug market) in British Columbia and Canada followed similar trends. Annual growth from 1998 to 2001 was 10.2% in British Columbia and 11.6% in Canada, explaining the gradual fall in BC expenditure per capita relative to the Canadian average. For the period 2001 to 2004, national and provincial expenditure growth slowed. The rates of average annual growth fell to 4.4% and 4% in British Columbia and Canada, explaining the increase in BC expenditure per capita relative to the Canadian average.

Figure 7 illustrates the sources of the difference between per capita expenditure in British Columbia and in Canada. The analytical framework employed is directly comparable to that presented above; details can be found in two recent studies (Morgan 2005b; Morgan et al. 2005). Differences between average BC and Canadian expenditure per capita for each quarter-year over the period of 1998 to 2004 are attributed to three broad categories of expenditure driver: volume effects, therapeutic choices and price effects. (There is no information about age in the IMS data, so there is no ability

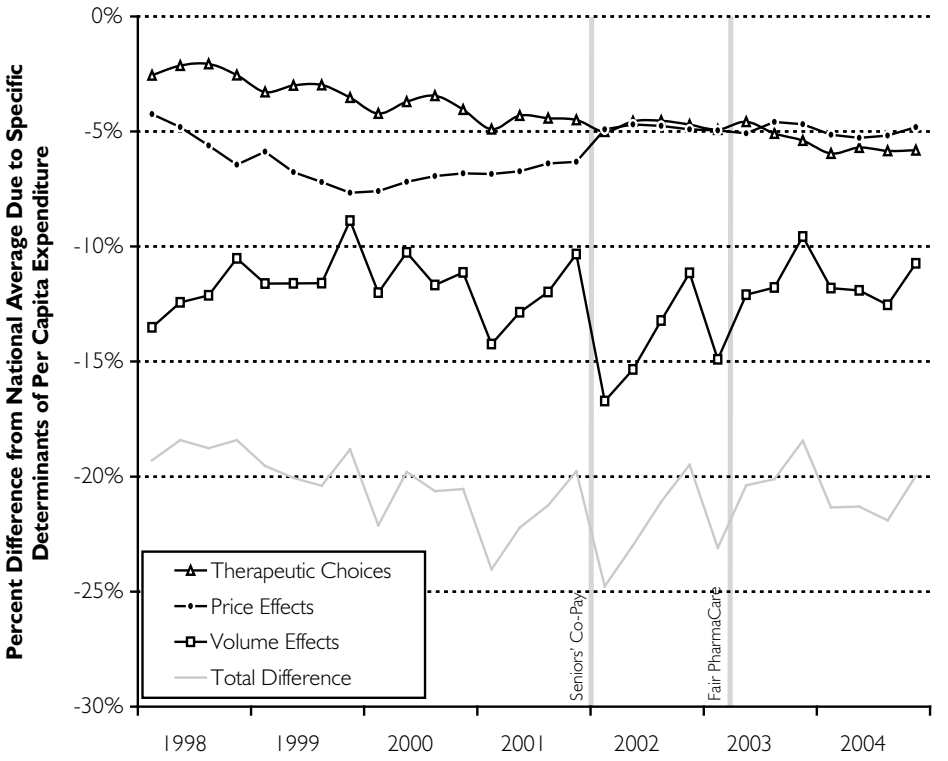
FIGURE 6. Expenditure per capita on oral solid prescription drugs, British Columbia and Canada, 1998–2004, inflation adjusted (2004) dollars



to account for population age effects.) Two findings from Figure 7 are similar to those identified with PharmaNet data above. First, the expenditure impact of therapeutic choices decreased in British Columbia, relative to the Canadian average, in 2003Q3 through 2004Q1. Second, there appears to have been an increase in the seasonal variation in volume effects in British Columbia just as the seniors' co-payment was introduced in 2002Q1. Although British Columbians purchased fewer medicines on average than other Canadians throughout the study period, they appear to have purchased more of their medicines at the end of the year and less at the beginning of the year as the co-payment came into effect in January 2002.

The slower growth in prescription drug utilization (and related expenditure) that was observed in British Columbia appears to have been part of a sectorwide trend that occurred in the Canadian market (and perhaps the global market). Thus, notwithstanding changes in the seasonality of drug utilization in British Columbia, the implementation of temporary seniors' co-payments in January 2002 and income-based pharmacare in May 2003 did not appear to have a significant impact on trends in drug utilization. The lack of large and differential policy impacts on drug utilization rates

FIGURE 7. Determinants of difference in per capita expenditure on oral solid prescription drugs, British Columbia versus Canada, 1998–2004



across age and income groups suggests that changes in the BC PharmaCare Program were designed in a manner that ensured continued access to medicines for the populations previously served by the drug plan (e.g., senior citizens). It also indicates that the policy did not significantly increase access to medicines by populations that might have been better served under the new policy (e.g., low-income non-seniors). Changes in access are explored in more detail in a related paper (Caetano et al. 2006).

Therapeutic choices

Notably, time series analysis of BC PharmaNet data and the analysis of IMS Health data show a reduction in the expenditure impact of therapeutic choices following 2003Q2. The statistical tests for policy impact detected this for seniors of all income levels and for several non-senior income groups. Were one to rely solely on statistical analysis, without the aid of other information, one might conclude that British Columbia's Fair PharmaCare Program had increased price sensitivity of residents in such a way that they sought lower-cost options within treatment categories (one of the

desired outcomes of the policy). However, upon review of the actual time trends and groups displaying this dynamic, it is unlikely that the changes in therapeutic choices observed can be attributed to the adoption of income-based pharmacare policy.

The findings presented above showed that the reduction in the expenditure impact of changes in the mix of specific drugs began in 2003Q3. Yet, Fair PharmaCare was implemented in early 2003Q2 (May). If income-based deductibles were to increase price sensitivity, this effect would be most pronounced during the first period of the policy – when the greatest number of individuals have not exceeded their annual deductibles and therefore face the full price of products. Thus, reduction in expenditure growth due to changes in the mix of specific drugs would be expected to begin in 2003Q2, not 2003Q3.

The likely reason for the 2003Q3 reduction in expenditures related to the mix of specific drugs is the preferential listing of a proton pump inhibitor (PPI) in July 2003, or 2003Q3 (British Columbia 2003). PPIs are the fourth largest drug class in terms of expenditure in the province, and the new policy would provide subsidy only

FIGURE 8. Total days supplied for proton pump inhibitors, BC residents aged 45–64 and 65–84

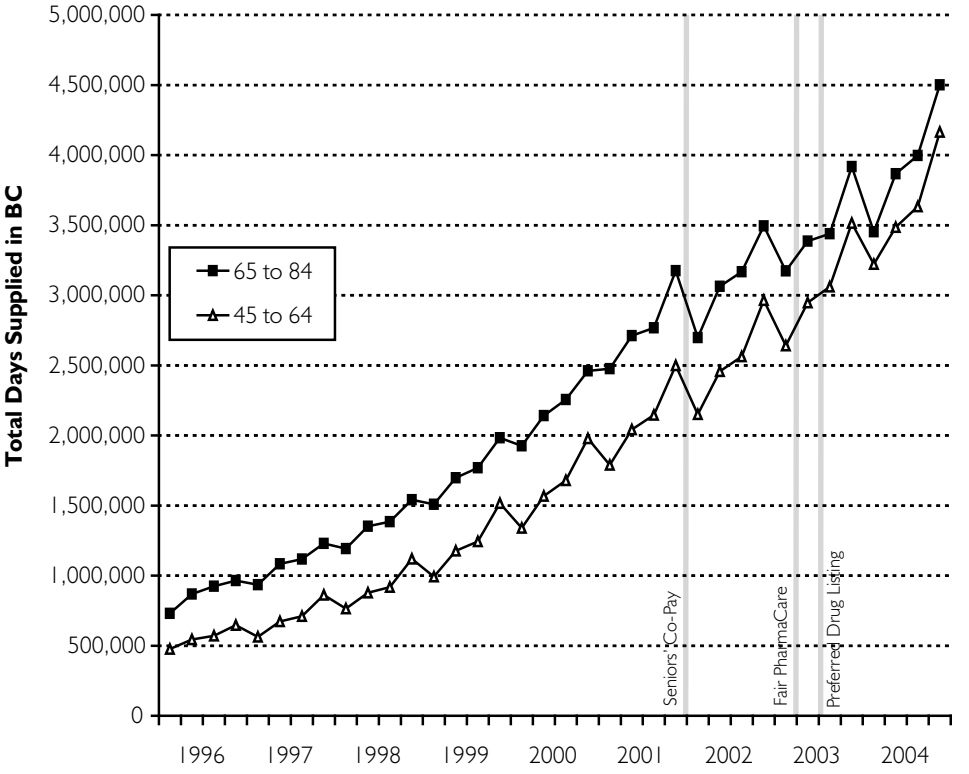
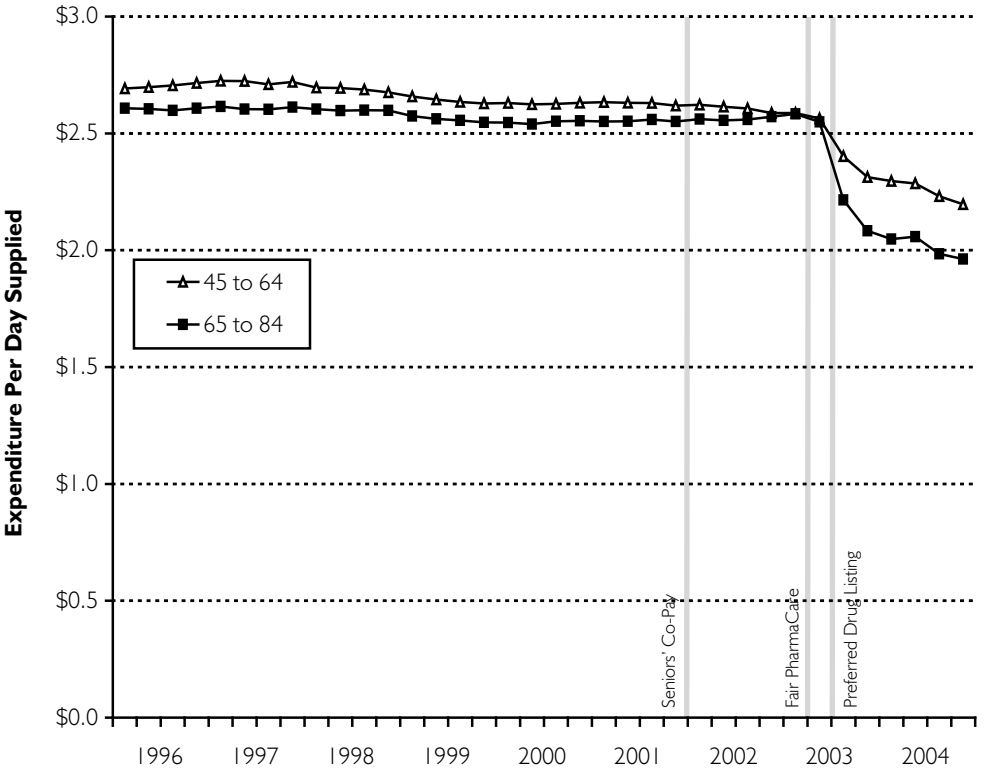


FIGURE 9. Total expenditure per day of supply for proton pump inhibitors, BC residents aged 45–64 and 65–84



for patients who first tried a preferentially listed brand that was less costly than other brand-name competitors in the drug class.

Figure 8 and Figure 9 illustrate trends in total days supplied and the total of private and public expenditure per day of supply for PPIs used by residents aged 45 to 64 and 65 to 84. These two age groups account for the majority of PPI drug use and illustrate a slight difference in response to the policy change. Neither Fair PharmaCare nor the preferred listing affected the trend in utilization of PPIs. Moreover, trends in utilization are similar for residents aged 45 to 64 and those aged 65 to 84.

Changes in expenditure per day of treatment are different. Although Fair PharmaCare appears to have had no impact on average expenditure per day of PPI treatment in 2003Q2, the average expenditure per day of therapy fell considerably following the preferred listing in 2003Q3. For residents age 65 to 84, the average expenditure per day of PPI therapy fell 20% between 2003Q2 and 2004Q1. This significant impact is a result of the fact that most of these seniors would be receiving at least some coverage under Fair PharmaCare and would therefore switch to the lower-

cost PPI when BC PharmaCare changed its listing policy. In contrast, average expenditure per day of therapy received by residents aged 45 to 64 fell by a more modest but respectable 10%. A possible reason for the lower response among the population aged 45 to 64 is that Fair PharmaCare would provide partial coverage for a smaller share of this demographic cohort (because their average needs are lower and their income-based deductibles are higher). Therefore, individuals under age 65 would be less likely to switch brands because of the preferential listing policy of the BC PharmaCare Program. Notwithstanding this different response across age groups, the decline in expenditure on PPI therapy due to changes in the brands selected between 2003Q3 and 2004Q1 was sufficient enough to reduce total expenditure by $17 million in 2004 alone. This change is almost certainly due to the preferred listing policy, rather than Fair PharmaCare.

Conclusion

This analysis indicates that the BC Ministry of Health was successful in reducing the public share of drug expenditure in recent years. It did so through the introduction of temporary seniors' co-payments in January 2002 and the subsequent reorganization of the public drug program into an income-based benefit in May 2003. The changes in the size, nature and distribution of public subsidy that resulted from these program changes do not appear to have had major effects on aggregate expenditure trends in the province. While several statistically significant changes in expenditure dynamics occurred during the period of study, careful analysis of provincial and national trends suggests that only changes in seasonal "stockpiling" of medicines by seniors can reasonably be attributed to the policy changes.

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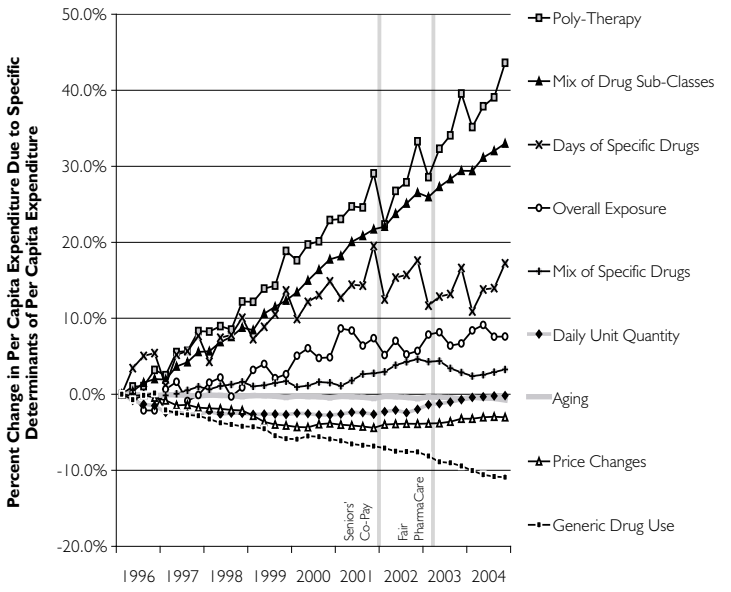
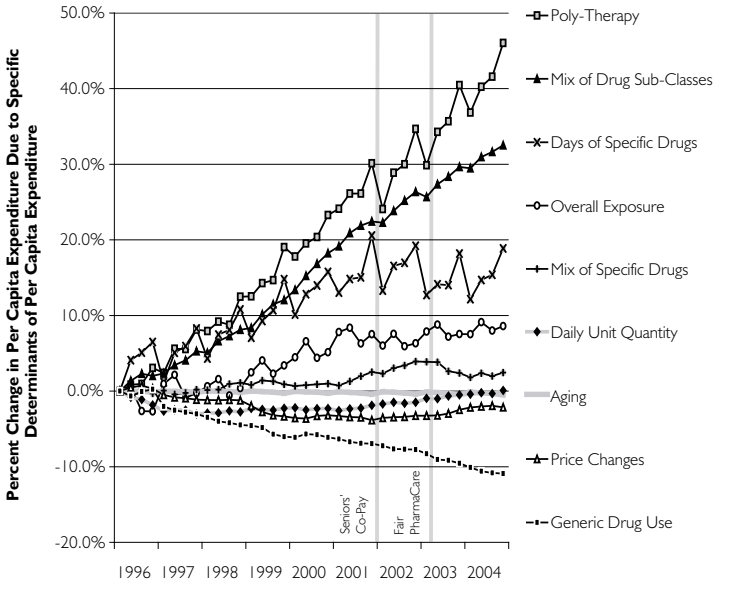
Appendix 1

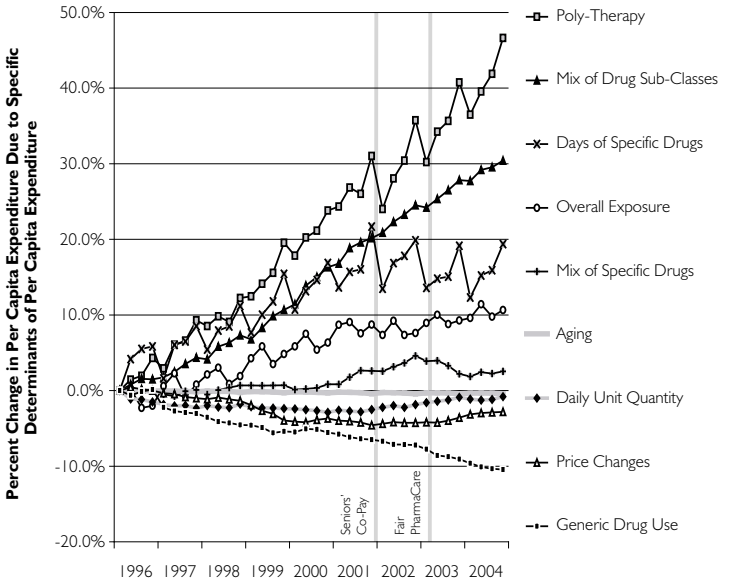
Seniors – Lowest Incomes (Decile 1)



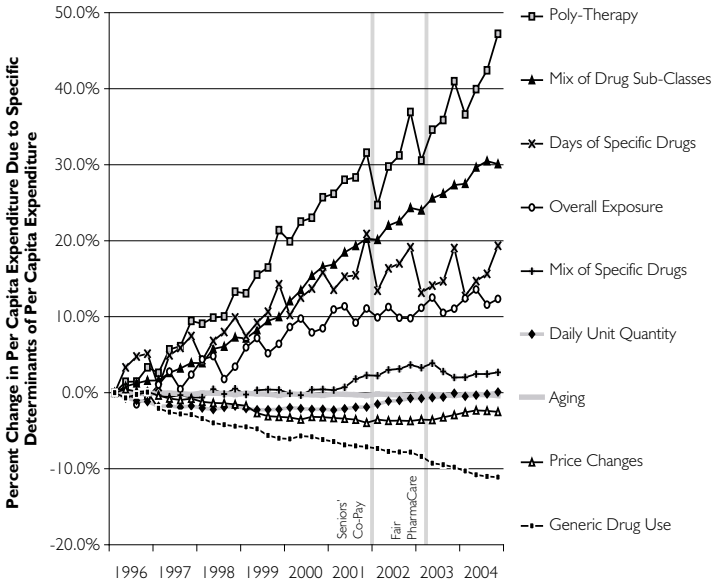
Seniors – Low Incomes (Decile 2)



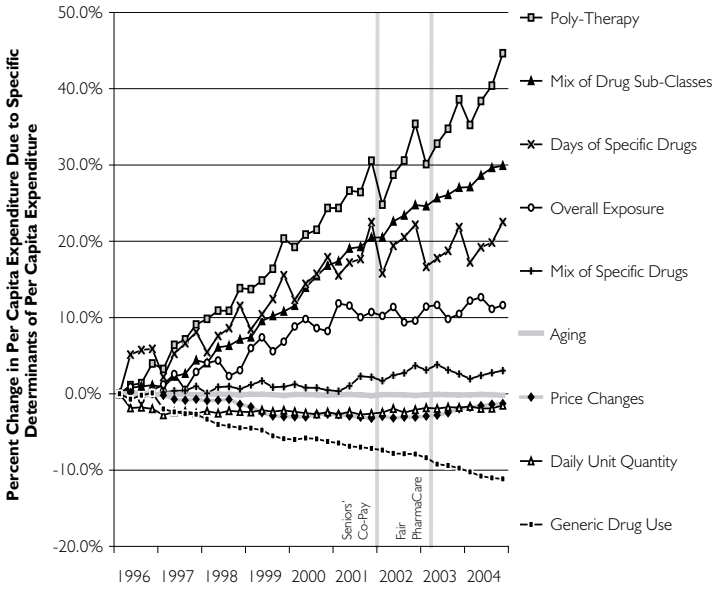
Seniors – Middle Incomes (Decile 4)



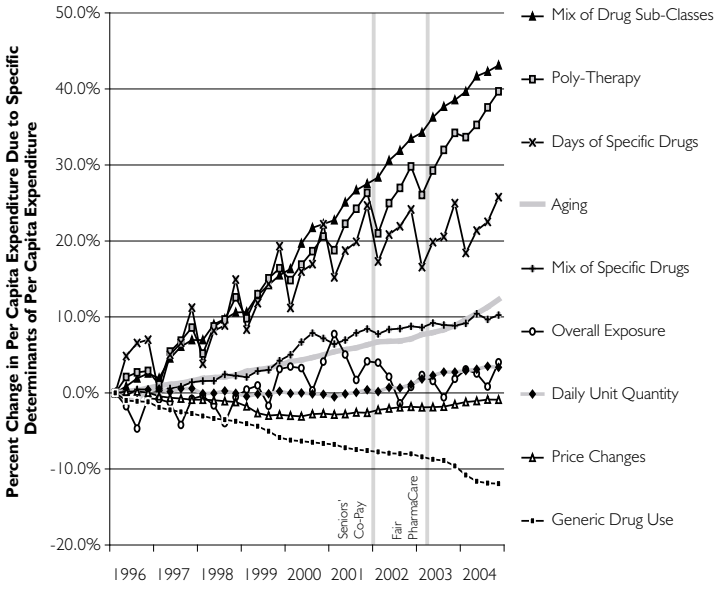
Seniors – High Incomes (Decile 7)



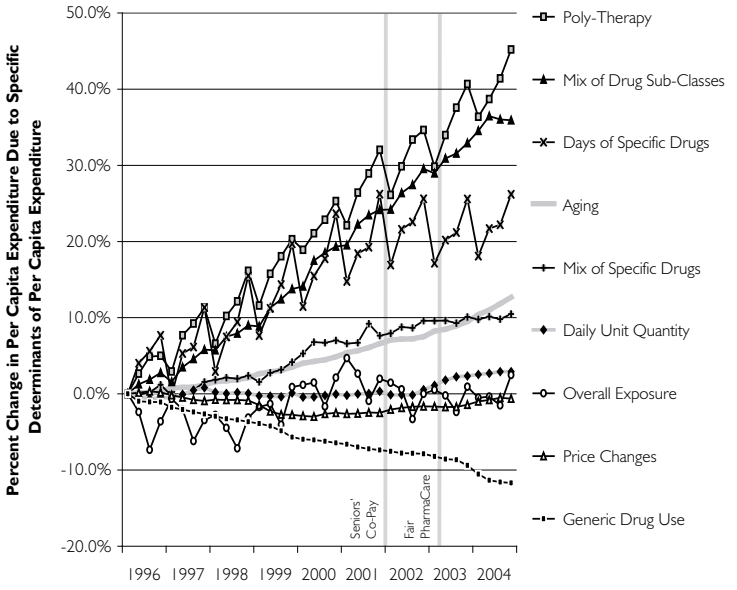
Seniors – Highest Incomes (Decile 10)



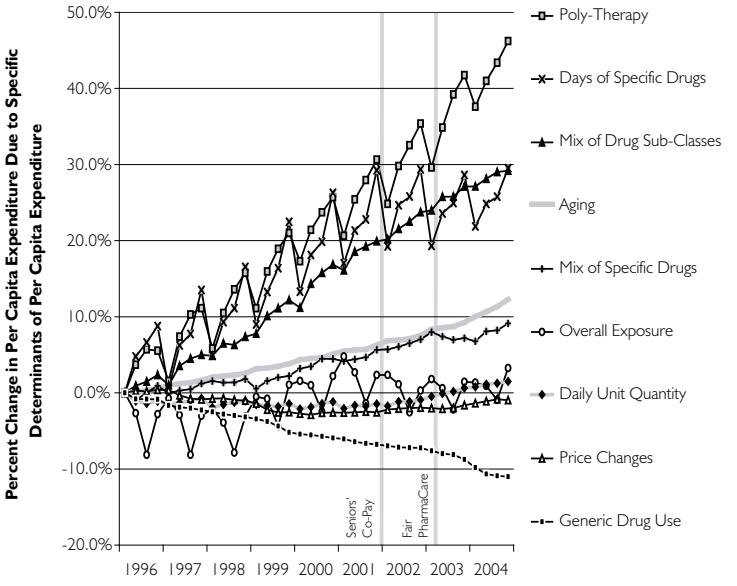
Non-Seniors – Lowest Incomes (Decile 1)



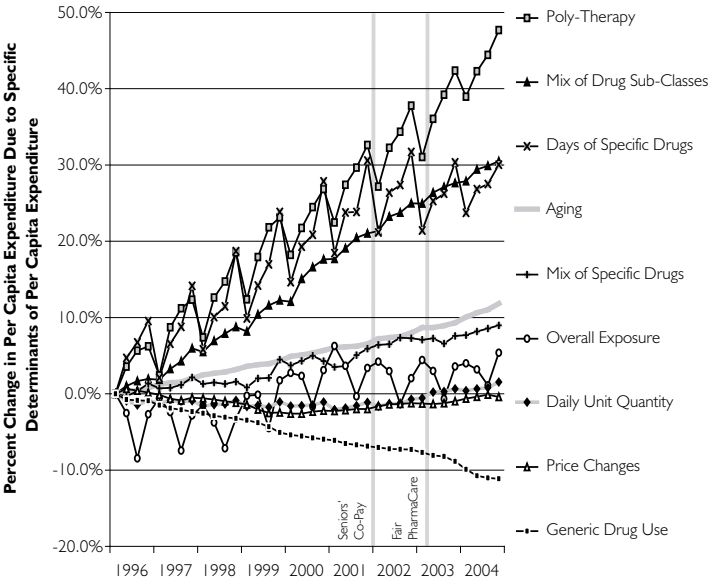
Non-Seniors – Low Incomes (Decile 2)



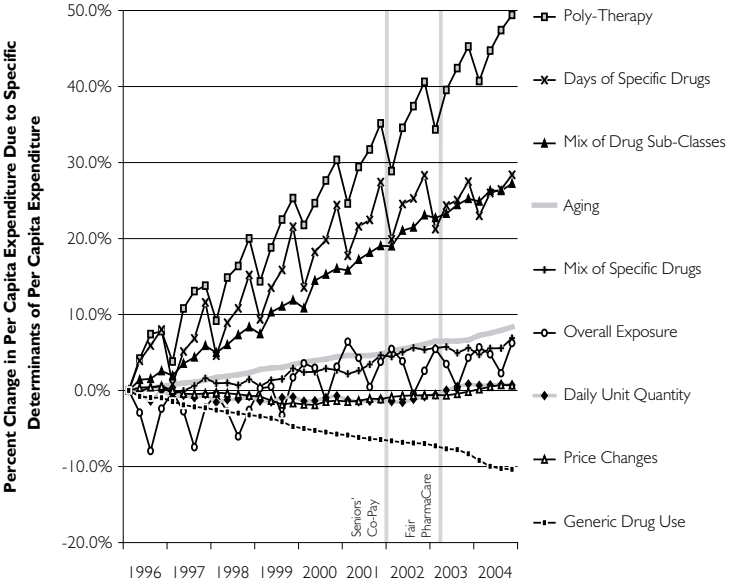
Non-Seniors – Middle Incomes (Decile 4)



Non-Seniors – High Incomes (Decile 7)



Non-Seniors – Highest Incomes (Decile 10)



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