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The Fantasy of Reference Pricing and the Promise of Choice in BC's Pharmacare

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Executive Summary

For about the price of a cup or two of coffee a day, patients can get relief from illnesses such as angina, hypertension, arthritis, or heartburn. Nevertheless, starting in 1995, the government of British Columbia and the managers of its universal drug benefit plan, Pharmacare, decided that many medicines for these conditions were too expensive, and not worth the prices previously negotiated with their manufacturers.

The government designed a strategy to shift much of the cost of the more expensive drugs onto patients: the Reference Drug Program (RDP). Under the RDP, prescription drugs that Pharmacare's managers claimed to be "therapeutically equivalent" were clustered into five therapeutic classes:

- nitrates (for angina);
- ACE inhibitors (for heart-related conditions);
- some calcium channel blockers (CCBs, also for heart-related conditions);
- histamine-2 receptor antagonists (H2RAs, used to treat certain stomach-related complaints, such as heartburn); and
- non-steroidal anti-inflammatory drugs (NSAIDs), for arthritis.

Pharmacare continued to fully subsidize the price of less expensive drugs in each class, while generally forcing patients to pay the entire difference in price for more expensive drugs. Around the same time, some other Canadian provinces, including Quebec, increased patients' share of prescription costs in a way that did not discriminate between more expensive and less expensive drugs. Since that time, prescription drug spending in BC has increased much faster than in other provinces:

- BC Pharmacare's costs have increased 38 percent more than costs in provincial drug benefit programs in the rest of Canada, whereas they had increased slower in BC before the RDP;
- Private spending on prescription drugs increased 23 percent more in BC than in the rest of Canada, a faster relative increase than before the RDP;
- Total spending on prescription drugs increased 20 percent more in BC than in the rest of Canada, whereas it had increased slower in BC before the RDP;
- Although provincial public spending on prescription drugs in Quebec grew faster than in BC, private and total spending grew slower; and
- Overall health care costs in Quebec grew 10 percent less than in BC.

There is also evidence that the Reference Drug Program had negative consequences for patients' health, although these conclusions are more tentative. Compared to their health status before the implementation of the RDP:

- Seniors who had been taking more expensive ACE inhibitors that became restricted under the RDP had a higher (but not statistically significant) risk of death from cardiovascular disease;
- In the short run, seniors who had been taking more expensive ACE inhibitors (and, to a lesser degree, CCBs) that became restricted under the RDP, likely had a higher risk of admission to hospital for surgery related to cardiovascular and other diseases, and opera-

tions such as coronary artery bypass graft or angioplasty;

- In the short run, there was also evidence of longer stays in hospital, and more visits to physicians and emergency rooms, for patients exposed to the RDP for nitrates;
- In the long run, exposure to reference pricing increased the odds of admission to hospital for coronary artery bypass graft or angioplasty by six or seven times for nitrate users.

The government of British Columbia must take a more responsible approach to managing how it divides the cost of prescription drugs between taxpayers and patients. In 2002, the government has taken a positive first step by increasing the deductible and co-payment for seniors, irrespective of what drug they use. In the near term, further reforms should include:

- eliminating the RDP, which biases patients' choice against innovative, new medicines;
- replacing the RDP with a more sophisticated, multi-tiered structure of co-payments that motivates patients and doctors to consider "value for money" when choosing medicines; and
- continuing to increase the annual deductible in accordance with an income-based means test, thereby restoring patients' ability to make responsible choices about the medicines they use.

In the longer term, reforms should include establishing tax-advantaged Medical Savings Accounts (MSAs), thereby encouraging British Columbians to save money throughout their working lives order to pay for prescription drug costs that are predictable and budgetable.

Generally, reforms to BC Pharmacare must recognize that centralized judgments by a government appointed committee about the relative values of medicines are inferior to decentralized decision-making by the doctors and patients who actually use the drugs. The government must relinquish its power to arbitrarily change Pharmacare's benefits, upsetting patients' finances and access to medicine. Rather, that power must be taken out of the hands of the government and given to patients who need the benefits.

Introduction: The Political Economy of Pharmacare

For defenders of government-run health care, the existence of provincial drug benefit plans is actually a blot on Canadian health care, in that they are not part of single-payer, first-dollar coverage, medicare (National Forum on Health, 1997: 22). When the state took over health care, it left prescription drugs out of its grasp. As of 2001, governments in Canada paid for an estimated 49 percent of prescription costs, private insurers 30 percent, and individuals 21 percent (CIHI, 2002a: 44).

It is not surprising that politicians avoided bringing prescription drugs into medicare. According to the Canadian government's interpretation of the Canada Health Act, patients or private insurers are not supposed to pay any money for health services insured by the government, under any circumstances. For most services, governments can control the supply, cutting off access while still pretending to provide universal health care. For example, the supply of doctors can be kept

low by restricting admissions to medical school, preventing physicians with foreign qualifications from practicing, or simply making the environment so unrewarding for them that they leave. Governments can artificially reduce the stock of modern medical technology by forbidding the operation of private clinics or hospitals. These approaches have been successful in Canada, where the growth in the number of doctors has significantly lagged that in other developed countries and the number of diagnostic tools such as computerized tomography scanners and magnetic resonance imaging machines ranks well below what the level of health spending would predict (Esmail, 2001; 2002a).

These strategies have resulted in waiting lists for diagnostic and surgical care, as documented by Fraser Institute authors for over a decade (Esmail and Walker, 2002a). Waiting lists are a method of privatizing the costs of illness without monetizing those costs, thereby preserving the illusion of universal health care. Unfortunately for governments, it is very difficult to create waiting lists for prescription drugs. There is not much an insurer can do to manage consumption of a medicine once it is listed on the formulary for reimbursement (Laupacis *et al.,* 2002: 17). Governed by the profit motive, manufacturers and pharmacies have every incentive to supply the amount of drugs that is demanded.[1] So, the government must manage the quantity of prescription drugs consumed from the demand side: by having patients pay some of the costs directly. Therefore, an examination of the effects of any cost-sharing policy must include its effects on both private and public pharmaceutical spending.

What Reference Pricing Is

"Reference pricing" is an activity in which everyone engages during commercial transactions: compare two competing products; if the more expensive one is not worth the premium, then buy the cheaper one. Who could object? When government agents make the decision on behalf of patients, however, the issue is not so clear.

There are often a number of competing prescription drugs that address a given medical condition. Reference pricing occurs when a government takes away its citizens' freedom to buy medicines of their choice for that condition, by taxing them and allocating the proceeds to drugs selected by a government appointed committee.

This is one method of sharing the cost of a prescription drug between patients and the taxpayer. Another is for the government to give a partial subsidy to patients, but not to become involved in the details of how the subsidy is spent.

Suppose there are two drugs that treat the same condition, one priced at $0.50 and the other $1.00, and the government decides to budget a subsidy of one dollar, divided between both of them. Table 1 shows costs to taxpayers and patients in two scenarios, labeled "co-insurance" and "reference pricing." In the first, the government subsidizes two thirds of the costs of either drug. In the second, the government allocates the subsidy at the full price of the first drug.

Table 1: Relative Price Effect of Different Subsidies for Two Prescription Drugs

	Co-insurance		Reference Pricing	
	Taxpayers' Costs	Patients' Cost	Taxpayers' Costs	Patients' Cost
$0.50 Drug	$0.33	$0.17	$0.50	$0
$1.00 Drug	$0.67	$0.33	$0.50	$0.50

The difference is irrelevant to the taxpayer, who loses $1.00

under either scenario. However, the effect on the patient is significant. In the first scenario, his minimum expense is $0.17 and maximum $0.33. Under the second, his choice is to fill his prescription for free, or pay $0.50. Obviously, reference pricing increases the likelihood that the patient will opt for the less expensive drug. Assuming that the more expensive drug is a superior medicine, subsidy by reference pricing is clearly inferior to co-insurance, because it biases patients' choice against the superior drug (López-Casasnovas and Puig-Junoy, 2001: 8-9).

However, co-insurance biases the patient's choice in favour of the more expensive drug. The lower the rate, the more the patient will be inclined to choose the more expensive one, even if its relative benefits are not so great. To manage this, private insurers in the US have implemented multi-tiered co-payments that charge one fee (e.g. $5) for generics, another for preferred branded drugs (e.g. $15) and the highest for non-preferred branded drugs (e.g. $25). Some have implemented progressive co-insurance, such as 10 percent coinsurance for drugs on the least expensive tier and 50 percent coinsurance for the most expensive tier. Between 1998 and 2000, the number of plans offering a three-tier design jumped from 36 percent to 80 percent, and most have abandoned closed formularies (Mays *et al.,* 2001: 2-3). Tiered co-payments are little used in Canada (Willison, 2002: 52).

Also, reference pricing likely biases the patient's choice relative to what existed previously, that is, when there was no tax and subsidy. In that case, the more expensive drug had to be twice as good as the cheaper one for the patient to choose it. Under reference pricing, the drug has to be much greater than twice as good as the free one for the patient to choose it.[2] The government has used its power of taxation to punish the manufacturer of the superior medicine.

This has important consequences for the behaviour of companies who develop new drugs. Assuming investors will still want to invest capital in companies that develop innovative medicines under such circumstances, those companies will have to focus their efforts on risky blockbusters that have little chance of success, but might escape the reference pricing. They will have little incentive to invest in developing competing drugs that have important, if small, differences with existing medicines to treat a given condition (Jönsson and Ekelund, 2001: 75).

Furthermore, BC Pharmacare employs reference pricing that lumps generic drugs (which are no longer protected by patents) in the same class as patented drugs, turning the economics of intellectual property upside down. Patents are the harness that hitches the profit motive to the wagon of innovation. As long as the innovator has the right to keep some of the economic surplus created by his exclusive right to commercially exploit the new medicine, patents result in a second-best solution to the problem of motivating research and development investment in an environment where competitors could otherwise take the fruits of innovation without paying for them (Danzon 1997; 1998; Viscusi *et al.,* 1995: 831-870). The first best solution (probably unworkable in the real world) is to fully fund research and development (R&D) via lump sum taxation, and allow pure price competition in manufacturing and selling the resulting medicine. Reference pricing between generic and patented drugs does the opposite: fully subsidizes consumption at marginal cost and forces the patient to pay the costs of R&D (Pichler, 2001: 46).

Indeed, managers of New Zealand's Pharmacare program (Pharmac) have explicitly (and erroneously) described their reference pricing in neo-classical economic terms of taking producer surplus and turning it into consumer surplus

(Brougham *et al.,* 2002: 84). However, this is more appropriately called political or bureaucratic surplus, because the surplus goes back to the government for its arbitrary use, rather than to patients.

Historically, governments have not generally adopted reference pricing or other cost-sharing methods when they started public drug benefit programs. Rather, they have implemented them as a way to reduce costs for public programs that had started by fully (or almost fully) subsidizing medicines. Fully subsidized health insurance is, in fact, overinsurance, and the excess demand for services creates a loss of social welfare through misuse of resources. Research going back almost 30 years shows the net benefits of using co-insurance or co-payments to reduce the cost of over insurance, as reviewed recently by Esmail and Walker (2002b: 14-20).

Also, under full subsidy, physicians are squeezed by a conflict of objectives, in that they are forced to serve the interests of both their patients and the government. Their professional relationship is with the patient, but their financial relationship is primarily with the public insurer. As well, the drug maker relies on the physician to distribute his product. Thus, the physician is a common agent, and the principals: the patient, Pharmacare, and the drug maker, all face the problem of predicting whose interests he will serve during a consultation (Mott *et al.,* 1998).

Because managers of pharmaceutical companies are superior agents of their shareholders than civil servants are of their taxpayers, drug makers are more sophisticated at communicating with physicians than governments are, which has implications for Pharmacare's costs. Practicing physicians do not change their behaviour only from research in scientific journals. Rather (like everyone), they change their behaviour in response to simpler messages, such as brief summaries, practice guidelines that are easy to follow, endorsements by respected peers, and face-to-face meetings. Pharmaceutical manufacturers use these techniques heavily to promote their medicines to doctors, but governments are much blunter, and are unlikely to impress doctors. For example, they seldom sponsor professional meetings or conferences to develop clinical guidelines, and have little interaction with disease-oriented societies (Laupacis *et al.,* 2002: 23-24; 2002b: 90).

As well, under full subsidy, doctors and patients have little incentive to learn about the relative value of drugs that address the same condition, and may likely overuse higher priced drugs. Fee-for-service medicine is generally a good way of paying doctors, because it rewards them for seeing patients (Esmail and Walker, 2002b: 25-28). However, there is a good argument that it motivates doctors to write prescriptions as a signal to end the consultation (Lindsey and West, 1999: 10).

If a government decides to allow patients to exercise responsible choice in the medicines they use by reducing the subsidy, either co-insurance or reference pricing should save money in the Pharmacare budget. On the other hand, especially if the government maintains a so-called universal health care system, any method of shifting costs back to patients will risk that they will cut back their use of drugs and end up in their doctors' offices or hospitals because of sickness that they could have avoided, potentially increasing overall health costs. This will be exaggerated in Canada, where patients bear no monetary cost for visits to physicians or procedures in hospitals.

Nevertheless, advocates of reference pricing argue that many drugs in a so-called "therapeutic class" have no effective differences, other than price. According to the BC Health Ministry:

> The Reference Drug program (RDP) is how Pharmacare comparison shops to get the best medically effective drug for the best cost effective price. When scientific evidence shows that several drugs work equally well for a certain condition, Pharmacare pays for the one that is least costly—this is the *reference drug*. The program reduces Pharmacare costs, keeping it affordable for the future and protecting the health benefits it provides to British Columbians. (BC Ministry of Health Services, 2002)

When drugs are almost fully subsidized, patients and doctors do not have any reason to learn whether a higher priced drug is worth the price; advocates of reference pricing confuse this incentive with an inability for patients and doctors to do so. Therefore, reference pricing takes this judgment away from the doctors who prescribe and patients who use the drug, and gives it to a government-appointed committee. This introduces a problem of incentives. Patients experience the consequences of those decisions directly, as do doctors indirectly, but the committee does not experience the consequences of its decisions at all.

Even if a government-appointed committee faced the right incentives to cast judgment on the relative value of drugs, reference pricing begs the question of whether it would be possible for the committee to do so. As one physician and professor of medicine with 35 years of experience has said: "Not all experts will necessarily arrive at the same conclusion when similar literature is reviewed" (Gray, 2002: 58).

Grouping drugs into "therapeutic classes" depends on a singular "class effect." However, there is no established clinical or scientific definition of class effect. The closest is that of the US Food and Drug Administration, which describes a class such that "all products within a class are assumed to be closely related in chemical structure, pharmacology, therapeutic activity and adverse reactions" (Furberg *et al.*, 1999: 1202). Perhaps ironically, some brand name drug makers (in an industry that relentlessly attacks reference pricing), carry a share of the responsibility for the notion of the class effect, in that they use it to market one drug versus its competitors. For example, Novartis, a Swiss-based drug maker, ran a television advertisement in the US claiming that its cholesterol-lowering agent, fluvastatin (Lescol®), was similar in effect to other cholesterol-lowering drugs, but cheaper (Furberg *et al.*, 1999: 1203).

One challenge to determining the value of one drug over another is that most clinical trials are done versus a placebo or control group, not "head to head" versus substitute drugs (Laupacis *et al.*, 2002: 19). It's kind of like having a Pepsi™ Taste Test where one group of tasters tries Pepsi™ versus water and another tries Coca-Cola™ versus water, instead of Pepsi™ versus Coca-Cola™ directly! However, clinical trials are already very costly; "head to head" trials would be longer and more expensive than placebo-controlled trials, and the choice of the comparable drug would be challenging (Fernandes, 2002: 72-73).

Despite these drawbacks, reference pricing is intuitively attractive, because it is easy for poorly informed people to understand (Pichler, 2001: 57). For those who believe that the state can make better decisions for the patient than the patient or his doctor can, it is obviously useful. It has a natural appeal to the employees of the health ministry, as well as scientists dependent on government funding, because it allows them to enlarge their area of activity by rendering expert judgments. For politicians in small jurisdictions, for whom the incentives faced by multinational drug makers are not an issue, any

negative consequences of reference pricing for innovation are irrelevant.

On the other hand, there are also potential benefits of reference pricing:

- Reference pricing is not a price control, but a method of limiting a subsidy. It institutes an avoidable co-payment (López-Casasnovas and Puig-Junoy, 2001: 9). People are free to pay for more expensive drugs if they desire, and manufacturers are free to charge a price higher than the reference price.
- If reference pricing saves money in certain areas, governments can spend that money on areas of higher social priority. Soon after reference pricing was implemented in New Zealand, the general manager of the public plan claimed that the plan saved money through the reference pricing of histamine-2 receptor antagonists (used for gastro-intestinal disorders), which was reallocated to increase the budgets for newer medicines such as anti-depressants and a proton pump inhibitor (also for gastro-intestinal disorders) (Moore, 1996: 89). (This claim does not ring quite true. If it were so, we would not expect brand name drug makers to generally oppose reference pricing. Manufacturers of the chosen few medicines who benefit from increased budgets should lobby heavily in favour of it.)
- Reference pricing ensures that everyone can receive at least one medicine in a class free of charge, or for a very low charge (Maclure *et al.,* 2001: 45).
- Some patients whose drugs become restricted, and therefore more expensive to them, will consult their doctor to discuss options after reference pricing is introduced. This consultation might reveal other health problems that might not otherwise have been identified (Grootendorst *et al.,* 2001a: 10).

International Experience with Cost-Sharing and Reference Pricing

Research on pharmaceutical cost-containment methods such as closed formularies (lists of drugs reimbursed), co-payments, co-insurance, and reference pricing focuses on two main issues: financial effects on both the program and patients, and effects on patients' health.

Cost-sharing in general

The only effect of cost sharing that is undisputed is that increasing costs to patients reduces the quantity of medicine purchased (Currie and Nielson, 1999: 12-16). Most research indicates that a 1 percent increase in patients' costs reduces consumption by less than 1 percent. However, in most of the cases, insurers increase patients' costs by a flat fee (co-payment), so patients can respond by demanding fewer prescriptions, but each one for a higher volume. As well, patients substitute less expensive for more expensive drugs. Perhaps most importantly, most increases in cost sharing (other than reference pricing), are very modest (Grootendorst and Levine, 2001: 50-51). No policy seems to be able to reduce increasing drug costs (Cassels, 2002: 18; Currie and Nielson, 1999: 20).

However, empirical data on health outcomes and costs shifted to other areas, such as hospitals and physicians' consultations, is weak, limited, and not prone to universal application (Currie and Nielson, 1999: 20; Grootendorst and Levine, 2001: ii; Lexchin and Grootendorst, 2002: 8; Tamblyn *et al.*, 1999b: 1.6; Willison *et al.*, 2000: 14). In one well-known paper, Horn *et al.* (1996) found that restrictive formularies were generally related to an increase in emergency room visits and hospital admissions, but that increased co-payments had a mixed relationship with other, costly interventions.

One problem with generalizing results of previous studies is publication lag: most recent articles analyze changes in the early 1990s (Willison *et al.*, 2000: 15). As time passes, and the mix of drugs changes, the results of these studies grow stale. Another is that the bulk of historical studies examine American patients covered by Medicaid, the government program that covers low income, non-elderly patients (Lexchin and Grootendorst, 2002: 11). Extrapolating the results of such research to Canada, where Pharmacare programs cover a larger population, especially seniors, is a stretch.

Reference pricing in particular

Most authors agree that reference pricing has failed to contain costs in jurisdictions outside of Canada. However, foreign experiences are not very comparable to BC's, because reference pricing means different things in different areas. For example, in Germany, reference pricing was no longer applied to newly-launched patented drugs as of 1996. In Denmark and Sweden, reference pricing covers only products whose patents have expired and have generic competitors (López-Casasnovas and Puig-Junoy, 2001: 12, 19, 20). (A similar policy generally employed in Canadian provinces' public plans is often called "generic substitution," described below.)

As well, jurisdictions often imposed reference pricing at about the same time as other policies; such as a price freeze for non-referenced classes in Denmark, drug budgets and co-payments in Germany, and elimination of co-payments in Holland (Lindsey and West, 1999: 14). This makes it difficult to isolate the effects of reference pricing. Norway's unsuccessful experiment with reference pricing, which included patented drugs, started in 1993 and was abandoned in 2000 (Trommald *et al.*, 2001: 116-117).

One of the goals of reference pricing internationally was to motivate manufacturers of more expensive drugs in the class to reduce their prices (Narine *et al.*, 1999). This happened for a number of countries that implemented it (Lindsey and West, 1999: 14-16; López-Casasnovas and Puig-Junoy, 2001: 27-28; Pavcnik, 2000). However, in New Zealand, where the program bundled both patented and off-patent drugs into the same class, manufacturers decided not to cut prices to the reference level for statins (used to lower cholesterol), with the result that two statins were fully subsidized and two sold at a premium. A similar situation arose for ACE inhibitors (for high blood pressure). The situation in New Zealand is also confused by the existence of cross-product pricing agreements negotiated between Pharmac and individual manufacturers for bundles of their drugs (Woodfield, 2001: 139-143). As well, New Zealand is the only foreign jurisdiction that allows exemptions by special authority, a key element in BC's Reference Drug Program (Lindsey and West 1999: 13). This means that a physician can apply for an exemption such that the patient does not have to pay for the restricted drug.

Interestingly, the previous introduction of a co-payment in New Zealand, in 1989, appears to have saved far more money in its first year than reference pricing did in its first year, 1994 (table 2). However, it should be noted that pharmaceutical subsidies declined gently from 1989 to 1993 and jumped up with a shock between 1993 and 1994, the last year before reference pricing was introduced (Scott 1996: 97).

Table 2: Estimated Effect on Annual, Real, Per Capita, Age-adjusted Pharmaceutical Subsidies in New Zealand of Two Policies

	Year imposed	After 1 year	Reduction
Co-payment	NZ $170.95	NZ $149.79	12%
Reference Pricing	NZ $163.50	NZ $162.33	1%

Source: Scott, 1996: 97. Subsidy adjusted for the percent of the population that is over 60 years old. Deflated by Consumer Price Index to 1995. Co-payment: March 1989 to March 1990. Reference pricing: June 1994 to June 1995.

Reference Pricing in BC: The Reference Drug Program

Even as late as 2001, prescription drug costs amounted to only 8.5 percent of all government health expenditures in Canada (CIHI, 2002a: 45). Nevertheless, provincial drug benefit plans have been under a lot of budgetary pressure. Governments in Canada are unlikely to want to spend health care dollars on prescription drugs. Money spent on prescription drugs primarily goes to multinational corporations whose shareholders generally live outside Canada. There is no satisfactory way for these shareholders to reward Canadian politicians for treating their companies generously. On the other hand, domestic interest groups have the credible threat of strikes to support their claims for more money from health care budgets. Hospital workers' unions, for example, make great efforts to stop any attempts to reform Canada's health care system from a government monopoly to a patient-focused one. Workers such as painters and payroll clerks in Vancouver's main hospital received in 2001 wage premiums over 30 percent higher than their unionized brothers and sisters in the city's hotels (Esmail, 2002b).

Nevertheless, because several provinces want pharmaceutical inward investment, they are unlikely to implement reference pricing, which is poison to the research-based drug industry (Willison, 2002: 52). As one supporter of reference pricing notes, brand name drug makers continuously skirmish with provincial drug plans over reimbursement, but reference pricing provoked a "war" between the government and the drug makers in BC (Cassels, 2002: 6). Indeed, the Pharmaceutical Manufacturers Alliance of Canada (since re-named Rx&D, Canada's Research-Based Pharmaceutical Companies) unsuccessfully sued the BC government on the basis that the Reference Drug Program violated its members' intellectual property rights. This carried no truck with the BC government, which was not one that cared about investment by the industry. Because there was little commercially funded pharmaceutical research and development (R&D) in British Columbia, the government had nothing to lose, on that front, by implementing reference pricing (Maclure *et al.*, 2001: 43).

BC Pharmacare was certainly not in any kind of financial crisis in 1995, when reference pricing was introduced. Indeed, from 1985 to 1995, per capita costs for BC Pharmacare grew much

slower than they did in public drug benefit programs in the rest of Canada (table 6). However, the bigger picture of overall government spending was grim.

Before 1995, total provincial government spending in British Columbia was lower than the Canadian average, as a share of GDP. In 1995, government spending in BC became more than the Canadian average, and settled at about 23 percent of GDP for the rest of the decade. The national average dropped to about 20 percent (Clemens and Emes, 2001: 32).

Before 1995, BC (and other provinces) had already implemented policies of generic drug substitution. This encourages the substitution of a less expensive generic drug for a more expensive brand-name drug, after patents on the branded drug have expired. Importantly, the active, therapeutic ingredient in a generic drug has the same chemical composition as its brand-name competitor. The substitution is encouraged by fully reimbursing the costs of the generic drug, but not the difference between the brand-name price and the generic price. If the patient demands the brand-name product, she pays the difference herself.[3]

In October 1995, British Columbia's Pharmacare program went one step further: the Reference Drug Plan (RDP). This is the substitution of cheaper drugs with the same therapeutic goals but an unrelated chemical composition to the "reference" drug in a so-called "therapeutic class." BC Pharmacare's Reference Drug Program covers five therapeutic classes:

- nitrates (for angina);
- ACE inhibitors (for heart-related conditions);
- some calcium channel blockers (also for heart-related conditions);
- histamine-2 receptor antagonists (H2RAs, used to treat certain stomach-related complaints, such as heartburn), a class closely related to proton pump inhibitors (PPIs), which were subjected to special authority at the same time; and
- non-steroidal anti-inflammatory drugs (NSAIDs), for arthritis.

Pharmacare's managers stated that they were strongly influenced by research published in 1993 that showed that one third of Pharmacare's cost increase was due to new (that is, patented) drugs or price increases of old drugs, rather than an aging population (Maclure *et al.,* 2001: 44). The RDP would encourage patients to use older drugs. Although other provinces were trying to contain costs by increasing co-payments, Pharmacare's managers were also influenced by research that indicated that even small co-payments caused some people to not fill prescriptions. Therefore, they wanted to fully subsidize at least one drug per class (Maclure *et al.,* 2001: 45).

However, although these drugs comprise a very expensive share of Pharmacare's budget, they are not drugs that are beyond the financial grasp of the ordinary British Columbian. For example, omeprazole (Losec®), although many times more expensive than other H2RAs, would cost a patient about $2.57 a day at full cost (table 3). Celecoxib (Celebrex®) and rofecoxib (Vioxx®), two relatively new painkillers, cost about the same. However, because they are many times more expensive than other painkillers, they have a large effect on Pharmacare's budget for NSAIDs.

BC Pharmacare's managers refer to closed formularies (lists of drugs used) in hospitals in support of reference pricing (Maclure *et al.*, 2001: 46). However, there is a difference between a closed formulary and reference pricing. BC's hospitals

excluded restricted ACE inhibitors from their formularies after the RDP, which explained why hospitalized patients were more likely to switch to reference ACE inhibitors if they had previously been on ACE inhibitors that became restricted (Schneeweiss *et al.,* 2002a: 827). However, hospitals in BC do not compete against each other; so face similar incentives as Pharmacare managers do.[4]

Hospitals in the US, which generally operate in quasi-competitive markets, sometimes employ therapeutic interchange (which has the same effect as reference pricing) for some classes of drugs.[5] A recent survey of 429 American hospitals, teaching and non-teaching, non-profit and for-profit, found that few used therapeutic interchange for the classes referenced in BC Pharmacare (table 4). Only therapeutic substitution of H2RAs was generally popular; substitution in other classes was rare. In any case, hospitals are different than the community in that patients are continuously monitored, reducing the effects of adverse reactions to inappropriate substitutions. We would expect programs for outpatients, such as BC Pharmacare, to be even more wary of negative consequences of inappropriate substitution than hospitals are.

Pharmacare's managers also supposed that reference pricing would cause manufacturers to drop prices of premium drugs (Maclure *et al.,* 2001: 46). It is not clear why Pharmacare's managers should have cared whether the manufacturers of higher priced drugs in the referenced classes reduced their prices. If they believed the more expensive drugs had no more value than the less expensive ones, it should not have mattered to them whether manufacturers stopped supplying them altogether.

However, Pharmacare's justification for reference pricing is internally contradictory. The program's

Table 3: Cost of First 30 Omeprazole (Losec®) Tablets for a Senior Citizen in 2001, Annual Income $20,000

	BC	AB	ON
Drug Cost	$70.62	$70.62	$72.60
Dispensing Fee	$6.54	$9.25	$8.71
Total Cost	$77.16	$79.87	$81.31
Pharmacare Pays	$70.62	$54.87	$0
Patient Pays	$6.54	$25.00	$81.31

Source: BC Ministry of Health Services, 2001: 39.

managers have written that it is based on the principle that: "If there is no evidence that a higher price buys better effectiveness or fewer toxicities, then the extra cost should not be covered…" but wrote on the same page: "A key feature of RDP in British Columbia is its flexibility to allow full funding of non-reference drugs if a physician reports that the patient has a specific clinical need…" implying a belief that the drugs in question are not therapeutically equivalent (Maclure *et al.,* 2001: 39).

All NSAIDs and nitrates "were judged equivalent in therapeutic effect, differing mainly in their adverse effect profiles" (Maclure *et al.,* 2001: 51). Surely different adverse events are significant to the effect of the therapy! As well, the RDP did not cover children, because of "the potential risk of a story in the news media of a child coincidentally suffering an adverse event shortly after switching medicines because of the policy" (Maclure *et al.,* 2001: 57).

Decisions about relative effects were not always obvious. Pharmacare's judgment differed in at least two cases from that of the Therapeutics Initiative, a government-appointed body founded in 1994 at the University of British Columbia's Department of Pharmacology and Therapeutics. In

one, the Therapeutic Initiative found no evidence of comparative advantage for a new drug, but Pharmacare fully subsidized it nevertheless. In the second, Pharmacare declined to cover a drug that the TI concluded had some advantage (Maclure and Potashnik, 1997: 142).

Table 4: Proportion of US Hospitals Using Therapeutic Interchange for Various Medications by Hospital, 1999

H2RAs	ACE Inhibitors	NSAIDs	Calcium Channel Blockers	Nitrates & Nitrites
91%	27%	22%	20%	11%

n = 429. Source: Adapted from Schachtner *et al.,* 2002: 531.

Pharmacare's managers decided to permit rapid individual exemptions, facilitated by PharmaNet, the newly launched computer network installed in all pharmacies in the province. For example, Pharmacare automatically exempted asthmatics and diabetics from restrictions for CCBs and ACE inhibitors. The RDP started only two weeks after PharmaNet was fully functional. Some patients were already exempted before the RDP was even implemented (Maclure *et al.,* 2001: 47). Because Pharmacare is a universal program, PharmaNet records all prescriptions, taking the information as government property. These two programs reinforce each other: the invasion of patients' privacy by the state reinforces the state's desire to choose medicines for patients.

Interested professionals immediately damned the program. The BC Pharmacy Association, which represents pharmacists in the province, has continuously opposed the RDP from the beginning (BC Pharmacy Association, 2002). Doctors resisted it because they thought it limited their prescribing autonomy, and the Canadian Cardiovascular Society also formally opposed it (Maclure *et al.,* 2001: 50, 54).

Even under RDP, the amount a patient paid for a subsidized drug had nothing to do with its value. Until 2002, a senior paid only the dispensing fee (the professional fee earned by pharmacists for each prescription) towards his annual deductible of $200, rather than a share of the medicine's cost. Table 3 shows how much a senior with an annual income of $20,000 would have paid for his first month's prescription of omeprazole (Losec®) in three provinces in 2001, assuming he received special authority from Pharmacare.

The BC Pharmacy Association notes that the co-payment based on the dispensing fee, which is usually a small part of the total prescription cost, caused patients to fill a smaller number of prescriptions for a larger quantity of medicine per prescription. This made wastage a problem (and reduced pharmacists' incomes) (BC Pharmacy Association, 2001: 26-27).

Questions about the effectiveness of the RDP have dogged it to the present. In November 2001, British Columbia's Minister of Health Planning established the Reference Drug Review Panel, a committee whose goal was to recommend alternatives to reference-based pricing in Pharmacare.

Because the RDP failed to control Pharmacare's costs since implementation, the Health Minister has resorted to more traditional measures to do so. The government has recently removed a number of drugs from the formulary altogether, and increased charges to patients. As of 2002, most seniors pay up to $25 towards the drug's costs and dispensing fee, up to an annual deductible of $275. Of course, this trivial increase in cost, about 20 cents a day, caused a commotion because seniors who filled many prescriptions concurrently were asked to pay almost the whole amount at

once. Early reports indicate that this has also shifted costs from taxpayers to patients, with a reduction in prescriptions of less than 1 percent (Barrett, 2002; Lee and Nuttall-Smith, 2002; McInnes *et al*., 2002; McMartin, 2002). Furthermore, the provincial government announced that it would impose a means test for Pharmacare benefits starting in 2003.

Financial Consequences of the Reference Drug Program (Camouflaged Cost Sharing)

Savings from the RDP

The financial results of the RDP have always been a bit of a mystery, and remain so. Going back to the beginning of the program, an independent consultant estimated savings of $20 million for 1996, while Pharmacare's own estimate was $25 million. The difference depended on a number of factors, including inflation and population growth (Auditor General of BC, 1998). It is difficult to see how Pharmacare's managers would have been able to estimate the figure, given that PharmaNet was not adequately set up to capture the required information. For example, the exemption identifier for nitrates was not introduced to the claims data until one year after nitrates had been reference priced, rendering it useless for analysis (Grootendorst *et al*., 2001b: 21).

More recently, Pharmacare's managers estimate that RDP saved $44 million per year (Maclure *et al*., 2001: 57, 62). On its own, the figure is difficult to interpret, because $44 million in 1995 was much more that it was in 2001. Specifically, Pharmacare claims annualized savings of $5 million for ACE inhibitors and $9 million for CCBs (Maclure *et al*., 2001: 55). For H2RAs and PPIs, Pharmacare's managers anticipated savings of $12 million per year, starting in 1996 (Maclure *et al*., 2001: 51). External research does not support these claims.

"Savings" are the difference between the actual costs experienced by the RDP, and what costs would have been without the policy. The latter is somewhat subjective, depending on how the researcher estimates the previous trend would have continued. Schneeweiss *et al*. claim savings of $6.7 million in the first year of RDP for ACE inhibitors, whereas Grootendorst *et al*. claim $1.2 million per year in the first two years, a huge difference (Anis, 2002: 127). Furthermore, Grootendorst *et al*. claim savings for all three cardiovascular classes of $7.7 million in 1997, and about $24 million total from October 1995 to May 1999 (2001a: 3).

There are also potential conflicts of interest in the research conducted by Dr. Schneeweiss' team, in that two of the six authors of both published articles were employees of the BC Pharmacare program. Indeed, one of them, Dr. Maclure, was the lead author of the Pharmacare managers' detailed defence of the RDP (Schneeweiss *et al*., 2002a, 2021b; Maclure *et al*., 2001). Although this does not imply that the research is not objective, it does reveal a double standard. When the Canadian Cardiovascular Society condemned the RDP in 1997, some researchers challenged the Society's background document because its authors worked in the research-based pharmaceutical industry (Holbrook *et al*., 1997).

Recent research indicates that the annualized savings for H2RAs and PPIs from January 1996

through May 1999 were between $7.3 million and $8.7 million (Marshall *et al*., 2002: 1659). There is no published independent estimate of financial consequences for NSAIDs, but two civil servants stated savings of $5 million, presumably during the first year (Maclure and Potashnik, 1997: 142).

Pharmacare's costs

Other, publicly available financial figures for pharmaceutical expenditures give a different picture of BC Pharmacare's performance before and after implementation of the RDP, and compared to the rest of Canada. Before the Reference Drug Program, public provincial pharmaceutical expenditures were increasing at a slower rate in BC than the rest of Canada. In the 10 years through 1995, the compound annual growth rate for the rest of Canada was 12 percent, versus only 10 percent for British Columbia. However, in the five years since 1995, this has reversed: 9 percent for the rest of Canada versus 12 percent for BC. From 1995 through 2001, BC Pharmacare's total growth in costs was 103 percent versus 65 percent for provincial and territorial plans in the rest of Canada (table 5).

Per capita figures tell the same story as aggregate figures do (table 6). In the 10 years through 1995, BC Pharmacare's costs per capita increased by 7 percent annually, versus 10 percent for provincial and territorial plans in the rest of the country. However, in the five years since the imposition of the Reference Drug Plan, BC Pharmacare's cost per capita has increased by 11 percent annualized, versus 8 percent annualized for the rest of Canada. The total increase has been 30 percent more than in the rest of Canada.[6]

A previous article by this author noted that British Columbians' total consumption of prescription drugs had decreased relative to other Canadians' over the period 1995 to 2000, making BC Pharmacare's failure to contain costs even more remarkable. This was reflected in the fact that British Columbians' private payment for prescriptions had increased slower than had other Canadians'. Because British Columbians had restrained their increasing use of prescription drugs compared with their countrymen, one would expect BC Pharmacare's costs to have shrunk relative to other provincial and territorial benefit plans, not to have outpaced them (Graham, 2001a).

That article drew criticism from Alan Cassels, another policy analyst who has analyzed BC Pharmacare's RDP. Referring to Quebec's policy of increasing co-payments, Mr. Cassels argued that other provinces' drug benefit plans had simply shifted costs to individuals. This is what caused their public plans to grow slower, and private expenditures to grow faster, than British Columbia's after 1995 (Cassels, 2002: 11). Marcy Cohen, Chair of the Canadian Centre for Policy Alternatives' office in BC, noted that BC's overall prescription spending, both public and private, was significantly less than in other provinces (CCPA, 2001). Mr. Cassels and Ms. Cohen both implied that the RDP had a beneficial crowding out effect: that BC Pharmacare did such a good job choosing drugs for people, relative to other provinces, that British Columbians were able to withdraw from the rat-race of spending ever-increasing amounts of their own money on new, ineffective, medicines. The argument was plausible, given the information available at the time. However, new information requires that it be rejected.

In the 2002 edition of its analysis of prescription drug expenditures, the Canadian Institute of Health Information revised previous years' data (CIHI, 2001; 2002a). The effect was to significantly change the reported rate of private spending

Table 5: Public Provincial/Territorial and Private Prescription Drug Expenditures: BC versus the Rest of Canada, 1985-2001 (millions, current $)

Year	Public Provincial/Territorial		Private		Total	
	BC	Rest of Canada	BC	Rest of Canada	BC	Rest of Canada
1985	$129	$911	$121	$1,327	$259	$2,299
1995 (RDP introduced October)	$329	$2,720	$354	$3,680	$714	$6,582
10 year Annualized Growth (Total)	10% (156%)	12% (200%)	11% (192%)	11% (177%)	11% (176%)	11% (186%)
2001[f]	$667	$4,496	$622	$5,627	$1,338	$10,965
6 year Annualized Growth (Total)	12% (103%)	9% (65%)	10% (76%)	7% (53%)	11% (87%)	9% (67%)

[f] = forecast
Note: "Total" includes Quebec's premium-financed drug insurance fund, workers' compensation board, and federal programs not included under "Public Provincial/Territorial" or "Private."
Source: CIHI (2002a: 44, 92)

growth in BC, such that the province did in fact have higher private expenditure growth than the rest of Canada after 1995, a clear change from the trend before 1995, when BC's rate of private expenditure growth was slightly slower that the rest of Canada's (tables 5, 6). Per capita, private spending in BC grew by 63 percent in the six years after 1995: 18 percent more than in the rest of Canada.

When this is added to the disproportionate growth in BC Pharmacare since the introduction of reference pricing, total per capita prescription drug spending increased by 73 percent in BC, as opposed to 58 percent in the other provinces and territories. Relatively speaking, that's a 25 percent faster rate of growth. Although BC still does have lower per capita drug costs than the rest of the country, the gap is closing fast.

Table 6: Per Capita Public Provincial/Territorial and Private Prescription Drug Expenditures: BC vs. Rest of Canada, 1985-2001 (current $)

Year	Public Provincial/Territorial		Private		Total	
	BC	Rest of Canada	BC	Rest of Canada	BC	Rest of Canada
1985	$43	$40	$41	$58	$87	$101
1995 (RDP introduced October)	$87	$106	$93	$144	$189	$257
10 year Annualized Growth (Total)	7% (101%)	10% (167%)	9% (129%)	10% (148%)	8% (117%)	10% (156%)
2001[f]	$163	$167	$152	$209	$327	$406
6 year Annualized Growth (Total)	11% (87%)	8% (57%)	8% (63%)	6% (45%)	10% (73%)	8% (58%)

[f] = forecast
Note: "Total" includes Quebec's premium-financed drug insurance fund, workers' compensation board, and federal programs not included under "Public Provincial/Territorial" or "Private."
Source: CIHI (2002a: 46, 94)

Nor is it likely that BC's higher rate of spending increase since the launch of the RDP was caused by a rapid increase in the proportion of seniors in the province. BC has had a greater share of seniors than other provinces for many years, and, for both BC and the rest of Canada, the proportion of seniors went up less than one percent between the 1996 and 2001 censuses (Statistics Canada, 2002). Nor does it look like BC's high rate of expenditure on prescriptions has reduced costs in other areas of health spending. For 1999/2000, BC's government health spending per capita was second only to Manitoba's of all provinces and territories (CIHI, 2002b: 15).

Nor is it clear how money supposedly saved through reference pricing was invested in innovative new drugs that were launched since the implementation of the program. An analysis of the average subsidized prescription use in 1999 for a BC senior citizen shows that over one third of the costs were for drugs listed on the formulary between 1990 and 1993, just before the Reference Drug Program began (table 7). So, four years after the program's start, costs had still not been wrestled to the ground, and drugs launched in 1993 and prior comprised 72 percent of expenditures.

So, BC has not only failed to contain public spending on drugs, it has somehow also shifted costs to individuals more than other provinces have, for an apparent net loss. If Pharmacare did save money on the classes subject to the RDP, it did not prevent things from going wrong in the program as a whole.

Nitrates

As noted above, one of the goals of the RDP was to get manufacturers of restricted drugs to reduce their prices. Actually, nitrates were the only class that experienced a significant price reduction.

The team of researchers who studied the effect of the RDP on nitrates concluded that Pharmacare expenditures on this class over three years was $14.9 million less than they would have been in the absence of the RDP (Grootendorst *et al.*, 2001c). However, much of these savings were caused by the entry of a new competitor into the market, an event independent of the RDP (Graham, 2002a).

Pharmacare imposed the RDP for nitrates in October and November 1995. The previously fully subsidized drugs in the class included isosorbide dinitrate, isosorbide mononitrate, pentaerythritol, and nitroglycerin. Under the RDP, the province continued to fully subsidize two reference drugs: isosorbide dinitrate tablets and nitroglycerin ointment. Henceforward, Pharmacare reimbursed the more expensive isosorbide mononitrate, sustained release isosorbide dinitrate, and pentaerythritol only at the lower price of isosorbide dinitrate, and reimbursed sustained release nitroglycerin tablets and nitroglycerin patches only to the price of the less expensive nitroglycerin ointment.

There was an almost immediate change in prescribing towards the less expensive reference

Table 7: Annual Cost of Drugs per Senior Citizen Covered by Pharmacare in 1999

Vintage	Pre 1986	1986-89	1990-93	1994-97	Post 1997	Total
Cost	$107.50	$71.70	$165.50	$125.70	$8.30	$478.6
Percent of Total	22%	15%	35%	26%	2%	100%

Note: "Vintage" is year Pharmacare listed drug.
Source: Morgan, 2001: 1508; author's calculations.

drugs, as table 8 shows. Isosorbide dinitrate and nitroglycerin paste were not very popular before the RDP, comprising only 8 percent of prescriptions for subsidized nitrates. They quickly captured 38 percent of prescriptions. The primary winner was nitroglycerin ointment, for which prescriptions went up over 10 times, versus isosorbide dinitrate for which volume only quadrupled (Grootendoorst *et al.,* 2001c: e-Table 1). From the two reference drugs, doctors and patients clearly and significantly preferred the drug that was put on the skin rather than the one that was swallowed. All the restricted drugs lost significant volume. (Pharmacare exempted sub-lingual nitroglycerin from the RDP because it is used for acute, not chronic, angina.) Sixteen percent of nitrate users received exemptions (Grootendorst *et al.,* 2001a: 12).

However, between January and March 1996, the market changed. As Grootendorst *et al.* note, manufacturers of nitroglycerin patches reduced their prices significantly. The mean price per daily dose of the patch dropped from 83 cents to 36 cents (Grootendorst *et al.,* 2001c: 1015). Because of the lower price, Pharmacare started to fully subsidize them again. Since doctors and patients had already demonstrated a preference for the ointment over isosorbide dinitrate tablets, it is not surprising that patches (being more convenient than ointment) quickly regained market share once Pharmacare began fully subsidizing them again. Patches captured 41 percent of prescriptions in the period of January 1996 through May 1999. Although this was an increase from 31 percent of prescriptions before the RDP, Pharmacare's spending on patches actually shrank by one third (Grootendorst *et al.,* 2001c: 1016). The price reduction for the patches clearly drove the savings identified by Grootendorst *et al*. Pharmacare's managers suspect that reference pricing motivated the lower price of the new product (Maclure *et al.,* 2001: 53). In fact, it was a coincidence.

The RDP initially destroyed the market share of all restricted nitrates, but only the manufacturers of nitroglycerin patches eventually reduced prices. This happened because Health Canada granted approval to 3M Pharmaceuticals in August 1995 to sell its new nitroglycerin patch, Minitran®, in Canada. 3M Pharmaceuticals launched its patch at a low price all over the country. Other manufacturers were forced to match 3M's price or lose market share everywhere, in both public and privately financed markets. In January 1996, when BC Pharmacare listed Minitran®, 3M priced them between 57 cents and 97 cents, depending on the dose. List prices for other patches were between $1.02 and $1.42, but came down quickly.

3M was a latecomer to the nitroglycerin market. Exploiting its expertise in making sticky technology, such as Scotch® tape and Post-It® notes, the company launched Minitran® in the US in 1989.

Table 8: Mean Monthly Number of Prescriptions of Nitrates Dispensed to Senior Citizens in British Columbia (% of Total)

Drug	Baseline (Apr 1994 to Oct 1995)	Initial RDP of nitrates (Nov to Dec 1995)	Nitroglycerin patch exempt ed from RDP (Jan 96 to May 99)
Reference Drugs	8	38	10
Restricted Drugs	31	11	18
Nitroglycerin, patch	31	18	41
Nitroglycerin, sub-lingual	31	33	31
Total	100	100	100

Author's calculations, adapted from Grootendorst *et al.,* 2001c: 1013.

The nitroglycerin was contained directly in the adhesive, rather than in a bulky reservoir or pouch, making the patch more convenient and attractive. One of the "trials" that 3M conducted was at a fashion show in New York City, where audience members were asked to guess which models were wearing the patch and which were not. As it was to do subsequently in Canada, 3M launched Minitran® in the US at a discount to competing patches (Perrin, 1989).

It is not remotely possible that 3M went to this effort in anticipation of a pharmaceutical cost-containment policy to be implemented in a distant Canadian province 7 years later. It quite likely that 3M's goal was not simply to capture market share and reduce other companies' profitability in the market for nitroglycerin patches, but to send a credible signal to other drug makers about the value of its sticky technology to their medicines. In the company's own words:

> 3M Pharmaceuticals drew on 3M's long-standing expertise in Scotch® Tape and Post-it® Notes to create the innovative "drug–in-adhesive" technology for transdermal patches. 3M's Minitran® (nitroglycerin) Transdermal Delivery System is the smallest and thinnest transparent nitroglycerin patch. *And today, most transdermal patches, from hormone replacement therapies to smoking cessation products, include components from 3M*. (3M Pharmaceuticals, 2001; italics author's)

Heightened competition in nitroglycerin patches has positive implications for hospital budgets too. Manufacturers of nitroglycerin patches sell at heavily discounted prices to hospitals in order to promote their patches for subsequent outpatient use (Grootendorst *et al.,* 2001b: 27).

This confounds any conclusion about the results of reference pricing alone. Because 3M's price reduction drove patients to nitroglycerin patches, which they clearly preferred, the RDP itself, which drove patients to the less preferable nitroglycerin ointment and isosorbide dinitrate, may well have had negative consequences for their health, had it continued undisturbed by 3M's entrepreneurship.

Another important effect of the RDP was that many seniors (or their insurers), whom Pharmacare did not exempt from payment, nevertheless opted to pay for the more expensive, restricted drugs. However, seniors with lower incomes (who did not receive exemptions) were more likely to proportionally reduce their use of restricted cardiovascular drugs (by between 6 percent and 14 percent) after Pharmacare imposed RDP (Grootendorst *et al.,* 2001a: 15, 125).

Table 9: Mean Monthly Payment for Nitrates per 100,000 Seniors in BC, by Payer

	Baseline, Apr 1994 to Oct 1995 (share of total)	RDP for nitrates, Nov to Dec 1995 (share of total)	*Change from Baseline*	Nitroglycerin patch exempted, Jan to Dec 1996 (share of total)	*Change from Baseline*	RDP for calcium channel blockers, Jan 1997 to May 1999 (share of total)	*Change from Baseline*
Pharmacare	$138,696	$44,625	*-68%*	$69,772	*-50%*	$69,699	*-50%*
Private	$789	$19,776	*2406%*	$6,576	*773%*	$3,863	*390%*
Total	$139,485	$64,401	*-54%*	$76,348	*-45%*	$73,562	*-47%*
% of Baseline	100%	46%		55%		53%	

Source: Grootendorst *et al.,* 2001c: 1016, 1018.

Table 10: Index of Mean Monthly Defined Daily Doses Dispensed of Three Cardiovascular Drug Classes in BC

	Baseline, Apr 1994 to Oct 1995	RDP for nitrates, Nov 1995 to Jan 1996	*Change from Baseline*	Nitroglycerin patch exempted, Feb to Dec 1996	*Change from Baseline*	RDP for CCBs, Jan 1997 to May 1999	*Change from Baseline*
Nitrates	20	16	*-23%*	17	*-14%*	17	*-14%*
CCBs	53	57	*1%*	57	*-1%*	63	*16%*
Beta Blockers	26	28	*5%*	29	*9%*	32	*21%*
Total	100	100		103		113	

Source: Grootendorst *et al.,* 2001b: 47, author's calculations.

Private payment for nitrates went up over 24 times in the period between the implementation of RDP and the price reduction for nitroglycerin patches caused by 3M's new product (table 9). We cannot say whether this would have persisted without the reduction in the price of nitroglycerin patches. Because this period lasted only two months, it may be that some seniors were initially ignorant of the policy when refilling their prescriptions, and would have asked for special exemption or a reference drug when they received their next prescription (Grootendorst *et al.*, 2001c: 1017). On the other hand, this short period might also under report the long-term private spending in the face of reference pricing, because patients stockpiled free prescriptions before Pharmacare imposed the RDP (Grootendorst *et* al., 2001b: 34): However, even after the prices of nitroglycerin patches dropped, confounding the whole experiment, private expenditures in 1996 stayed at over 7 times what they were during the baseline period. In 1997, they dropped to about 4 times what they were during the baseline period, but this is associated with an increase in use of a drug not subject to the RDP.

There was a decrease in use of nitrates in general after the introduction of the RDP. Table 10 shows an index of mean monthly defined daily doses of nitrates as well as CCBs and beta blockers (which can substitute for nitrates), around the time Pharmacare imposed the RDP.

Grootendorst *et al.* attribute little significance to the reduced use of nitrates and increased use of beta blockers (2001c: 1016). They cite evidence that the use of beta blockers was increasing in other jurisdictions as well, perhaps implying an unexplained change in clinical practice (2001c: 1017). However, it cannot be dismissed that some patients may have switched to free beta blockers because the RDP imposed costs on their restricted nitrates. Indeed, Grootendorst *et al.*'s estimate of the savings for nitrates depends on the fact that expenditures on beta blockers did not increase significantly over the period (2001c: 1016).

There is only one way that spending on beta blockers could have remained stable as volumes dispensed increased significantly: a price reduction. During the baseline period, April 1994 through October 1995, Pharmacare's mean monthly reimbursement for beta blockers was 76 cents per defined daily dose, falling to 65 cents during January 1997 through May 1999, a drop of 14 percent. In this case, the costs were not shifted to individuals. Beta blockers were not reference priced, so the cause of this reduction in price must have been competitive forces outside Pharmacare.

Table 11: Patterns of Drug Use After Reference Pricing for Seniors Using Restricted ACE Inhibitors in BC, January 1997

	Paid the Difference	Exempted	Switched to Reference	Switched Class	Stopped Therapy
Patients	19,083	12,446	7,517	1,654	1,093
Proportion	46%	30%	18%	4%	3%

Source: Schneeweiss *et al.,* 2002b: 742.

ACE inhibitors

Pharmacare introduced the RDP for ACE inhibitors in January 1997. The RDP for ACE inhibitors contained an inappropriate incentive from the beginning: Pharmacare limited reimbursement to $27 per month, rather than a price per pill. This meant that expenditures for patients who used low volumes of the restricted drugs were under the reference price. For example, 46 percent of the users of enalapril (Vasotec®), a restricted ACE inhibitor, had monthly drug costs below the limit, so the cost sharing was irrelevant to them (Grootendorst *et al.,* 2001a: 12; 2001b: 2).

In two published articles, Schneeweiss *et al.* demonstrated that the majority of seniors on restricted ACE inhibitors who were exposed to the policy paid the difference rather than switching to a reference ACE inhibitor when Pharmacare imposed the RDP (Schneeweiss *et al.,* 2002a; 2002b). Looking at all BC seniors who had been using an ACE inhibitor before the RDP, they found that only 18 percent of those on restricted ACE inhibitors switched when the RDP enveloped this class in January 1997 (table 11).

Fully 75 percent of seniors on restricted ACE inhibitors stayed on their drugs. Most interestingly, the number of patients who paid the difference was far greater than the number that Pharmacare exempted. The authors estimate savings of $6.7 million, but this is only to Pharmacare, and does not include the amount that patients or their private insurers paid (Schneeweiss *et al.,* 2002b: 741).

Examining approximately the same period, Grootendorst *et al.* showed that private payment more than tripled after the RDP for ACE inhibitors. Even when adjusted

for the secular, upward trend in spending on ACE inhibitors, the amount of private payment is over

Table 12: Mean Monthly Payment for ACE Inhibitors per 100,000 Seniors in BC, by Payer

	Baseline, Oct 1995 to Sep 96 (share of total)	Post RDP for ACEIs, Apr 1997 to Mar 98 (share of total)	*Change from Baseline*	Normalized to Baseline	*Change from Baseline*
Pharmacare	$343,470	$390,964	*14%*	$331,235	*-4%*
Private	$4,775	$20,077	*320%*	$17,010	*256%*
Total	$348,245	$411,041	*14%*	$348,245	*0%*
% of Baseline	100%	118%		100%	

Source: Grootendorst *et al.,* 2001b: 61-62; author's calculations.

two and a half times what it was previous to the program (table 12).

Dihydropyridine Calcium Channel Blockers

Grootendorst *et al.*'s investigation of calcium channel blockers tells virtually the same story as for ACE inhibitors: savings through significant shifting of costs to patients. The amount of private payments tripled, although the amount of mean monthly defined daily doses went down by 17 percent, a greater decline than the trend before the RDP predicted (Grootendorst *et al.*, 2001b: 38). When adjusted for the reduced mean monthly spending on CCBs overall, the increase in private payment is over two and a half times the amount before the RDP (table 13).

Histamine-2 receptor antagonists and proton pump inhibitors

Marshall *et al.* found that private expenditure on H2RAs spiked up to 16 percent of costs, from almost zero before the RDP (2002). Interestingly, spending on H2RAs was dropping before the implementation of RDP, in favour of omeprazole (Losec®), the first PPI. From monthly expenditures on H2RAs of about $2 per senior beneficiary in the beginning of 1993, Pharmacare expenditures had already dropped to just over $1 in September 1995 (Marshall *et al.*, 2002: 1659). The RDP for H2RAs, and requirement for special authority for PPIs started in October 1995.

Although costs dropped drastically after reference pricing was implemented, the RDP also appears to have broken the downward trend, and monthly costs for H2RAs "flat-lined" after the program's start. If the previous, downward trend had continued, monthly costs would have intersected with the flat, post-RDP trend in the first half of 1999. So, the savings of $7.3 million to $8.7 million identified by Marshall *et al.* may have been the total savings possible from the RDP for H2RAs for all time, not just one period. Of course, the farther out we extrapolate the two trends, the less legitimate they are, but the relative trends imply that, by the end of 1999, the costs under RDP were higher than they would have been under the previous policy. The authors do not discuss changes in clinical practice that might have caused the change in trend (Marshall *et al.*, 2002: 1659).

In *no* cases do any of the articles cited above estimate costs to the health care system of increased adverse events, reflected in visits to emergency rooms or hospitalization.

Table 13: Mean Monthly Payment for CCBs per 100,000 Seniors in BC, by Payer

	Baseline, Oct 1995 to Sep '96 (share of total)	Post RDP for CCBs, Apr 1997 to Mar '98 (share of total)	*Change from Baseline*	Normalized to Baseline	*Change from Baseline*
Pharmacare	$468,227	$378,711	*-19%*	$454,643	*-3%*
Private	$5,340	$15,763	*195%*	$18,924	*254%*
Total	$473,567	$394,474	*-17%*	$473,567	*0%*
% of Baseline	100%	83%		100%	

Source: Grootendorst *et al.*, 2001b: 61-62; author's calculations.

Health Consequences of the Reference Drug Program

As noted above, Pharmacare's managers made great efforts to minimize any negative consequences to patients' health of the RDP, despite their rhetoric that all drugs in a therapeutic class have the same effect. Nevertheless, William Macarthur, MD, former Chief Coroner of BC, and a Senior Fellow of The Fraser Institute when the province launched the RDP, collected a host of damning anecdotes from doctors in the province about the consequences to patients' health of the Reference Drug Program, which was published independently of the Institute (McArthur, 2001). The anecdotes make depressing reading, but are no substitute for systemic measurements of the effect of the RDP on patients' health. Researchers have recently produced those measurements for the three cardiovascular classes.

Grootendorst *et al.*'s article in the *Canadian Medical Association Journal* concludes: "The effects of this policy on patient health, associated health care costs, and administrative costs remain to be investigated" (Grootendorst *et al.*, 2001c: 1011). However, in their publicly available report to their project's funder, the Health Transition Fund, a number of adverse events are reported.

Grootendorst *et al.*'s conclusions about health outcomes are ambiguous, and they express some dissatisfaction with their ability to determine the effect of reference pricing on a number of indicators of morbidity. Their final report states that they found no evidence of an increase in rates of mortality associated with cardiovascular or renal disorder (Grootendorst *et al.*, 2001a: 4, 14-15; 2001b: 28). However, their technical report notes increased adverse events, including death:

- "In each drug group, those who were not dispensed Restricted drugs post-RP had higher death rates within the first 20 weeks post policy than the other groups" (Grootendorst *et al.*, 2001b: 80);
- Patients who had been using restricted ACE inhibitors before reference pricing, but stopped using ACE inhibitors altogether (rather than switch to a reference drug) had a very high hazard of mortality within the first 12 weeks after reference pricing (Grootendorst *et al.*, 2001b: 80). (It is not clear why patients did this);
- After controlling for the baseline differences in mortality for patients using restricted and unrestricted ACE inhibitors, patients exposed to the RDP (i.e., those taking ACE inhibitors that were to become restricted under the RDP) had a higher risk of death from cardiovascular disease than those not exposed, although it was not significant at the 5 percent level (Grootendorst *et al.*, 2001b: 83);
- In the short run, exposure to reference pricing for ACE inhibitors, and to a lesser degree, CCBs likely increased the risk of admission to hospital for surgery related to cardiovascular and other diseases, and revascularization (such as coronary artery bypass graft or angioplasty) (Grootendorst *et al.*, 2001a: 4; 2001b: 91);
- In the short run, there was also some evidence of longer stays in hospital, and more visits to physicians and emergency rooms, by patients exposed to the RDP for nitrates (Grootendorst *et al.*, 2001b: 91);
- In the long run, exposure to reference pricing increased the odds of admission to hospital for revascularization by six or seven times for nitrate users (Grootendorst *et al.*, 2001a: 14; 2001b: 91).

Grootendorst *et al.* mention these effects tentatively, suspecting sample selection bias, and do not estimate their costs. One of the challenges to measuring differences in adverse events between patients exposed to the RDP and those who were not was that both groups had dramatic and unexplained increases in them. There were higher probabilities of ER visits, hospital admissions, revascularizations, cardiovascular disease diagnostic procedures, and prescriptions for sublingual nitroglycerin (for acute angina) for all patients taking the drugs, not just those exposed to reference pricing, after the RDP started. As well, there was a dramatic drop in physicians' consultations, a result of the provincial Medical Services Plan delisting a number of procedures in the autumn of 1996 (Grootendorst *et al.,* 2001b: 28, 97-120). Grootendorst *et al.* do not thoroughly discuss these confounders, but they are a remarkable coincidence.

Schneeweiss *et al.*, in their article on reference pricing of ACE inhibitors, found little evidence of adverse events. However, that doesn't mean there were not any adverse events, just that there was not enough statistical power in their model to dig them out. Schneeweiss *et al.* observed 37,362 seniors taking restricted drugs. Because only 5,353 switched, it was hard for them to stand out from the crowd, statistically speaking, when they suffered adverse events (2002a: 823).

In the first two months after the policy, the rate of hospitalization for patients who switched to a reference ACE inhibitor from a restricted one increased by 19 percent, even after correcting for hospitalizations before the policy. However, this increase is not considered statistically significant at the 5 percent level, because the confidence intervals are between -1 percent and 42 percent. That means that the rate of hospitalization would have to have increased more than 42 percent to claim an increase in hospitalizations! In the longer term, the rate fell to 3 percent, but the authors also note that some patients who switched to reference ACE inhibitors switched back to restricted ones after a while (Schneeweiss *et al.,* 2002a: 824; 2002b: 743).

As well, patients on ACE inhibitors had a monthly mortality rate 20 percent higher than for all other British Columbians before the RDP, with a confidence interval of zero percent to 44 percent. In 1997, the first year of the policy, the rate appears to have been above 20 percent for all months but two, and above 30 percent in six months, but this is still within the confidence interval (Schneeweiss *et al.,* 2002a: 824-827). Unfortunately, the authors did not report differences in mortality for those who switched ACE inhibitors versus those who did not, after the policy.

Even if these indications of adverse events turn out not to be significant in subsequent analysis, it does not mean that Pharmacare is right to suggest that all ACE inhibitors are effectively the same. Patients with a high chronic disease score, congestive heart failure, or diabetes were more likely to stay on the more expensive ACE inhibitors (Schneeweiss *et al.,* 2002b: 741).

Non-steroidal anti-inflammatory drugs

Although there is no published research on the effect of BC's RDP on health outcomes for patients taking NSAIDs, the current debate over drugs in that class is indicative of the problem of handing power over prescriptions to experts. Two recent entrants into the class are celecoxib (Celebrex®) and rofecoxib (Vioxx®), both restricted drugs in BC's RDP. These drugs, called COX-2 inhibitors, are sometimes described colloquially as "Super-Aspirins," but recent research has generated a debate about their effect on the risk of heart attacks (Dalen, 2002; Landers, 2002; Wooltorton, 2002).

This debate spilled into the popular press after the Therapeutics Initiative gave a less than glowing recommendation of them, stating that they caused more adverse events than other, less expensive, NSAIDs (Therapeutics Initiative, 2001; Vallis and Fayerman, 2002). This judgment immediately drew a response from other experts with different opinions. Dr. Milton Baker, President of the BC Society of Rheumatology, Dr. A.V. Jovaisas, Associate Professor of Medicine at the University of Ottawa, and Mr. Denis Morrice, President of the Arthritis Society, immediately had letters critical of the Therapeutics Initiative published in the *National Post* newspaper, extolling the efficacy and value of the COX-2 inhibitors (Baker, 2002; Jovaisas, 2002; Morrice, 2002).

The Fallacy of Central Planning in the Reference Drug Program

Writing in the journal of the BC Medical Association, a group of doctors and scientists representing different specialties accused Pharmacare of lacking transparency, selectively using information for making decisions, and having an inadequate process of appeal for reviewing drugs (Bebb *et al*., 2001). We have already seen that patients responded to the RDP by paying extra for restricted drugs, resisting Pharmacare's notion of "therapeutic equivalence." However, there is even clearer evidence that Pharmacare's claim that it is competent to judge the value of different drugs is inaccurate. In a number of cases, dispensed volumes of restricted drugs actually went up after Pharmacare imposed the RDP, relative to reference or exempt drugs.

Table 14 shows the change in mean monthly defined daily doses of nitrates before RDP and after one year of reference pricing. The two fastest growing nitrates by far were isosorbide mononitrate and isosorbide mononitrate (sustained release), both of which are restricted, and grew by multiples. Their rate of growth was even greater than that of nitroglycerin patches, which captured a large share of the market after their prices were reduced. This growth happened against a background of reduced use of nitrates as a class.

This growth in dispensing of restricted drugs might seem idiosyncratic, because the volumes for those two drugs are still very low, but the other two cardiovascular classes show similar effects. Table 15 shows the change in mean monthly defined daily doses of ACE inhibitors before and after the RDP. Although the two primary beneficiaries of the program are reference drugs, one restricted drug, cilazapril (Inhibace®) grew faster than the market of all ACE inhibitors. As well, one reference drug, captopril, lost significant volume.

Bourgault and colleagues reported that middle-aged and senior patients who were initially prescribed captopril used health services more than those prescribed lisinopril or enalapril, using data from the period 1991 to 1993 (Bourgault *et al*., 1999; Bourgault and Suissa, 2000). It appears that by the late 1990s, clinical practice had changed and captopril was falling out of favour. Even though it is available without restriction under the RDP, doctors and patients are telling us that captopril is a less satisfactory ACE inhibitor

Table 14: Mean Monthly Defined Daily Doses of Nitrates Dispensed per 100,000 Seniors in BC

	Baseline, Apr 1994 to Oct 1995	Long Term, Jan 1997 to May 1999	*Growth*	Normalized to Baseline	*Normalized Growth*
Isosorbide mononitrate	24	262	*992%*	305	*1173%*
Isosorbide mononitrate (SR)	175	470	*169%*	548	*213%*
Nitroglycerin patch	39,075	60,662	*55%*	70,712	*81%*
Isosorbide dinitrate	14,688	22,048	*50%*	25,705	*75%*
Nitroglycerin sublingual	15,119	14,489	*-4%*	16,892	*12%*
Nitroglycerin paste	460	178	*-61%*	208	*-55%*
Nitroglycerin tablets (SR)	70,109	22,220	*-68%*	25,905	*-63%*
Pentaerythritol	331	85	*-74%*	99	*-70%*
Isosorbide dinitrate (SR)	453	51	*-89%*	59	*-87%*
Total	140,434	120,455	*-14%*	1,401,434	*0%*

SR = sustained release; **bold** = restricted; underlined = exempt; normal type = reference.
Source: Grootendorst *et al*., 2001b: 47.

for many patients, and they prefer many of the restricted drugs, especially cilazapril.

Table 16 tells a similar story for the CCBs. This class includes a number of drugs that are exempt from reference pricing. Nevertheless, the second fastest growing drug in the class was amlodipine (Norvasc®), a restricted drug the use of which grew by 34 percent when the entire class grew by only 7 percent. The use of another restricted drug, sustained release nifedipine (Adalat®), also grew faster than two exempt drugs, verapamil and diltiazem.

What these dispensing figures explain is that the central planners at Pharmacare are not nearly as sophisticated in their decision making as are the many thousands of doctors in the province. Any benefits of the RDP appear to have come from elements of the program that tolerated choice: the

Table 15: Mean Monthly Defined Daily Doses of ACE Inhibitors Dispensed per 100,000 Seniors in BC

	Baseline, Oct 1995 to Sep 1996	Long Term, Apr 1998 to May 1999	*Growth*	Normalized to Baseline	*Normalized Growth*
Ramipril	22,063	189,161	*757%*	126,519	*473%*
Quinapril	11,412	94,129	*725%*	62,958	*452%*
Cilazapril	13,265	23,548	*78%*	15,750	*19%*
Fosinopril	15,348	19,211	*25%*	12,849	*-16%*
Lisinopril	81,095	78,610	*-3%*	52,578	*-35%*
Benazepril	5,606	4,884	*-13%*	3,267	*-42%*
Captopril	60,946	49,237	*-19%*	32,932	*-46%*
Enalapril	181,600	126,312	*-30%*	84,483	*-53%*
Total	391,335	585,092	*50%*	391,335	*0%*

Bold = restricted; normal type = reference.
Source: Grootendorst *et al*., 2001b: 59.

Table 16: Mean Monthly Defined Daily Doses of Calcium Channel Blockers Dispensed per 100,000 Seniors in BC

	Baseline, Oct 1995 to Sep 1996	Long Term, Apr 1998 to May 1999	*Growth*	Normalized to Baseline	*Normalized Growth*
Felodipine	41,219	86,850	*111%*	81,107	*97%*
Amlodipine	55,059	73,661	*34%*	68,790	*25%*
Verapamil (SR)	32,265	33,018	*2%*	30,835	*-4%*
Diltiazem (SR)	81,327	78,890	*-3%*	73,673	*-9%*
Nifedipine (SR)	115,976	89,843	*-23%*	83,902	*-28%*
Verapamil	7,347	4,921	*-33%*	4,596	*-36%*
Diltiazem	8,915	3,943	*-66%*	3,682	*-59%*
Nicarpidine	1,276	553	*-67%*	516	*-60%*
Nifedipine	3,811	101	*-97%*	94	*-98%*
Total	347,195	371,780	*7%*	347,195	*0%*

SR = sustained release; **bold** = restricted; underlined = exempt; normal type = reference.
Source: Grootendorst *et al*., 2001b: 59.

ability of doctors to apply for special authorizations, and, even more so, for patients to pay the difference in the absence of exemptions. Pharmacare's selection of drugs by "class effect" was not effective.

Quebec's Alternative to Reference Pricing

During BC's experiment with reference pricing, Quebec also increased the share of prescriptions' costs paid for by patients. However, Quebec assessed patients' ability to pay, rather than casting judgment on which medicines in a class were best. Quebec's plan had previously covered welfare recipients and seniors, with maximum annual individual expenditures of either zero or $100. In August 1996, Quebec raised the caps to between $200 and $750, based on patients' incomes.

A group led by Professor R. Tamblyn has made a detailed study of the effect of the increased deductibles (Tamblyn *et al.,* 1999a; 1999b; 1999c; 2001). There are a number of differences between BC's and Quebec's experiences and the research conducted on them, which means that a comparison of the effects of the different policies should be undertaken cautiously:

- BC's RDP was for five classes of drugs, whereas Quebec's increase in co-payments was for all drugs;
- Research on the effects of Quebec's reform on adverse events looked only at patients who were taking drugs determined "essential" or "less essential" by the investigators, not a random sample of all effected patients, whereas this was not a factor for researching BC's RDP (Tamblyn *et al.,* 2001: 422);

- Quebec's increase in co-payments corresponded with the introduction of a European-style social insurance plan for drugs, financed by premiums rather than general taxation, for all Quebecers not covered by private insurance or pharmacare, whereas BC already had universal coverage within Pharmacare;

- Tamblyn *et al.*'s research on the effects of Quebec's reforms is on both elderly patients and those on welfare, whereas the research on BC's RDP by Grootendorst *et al*., Schneeweiss *et al*., and Marshall *et al*. is only on elderly patients;

- Tamblyn *et al*. estimate the change in the use of prescription drugs and number of adverse events, but estimate the public plan's savings only for changes in the use of psychiatric drugs by welfare recipients, whereas the three teams of researchers for BC's RDP estimate Pharmacare's savings for the entire elderly populations they studied (Tamblyn *et al*., 1999c: 7.1-7.9); and

- Quebec had a plan in place to study the effects of the change—the only province to do so (Lexchin and Grootendorst, 2002: 32).

Mr. Cassels notes that "the rate of drug-related adverse experiences among the elderly and welfare recipients more than doubled after the Quebec cost-sharing scheme was introduced" (Cassels, 2002: 8). This statement invites misunderstanding because it uses relative changes rather than absolute changes in outcomes to make the adverse events appear much worse than they were. The absolute change in both adverse events and emergency room visits was 3 percentage points for seniors and 9.5 percentage points for welfare clients (Tamblyn *et al.,* 2001: 426-427). This change was accompanied by an estimated increase in the monthly rate of adverse events and emergency room visits of about one fifth of one percent per person-month for elderly patients and two thirds of one percent per person-month for welfare patients (Tamblyn *et al.,* 2001: 426-427). The authors conclude that the policy may have caused 0.7 percent more adverse events in Quebec's elderly population (Tamblyn *et al.,* 2001: 428).

The fact that the impact of the higher co-payment appears to have been greater for welfare clients than seniors is not surprising. The poverty rate among seniors is relatively low. The number of seniors in income poverty was about 2 percent from 1991 through 1996, whereas it was over 25 percent for Canadians under 25 years old, and between 5 and 10 percent for other adults (Sarlo, 2001: 38). It has been long understood that the poor tend to avoid paying co-insurance or co-payments, and it is possible to exempt them from paying while allowing the majority to pay some of their medical costs themselves without funneling it through the taxman, as discussed in Esmail and Walker (2002b: 16-20). Therefore, it is not surprising that research on Quebec's experience should demonstrate worse health consequences than research for BC's RDP, which has not investigated the effects of the RDP on welfare clients. This does not mean that BC's approach has been superior to Quebec's.

Responding to Tamblyn *et al.*'s article, another team of researchers reported from their work that increasing patients' costs in a privately-insured American population did not result in reduced drug use over the long term, but did increase the variance of use in the population, supporting other evidence that regular working folks and seniors are able to pay a share of costs themselves (Gibson *et al.,* 2001). More recently, a separate study of Quebec seniors suffering heart attacks in the period before and after the change in cost-sharing showed an increase in prescriptions

of relevant cardiovascular drugs (beta blockers, ACE inhibitors, and lipid-lowering drugs) and no change in adverse events in groups who were admitted to hospital for heart attacks before and after the change in policy (Pilote *et al*., 2002).

Furthermore, Tamblyn and colleagues did two separate studies, one of which followed patients until August 1997, and the other until January 1998. Separate research indicates that seniors resumed their previous consumption of prescriptions for all covered drugs within a couple of years after the policy change. Just before the change, a "snapshot" from June 9, 1996, indicated that the average, publicly-insured, senior outpatient was using 2.3 perscriptions, and of those actually taking medicines, the average was 3.3. On June 7, 1998, the numbers were 2.4 and 3.4, respectively (RAMQ, 2001: 11).

Furthermore, the presentation in Tamblyn *et al*. (2001) does not make clear that the increase in adverse events associated through cutting back prescriptions was statistically significant when compared to that which would have occurred through "naturally" increasing non-compliance as the 10 months of observation passed. For welfare recipients, for example, the risk ratio per reduction of one drug went from 1.24 naturally to 1.32 as a result of policy. However, the 95 percent confidence interval for the former was 1.09 to 1.41, and 1.19 to 1.46 for the latter. As discussed above, Schneeweiss *et al*., in their study of the health consequences of switching ACE inhibitors due to BC's RDP, reject consequences of similar magnitude because they fall within 95 percent confidence intervals. Because the authors of the two articles appear to differ in the strictness of their interpretations, it is inappropriate to compare their conclusions.

Tamblyn *et al*. do not categorize the adverse events as to hospitalization, institutionalization, or death, nor do they do any budgetary analysis of the effects on the health care system overall. Indeed, it is not clear that the policy caused extra deaths: although the researchers report the number of deaths caused by reduction of consumption after implementation of the policy, they do not explicitly report the number of deaths from "natural" reduction of consumption, so we cannot estimate the difference in this outcome alone (Tamblyn, *et al* 1999c: 5.48-5.51, 5.96-5.108).

Before the policy, average monthly drug costs were about $88 for elderly patients and $75 for welfare patients, who reduced their consumption of the drugs in question by about 9 percent and 16 percent respectively (Tamblyn *et al*., 2001: 424-425). Rough calculations imply savings of about $3,800 per adverse event for seniors and $1,800 per event for welfare cases. Therefore, it is not immediately obvious that the policy was not a good trade-off.

For welfare cases who reduced psychiatric drugs, the savings to the Health Ministry were between $16.1 million and $17.3 million, of which patients paid $5.6 million to $6.8 million, in the first 10 months. The costs of hospitalization, physicians' visits, and emergency room visits cost $4.4 million (Tamblyn *et al*., 1999a: 21; 1999c: 7.1-7.9). This implies net savings of about $5.9 million to $8.8 million in the first year for this group alone. A calculation of convenience, extrapolating to the elderly and welfare cases that were regular pharmaceutical users, results in net savings of between $14 million and $21 million.[7] The researchers expect that they over estimated savings. However, they excluded patients who were only using drugs such as antibiotics and gastro-protective medications, which they argue are often overused (Tamblyn *et al*., 2001: 422). Therefore, savings from reductions in costs for these patients are absent.

Tamblyn *et al*. accept that the new policy probably had beneficial effects for two groups of vulnerable patients under observation, for which the risks of over medication outweigh those of under medication (1999c: 5.42). For example, they attributed a huge reduction in doctors' visits to reduced use of non-essential medicines (1999a: 22). However, there were also patients who increased their consumption of some drugs in response to the policy, the health outcomes for which the team could not measure (1999c: 5.59).

Most importantly, the article does not examine the benefits of the policy to Quebecers who received benefits under the new drug insurance program, the goal of which was to expand pharmaceutical benefits from the poor and elderly to the entire population (Currie and Nielson, 1999: 47). From 1996 to 1997, costs for the provincial drug benefit plan dropped from $101 to $96 per capita, whereas the new drug insurance fund for those previously uninsured went from zero to $24 per capita (CIHI, 2002a: 74). Zelder (2000), examining the period 1993 through 1998, which embraces the policy change, found that Quebec was the only Canadian province where increased public health spending reduced waiting times for surgery (although his sample was too small for statistical significance), which he attributed to Quebec's relatively high spending on prescription drugs, the most productive area of health spending. The data from 1995 through 2001 support this conclusion.

The total growth in expenditures for Quebec's public drug benefit plan (for seniors and welfare clients) and compulsory drug insurance plan (for others not privately insured) was 106 percent over the period, whereas BC Pharmacare's was 87 percent (table 17). However, Quebec's growth in private spending on prescriptions was much less than BC's, with the result that BC's total provincial public plus private growth was slightly more than Quebec's. Furthermore, Quebec's total health spending per capita grew significantly slower than BC's, such that BC's estimated spending per head was one fifth more than Quebec's in 2001: $3,540 versus $2,899. This suggests that Quebec's approach to managing drug benefits probably had a better effect on overall health costs than BC's.

However, Quebec's increased co-payments also contained a welfare trap. Seniors who did not re-

Table 17: Per Capita Health Spending in Two Provinces, 1995 and 2001[f]

Year	British Columbia						Quebec					
	Prescription Drugs					Total Health Care	*Prescription Drugs*					Total Health Care
	Pharmacare	Drug Insurance Fund	Pharmacare + Insurance	Private	Total		Drug Benefit Plan	Drug Insurance Fund	Drug Benefit Plan + Insurance Fund	Private	Total	
1995	$87	N/A	$87	$93	$180	$2,681	$111	N/A	$111	$139	$250	$2,384
2001[f]	$163	N/A	$163	$152	$315	$3,540	$158	$71	$230	$192	$422	$2,899
Growth	87%		87%	63%	74%	32%	42%		106%	39%	69%	22%

[f] = forecast
Source: CIHI 2002a: 74-75, 94-95.

ceive the Guaranteed Income Supplement, that is, who are not considered very poor, reduced their drug use more than the very poor who received the full (GIS). This is because the very poor faced an annual deductible of $200 per year, whereas the deductible for those who received partial GIS was $500, and $750 for seniors not receiving any GIS. The $750 cap came into effect at an income of about $10,000, whereas the average revenue for seniors in the cohort was about $40,000 (Tamblyn *et al.,* 1999a: 13; 1999b: 4.4, 4.31-4.34). Therefore, the plan penalized seniors who earned just over $10,000 by $250 and penalized by $300 those who earned slightly more than the level of income that triggered the full GIS.

As well, both Quebec and British Columbia failed to return residents' money to them to help them pay the higher costs shifted onto them. One measure of this is Tax Freedom Day: the day when Canadians stop working for government and start working for themselves. In 1992, Tax Freedom Day was June 13 in BC and June 7 in Quebec. By 2000, our rulers had postponed it by a few weeks: to July 5 in BC and July 6 in Quebec (Clemens and Emes, 2002: 7). Had they reduced the tax burden, more residents would have been able to lift themselves out of poverty.

Conclusions

The research so far indicates that the Reference Drug Program has not achieved its stated objectives:

- Savings to Pharmacare have not been satisfactorily quantified;
- Some apparent savings to Pharmacare are due to increased competition;
- Some apparent savings to Pharmacare are due to increased private payment;
- The RDP did not cause manufacturers of restricted drugs to reduce their prices;
- The RDP did not slow the growth in Pharmacare's spending relative to other provincial public drug benefit plans' spending;
- The RDP did not slow the growth in BC's private pharmaceutical spending relative to the rest of Canada;
- Quebec's reforms clearly led to much better budgetary results than BC's RDP did;
- BC Pharmacare did not select the drugs that best represented "value for money" as reference drugs;
- There is tentative evidence that patients' health suffered due to the RDP; and
- It is not clear how the effects on patients' health in Quebec due to that province's reforms differed from those in BC due to the RDP.

Nevertheless, the media "spin" on the RDP has been much better than it has been for Quebec's reforms, despite the RDP's failings. Media coverage of the research on ACE inhibitors conducted by Dr. Schneeweiss' team was unflinchingly favourable to the RDP. A *Vancouver Sun* headline stated: "US Government Hopes to Emulate Reference-based System" (Fayerman, 2002). More re-

cently, a columnist in the same newspaper reiterated the notion that "reference-pricing has worked" (Wilcocks, 2002).

On the other hand, Professor Tamblyn and colleagues' research in Quebec was first reported to the public by an anonymous source, who leaked onto the front page of the *Montreal Gazette* that: "More than 100 people have died and almost 4,000 have been hospitalized as a direct result of Quebec's drug-insurance plan" (Authier and Robinson, 1998). When their article was published in the *Journal of the American Medical Association*, the *Gazette* reported that increased hospitalization costs due to adverse events overwhelmed the savings to the drug plan (Branswell, 2001).

The "spinning" of the results of the two reforms in completely different directions indicates that BC's RDP did serve political or bureaucratic interests better than Quebec's reforms did. The RDP was certainly superior to Quebec's co-payments in this respect, for a number of reasons:

1. It allowed government agents to take credit for savings that actually came about as a result of competition between suppliers.

2. It allowed members of a government-appointed committee to pose as omniscient judges of the value of one medicine over another.

3. It allowed Pharmacare to levy a *de facto* co-payment, by forcing patients to pay for restricted drugs, while denying that such cost shifting was a necessary consequence of the RDP.

4. It justified the invasion of privacy implicit in PharmaNet, the system whereby the government centralizes all prescription information in the province. Because researchers examining reference pricing required detailed information on patients, data from PharmaNet was necessary to conduct their research so thoroughly (Cassels, 2002: 10).

5. One potentially important cost of reference pricing, the destruction of incentives for innovating new medicines, is not borne by government agents, especially in a small jurisdiction like BC. Global pharmaceutical manufacturers are unlikely to change their R&D programs because of the reference pricing in one Canadian province. Even if they did, the lost opportunities would not become apparent for many years, and would have no direct consequences for Pharmacare's managers.

Policy Implications

The ambiguity of the results on patients' health due to the RDP relative to those due to Quebec's increase in co-payments is not surprising. To expect a provincial government to ensure that each and every resident is taking exactly the correct type and amount of a prescription in all cases, with zero risk of adverse events, is obviously a goal outside the bounds of common sense. Rather, a more appropriate goal is that the government ensures that all patients have the means to make responsible choices in their use of medicines, and that it does not destroy incentives for drug makers to continue to develop medicines.

The failure of the RDP to create lower prices, in an outcome similar to the New Zealand experience,

is not surprising. It demonstrates than BC is a price-taker, not a price-setter, in the prescription drug market. If the manufacturers of restricted drugs had dropped their prices in BC, public drug benefit plans in Quebec and Ontario would have demanded the same prices, even though those provinces do not employ reference pricing (Narine *et al*., 1999: 288). For the drug makers, losing sales in BC was not as bad as losing profits in the larger provinces would have been, due to lower prices.

This has a disturbing implication, in that it implies that BC cannot create a domestic pharmaceutical free market. Free markets in patented drugs are typified by price differentiation. As long as manufacturers can prevent patients from arbitraging their medicines, they earn maximum profits by selling drugs for higher prices to higher income persons, and lower prices to lower income persons (Danzon, 1997; 1998). Of course, when government-operated plans demand the "best price," this option disappears, and a welfare loss results. Even if the BC government wanted such a result, it could not do so independently, because manufacturers would not respond by price differentiating to maximize local profits. They would fear that governments in other jurisdictions would demand to be supplied at the lowest price charged to low-income individuals in BC.

BC's experience with the Reference Drug Program invites a number of policy implications in the near term:

1. *BC Pharmacare must abandon the RDP*. As noted above, even some governments in the United States are looking to implement reference pricing. If they do follow BC's example, their actions will have negative consequences for global pharmaceutical innovation. However, even when measured against solely parochial standards, the RDP is less effective than a more even-handed imposition of co-payments, as demonstrated by Quebec's experience.

2. *BC Pharmacare must implement a multi-tiered structure of co-payments*. American health plans, which have to satisfy their clients in quasi-competitive markets, have rejected tools like reference pricing in favour of tools that give patients better incentives to choose medicines based on value for money. Patients must decide this value, not a government appointed committee.

3. *BC Pharmacare must increase the annual deductible, based on a means test*. Manitoba and Saskatchewan both determine deductibles as a percentage of a person's income. This does have the negative effect of punishing people for earning more, but Canada already does that anyway. In 1997, the top quarter of taxpayers paid about 80 percent of taxes (Emes and Walker, 2001: 30). However, a means-tested deductible has the positive effect of rationing the subsidy based on ability to pay, rather than medical need, as the RDP does. As well, it serves as a proxy for what would occur in a global free market for prescription drugs: manufacturers would charge different prices, such that higher earners would pay more. Evidence supports this type of reform: Manitoba's increases in pharmaceutical spending have been much less than BC's in recent years (Graham, 2002b).

In the longer term, further reforms should include establishing tax-advantaged Medical Savings Accounts. MSAs are flexible tools that allow people to save money for their future health expenses (Ramsay, 1998). The current system, whereby British Columbians are heavily taxed throughout their working lives and then thrown on the mercy of the state when they need medicines in their later years contains the wrong incentives. The drugs in the five therapeutic classes

covered by the RDP are for conditions that are predictable for many British Columbians. The government must let them save in anticipation of those needs. An analysis of privatizing the Ontario Drug Benefit Plan, although not done with actuarial techniques, estimated that a 35-year-old Ontario resident who invested 2.8 percent of his income in an MSA for the 30 years from 1968 to 1998 in low-yielding, risk-free government bonds would have been able to finance his prescriptions in retirement (Graham, 2000).

Appendix A: The Effect of Government-Mandated Reference Pricing on Choice

The form of this demonstration follows that of Professor Eva Pichler of the Wirtschaftsuniversität Wien in Austria, who compared the effects of reference pricing on moral hazard for two classes of drugs (Pichler, 2001: 59-62). It differs in that it looks at the change in the relative value required by a patient to use a more expensive, innovative drug over an older, less expensive drug, and how government-mandated reference pricing changes that relative value. Furthermore, the model describes government intervention to subsidize costs that are not catastrophic, that is, where costs in a truly private insurance market would be below the deductible negotiated between the insurer and client.

Without government intervention, a patient exercises individual choice and pays from disposable income for prescription drugs. The people in this society suffer from one disease, for which there are two drugs.

- A is an innovative, more expensive drug that has superior qualities to drug B;
- P_A and P_B are the prices of A and B such that $P_A > P_B$;
- Y is the patient's disposable income; and
- U introduces the utility functions for A, B, and Y, such that U[A]>U[B].

The patient will choose A if:

$$(1) \quad U[A]+U[Y-P_A]>U[B]+U[Y-P_B]$$

Rewriting:

$$(2) \quad U[A]-U[B]>U[Y-P_B]-U[Y-P_A]$$

Assume that the marginal utility of income decreases. That is, the loss of utility of paying P_A versus P_B slows as Y rises. Therefore, *ceteris paribus*, patients with higher incomes are more likely to use A than those with lower incomes are.

Next, the government imposes a Pharmacare program, funded by a tax, T, levied on the patient. Pharmacare reimburses the reference price, set at P_B. The tax on the patient does not fully fund the program. The state also taxes the patient's neighbour, who does not consume prescription drugs. This results in a transfer payment to this patient such that $T+G=P_B$. The transfer is not monetary, but takes the form of drug B, which he gets for "free," less his share of the tax paid to Pharmacare.

The patient will choose A if:

$$(3) \quad U[A]+U[Y-T+T+G-P_A]>U[B]+U[Y-T+T+G]$$

Note that Y-T is the patient's income after tax, and T+G =P_B, the amount that Pharmacare reimburses him whichever drug he chooses. The Ts cancel. Rewriting:

(4) U[A]-U[B]>U[Y+G]-U[Y+G-P_A]

Comparing the right-hand sides (r.h.s.) of (2) and (4), we see that Pharmacare's reference-based pricing tilts the playing field against A relative to B if:

(5) U[Y+G]-U[Y+G-P_A]> U[Y-P_B]-U[Y-P_A]

There are two effects: income and substitution. The fact that the patient pays nothing for B increases his budget, so he has more income to spend on all goods and services. If G is large relative to Y, it may be the case that (5) is not true. That is, the income effect may be larger than the substitution effect, and the patient will be biased towards A. However, it is highly likely that G is very small relative to Y, and that (5) will be true.

Therefore, under reference pricing, innovative manufacturers will move away from R&D with a high probability of smaller improvement in product attributes in favour of R&D with a low probability of large improvement (Jönsson and Ekelund, 2001: 74).

Suppose that Pharmacare institutes a single tier, or flat rate, co-insurance, instead of reference pricing. In this case, the patient has the option of deciding how much subsidy he gets, because the amount of subsidy will be higher if he chooses A instead of B. That is, for a given tax levied, the transfer payment will depend on which drug he chooses. For this case, the model is simplified by assuming that the tax is levied solely on non-patients.

If x is the rate of co-insurance, then the patient will choose A if, similar to (1):

(6) U[A]+U[Y-$x$$P_A$]>U[B]+U[Y-$x$$P_B$]

Rewriting, similar to (4):

(7) U[A]-U[B]>U[Y-$x$$P_B$]-U[Y-$x$$P_A$]

Comparing the r.h.s. of (2) and (7) we see that the bias introduced by the co-payment relative to individual choice is in favour of A.

(8) U[Y-$x$$P_B$]-U[Y-$x$$P_A$]< U[Y-$P_B$]-U[Y-$P_A$]

Under co-insurance, A does not have to be as superior to B as under individual choice, and the patient's choice is biased towards A. As x, the co-insurance rate, increases, the bias is reduced.

This approach also has consequences for manufacturers' R&D. As P_A decreases versus P_B, U[Y-P_A] increases faster than U[Y-$x$$P_A$]. Therefore, the l.h.s. of (8) increases faster than does the r.h.s., and it is more likely that patients will opt for A. This motivates manufacturers to invest more in incremental innovation than they would have under individual choice.

Notes

[1]One obstacle to their willingness to satisfy demand is the requirement that new drugs be approved for sale by Health Canada, a process that takes significantly longer in Canada than in some other developed countries (Rawson and Kaitin, 2000). Another exception would be "parallel importing," a notion that arises intermittently in the United States. Certain American politicians believe that Canadian prescription drugs, which are often cheaper than American ones, should be forcefully taken out of their manufacturers' distribution chains and sold into the US. This would motivate brand-name drug companies to restrict their supplies to Canada (Graham and Robson, 2000; Graham, 2001b, Grubel, 2002).

[2]This substitution effect is somewhat countered by an income effect, depending on how the tax is levied, but the income effect is unlikely to overwhelm the substitution effect. Appendix A contains a more technical treatment of this issue.

[3]If the doctor requests "no substitution," the plan may reimburse the full cost of the brand-name medicine.

[4]Hospitals in BC maintain their own formularies, free of central government control. In a 1990 survey of BC's hospital pharmacies, the researchers determined that some were early adopters (listing a drug between 4 to 8 months after Health Canada had approved it for use in Canada), some were laggards (taking more than 20 months to list a drug), and the median time to listing was 11 months (D'Sa *et al.,* 1994: 258).

[5]"Quasi-competitive" because American hospitals have a long history of collusion and co-operation (Frech, 2002: 52-53).

[6]Per capita figures for the "rest of Canada" are calculated as: (Canadian total costs minus BC total costs) divided by (Canadian population minus BC population).

[7]The researchers reckon that the welfare cases using psychiatric drugs suffered 451 more adverse events (total cost: $300,000), 9,511 more physicians' visits (cost $3.8 million), and 3,647 more ER visits (cost $300,000). The entire group of senior and elderly regular users suffered 1,946 more adverse events, 16,092 more physicians' visits, and 12,991 more ER visits, implying a total cost of about $10.5 million, if the costs per service are extrapolated from the welfare psychiatric users. If the ratio of pharmaceutical savings to cost of these three services is constant, the total net savings is between $14 million and $21 million per year.

References

3M Pharmaceuticals (2001). *About 3M Pharmaceuticals*. St. Paul, MN: Minnesota Mining & Manufacturing Company, Inc. Digital document at *www.3m.com/us/healthcare/pharma/pharma_about.jhtml* (as at January 16, 2002).

Anis, Aslam (2002). "The Author Replies." Letter. *Canadian Medical Association Journal* 167, 2 (July 23): 127-128.

Auditor General of BC (1998). *Managing the Cost of Drug Therapies and Fostering Appropriate Drug Use*. 1998/99 Report 2. Victoria, BC: Auditor-General of British Columbia. Digital document at *http://bcauditor.com/AuditorGeneral.htm* (as of September 3, 2002).

Authier, Philippe, and Jennifer Robinson (1998). "Quebecers Sick, Dying Due to Drug Plan: Study." *Montreal Gazette* (November 12): A1.

Baker, Milton F. (2002). "Painkiller Dangers Overstated." Letter. *National Post* (March 9): A19.

Barrett, Tom (2002). "700,000 Prescriptions for Seniors 'Unfilled.'" *Vancouver Sun* (April 11): A1.

BC Pharmacy Association (2001). *Pharmacare in the New Era*. Richmond, BC: British Columbia Pharmacy Association (September).

_____ (2002). *A Submission to the BC Reference Drug Program Review Panel*. Richmond, BC: British Columbia Pharmacy Association (February 20).

BC Ministry of Health Services (2001). *Pharmacare Trends 2000*. Victoria, BC: British Columbia Ministry of Health Services.

_____ (2002). *Reference Drug Program*. Victoria, BC: British Columbia Ministry of Health Services. Digital document at *www.healthservices.gov.bc.ca/pharme/rdp.html* (as of August 28).

Bebb, Richard, Claire Cameron, Kevin Elwood, Jonathan Fleming, Jiri Frohlich, Anthony Fund, Alice Klinkhoff, Barry Koehler, Graydon Meneilly, Tim Rowe, Derryk Smith, and John Wade (2001). "The Drug Review Process in BC: A Critique." *BC Medical Journal* 43, 2 (March): 86-87.

Bourgault, Chantal, Eleanor Elstein, Jacques Le Lorier, and Samy Suissa (1999). "Reference-based Pricing of Prescription Drugs: Exploring the Equivalence of Angiotensin-converting-enzyme Inhibitors." *Canadian Medical Association Journal* 161, 3 (August 10): 255-260.

Bourgault, Chantal, and Samy Suissa (2000). "Reference-based Pricing." Letter. *Canadian Medical Association Journal* 162, 1 (January 11): 18.

Branswell, Helen (2001). "Pharmacare Under Attack: Cost-sharing Plans May be More Costly to System: Study." *Montreal Gazette* (January 26): A7.

Brougham, Matthew, Scott Metcalfe, and Wayne McNee (2002). "Our Advice? Get a Budget!" *HealthcarePapers: New Models for the New Healthcare* 3, 1 (July): 83-85.

Cassels, Alan (2002). *Paying for What Works: BC's Experience with the Reference Drug Program as a Model for Rational Policy Making*. Vancouver, BC: Canadian Centre for Policy Alternatives.

Canadian Centre for Policy Alternatives (CCPA) (2001). *Cutting Pharmacare would be a Costly Mistake, says Canadian Centre for Policy Alternatives*. News release. Vancouver, BC: Canadian Centre for Policy Alternatives (September 6).

CIHI (2001). *Drug Expenditure in Canada: 1985-2000*. Ottawa, ON: Canadian Institute for Health Information.

_____ (2002a). *Drug Expenditure in Canada: 1985-2001*. Ottawa, ON: Canadian Institute for Health Information.

_____ (2002b). *Provincial and Territorial Government Health Expenditure Estimates, 1974/1975 to 2001/2002*. Ottawa, ON: Canadian Institute for Health Information.

Clemens, Jason, and Joel Emes (2001). *Returning British Columbia to Prosperity*. Public Policy Source No. 47. Vancouver, BC: The Fraser Institute.

_____ (2002). "Canadians Celebrate Tax Freedom Day on June 28." *Fraser Forum* (July): 6-11.

Currie, Gillian R., and Norma L. Nielson (1999). *Models for Funding Prescription Drug Programs*. Working Paper 99-5. Edmonton, AB: Institute for Health Economics.

Dalen, James E. (2002). "Selective COX-2 Inhibitors, NSAIDS, Apsirin, and Myocardial Infarction." *Archives of Internal Medicine* 162, 10 (May 27): 1091-1092.

Danzon, Patricia M. (1997). "Price Discrimination for Pharmaceuticals: Welfare Effects in the US and the EU." *International Journal of the Economics of Business* 4, 3 (November): 301-321.

_____ (1998). "Can Pharmaceutical Price Regulation and Innovation Co-exist?" *Fraser Forum* (April): 24-27.

D'Sa, Mel M., David S. Hill, and Timothy P. Stratton (1994). "Diffusion of Innovation I: Formulary Acceptance Rates of New Drugs in Teaching and Non-Teaching British Columbia Hospitals—A Hospital Pharmacy Perspective." *Canadian Journal of Hospital Pharmacy* 47, 6: 254-260.

Emes, Joel, and Michael Walker (2001). *Tax Facts 12*. Vancouver, BC: The Fraser Institute.

Esmail, Nadeem (2001). "Canada's Abysmal Health Technology Record." *Fraser Forum* (November): 24-26.

_____ (2002a). "When Does Fewer Doctors Mean Less Access?" *Fraser Forum* (April): 3-6.

_____ (2002b). "Labour Costs in the Hospital Sector Revisited." *Fraser Forum* (January): 31-32.

Esmail, Nadeem, and Michael Walker (2002a). *Waiting Your Turn: Hospital Waiting Lists in Canada (12th Edition)*. Critical Issues Bulletin. Vancouver, BC: The Fraser Institute.

_____ (2002b). "How Good Is Canadian Health Care? An International Comparison of Health Care Systems." *Fraser Forum* (August): 1-52.

Fayerman, Pamela (2002). "Harvard Study Probes BC's Drug-cost-control Experiment: US Government Hopes to Emulate Reference-based System." *Vancouver Sun* (March 14): A3.

Fernandes, Rudy (2002). "Managing Healthcare Costs Within An Integrated Framework."

Healthcare Papers: New Models for the New Healthcare 3, 1 (July): 70-76.

Frech III, H.E. (2002). The Competitive Revolution. *Regulation* 25, 2 (Summer): 52-57.

Furberg, Curt D., David M. Herrington, and Bruce M. Psaty (1999). "Are Drugs Within a Class Interchangeable?" *The Lancet* 354, 9185 (October 2): 1202-1204.

Gibson, Teresa B., Catherine G. McLaughlin, and Dean G. Smith (2001). "Cost-sharing for Prescription Drugs." *Journal of the American Medical Association* 285, 18 (May 9): 2328.

Graham, John R. (2000). "Financing Pharmaceuticals in Canada." *Fraser Forum* (September): 24-25.

_____ (2001a). "Reference-based Pricing in British Columbia's Pharmacare: A Fiscal Failure." *Fraser Forum* (May): 19-21.

_____ (2001b). "The Medicine Piracy and Drug Counterfeit Act of 2000." *Fraser Forum* (January): 16-30.

_____ (2002a). "Reference-Based Pricing in British Columbia's Pharmacare: How Post-it® Notes Changed the Market for Nitrates." *Fraser Forum* (February): 11-13.

_____ (2002b). "A Lesson from Manitoba's Means Test for British Columbia's Pharmacare." *Fraser Forum* (November): 20-22.

Graham, John R. and Beverley Robson (2000). *Prescription Drug Prices in Canada and the United States—Part 1: A Comparative Survey*. Public Policy Sources No. 42. Vancouver, BC: The Fraser Institute.

Gray, Jean (2002). "Drug Policy: An Oxymoron?" *Healthcare Papers: New Models for the New Healthcare* 3, 1 (July): 56-62.

Grootendorst, Paul V., Lisa R. Dolovich, Anne M. Holbrook, Adrian R. Levy, and Bernie J. O'Brien (2001a). *The Impact of Reference Pricing of Cardiovascular Drugs on Health Care Costs and Health Outcomes: Evidence from British Columbia Volume 1: Final Report to HTF*. Health Transitions Fund Project NA222. Hamilton, ON: Centre for Evaluation of Medicines (October 4).

_____ (2001b). *The Impact of Reference Pricing of Cardiovascular Drugs on Health Care Costs and Health Outcomes: Evidence from British Columbia Volume II: Technical Report*. Health Transitions Fund Project NA222. Hamilton, ON: Centre for Evaluation of Medicines (October 4).

Grootendorst, Paul V., Lisa R. Dolovich, Bernie J. O'Brien, Anne M. Holbrook, and Adrian R. Levy (2001c). "Impact of Reference-based Pricing of Nitrates on the Use and Costs of Anti-anginal Drugs." *Canadian Medical Association Journal* 165, 8 (October 16): 1011-1019.

Grootendorst, Paul, and Mitchell Levine (2001). *Do Drug Plans Matter? Effects of Drug Plan Eligibility on Drug Use Among the Elderly, Social Assistance Recipients and the General Population*. Hamilton, ON: Centre for Evaluation of Medicines (April 17).

Grubel, Herb (2002). "Uniform Global Prices mean Higher Prices for Drugs." *Fraser Forum* (February): 4-5, 10.

Holbrook, Anne, Bernie J. O'Brien, and Paul V. Grootendorst (1997). "Reference-Based Pricing (RBP) of Prescription Drugs." Letter. *Canadian Journal of Cardiology* 13, 7 (July): 689-690.

Horn, Susan D., Phoebe D. Sharkey, and Julie Gassaway (1996). "Intended and Unintended Consequences of HMO Cost Containment Strategies: Results from the Managed Care Outcomes Project." *American Journal of Managed Care* II, 3 (March): 253-264.

Jönsson, Bengt, and Mats Ekelund (2001). "Reference Pricing and Innovation in Medicine." In Guillem López-Casasnovas and Bengt Jönsson (eds.), *Reference Pricing and Pharmaceutical Policy: Perspectives on Economics and Innovation* (Barcelona: Springer-Verlag Ibérica): 63-79.

Jovaisas, A.V. (2002). "Safe Pain Drugs." Letter. *National Post* (February 21): A21.

Landers, Susan J. (2002). "Doctors Urged to do More to Control Seniors' Pain." *AMNews* (June 3).

Laupacis, Andreas, Geoffrey Anderson, and Bernie O'Brien (2002). "Drug Policy: Making Effective Drugs Available Without Bankrupting the System." *Healthcare Papers: New Models for the New Healthcare* 3, 1 (July): 12-30.

Lee, Jeff, and Chris Nuttall-Smith (2002). "Drug Cost Pain makes Seniors Sore." *Vancouver Sun* (April 12): A4.

Lexchin, Joel, and Paul Grootendorst (2002). *The Effects of Prescription Drug User Fees on Drug and Health Services Use and Health Status: A Review of the Evidence*. Hamilton, ON: Centre for Evaluation of Medicines.

Lindsey, Robin, and Douglas S. West (1999). "National Pharmacare, Reference-Based Pricing, and Drug R&D: A Critique of the National Forum on Health's Recommendations for Pharmaceutical Policy." *Canadian Public Policy* 25, 1 (March): 1-27.

López-Casasnovas, Guillem, and Jaume Puig-Junoy (2001). "Review of the Literature on Reference Pricing." In Guillem López-Casasnovas and Bengt Jönsson (eds.), *Reference Pricing and Pharmaceutical Policy: Perspectives on Economics and Innovation*. Barcelona: Springer-Verlag Ibérica: 1-41.

Maclure, Malcolm, Robert S. Nakagawa, and Bruce G. Carleton (2001). "Applying Research to the Policy Cycle: Implementing and Evaluating Evidence-Based Drug Policies in British Columbia." In *Informing Judgment: Case Studies of Health Policy and Research in Six Countries*. New York, NY: Milbank Memorial Fund (September): 35-70.

Maclure, Malcolm, and Tanya M. Potashnik (1997). "What is Direct Evidence-Based Policy-Making? Experience from the Drug Benefits Program for Seniors in British Columbia." *Canadian Public Policy* 23, Supplement 1 (Spring): 132-146.

Marshall, John K., Paul V. Grootendorst, Bernie J. O'Brien, Lisa R. Dolovich, Anne M. Holbrook, Adrian R. Levy (2002). "Impact of Reference-based Pricing for Histamine-2 Receptor Antagonists and Restricted Access to Proton Pump Inhibitors in British Columbia." *Canadian Medical Association Journal* 166, 13 (June 25): 1655-1662.

Mays, Glen P., Robert E. Hurley, and Joy M. Grossman (2001). *Consumers Face Higher Costs as Health Plans Seek to Control Drug Spending*. Issue Brief. Washington, DC: Center for Studying Health System Change (November).

McArthur, William J. (2001). "Patient Outcomes and Public Health Consequences of Reference Pricing." In Guillem López-Casasnovas and Bengt Jönsson (eds.), *Reference Pricing and Pharmaceutical Policy: Perspectives on Economics and Innovation*. Barcelona: Springer-Verlag Ibérica: 145-160.

McInnes, Craig, Tom Barrett, and Jeff Lee (2002). "Seniors Still Getting Prescriptions: Hansen." *Vancouver Sun* (April 12): A1.

McMartin, Pete (2002). "Doomsday Scenario All Wrong, Pharmacist Says." *Vancouver Sun* (April 13): B1.

Moore, David (1996). "Reference Pricing for Pharmaceuticals." In William McArthur, Cynthia Ramsay, and Michael Walker (eds.), *Healthy Incentives: Canadian Health Reform in an International Context*. Vancouver, BC: The Fraser Institute: 85-90.

Morgan, Steve (2001). "Statistics and Drug Utilization: Are Prescribing Rates Really that High?" *Canadian Medical Association Journal* 165, 11 (November 27): 1507-1508.

Morrice, Denis (2002). "Safe Pain Drugs." Letter. *National Post* (February 21): A21.

Mott, David A., Jon C. Schommer, William R. Doucette, and David H. Kreling (1998). "Agency Theory, Drug Formularies, and Drug Product Selection: Implications for Public Policy." *Journal of Public Policy and Marketing* 17, 2 (Fall): 287-295.

Narine, Lutchmie, Mahil Senathiraja, and Tina Smith (1999). "Evaluating Reference-based Pricing: Initial Findings and Prospects." *Canadian Medical Association Journal* 161, 3 (August 10): 286-288.

National Forum on Health (1997). *Canada Health Action: Building on the Legacy—Volume 1: The Final Report of The National Forum on Health*. Ottawa, ON: Minister of Public Works and Government Services.

Pavcnik, Nina (2000). *Do Pharmaceutical Prices Respond to Insurance?* Working Paper 7865. Cambridge, MA: National Bureau of Economic Research (August).

Perrin, Forrest V. (1989) "Patients Give High Marks to New Nitroglycerin Patch." *Drug Topics* (April 17): 27-28.

Pichler, Eva (2001). "Is Reference Pricing Based on Economic Criteria?" In Guillem López-Casasnovas and Bengt Jönsson (eds.), *Reference Pricing and Pharmaceutical Policy: Perspectives on Economics and Innovation*. Barcelona: Springer-Verlag Ibérica: 42-62.

Pilote, Louise, Christine Beck, Hugues Richard, and Mark J. Eisenberg (2002). "The Effects of Cost-sharing on Essential Drug Prescriptions, Utilization of Medical Care and Outcomes After Acute Myocardial Infarction in Elderly Patients." *Canadian Medical Association Journal* 167, 3 (August 6): 246-252.

RAMQ (2001). *Portrait quotidien de la consommation médicamenteuse des personnes âgées non hébergées: Les 9 juin 1996, 7 juin 1998, et 11 juin 2000*. Quebec, QC: Régie de l'assurance maladie du Québec.

Ramsay, Cynthia (1998). *Medical Savings Accounts: Universal, Accessible, Portable, Comprehensive Health Care for Canadians*. Critical Issues Bulletin. Vancouver, BC: The Fraser Institute.

Rawson, Nigel S.B., and Kenneth I. Kaitin (2000). "New Drug Approval Times and 'Therapeutic Potential' in Canada, Australia, Sweden, and the United States During the Period 1992 to 1998." *Canadian Journal of Clinical Pharmacology* 7, 2 (Summer): 97-101.

Sarlo, Chris (2001). *Measuring Poverty in Canada*. Critical Issues Bulletin. Vancouver, BC: Fraser Institute.

Schachtner, Jill M., Roy Guharoy, Joseph J. Medicis, Nancy Newman, and Ronald Speizer (2002). "Prevalence and Cost Savings of Therapeutic Interchange Among US Hospitals." *American Journal of Health-System Pharmacy* 59, 6 (March 15): 529-533.

Schneeweiss, Sebastian, Alexander M. Walker, Robert J. Glynn, Malcolm Maclure, Colin Dormuth, and Stephen B. Soumerai (2002a). "Outcomes of Reference Pricing for Angiotensin-Converting-Enzyme Inhibitors." *New England Journal of Medicine* 346, 11 (March 14): 822-828.

Schneeweiss, Sebastian, Stephen B. Soumerai, Robert J. Glynn, Malcolm Maclure, Colin Dormuth, and Alexander M. Walker (2002b). "Impact of Reference-based Pricing for Antiotensin-converting Enzyme Inhibitors on Drug Utilization." *Canadian Medical Association Journal* 166, 6 (March 19): 737-745.

Scott, Alister (1996). "Reference Pricing: A Sham and a Shambles." In William McArthur, Cynthia Ramsay, and Michael Walker (eds.), *Healthy Incentives: Canadian Health Reform in an International Context*. Vancouver, BC: The Fraser Institute: 91-99.

Statistics Canada (2002). *Age (122) and Sex (3) for Population, for Canada, Provinces, Territories, Census Divisions, Census Subdivisions and Dissemination Areas, 2001 Census—100% Data*. Cat. No. 95F0300XCB01001 (July 16). Ottawa, ON: Statistics Canada.

Tamblyn, Robyn, Réjean Laprise, Nancy Mayo, Susan Scott, Eric Latimer, Tracey Reid, Michal Abramowicz, Jim Hanley, Louise Mallet, Roland Grad, Peter McLeod, Allen Huang, Robert Perreault, Jerry Hurley, Pierre Larochelle, and Élie Assal (1999a). *Rapport d'évaluation de l'impact du régime general d'assurance-medicaments: Résume*. Report available from the Quebec Ministry of Health and Social Services. Montreal, QC: McGill University.

_____ (1999b). *Évaluation de l'impact du régime general d'assurance-medicaments: Partie I*. Report available from the Quebec Ministry of Health and Social Services. Montreal, QC: McGill University.

_____ (1999c). *Évaluation de l'impact du régime general d'assurance-medicaments: Partie II*. Report available from the Quebec Ministry of Health and Social Services. Montreal, QC: McGill University.

Tamblyn, Robyn, Rejean Laprise, James A. Hanley, Michael Abrahamowicz, Susan Scott, Nancy Mayo, Jerry Hurley, Roland Grad, Eric Latimer, Robert Perreault, Peter McLeod, Allen Huang, Pierre Larochelle, and Louise Mallet (2001). "Adverse Events Associated With Prescription Drug Cost-Sharing Among Poor and Elderly Persons." *Journal of the American Medical Association* 285, 4 (January 24): 421-429.

Therapeutics Initiative (2001). *COX-2 Inhibitors Update: Do Journal Publications Tell the Full Story?* Therapeutics Letter 43. Vancouver, BC: University of British Columbia, Department of Pharmacology and Therapeutics (November).

Trommald, Mari, Einar Skancke, Arild Bjørndal, Audun Hågå, and Andrew D. Oxman (2001). "Blue Prescriptions: A Program in Transition." In *Informing Judgment: Case Studies of Health Policy and Research in Six Countries*. New York, NY: Milbank Memorial Fund (September): 113-136.

Vallis, Mary, and Pamela Fayerman (2002). "Doctors Warned about Popular Painkillers." *National Post* (February 18): A4.

Viscusi, W. Kip, John M. Vernon, and Joseph E. Harrington, Jr. (1995). *Economics of Regulation and Antitrust*. 2nd edition. Cambridge, MA: MIT Press.

Wilcocks, Paul (2002). "The Problem with Pharmacare 'Fairness.'" *Vancouver Sun* (September 25): A22.

Willison, Donald J. (2002). "More of the Same Is Not Enough." *Healthcare Papers: New Models for the New Healthcare* 3, 1 (July): 47-55.

Willison, Donald J., Paul V. Grootendorst, Bernie J. O'Brien, Mitchell A.H. Levine, and Stuart M. MacLeod (2000). *Outcomes Associated With Formulary Cost-Containment Strategies: A Literature Review and Methodological Critique*. Hamilton, ON: Centre for Evaluation of Medicines.

Wooltorton, Eric (2002). "What's All the Fuss? Safety Concerns about COX-2 Inhibitors Rofecoxib (Vioxx) and Celecoxib (Celebrex)." *Canadian Medical Association Journal* 166, 13 (June 25): 1692-1693.

Woodfield, Alan E. (2001). "Reference Pricing: Theory and Evidence from New Zealand." In Guillem

López-Casasnovas and Bengt Jönsson (eds.), *Reference Pricing and Pharmaceutical Policy: Perspectives on Economics and Innovation.* Barcelona: Springer-Verlag Ibérica: 127-143.

Zelder, Martin (2000). "Spend More, Wait Less? The Myth of Underfunded Medicare in Canada." *Fraser Forum* (August): 1-49.

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