Distributional Effects of Prescription Drug Programs: Canadian Evidence

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Introduction

In Canada, the public provision of hospital care and physician services is mandated by federal legislation.

However, neither the Medicare Care Act (1968) nor the Canada Health Act (1984) mandate the public subsidization of prescription drugs used outside of hospital.
Introduction

- The scope for drugs to manage health problems continues to grow, as do the attendant drug expenditures.
- The outpatient prescription drug share of total Canadian health care expenditures is estimated to have increased from 6% in 1975 to 13% in 2002.
- This share that is about equal to the share allocated to physicians’ services.
Introduction

- Provincial governments have introduced outpatient prescription drug subsidies for seniors and for social assistance recipients.
- There are some provincial programs that defray drug costs for the general population.
Introduction

- Recently the *Kirby Report* and the *Romanow Report* have called for the federal government to take actions which would expand publicly funded prescription drug plans in Canada.
Introduction

- There are a number of **efficiency** or cost arguments for public prescription drug plans:
  - Costs may be controlled through the purchasing power of a single provider;
  - Individuals lacking prescription drug cover may substitute (more expensive) hospital or physician services for drugs in the management of health problems.
Introduction

- However, much of the public discussion (see especially *National Forum on Health, 1997*) has concentrated on **redistribution** (affordability).

- Prescription drug subsidies almost surely redistribute from the well to the sick. But do they benefit the poor more than the rich?
Objective

- Examine the distributional consequences of prescription drug subsidies using household expenditure data.
Approach

- Compare changes in out-of-pocket prescription drug expenditure by households of different levels of affluence before and after the introduction of provincial prescription drug subsidies.

- Canadian provincial prescription drug subsidies were introduced:
  - After the beginning of the collection of household-level expenditure data;
  - In a staggered fashion.
Papers

- **Seniors:**

- **`General Population`:**
  - Distributional Effects of “General Population” Prescription Drug Programs in Canada (December, 2003)
    - [http://socserv.mcmaster.ca/crossley/research/drugs151203.pdf](http://socserv.mcmaster.ca/crossley/research/drugs151203.pdf)
Bottom Line:

- A simple senior prescription drug subsidy would be no more redistributive to senior households than an equal-cost proportional-to-income transfer to senior households.

- There is much more evidence that drug subsidy programs are redistributive in the income sense among non-seniors.
If a small subsidy of size $s$ is introduced, an approximation of the total increase in the indirect utility $v_h = v(x_h, \rho)$ of household $h$ is:

$$s \frac{\partial v_h}{\partial s} = sp_i q_{ih} \left( \frac{\partial v_h}{\partial \ln x_h} \right) \frac{1}{x_h} = s \omega_{ih} \frac{\partial v_h}{\partial \ln x_h}$$

The cost of such a subsidy would be $sp_i q_{ih}$ summed over all $H$ households.
Suppose instead the same resources were distributed as a proportion cash transfer $T_h$.

The utility gain to household $h$ would be:

$$T_h \frac{\partial V_h}{\partial T_h} = T_h \frac{\partial V_h}{\partial \ln x_h} x_h = s\omega^A_i \frac{\partial V_h}{\partial \ln x_h}$$

where $\omega^A_i$ is the average budget share.

Household $h$ prefers the cash transfer if:

$$\omega_{ih} > \omega^A_i$$
If the Engel curve ($\omega_{ih}$ against $\ln x_h$) for good $i$ is downward sloping, then this is a **progressive** subsidy, in the sense that those with low income will prefer the subsidy to a proportional cash transfer.
Is the Engel Curve sufficient?

- This `textbook' analysis is a first order approximation and only appropriate for infinitesimal subsidies.
- If subsidies are of significant size, price elasticities matter (and especially if they vary by with income).
- Our data are not suited to the estimation of price elasticities.
- The literature (Leibowitz, Manning and Newhouse, 1985; Hurley, 1990; Grootendorst and Levine, 2001) suggests prescription drug elasticities price elasticities are small.
Is the Engel Curve sufficient?

- But there are other issues:
  - The pre-policy Engel curve is not the same as the counter-factual Engel curve because many new drugs have been developed in the interim.
  - The `textbook’ analysis relies on the household consuming a non-zero amount of the commodity.
  - Existing programs are not close to ad valorem subsidies but have deductibles, co-payments, and maximum out of pocket provisions.
Can We Explicitly Model the (Nonlinear) Budget Constraints?

- Price and quantity data are difficult to obtain.
- Programs are very complex:
  - Grootendorst (2003) takes 6 pages to describe the premiums, co-payments and deductibles.
- Formulary issues.
- Households may have different:
  - Probabilities of need non-formulary drugs;
  - Numbers of uninsured individuals;
  - Degrees of success at obtaining financial benefit from a plan.
“Difference-in Difference” Approach

\[
\left(w_{q1,after} - w_{q1,before}\right) - \left(w_{q4,after} - w_{q4,before}\right)
\]

- Implemented by mean regression.
- Implemented with quantile regression (80\textsuperscript{th} percentile):
  - A way of dealing with zeros and other heterogeneity in effects, and of focusing the analysis on those who may benefit from the program.
Data

- Canadian Family Expenditure Survey (FAMEX)
- 9 surveys between 1969 and 1996.
- Annual expenditure (including on prescription drugs) and income data is collected in extensive face-to-face interviews, conducted in the first quarter of the following year.
Sample

- The survey is designed to be representative of all persons living in private households, except that in some years rural households are not covered.

- For consistency limit we the sample to urban households in all years (50-60%).

- For consistency, we must also exclude households with multiple economic families (~5%).

- The survey is a stratified multistage sample; we use survey weights provided by Statistics Canada in all calculations.

- We use robust standard errors throughout, but Statistics Canada will not provide the information that would allow us to correct for cluster effects.
Variable Definitions

- Total outlay (expenditure) excludes large durables (vehicles), savings.
- Budget share is the ratio of a category of expenditures to total outlay.
- We define a “high income” household as one in the top quartile of total outlay (“permanent income”) and a “low income” household as one in the bottom quartile of total outlay.
- Households with heads under 65 years of age are deemed to be non-senior.
## Mean Real Annual Out-of-Pocket Medical Expenses, Canadian Households, $

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (Excluding Insurance)</th>
<th>Prescription Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Senior</td>
<td>Senior</td>
</tr>
<tr>
<td>1969</td>
<td>862</td>
<td>639</td>
</tr>
<tr>
<td>1974</td>
<td>644</td>
<td>482</td>
</tr>
<tr>
<td>1984</td>
<td>565</td>
<td>394</td>
</tr>
<tr>
<td>1986</td>
<td>576</td>
<td>477</td>
</tr>
<tr>
<td>1990</td>
<td>631</td>
<td>571</td>
</tr>
<tr>
<td>1992</td>
<td>628</td>
<td>541</td>
</tr>
<tr>
<td>1996</td>
<td>638</td>
<td>693</td>
</tr>
</tbody>
</table>

Source: Table 1, ACGV 2002
### Heterogeneity in Prescription Drug Budget Shares, 1996

<table>
<thead>
<tr>
<th></th>
<th>Seniors</th>
<th>Non-Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>1.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
<tr>
<td><strong>90th</strong></td>
<td>2.9%</td>
<td>1.2%</td>
</tr>
<tr>
<td><strong>95th</strong></td>
<td>4.6%</td>
<td>2.2%</td>
</tr>
<tr>
<td><strong>99th</strong></td>
<td>9.5%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

Source: 1996 FAMEX
Introduction and Changes to Prescription Drug Subsidy Programs for Non-senior Households, Not on Social Assistance, by Province, Canada, 1969-1996

<table>
<thead>
<tr>
<th>Province</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>Jan., 1972; June, 1977; April, 1994</td>
<td>In Jan. 1972, program introduced for the working poor with co-payment of $2 per prescription + 50% of remainder; in June 1977 that program was discontinued and replaced by a program for all non-senior households not on social assistance: co-payment=20%; deductible initially $100 rising incrementally to $500 by March 1993; April, 1994: co-payment lowered to zero for low income households and raised to 30% for high income households, in both cases with $600 deductible.</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>Sept., 1975; July, 1987; Mar., 1991; May, 1992; Mar., 1993</td>
<td>Initially $2 per prescription co-payment which increased incrementally to $3.95 by June 1984; July 1987: $125 deductible, 20% co-payment; March, 1991: $125 deductible, 25% co-payment; May, 1992: semi-annual deductible of $190/family, 35% co-payment to semi-annual out-of-pocket limit of $375, then 10% co-payment; March, 1993: $850 semi-annual deductible, then 35% co-payment to semi-annual out-of-pocket limit of 1.7% of adjusted household income for those with adjusted income under $50,000.</td>
</tr>
</tbody>
</table>
## Introduction and Changes to Prescription Drug Subsidy Programs for Non-senior Households, Not on Social Assistance, by Province, Canada, 1969-1996

<table>
<thead>
<tr>
<th>Province</th>
<th>Start Date</th>
<th>End Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manitoba</td>
<td>Jan., 1975</td>
<td>Jan., 1993</td>
<td>Apr., 1996</td>
</tr>
<tr>
<td>Ontario</td>
<td>April, 1995</td>
<td>April, 1996</td>
<td>July, 1996</td>
</tr>
</tbody>
</table>
Semiparametric Engel Curves

\[ \omega_h = g(\ln x_h) + z_h \gamma + \epsilon_h \]

- Estimated by the differencing method described by Yatchew (1998).
- \( \gamma \) coefficients are given in Table 2 in ACGV, 2003.
General Population
Engel Curve

Engel Curves for Prescription Drugs, Non-senior Population

Source: Fig. 1, ACGV 2003.
# Province-Specific, `D-in-D’ Estimates of Program Introduction Effects (on Budget Shares)

<table>
<thead>
<tr>
<th>Province</th>
<th>Mean Change, Low Income Group</th>
<th>Mean Additional Change, High Income Group</th>
<th>80&lt;sup&gt;th&lt;/sup&gt; Percentile Change, Low Income Group</th>
<th>80&lt;sup&gt;th&lt;/sup&gt; Percentile Additional Change, High Income Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.</td>
<td>-0.0068 *</td>
<td>0.0040 *</td>
<td>-0.0118 *</td>
<td>0.0082 *</td>
</tr>
<tr>
<td>Alberta</td>
<td>-0.0015</td>
<td>0.0000</td>
<td>-0.0020</td>
<td>-0.0006</td>
</tr>
<tr>
<td>Sask.</td>
<td>-0.0063 *</td>
<td>0.0025</td>
<td>-0.0142 *</td>
<td>0.0089 *</td>
</tr>
<tr>
<td>Manitoba</td>
<td>-0.0044 *</td>
<td>0.0055 *</td>
<td>-0.0072 *</td>
<td>0.0088 *</td>
</tr>
<tr>
<td>Ontario</td>
<td>0.0009</td>
<td>-0.0010</td>
<td>-0.0007</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

Source: Table 3, ACGV 2003
Pooled ‘D-in-D’ Estimates

- Table 4, ACGV 2003.
- All provinces and years.
- 17 program dummies (interacted with income group).
- Province-specific time-trends.
- Program introduction effects qualitatively and quantitatively similar.
- The addition of co-payments and deductibles reduce the effectiveness and redistributive nature of the subsidies.
Private Supplemental Health Insurance

- The probability of private prescription drug coverage rises with income (Grootendorst and Levine, 2001).

- Supplemental health insurance may be employer provided:
  - In Canada, the after-tax cost of employer provided health insurance rises with income (Stabile, 2001).

- The FAMEX contains data on out-of-pocket payments for health insurance premiums.

- Such premiums may relate to cover for items other than prescription drugs.
Table 5, ACGV 2003.

Similar results except large and redistributive effects now for Alberta and Ontario (and stronger results for Manitoba.)

Consistent with the idea that in these instances the drug programs “crowd out” private insurance among low income households (but less so among high income households.)
Additional Specification Checks

- Re-estimated the Rx drug budget share models only on those with no out-of-pocket health insurance premium payments:
  - Similar effects for low income households but less evidence of a differential effect for high income households.

- Estimated program effects on Rx + OTC budget shares,

- Province specific income effects,

- Exclusion of likely Social Assistance recipients,
  - All led to qualitatively – and usually quantitatively – similar results.
Summary

- Much more evidence that prescription drug subsidy programs are redistributive (in the income sense) among non-seniors:
  - The pre-1969 Engel curve is uniformly downward sloping
  - With the introduction of subsidies, the Engel curve shifted down more at lower incomes
  - Mean, and especially quantile, regressions suggest that budget share reductions with new programs were larger for low income households
Summary

- There is evidence that this is largely due to differential private supplemental health insurance coverage by income group and "crowd-out."

- As expected, large deductibles appear to reduce both the effectiveness and redistributive nature of prescription drug subsidies.
Concluding Remarks

- Seniors versus “General” Population
  - Prescription drug programs for seniors operate within the context of a number of redistributive programs specifically targeted at seniors.
  - Prescription drug programs for the “general” population operate within the context of widespread (and often employer provided) supplemental health insurance.
Concluding Remarks

- A key issue remains whether price elasticities for prescription drugs vary by income group (and other demographic characteristics).
- If the poor in particular had significant price elasticities, this would bias our results against finding that prescription drug subsidies are redistributive.
Concluding Remarks

- Why use prescription drug subsidies as distributional tool?
  - Unobservable income or need?
  - Paternalism?
- Efficiency considerations are important.