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Out-of-Pocket Prescription Drug Expenditures and Public Prescription Drug Programs

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SEDAP Research Paper No. 88

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Out-of-Pocket Prescription Drug Expenditures and Public Prescription Drug Programs*

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Abstract: Canadian household prescription drug expenditures are studied using different years of the Statistics Canada Family Expenditure Survey. Master files are used, expanding the number of available years and permitting provincial rather than regional identifiers. Nonparametric Engel curves are estimated. Difference-in-difference mean and 80th percentile regressions examine budget shares by low-income and high-income households before and after the introduction of provincial prescription drug programs. The evidence is consistent with the view that unlike senior prescription drug subsidies, nonsenior prescription drug subsidies are probably more redistributive than an equal-cost proportional income transfer.

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1. Introduction

Publicly funded and provided prescription drug plans are high on the policy agenda in a number of countries, including Canada and the United States. While there are a number of efficiency arguments for such plans, it is clear from the policy discourse that a major motivation for such proposals includes distributional concerns[1],. Prescription drug subsidies almost surely redistribute from the well to the sick. But do they benefit the poor more than the rich?

One way to examine the possible distributional consequences of prescription drug subsidies is to compare changes in out-of-pocket prescription drug expenditure by households of different levels of affluence before and after the introduction of prescription drug subsidies. Canada already has had considerable experience with the introduction of such programs at the provincial level. Importantly, most of these introductions occurred after the beginning of the collection of household-level expenditure data.

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[1]Much policy discussion on the efficiency side involves controlling cost by having a single purchaser, the tradeoff often seen as the loss of research and development of new drugs in Canada. With respect to equity issues, the National Forum on Health (1997) suggests a definition of equity that involves equal distribution of health care with no acceptable tradeoff of less equal health care for a more equal distribution of other goods. Lindsey and West (1998) criticize this position and raise many efficiency issues as well. See also the proceedings of the Conference on National Approaches to Pharmacare (Health Canada, 1998) for general discussion of efficiency and redistributive issues in a policy context.

Alan, Crossley, Grootendorst and Veall (2002, henceforward ACGV) use the public-use Family Expenditure Survey for Canada to examine changes in out-of-pocket prescription drug expenditure as provincial drug programs for seniors were introduced.[2] This evidence may be relevant for potential changes in Canadian programs as well as relevant for discussion of potential introduction of a national U.S. seniors prescription drug program. As we will do in this study, ACGV define "high-income" households as those in the top quartile of *permanent* income, as measured by their total outlay on all goods and services except large durables. "Low-income" households are defined analogously using the lowest quartile. ACGV find that the dollar reduction in prescription drug out-of-pocket expenditure corresponding to the onset of a provincial drug programs for seniors appears to be much larger for high-income households than for low-income households[3], so much so that the reduction in budget share devoted to prescription drugs is only slightly greater for low-income households. Comparisons over periods when prescription drug subsidies were cut back are consistent with this basic finding. The results suggest that a senior prescription drug subsidy would be about as redistributive to senior households as an equal-cost proportional income transfer (restricted to senior households) and less redistributive than an equal-cost fixed dollar transfer to senior households. Thus ACGV conclude that, on current evidence, any case for prescription drug subsidies for seniors must not rest on concerns about income distribution.

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[2]An overview of such plans is provided in ACGV. Greater detail can be found in Grootendorst (2002).

[3]A senior household is defined as one with a head 65 years of age or greater.

In this paper we extend our analysis of the senior population but, more importantly, turn our attention to the nonsenior population. All Canadian provinces currently provide prescription drug subsidies for the senior population (though co-payments in these plans have generally been increasing in recent years). Only some Canadian provinces have programs for the nonsenior general population and some of these programs are very limited. Current Canadian policy discussion (see, for example, National Forum on Health, 1997) has focused on extending nonsenior programs.

In addition to examining a different population, this paper uses a superior data set and a broader range of econometric methods than our previous research. In particular we now have access to Statistics Canada Family Expenditure Survey master files. This allows us to identify province of residence (as opposed to region of residence) and include the 1978 and 1982 surveys in our analysis (as pharmaceutical expenditures were not included in the public-use surveys for those years). Because prescription drug subsidies have been introduced on a provincial level, access to this data set is obviously of considerable value in isolating populations affected by policy changes. Data from 1978 and 1982 are also useful in creating tighter before-and-after comparisons for some of the policy changes. Thus access to the master files permits more reliable identification of program effects[4].

In this paper we also emphasize an 80th percentile quantile regression analysis with dependent variable out-of-pocket prescription drug budget share. This approach has two main benefits over modeling the conditional mean. First, even in the absence of a public subsidy, a

[4]We sometimes call our before-and-after estimates "effects" for convenience, although naturally there may be confounders.

large number of households report no out-of-pocket expenditures on prescription drugs. While some of these households may be constrained (at a corner solution) it is surely the case that some of these zeros reflect good health status, while others reflect the fact that the household is covered by comprehensive private insurance.[5] We should expect that the expenditure patterns of the latter two groups will be largely unaffected by a prescription drug subsidy, and thus the mean effect in the population may be muted. Focusing on the 80th quantile of the budget share distribution focuses the analysis on those households who are most likely to be affected by such policies, presumably because of poor health status and a lack of private insurance coverage. The quantile regression is simply a way of dealing with heterogeneity in policy effects.

Second, as noted above, prescription drug subsidies almost surely redistribute from the well to the sick. This *ex post* redistribution can also be thought of as *ex ante* insurance against health shocks. The quantile analysis gives us some empirical feeling for the importance of this insurance (or redistribution from healthy to ill). For example, if prescription drug expenditures represent a significant risk to households, and if public prescription drug subsidies help fill an insurance market that may be missing because of adverse selection or moral hazard problems, then we would expect to observe a number of households with large out-of-pocket prescription expenditures prior to the introduction of such a plan, and a significant reduction in the number of such observations with the introduction of the plan. Were this not the case, it might indicate that prescription drug expenses did not represent a large risk, or that the public

[5]This may be particularly true among the nonsenior population as private medical insurance is sometimes provided by current employers.

program was simply crowding out private insurance. The bottom line is that those in poor health are almost surely a group of particular policy concern and the quantile regression allows us to focus on this group.

An outline of our findings is as follows. First, we are able to replicate the findings of ACGV (which pertain to seniors) on the master data files. Second, a reanalysis of seniors using quantile regression shows that the introduction of a prescription drug subsidy for seniors is associated with a larger change for large users than for those at the mean, which is consistent with the view that such programs are particularly beneficial for those with large expenditures (those who are ill, and not covered by private insurance). However, as with the conditional mean estimates, the quantile regressions suggest that the reductions in budget share at program onset were almost as large for high income households as low income households. There is evidence that for periods of program cutback, the prescription drug budget shares of high-income, high-usage households jump by less than those of low-income, high-usage households. However this is not the case when the budget share definition includes health insurance premiums. Thus it may be that cutbacks affect the purchase of supplemental insurance by high-income, high-usage households. Overall, our evidence supports the conclusions in ACGV that senior drug subsidy programs do not seem to be redistributive in an income sense.

The key results of this paper concern nonsenior households, and are based on the five provinces that introduced prescription drug benefit programs for nonseniors between 1970 and 1995. The provincial programs are each so different, however, that it is more difficult to synthesize the results. As in the senior case, the evidence is clear that the programs are

associated with a bigger budget share change by high-usage households. Generally, however, there is much more evidence in the nonsenior case supporting the hypothesis that drug subsidy programs were redistributive. First the pre-subsidy 1969 nonparametric estimate of the Engel curve is uniformly downward sloping and there is clear evidence that this Engel curve shifted down by more at lower incomes than at higher incomes. In addition, the mean regressions and especially the quantile regression results again suggest that the budget share reductions associated with new programs were larger for low-income households than for high-income households.

Section 2 discusses the data and methods used in this study. It also investigates the robustness of the analysis of seniors in ACGV to these new data and methods. Section 3 contains our main empirical results. Section 4 concludes.

2. Data and Methods

The Canadian Family Expenditure (or FAMEX) data is a series of cross sectional household surveys conducted by Statistics Canada at irregular multi-year intervals from 1969 to 1996. FAMEX data are intended to be representative of all persons living in private households.[6] The survey is a stratified multi-stage sample, and lower population regions such as the Atlantic provinces are over-sampled. For comparability across years, we limit the sample in all years to urban respondents as the surveys were so limited in 1974, 1984 and 1990. In most years in which both urban and rural populations were surveyed, this urban

[6]This excludes, for example, individuals residing in hospitals, long term care facilities, penal institutions or indigenous reserves.

population comprised between 50 and 60% of the total.[7] The reporting unit was changed slightly (from a "household" to a "spending unit") in 1990. To maximize comparability through time we drop multiple family households, which are typically about 5% of the sample.

Face-to-face interviews are conducted in January, February and March to collect expenditure (including prescription drug expenditure) and income information for the previous calendar year (for example, the 1996 data were collected in the first quarter of 1997). Throughout, we convert all dollar values into 1992 dollars using the national Consumer Price Index.

We begin our analysis by estimating the Engel curve between the budget share of out-of-pocket prescription drugs and income. While the theoretical background regarding such estimates is more fully developed in ACGV, the essential idea is that if households optimize "utility" subject to income and prices, a first order approximation to the gain to a household from an incremental subsidy is the amount of the subsidized commodity that is being consumed. This approximation will be the more accurate the smaller the price elasticity of the subsidized commodity. ACGV quotes numerous studies to support the contention that price elasticities for prescription drugs are likely very small[8].

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[7]Due to a change in the definition of "urban", the urban respondents comprise a larger fraction of the population in 1996.

[8]Tamblyn et al. (2001) find for a recent reform in Quebec that even though the quantity response may not have been large in aggregate for those affected by price increases (see also Poirier et al, 1998 and Blais et al., 1999), the adverse consequences for those who do respond may be substantial.

Our Engel curve analysis is set in a multivariate framework. This is an attempt to isolate the relationship between such expenditures and income from other determinants of demand such as household size and other demographics.

Because a general *nonparametric* model for prescription drug share for household h

$$\omega_h = f(ln\ x_h, z_h) + \varepsilon_h \tag{1}$$

would have too many dimensions and be infeasible to estimate and interpret, we instead posit a *semiparametric* model

$$\omega_h = g(ln\ x_h) + z_h\beta + \varepsilon_h, \tag{2}$$

that is, we allow the hth household's expenditure share (ω_h) [9] to be a flexible function of the log of its total income ($ln\ x_h$) but restrict the household attributes (z_h) to affect the share in the linearly additive way assumed for standard linear regression analysis. (Standard assumptions are also made about the random error ε_h.) This "hybrid" approach keeps the dimensionality of the model down but still allows a detailed analysis of the relationship of prescription drug expenditure share to income.

There are at least two methods to estimate models such as (2) discussed in the literature. Blundell and Duncan (1998) discuss a method due to Robinson (1988) which is fully efficient. In ACGV we found it gave very similar results to the "differencing" method discussed by Yatchew (1998) which we have used here. This method is not fully efficient in a

[9]In the analysis for ACGV we estimate equations such as (2) by weighting by our measure of income. We also estimate without income weights, finding it makes little difference. We will follow the latter procedure here. Both in ACGV and here, we do use the stratification weights provided by Statistics Canada.

statistical sense but is much more rapid computationally.

There are several reasons why the first order approximation may not be a satisfactory approach to the problem at hand. These include, but are not limited to, the possibilities that price elasticities are not small (as noted above) and that some of our households may be at a corner solution or face a kinked budget constraint. A fuller discussion of these issues is presented in ACGV. For these reasons we also pursue a second approach to estimating the potential distributional consequences of prescription drug subsidies. This is based on an analysis of out-of-pocket prescription drug expenditures before and after the introduction of actual prescription drug subsidies. A number of Canadian provinces have introduced prescription drug subsidies for the general population and some have also cut back such subsidies over the period captured by our data. These province level introductions and retrenchments were not synchronized, so that it may be possible to distinguish policy effects from general time effects. Because we are interested in distributional effects we pursue a "difference-in-difference" strategy in which we compare the changes in the mean prescription drug expenditure and budget share between high-income and low- income households.

If, for example, the introduction of a drug subsidy resulted in a larger percentage point fall in the budget share of out-of-pocket prescription drug expenditures for low-income households than for high-income households, then low-income households would prefer this program to a proportional (to income) household cash transfer (of the same total public outlay). If the difference in low-income budget shares were sufficiently large, low-income households might prefer the subsidy to a fixed per household cash transfer (again of the same

total public outlay).[10]

The third stage of our analysis repeats the "difference-in-difference" procedure outlined above but focuses on conditional quantiles of the budget share distribution rather than on conditional means. As noted in the introduction, focusing on the 80th quantile of the budget share distribution concentrates the analysis on those households for which these policies are likely to have the greatest effect: those households that, presumably because of poor health status and a lack of private insurance coverage, have relatively high usage of prescription drugs.[11]

Koenker and Hallock (2001) provide a useful recent exposition of quantile regression methods. One issue in the use of these methods is the appropriate basis for inference. It is now widely know that the standard asymptotic variance formulas for estimated quantile regression parameters perform poorly. The inference statistics we present below are based on a bootstrap procedure implemented in STATA 7.0, with 100 replications in each instance.

To investigate the consequences of the new data and new methods employed in this paper, Table 1 presents a reanalysis of the senior households and senior programs previously studied in ACGV. The table notes the before/after years of senior program introduction and reduction. The programs themselves and the natures of the reductions are summarized briefly in ACGV.

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[10]These assertions assume negligible price responses. See ACGV for more discussion.

[11]Another reason for examining the 80th percentile is that the general population drug programs enacted have had high deductibles. Focusing on the upper end of the usage distribution concentrates the analysis on those who are more likely to have exceeded their deductible.

In ACGV we presented individual regional results but we found it reasonable also to present pooled All-Canada results and for brevity here, we confine ourselves to the latter approach. The first two columns of results in Table 1 are from mean regressions on the public use files.[12,13] The first entry for "Change by Low Income Group" column indicates that for households in the low income group there was an estimated prescription drug budget share reduction of about 1.3 percentage points associated with the introduction of a provincial drug benefit program for seniors. This value was statistically significant (where "statistically significant" will mean throughout this paper that the null hypothesis that the true value is zero can be rejected at a 5 per cent level of significance.) The corresponding "Additional Change by High Income Group" entry indicates that the budget drug share reduction was an estimated 0.4 percentage points less for high income households, but that this value was not statistically significant.[14] Moving down these two columns, it can be seen that the results are very similar if we use a dependent variable that includes either medical insurance or over-the-counter medication along with prescription drugs in the budget share. Continuing further down, it appears that subsidy reductions are associated with budget share increases by low income households (of smaller magnitude than the decreases associated with program introduction)

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[12]These results are not exactly the same as those published in ACGV because these do not use income weights. See footnote 9.

[13]The mean prescription budget share for Canada for seniors in 1996 was about one percent, with the 80th percentile budget share about 1.6 percent.

[14]As ACGV show, the absolute dollar reduction in prescription drug expenditure associated with a new plan was significantly greater for high income households.

but again the additional change by high income households is not statistically significant.

The master files allow the use of 1978 and 1982 data and provincial rather than regional identifiers. The master files mean regression results are in the middle two columns and are remarkably similar to those from the public use data. If anything, the evidence of a difference between the budget share changes of the low and high income quartiles is weaker.

Finally, the last two columns re-analyze the introduction and retrenchment of these programs with a quantile regression approach. In particular we focus on the conditional 80th quantile of budget shares to concentrate the analysis on 'large users'.[15] We find that the introduction of a drug benefit program is associated with a reduction in the out-of-pocket budget share for prescription drugs of about 2.4 percentage points for those in the 80th percentile of usage as measured by budget share. This is more than twice as much as the budget share reduction from the master file mean regression. Thus, as expected, the subsidies do seem to offer greater benefit to high users. The table also shows that, as with the mean regressions, the differential change by households in the high income group is not statistically significant. Thus even among (conditional) high users the introduction of these programs does not seem to have been redistributive (in an income sense).

Finally, repeating the quantile regression analysis for periods of subsidy reduction, the increase among the low income high prescription drug users is roughly 1.5 percentage points.

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[15] 'Large' in this case is relative to budget share. In the quantile regression analysis, Prince Edward Island and New Brunswick are not included because of Statistics Canada confidentiality restrictions. Newfoundland had no program reduction and hence is not included in the corresponding regressions.

However, in contrast with the mean regression analysis, the evidence is that low-income, high-usage households had a statistically significant larger budget share increase than did high-income, high-usage households. Interestingly, when health insurance premiums are included in the budget share variable, there is no statistically significant difference in these budget share changes. In part this is because some provinces applied premiums to high-income senior households as part of the retrenchment. But it also may be that by the time of the cutbacks (as compared to the earlier program introduction period), health insurance that helped defray high out-of-pocket outlays had become more common among high-usage, high-income seniors. For such households the cutbacks had less direct effect on prescription drug budget share but they were nonetheless hit by rising medical insurance premiums.

3. Main Empirical Results

We now turn to nonsenior households (that is households in which the head is less than 65 years of age), which are the focus of this paper. Table 2 gives a brief description of the subsidy programs for this population in the five provinces that introduced such programs between 1970 and 1995. The key points to note are (a) the programs are quite different across provinces (b) in some provinces there is substantial targeting to aid those with high usage-to-income ratios and (c) in the cases of Manitoba, Saskatchewan and arguably British Columbia there have been program cutbacks and while the nature of these cutbacks differs, there has always been an effort to cushion their effect on low-income households.

We now turn to the data. Figure 1 is a basic scatter which emphasizes how much prescription drug use varies across households. (Mean budget share for nonsenior households is just under one half of one percent in 1996; the 80^{th} percentile budget share is about six-

tenths of one percent.) Using the data for our nonparametric estimation, Table 3 gives the coefficients of the linear part of equation (2) for this sample. The coefficients are multiplied by one hundred, so that they should be read as percentage points. Thus in 1969 the budget share of prescription drugs was about .4 percentage points higher for households with married heads as opposed to unmarried heads, and this gap was statistically significant. In 1986 and 1996 the gaps were smaller, but still statistically significant. Other demographics such as the age and household size variables are also statistically significant in some years. The signs of the provincial dummy coefficients do not perfectly correspond to the programs described in Table 2, as for example the provincial dummy coefficients for two of the four Western provinces increase between 1969 and 1986 even though drug subsidy programs were introduced in all four cases. This is one reason we supplement this broad analysis (which requires large samples) with specific province-by-province regression analysis that concentrates on only the period immediately before and after a policy change.

Figure 2 presents the nonparametric prescription drug Engel curves for 1969, 1986 and 1996 (corresponding to the estimates of g in (2)).[16] In our analysis of senior household data in ACGV, the 1969 pre-subsidy Engel curve had a sharp downward slope at very low incomes followed by a fairly flat portion with a mild hump and perhaps a very slight overall downward tilt. By 1986, income assistance programs for seniors essentially eliminated observations at the very low end; the remaining Engel curve was almost a parallel, downward shift of the curve for 1969. This suggested that provincial drug benefit programs for seniors (almost all

[16]The predicted budget shares in Figure 2 are constructed to have the same mean as the actual budget shares in each year by adding back the estimated (yearly) mean of $z_h\beta$.

introduced between 1969 and 1986) were associated with about the same reductions in prescription drug budget share on high income and low income households. Similarly an almost parallel upward shift in the 1996 curve seemed to suggest the prescription drug budget share changes associated with public program cutbacks were similar across income groups.

Figure 2 of this paper illustrates that in 1969 there is a fairly obvious downward slope to the Engel curve for nonseniors. After the introduction of programs by 1986 the Engel curve has a distinct hump shape, indicating larger budget share reductions at low incomes. This pattern is apparent even though a number of provinces have not introduced nonsenior programs. There have only been very limited cutbacks in these programs and hence it is not surprising that the 1996 Engel curve is essentially identical to its 1986 counterpart.

Table 4 provides a difference-in-difference analysis comparing prescription drug budget share changes for high and low income nonsenior households before and after the introduction/ cutback of provincial drug benefit programs. The mean regressions indicate that program introduction is associated with essentially no change in Ontario (whose program has limited takeup and high deductibles), a statistically insignificant reduction in Alberta (the only province with premiums) and statistically significant reductions in Manitoba, Saskatchewan and British Columbia. For these last three provinces, there is evidence (statistically significant in the case of Manitoba and one of the British Columbia cases[17]) that the budget share

[17]In British Columbia two time spans are tried; 1969 to 1974 includes only the January, 1974 introduction of a "working poor" program while 1969 to 1978 also includes the plan for all nonsenior, non-social-assistance households introduced in January 1977. As might be expected, the second span results indicate a smaller differential between the budget-share changes of high-

reductions for high-income households were smaller than those for low-income households, suggesting that the programs were redistributive in the budget share sense. We follow ACGV and produce a "Canada" aggregate by pooling the samples for these five provinces: the estimated changes are not statistically significant perhaps because the programs are so different by province and in particular, the Ontario program is associated with little budget share change. There has not been much experience with cutbacks: there is some evidence from the mean regressions that in Saskatchewan, program reductions were associated with prescription drug budget share increases among low-income households and there is also evidence (not quite statistically significant) that the cutbacks were associated with smaller budget share increases by high-income households.

The 80th percentile regression results are more striking. For Manitoba, Saskatchewan and both British Columbia cases, there is evidence that the low-income high-usage group experienced a prescription drug budget share reduction ranging from about 0.7 to 1.4 percentage points with the introduction of provincial drug benefits. These values are substantially larger than the corresponding mean regression estimates. Particularly for Manitoba and Saskatchewan, there is also evidence that the high-income high-usage group experienced smaller budget share reductions. There is still no evidence of changes associated with the Ontario program but even when we include it in the pooled sample, the overall "Canada" estimate is that there is a statistically significant reduction and also statistically significant evidence as well that the reduction is much smaller among high-income, high users. Again the only strong evidence of cutback effects is from Saskatchewan where it is clear that

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income and low-income households.

there were sharp budget share increases among low-income high-users.

In additional results in Appendix Table A1 we provide estimates where the dependent variable is changed from prescription drug budget share to the combined budget share of prescription drugs and health insurance premiums. The results are very similar, province-by-province, the main exception being that the mean regression for program introduction in Alberta now indicates a statistically significant budget share reduction in the low-income case with (not statistically-significant) evidence that budget share reduction is less for high-income households. The corresponding 80th percentile regression for Alberta also indicates a statistically-significant budget share reduction for low-income households (that is larger than the mean regression estimate) and the differential with respect to high-income households is now statistically significant.

In Table A2 the dependent variable is prescription plus non-prescription drug budget share and again the results are very similar to Table 4. While our focus has been on budget share, for completeness we also include Table A3 with results based on real dollar expenditures. Here the results are particularly different by province, with some evidence that the programs in Saskatchewan and British Columbia were associated with larger drug-related dollar reductions for high-income individuals but evidence of the opposite in Manitoba and in an overall sense, no clearcut evidence one way or the other. Hence unlike the senior case, there is no *prima facie* case that a fixed per household dollar transfer would benefit low income households more than a nonsenior drug subsidy program of equal total cost.

Our conclusion from Table 4 and the related tables is that the nonsenior programs are associated with much different distributional changes than the senior programs analyzed in

ACGV. While results differ sharply by province (in part because of apparent differences in programs), our overall reading is that there is evidence that the introduction of nonsenior drug subsidies has been associated with larger budget share reductions in low-income households. This evidence is stronger when we consider high-users using the 80th percentile regressions.

4. Summary and Conclusions

In this paper we have reported evidence on the changes in out-of-pocket prescription drug expenditures by Canadian nonsenior households over the period 1969 to 1996. Our focus has been on the relative changes by high income and low income households (where we consider income as permanent income and measure it as total outlay on all goods and services except large durables). As well as estimating Engel curves nonparametrically to examine how prescription drug expenditures vary with income, we examine the budget share changes associated with the introduction of provincial subsidy programs in five provinces (and subsequent cutbacks in three provinces) using mean regression (to focus on average usage) and 80th percentile regression (to focus on high-usage households).

Our data sets were the Statistics Canada Family Expenditure Surveys from 1969 to 1996. Unlike our earlier work for seniors, we were able to work with the master files which, unlike the public use files, contain more complete information on expenditures for some years and provincial rather than regional identifiers. Hence while it is not our main focus here, we can confirm our earlier findings for seniors on this superior data. Specifically, the onset (cutback) of a provincial program for seniors is associated with approximately the same prescription drug budget share reduction (increase) among low-income and high-income households. The 80th percentile regressions also suggest that budget share reductions by low-

income and high-income high-usage households were similar upon program onset. While there is some evidence that during the more recent cutback period, budget share increases by low-income high-usage households were greater than those for high-income, high-usage households, this is not the case when the budget share dependent variable includes health insurance premiums as well as prescription drug spending. This is consistent with the possibility that some senior high-usage households experienced some of the cutback impact in the form of higher insurance payments. Overall the evidence suggests that in terms of income distribution, a prescription drug subsidy was about as redistributive as an equal-cost proportional income transfer to senior households and less redistributive than an equal cost fixed dollar transfer to senior households.

With respect to nonseniors, our main finding is that the situation is much different than that for seniors. First, unlike the case of seniors, our estimate of the 1969 (pre-subsidy) Engel curve is uniformly downward sloping and the shift of this Engel curve over the period in which nonsenior subsidies are introduced indicates a greater reduction in the prescription drug budget shares of low-income households. Second, again unlike the case of seniors, there is evidence that when provincial subsidy introductions are associated with a budget share impact (that is in all introductions except for that of the limited program in Ontario), the budget share reduction by low-income households is significantly greater than that by high-income households. The 80^{th} percentile regressions strongly reinforce this finding. There is little evidence from the cutback period because only one cutback (Saskatchewan's) had much impact on budget share.

For high and low income senior households and for high and low income nonsenior

households, the 80th percentile regressions indicate large-user budget share changes associated with program onset or cutback that are typically two or more times greater than mean budget share changes. This suggests that the subsidies may be filling a rather large gap in the insurance market at the catastrophic end.

However our primary conclusion remains that with Canada's income assistance programs to the older population in place, analysis of the redistributive effect of other programs may yield quite different results for the senior population than for the nonsenior population. While it seems appropriate that the national pharmacare debate will and should be dominated by issues involving cost, research and development, health insurance market deficiencies and the potential substitutability between prescription drugs and other health care services, our evidence suggests that while expanding prescription drug benefit programs to seniors is unlikely to be substantially redistributive in the income sense, the targetted programs for nonseniors that have been developed so far appear to have had mildly progressive consequences for the distribution of resources across households.

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Table 1
Results for Senior Households, Alternative Data and Methods, Pooled All-Canada Sample

	Mean Regression Public Use Files		Mean Regression Master Files		80th Quantile Regression Master Files	
Case	**Change by Low Income Group**	**Additional Change by High Income Group**	**Change by Low Income Group**	**Additional Change by High Income Group**	**Change by Low Income Group**	**Additional Change by High Income Group**
Coefficient of dummy for introduction of prescription drug benefit programs						
Prescription drugs	-0.0134 (4.99)	0.0041 (1.28)	-0.0094 (3.01)	0.0008 (0.23)	-0.0239 (4.69)	0.0062 (1.04)
Prescription drugs + medical insurance	-0.0122 (4.21)	0.0027 (0.75)	-0.0092 (2.89)	-0.0008 (0.22)	-0.0216 (3.84)	0.0038 (0.58)
Prescription drug+over-the-counter medication	-0.0156 (5.11)	0.0052 (1.44)	-0.0127 (3.77)	0.0034 (0.91)	-0.0179 (3.61)	0.0034 (0.55)
Coefficient of dummy for reduction of prescription drug benefit programs						
Prescription drugs	0.0061 (3.47)	-0.0010 (0.37)	0.0062 (3.48)	-0.0019 (0.75)	0.0145 (7.39)	-0.0059 (2.72)
Prescription drugs + medical insurance	0.0058 (2.50)	0.0027 (0.81)	0.0051 (2.19)	0.0013 (0.40)	0.0154 (4.25)	-0.0014 (0.30)
Prescription drug+over-the-counter medication	0.0067 (3.38)	-0.0009 (0.029)	0.0078 (4.07)	-0.0029 (1.01)	0.0174 (5.51)	-0.0067 (1.92)

Parentheses contain absolute values of robust *t*-statistics. All results come from difference-in-difference regression models in which the dependent variable is the budget share relative to total outlay (consumption expenditure not including cars and recreational vehicles). "Low Income" and "High Income" are those households with total outlay in the bottom and top quartiles respectively. All results are based on a national pooled sample, constructed by including all households by region/province for the survey year before and the survey year after the change in that region/province. For the public-use sample (which has no prescription drug data for 1978 and 1982 and only has regional identifiers) and plan introduction (703 observations), the before/after years are 1969/1986 for Atlantic, 1969/1974 for British Columbia and 1969/1984 for Ontario, the Prairies and Quebec. For the public-use sample and plan reduction (1155 observations), the before/after years are 1992/1996 for Ontario, 1990/1996 for Quebec and 1986/1996 for Atlantic, British Columbia and the Prairies. For the master files (which have prescription drug data for 1978 and 1982 and provincial identifiers) and plan introduction (727 observations), the before/after years are 1969/1974 for Alberta, British Columbia and Manitoba, 1969/1978 for Nova Scotia, Ontario and Quebec, 1974/1978 for Saskatchewan and 1978/1982 for Newfoundland. (New Brunswick and Prince Edward Island results were not cleared by Statistics Canada for confidentiality reasons.) For the master files and plan reduction (1004 observations), the before/after years are 1986/1996 for British Columbia, Nova Scotia and Saskatchewan and 1992/1996 for Alberta, Manitoba, Ontario and Quebec. (Newfoundland did not have a program reduction.) All regressions include a constant and provincial dummy variables.

Table 2
Brief Summary of Introduction and Changes to Prescription Drug Subsidy Programs for Nonsenior Households Not on Social Assistance, by Province, Canada, 1969-1996

Province	Introduction	Brief Description
Ontario	April, 1995	Deductible falls with family size and ranges from $300 (household of 3 or more, net income up to $6,500) to $4089 (single with household income of approx.$100,000). Higher deductibles possible for households with income in excess of $100,000. + $1 × (family net income in excess of $100,000); in April, 1996: minimum deductible lowered to $150; in July, 1996, $2 per prescription co-payment added.
Manitoba	Jan., 1975	20% co-payment and deductible (e.g. $50 at inception, increasing over time); January 1993: copayment increased to 40%; beginning April 1996 zero copayment with income-contingent deductible (2%-3% of household income, for households with incomes of less than, and greater than $15,000, respectively).
Saskatchewan	Sept., 1975	Initially $2 per prescription co-payment which increased incrementally to $3.95 by June 1984; July 1987: $125 deductible, 20% copayment; 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.
Alberta	July, 1970	co-payment = 20%; June 1994, co-payment=min[30%,$25]; premiums contingent on income and household size.
British Columbia	Jan. 1972; June, 1977	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 nonsenior 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.

Table 3
Coefficients from Semiparametric Regression with Prescription Drug Expenditure Share as Dependent Variable and Log of Total Expenditure as "Nonparametric Variable": Nonseniors, 1969, 1986 and 1996

	1969	1986	1996
Variable	Coefficients ($\times 10^2$)		
Female (=1 if female)	-0.055	-0.060	0.240
	[0.30]	[0.74]	[0.17]
Married (= 1 if Married)	0.409	0.110	0.278
	[4.44]	[2.74]	[4.96]
Age (household head)	0.016	0.007	0.023
	[10.25]	[7.09]	[11.35]
Age*Female	0.009	0.002	0.002
	[2.38]	[1.17]	[0.56]
ln(Household size)	0.362	-0.051	0.036
	[2.74]	[0.66]	[0.29]
ln(Household size) squared	-0.137	0.040	-0.059
	[2.44]	[1.00]	[0.88]
Newfoundland	0.009	0.075	0.268
	[0.10]	[1.41]	[3.01]
Prince Edward Island	0.442	n.a.	0.189
	[3.15]		[1.92]
Nova Scotia	-0.036	0.117	0.353
	[0.42]	[2.27]	[4.57]
New Brunswick	0.343	0.006	0.058
	[3.49]	[0.11]	[0.71]
Quebec	0.211	0.057	0.241
	[3.95]	[1.73]	[4.36]
Manitoba	0.025	0.130	0.293
	[0.34]	[2.83]	[3.67]
Saskatchewan	0.143	-0.60	0.327
	[1.82]	[1.49]	[4.89]
Alberta	0.039	0.167	0.186
	[0.61]	[0.46]	[2.78]
British Columbia	0.144	0.068	0.108
	[2.26]	[1.78]	[1.94]
Constant	0.000	-0.000	-0.000
	[0.00]	[0.00]	[0.01]
Number of Observations	5537	4340	7033
R^2	0.05	0.03	0.05

Notes: "Total expenditure" is expenditure on all goods and services except large durables. Ontario is the reference case for the provincial dummy variables. For confidentiality reasons, Prince Edward Island is excluded from the 1986 sample. Absolute values of *t*-statistics in brackets. Number of observations are before the first differencing used in the technique. R^2 values are for parametric part of model only (as estimated by OLS).

Table 4
Difference-in-difference Estimates of Changes in Out-of-Pocket Prescription Drug Budget Share: High Income vs. Low Income Nonsenior Households, Before and After Introduction/Cutback of Major Drug Benefit Programs

Province	Before	After	Mean Regression		80th Percentile Regression	
			Change, Low Income Group	Additional Change, High Income Group	Change, Low Income Group	Additional Change, High Income Group
Introduction:						
Ontario	1992	1996	0.0009 (0.55)	-0.0010 (0.60)	-0.0007 (0.36)	0.0004 (0.20)
Manitoba	1974	1978	-0.0044 (3.36)	0.0055 (3.59)	-0.0072 (2.76)	0.0088 (3.10)
Saskatchewan	1974	1978	-0.0063 (5.16)	0.0025 (1.77)	-0.0142 (4.67)	0.0089 (2.79)
Alberta	1969	1974	-0.0015 (1.42)	-0.0000 (0.00)	-0.0020 (1.15)	-0.0006 (0.28)
British Columbia (BC)	1969	1974	-0.0068 (4.41)	0.0040 (2.26)	-0.0118 (2.89)	0.0082 (1.95)
	1969	1978	-0.0066 (4.26)	0.0024 (1.37)	-0.0118 (3.36)	0.0052 (1.40)
"Canada"*			-0.0013 (1.32)	0.0007 (0.66)	-0.0059 (4.62)	0.0042 (3.12)
Cutback:						
Manitoba	1992	1996	0.0014 (0.37)	0.0005 (0.12)	-0.0019 (0.55)	0.0034 (0.84)
Saskatchewan	1986	1996	0.0075 (4.92)	-0.0025 (1.43)	0.0101 (3.17)	-0.0037 (0.97)
BC	1992	1996	0.0015 (1.10)	-0.0025 (1.42)	-0.0001 (0.04)	-0.0006 (0.19)
"Canada"*			0.0025 (2.02)	-0.0024 (1.60)	0.0044 (2.60)	-0.0019 (1.01)

*The "Before" column gives the year of the survey used for before the policy change. The "After" column gives the year of the survey used for after the policy change. The Canada result is based on a difference-in-difference pooled regression using the same time periods as above (for British Columbia only 1969 to 1978) with provincial intercept dummies. Values in parentheses are absolute values of *t*-statistics based on robust standard errors.

Figure 1: Out-of-Pocket Prescription Drug Expenditures

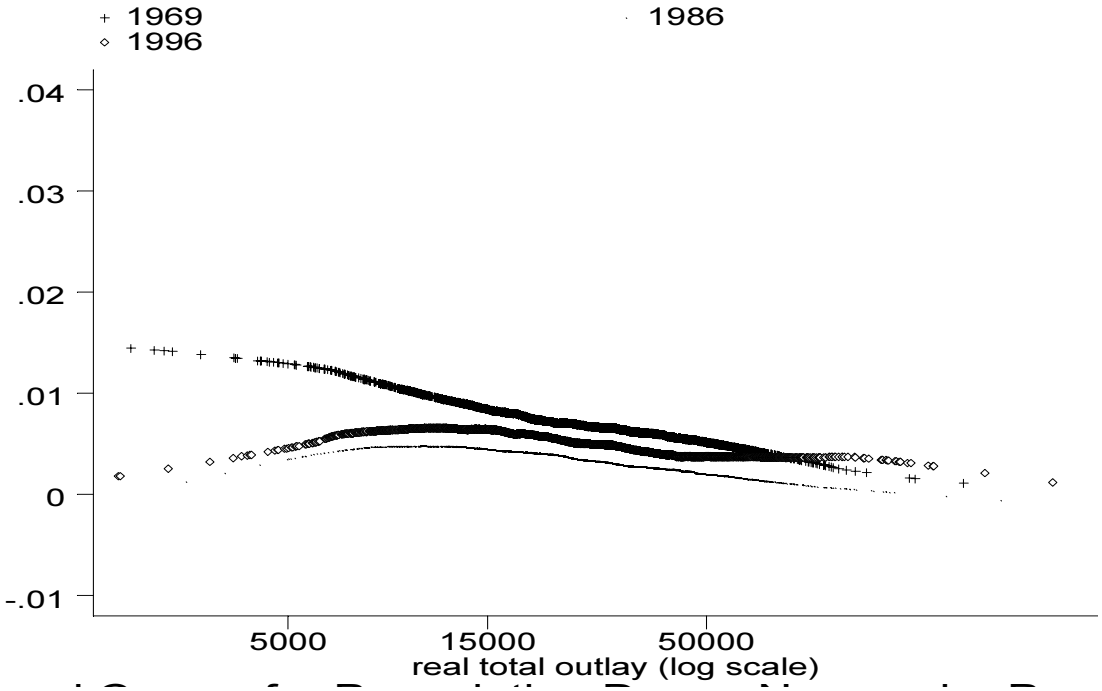

Figure 2: Engel Curves for Prescription Drugs, Nonseniors

Appendix Table A1
Difference-in-difference Estimates of Changes in the Sum of Out-of-Pocket Prescription Drug and Health Insurance Premium Budget Share: High Income vs. Low Income Nonsenior Households, Before and After Introduction/Cutback of Major Drug Benefit Programs

Province	Before	After	Mean Regression		80th Percentile Regression	
			Change, Low Income Group	Additional Change, High Income Group	Change, Low Income Group	Additional Change, High Income Group
Introduction:						
Ontario	1992	1996	0.0018 (0.99)	-0.0025 (1.25)	0.0006 (0.19)	-0.0022 (0.64)
Manitoba	1974	1978	-0.0053 (3.65)	0.0065 (3.29)	-0.0073 (2.19)	0.0100 (2.16)
Saskatchewan	1974	1978	-0.0074 (5.40)	0.0038 (2.24)	-0.0154 (8.38)	0.0111 (4.73)
Alberta	1969	1974	-0.0038 (2.62)	0.0023 (1.37)	-0.0086 (3.74)	0.0056 (2.07)
British Columbia (BC)	1969	1974	-0.0064 (3.38)	0.0040 (2.11)	-0.0131 (3.31)	0.0103 (2.37)
	1969	1978	-0.0052 (2.89)	0.0033 (1.64)	-0.0095 (1.96)	0.0080 (1.62)
"Canada"*			-0.0010 (0.85)	0.0001 (0.07)	-0.0085 (5.50)	0.0064 (3.60)
Cutback:						
Manitoba	1992	1996	-0.0003 (0.06)	-0.0021 (0.44)	-0.0045 (1.08)	0.0025 (0.36)
Saskatchewan	1986	1996	0.0074 (3.94)	-0.0033 (1.39)	0.0076 (2.13)	-0.0000 (0.01)
BC	1992	1996	0.0019 (1.26)	-0.0040 (1.66)	0.0006 (0.17)	0.0035 (0.80)
"Canada"*			0.0024 (1.80)	-0.0040 (1.97)	0.0023 (1.29)	-0.0014 (0.55)

*Notes to Table 4 apply.

Appendix Table A2
Difference-in-difference Estimates of Changes in Sum of Out-of-Pocket Prescription and Non-Prescription Drug Budget Share: High Income vs. Low Income Nonsenior Households, Before and After Introduction/Cutback of Major Drug Benefit Programs

Province	Before	After	Mean Regression		80th Percentile Regression	
			Change, Low Income Group	Additional Change, High Income Group	Change, Low Income Group	Additional Change, High Income Group
Introduction:						
Ontario	1992	1996	0.0028 (1.66)	-0.0021 (1.22)	0.0038 (2.62)	-0.0029 (1.85)
Manitoba	1974	1978	-0.0042 (2.27)	0.0056 (2.69)	-0.0050 (1.52)	0.0063 (1.73)
Saskatchewan	1974	1978	-0.0067 (5.14)	0.0030 (1.91)	-0.0125 (5.19)	0.0075 (2.82)
Alberta	1969	1974	-0.0012 (0.96)	-0.0005 (0.36)	-0.0022 (1.47)	-0.0001 (0.08)
British Columbia (BC)	1969	1974	-0.0070 (3.82)	0.0037 (1.78)	-0.0141 (4.58)	0.0102 (3.20)
	1969	1978	-0.0077 (4.60)	0.0026 (1.37)	-0.0137 (4.73)	0.0061 (2.00)
"Canada"*			-0.0004 (0.34)	0.0002 (0.21)	-0.0041 (2.29)	0.0023 (1.17)
Cutback:						
Manitoba	1992	1996	0.0017 (0.43)	0.0009 (0.22)	0.0021 (0.58)	0.0024 (0.61)
Saskatchewan	1986	1996	0.0087 (5.09)	-0.0013 (0.65)	0.0119 (3.83)	-0.0007 (0.19)
BC	1992	1996	0.0035 (1.90)	-0.0036 (1.63)	0.0002 (0.05)	0.0002 (0.04)
"Canada"*			0.0039 (2.69)	-0.0028 (1.61)	0.0060 (3.31)	-0.0017 (0.86)

*Notes to Table 4 apply

Appendix Table A3
Difference-in-difference Mean Regression Estimates of Changes in Out-of-Pocket Real (1992) Dollar Expenditure: Prescription Drugs Alone or Combined with Related Categories, High Income vs. Low Income Nonsenior Households, Before and After Introduction/Cutback of Major Drug Benefit Programs

Province	Before	After	Prescription Drugs		Prescription Drugs + Health Insurance Premium		Prescription + Non-prescription Drugs	
			Change Low Income Group	Additional Change High Inc. Group	Change Low Income Group	Additional Change High Inc. Group	Change Low Income Group	Additional Change High Inc. Group
Introduction:								
Ontario	1992	1996	-3.4 (0.15)	2.8 (0.10)	7.8 (0.29)	-40.4 (0.78)	19.7 (0.85)	19.6 (0.63`)
Manitoba	1974	1978	-53.6 (2.80)	128.8 (2.56)	-63.9 (2.89)	110.7 (2.56)	-46.8 (1.79)	139.0 (2.26)
Saskatchewan	1974	1978	-86.7 (5.31)	-81.3 (1.98)	-103.3 (5.25)	-39.0 (0.73)	-90.1 (5.10)	-65.0 (1.38)
Alberta	1969	1974	-25.4 (1.69)	-35.9 (1.04)	-63.7 (3.02)	8.9 (0.18)	-26.5 (1.49)	-46.0 (1.09)
British Columbia (BC)	1969	1974	-97.2 (4.18)	-27.9 (0.63)	-94.3 (3.79)	-6.3 (0.13)	-99.3 (3.76)	-43.4 (0.88)
	1969	1978	-92.4 (3.96)	-84.2 (2.00)	-67.5 (2.41)	13.8 (0.26)	-104.3 (4.18)	-102.4 (2.24)
Canada*			-24.9 (1.79)	-0.3 (0.02)	-26.7 (1.55)	-10.3 (0.28)	-16.0 (1.09)	19.6 (0.91)
Cutback:								
Manitoba	1992	1996	4.3 (0.08)	87.7 (1.23)	-24.3 (0.42)	-202.4 (1.04)	4.9 (0.08)	121.5 (1.54)
Saskatchewan	1986	1996	111.0 (4.44)	136.0 (2.92)	107.7 (3.50)	47.2 (0.52)	130.0 (4.56)	260.9 (4.07)
BC	1992	1996	19.1 (0.92)	-71.8 (1.15)	25.5 (1.04)	–160.0 (1.08)	49.0 (1.75)	-57.7 (0.82)
"Canada"*			30.3 (1.64)	-30.2 (0.62)	29.3 (1.43)	-150.0 (1.61)	50.1 (2.25)	3.60 (0.07)

*Notes to Table 4 apply

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