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HOUSEHOLD RESPONSES TO PUBLIC HOME CARE PROGRAMS

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ABSTRACT

A choice-theoretic model of household decision-making with respect to care-giving time allocations and the use of publicly and privately financed home care services is proposed. Predictions concerning the effect of increased availability of publicly financed home care services on home care utilization, informal care-giving, and health status are derived. These predictions are assessed through use of Canadian inter-provincial survey data on home care use and care-giving that are matched with data on home care funding for the period 1992 to 1998. Increased availability of publicly financed home care is associated with an increase in its utilization and a decline in informal care-giving, with this effect more pronounced among lower income Canadians. While self-reported health status was positively correlated with the increased availability of publicly financed home care, the perceived need for home care was invariant to this change.

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1.0 Introduction

One of the dominant shifts in the delivery of health care over the past decade has been in the place of care, particularly from the hospital to the home. Whereas individuals used to spend prolonged periods in hospital for treatment and recovery, hospital stays have dramatically decreased (or ceased altogether) and many aspects of care now take place at home (Coyte and McKeever, 2001). An important implication of this change in the care setting is its effect on who pays for and who delivers care. In both the United States and Canada, hospital care provided to the elderly is explicitly covered under the Medicare Program and the Canada Health Act, respectively. However, in-home care is not necessarily covered by public insurance in either country. More significantly, once outside the hospital, the onus on family and friends to assist with, or even take responsibility for the provision (and financing) of care is greater. As such, the public-private financing of in-home care has become a prominent issue for health policy makers.

Despite a dramatic increase in the provision of in-home care, there are wide variations in the services used. In many jurisdictions, under the in-home service designation, an array of agencies and providers participate in the provision of a complex range of health professional and lifestyle enhancement services to a variety of recipients. The range of services is large and includes nursing, social work, physiotherapy, speech language pathology, personal support care, audiology, occupational therapy, and meals on wheels. While most care recipients receive these services to prevent or retard the deterioration of health and to assist them to maintain independence in the community, others receive a more specialized variety of rehabilitation services following hospitalization. These services "enable clients, incapacitated in whole or in part, to live at home, often with the

effect of preventing, delaying, or substituting for long term or acute care alternatives" (Health Canada, 1999).

In the last twenty-five years, Canadian public home care expenditures have increased at an average annual compound rate of 17.4 percent from $62 million in fiscal year 1975 to $2,096 million in fiscal year 1997 (Health Canada, 1999). This increase was more than double the equivalent annual growth rate of 8.3 percent for total public health spending, (Canadian Institute for Health Information, 1999) and represents an extension of provincial health insurance to services and settings not encompassed by the principles of the Canada Health Act. Since this Act stipulates the terms and conditions of physician and hospital service provision that the provinces must abide by to ensure that they receive their full share of federal transfers, the exemption of in-home services from such conditions provide provinces with discretion in their allocation of health expenditures. Thus, while Canadian public per capita spending on in-home services was $69, in 1997, there was almost a three-fold variation in spending by comparing New Brunswick, Newfoundland, Ontario and Manitoba, where per capita spending exceeded $90, to Quebec and Prince Edward Island, where spending was less than $40 (Coyte and McKeever, 2001).

As public programs expand into what was previously a privately dominated segment of the health system, families may alter their behavior in order to take advantage of these public offerings. In some cases, these public offerings substitute for services that were previously funded privately through either direct payments or time commitments by family and friends. In other circumstances, this extension of public coverage may meet some previously unmet need, and thereby, increase overall utilization as these services complement existing care.

This paper investigates household responses to publicly funded programs for in-home care. The paper begins with a choice-theoretic model of household decision making when one member requires in-home care. The paper then uses Canadian data on home care use and care-giving matched with provincial level data on home care funding to test the model's implications. Our findings suggest that family behavior is consistent with the simple economic model. Increases in the generosity of public programs affect home care utilization and the amount of family care-giving undertaken. In addition, increases in publicly funded in-home care are correlated with improvements in the health of home care recipients, but perceived needs for home care are invariant to this change.

This paper proceeds as follows: Section 2 reviews the previous literature on public provision of in-home care and household decision-making. Section 3 outlines a model of household decision-making that incorporates in-home care. Section 4 describes the public home care programs in Canada. Section 5 outlines the data used in the analysis. Section 6 outlines our empirical specification and trends in home care use. Section 7 presents our findings with respect to health status, while Section 8 reports on the propensity to engage in care-giving. Section 9 provides a brief conclusion.

2.0 Previous Literature

Much of the literature on the impact of public health subsidies and programs for the elderly on care-giving, living arrangements and use of in-home services comes from the United States. This research has focused primarily on the effects of Medicaid reimbursement for nursing home facilities and various state level policies designed to combat the moral hazard problem that Medicaid reimbursements may create.

Cutler and Sheiner (1993) examine the effect of government nursing home policies on institutionalization rates and on the amount of care received in the community. The authors examine both the price differential between Medicaid and the private market, as well the ability of some higher income elderly beneficiaries to receive Medicare support for nursing home care. They find that in states with more liberal Medicaid rules, the higher income elderly are more likely to use a nursing home. In states with larger underpayments the poor appear to have reduced access to nursing homes. They find that as Medicaid support increases, informal family care decreases.

Ettner (1994) examines whether Medicaid home care benefits affect nursing home entry and the use of formal and informal care. Home care subsidies were found to reduce the rate of nursing home use for the elderly in need of long-term care and resulted in a substantial replacement of informal care with formal care for non-medical services.

Pezzin et al (1996) use data from the Channeling experiment, a national assessment of expanded public financing for in-home care conducted from 1982-85[1]. They found that more generous public home care programs lowered the probability that an individual would live in a nursing home, and increased the probability that *unmarried* individuals would live independently[2]. They found that the substitution between formal and informal care was small, but the effect on hours of care was large and dominated the overall effect of subsidized formal care on informal care.

Hoerger et al (1996) quantify the use of state policies that encourage the elderly to stay in their communities. They use the National Long Term Care Survey and exploit the

[1] Pezzin et al suggest seeing Kemper et al. (1988) for a description of the of the Channeling experiment.
[2] Previous research using the Channeling Demonstration by Christianson (1988) and Woolridge and Schore (1988), however, found only a small effect/no effect of the formal home care program on informal care or institutionalization. Pezzin et al. argue that their result comes from modeling living and care arrangements jointly and having examined shifts in living arrangements in the community.

variation in Medicaid State policies for formal in-home care and care in nursing homes. They found that Medicaid subsidies affected the choice of living arrangements. A loosening of financial requirements for Medicaid eligibility for nursing home care increased the use of nursing homes. However, subsidizing home health services simply increased the probability that individuals lived independently from their children rather than affecting the probability of institutionalization.

While much of the literature has examined the effects of various policies on the types of care received, there is little evidence of the effects of policy on the health of the individuals receiving care. In this paper, we not only consider how provincial home care policies affect care-giving, living arrangements and the use of in-home services, we also examine their effects on the self-reported health status of care recipients.

3.0 A model of family home care decisions

We consider a simple model of decision making using a representative household with both care receivers and care-givers. The purpose of the model is to determine what testable implications arise from implementing or increasing public home care programs. Households allocate time and financial resources subject to resource and technology constraints. In a two-person household, where one person is a care recipient and the other is a healthy care-giver, household utility is defined by the function:

(1) $U(X, L, A \mid \tau)$,

where X represents market goods and services, L leisure time, A the ability of care recipients to perform activities of daily living, and τ represents household preferences.

A care recipient's performance ability is defined by the production technology:

(2) $A(M(m, m^*), C \mid H)$,

where M is total formal home care, composed of publicly funded care up to a maximum allocation of m, and privately financed care, m^*. C is care-giving time performed by the other family member, and H is the care recipient's health status.

Time and financial constraints are satisfied if:

(3) $P_xX + Pm^* + (P - s)m = V + W(T - L - C)$,

where P_x is the unit cost of X, P is the unit cost of private care, m^*, *(P-s)* is the unit out-of-pocket cost of public care, m, s is the unit subsidy for public care, V is non-wage income, W is the unit cost of time, and finally, T is the total time for leisure, care-giving and labor market work.

To simplify the household decision problem, we assume that public and private in-home care are perfect substitutes, so that equation (2) may be re-written as:

(2') $\mathrm{A}(\mathrm{M}, C \mid H)$,

where M is now just the sum of public and private care. Consequently, the household's resource constraint, equation (3), may be re-written as:

(3') $P_xX + PM + WC = V + W(T - L) + sm$.

The household then maximizes utility, equation (1), by selecting M, C, and L subject to technology, equation (2'), and resource, equation (3'), constraints.

The household's optimization problem can be broken down into three stages. First, the household selects performance ability, A^*, where the marginal benefit of greater ability just offsets the marginal cost of its production. Second, the household cost-effectively selects production inputs, M and C, in order to achieve the optimal level of performance ability, A^*. Finally, leisure time, L, is selected where the marginal benefit of increased leisure just equals the marginal cost of forgone market goods and services.

While this model is a simplification of complex household decision-making processes, it may be used to examine the effects of changes in the availability of publicly financed home care. However, the effects of this increase depend on the initial equilibrium. Three household care-giving equilibria are possible. Each depend on the relationship between the total use of in-home care, M, and the publicly financed maximum allocation for care recipients, m. First, in a low in-home care equilibrium, $M<m$, the use of home care is less than the care recipient's publicly financed maximum allocation of care, m. This occurs where the subsidized unit price for publicly financed care, $(P\text{-}s)$, is sufficiently large relative to the household's willingness to pay. In this case, the care recipient's full allocation of publicly financed care, m, is not exhausted. Second, in a medium (or corner solution) utilization equilibrium, $M=m$, the household fully exhausts the publicly financed allocation of care, m, but the unit cost of private in-home care, P, is too large for utilization, $m^*=0$. Third, in the high utilization (or interior) equilibrium, M>m, the household fully exhausts its publicly financed allocation, m, and supplements this care with privately financed care, $m^*>0$.

If we were to focus on an equilibrium in which the care recipient supplemented publicly financed care with privately financed care, an increase in the allocation of publicly financed care, m, is tantamount to an increase in the household's non-wage income. Specifically, this change *increases* the optimal level of performance ability, A, through an income effect; it *increases* inputs of care-giving time, C, and total in-home care, M, if these inputs are normal inputs to the production process, as relative input prices are invariant to this increase in m; and it *increases* the consumption of leisure time and market goods and services through an income effect. In this case, an increase in

publicly financed care, *m*, results in a complementary increase in care-giving activities. In contrast, however, if the initial equilibrium were represented by a low utilization equilibrium, $M<m$, in which the household did not fully exhaust its maximum allocation of publicly financed care, *m*, household behavior would be invariant to a marginal change in this maximum allocation.

Finally, if the initial equilibrium were represented by a corner solution, $M=m$, a marginal change in the maximum allocation of publicly financed care yields a relative price effect. This effect, which is associated with a reduction in the effective unit cost of in-home care from *P* to *(P-s)*, yields a *substitution away* from care-giving time, *C*, *towards more* in-home care, *M*, and also yields an *increase* in care recipient performance ability, *A*. Thus, in the case of a corner solution, whereby the household only exhausts the public allocation of care, an increase in that allocation results in a *decrease* in informal care-giving activities as publicly financed care substitutes for household care-giving activities. Moreover, this increased allocation of public care *increases* the household's consumption of leisure time and market goods and services.

In sum, if households supplement publicly financed home care with private care, an increase in the public allocation yields an income effect that increases care-giving activities. In contrast, if households fully exhaust, but do not supplement the public allocation of care, an increase in that allocation results in a price effect that lowers care-giving activities. In both cases, care recipient performance ability is enhanced. Because the cost (P-s) of publicly financed care is relatively low and the cost (P) of private care is relatively large, most Canadians fully exhaust their public allocation (*m*) without supplementing such care with services from the private sector, $m^*=0$. Consequently, an

increase in the public allocation of home care is anticipated to decrease care-giving, *C,* to increase the utilization of formal care, *M,* and to increase the performance ability of the care recipient, *A*.

4.0 Public home care in Canada

Home care in Canada is administered at the provincial level. Provinces are not obligated to provide in-home care under the Canada Health Act, but every province provides some amount of public home care to its residents. All provinces offer a similar basic range of services, including nursing services and personal support. Other services are offered to varying degrees across the country. In this Section, some inter-provincial differences in home care programs are sketched. A more detailed description can be found in Health Canada (1999).

The provinces differ in the eligibility requirements for in-home services. Seven provinces have income tests to determine co-payments for personal support services. Two other provinces, Quebec and Manitoba, do not have a formal income cutoff, but do prioritize service provision based on a household's available private alternatives, be they formal or informal care. The remaining province, Ontario, has no formal income assessment program.

Provinces also differ in the maximum amount of publicly insured in-home care provided to an individual. For example, Alberta has an upper limit of $3,000 per month and Nova Scotia has an upper limit of $2,200 per month. Some provinces impose restrictions on the maximum number of hours for in-home personal support, such as Quebec at 40 hours per week, and Ontario at 80 hours in the first month of service and 60 hours per month thereafter.

The method by which individuals gain access to home care also varies across provinces. While many provinces have moved towards a standard assessment tool, the tools vary from province to province. Physician referrals are required in some, but not all provinces. In some provinces nurses can request access to home care services and in others care recipients themselves may self-refer.

One way of summarizing the varying degrees of generosity in home care programs is by looking at differences in the share of provincial public health spending devoted to home care. Table 1 shows this for selected years between 1992-1998. While there has been an upward trend in the share of health spending devoted to home care, the level and its rate of growth differ significantly across provinces. In 1998, Ontario's share was 5.3 percent and New Brunswick's was 5.8 percent, while Prince Edward Island's share was 2.3 percent. Nova Scotia has had dramatic growth (from 1.5 percent to 5.1 percent) compared with provinces such as B.C. and PEI. While it is this variation in home care program generosity that will be used to empirically test the model of household decision-making, other measures are reported in Appendix A.

5.0 Data

We use two data sources for our analysis. The first data source is the public use file from the National Population Health Survey (NPHS). The NPHS collects family and individual information on health status and utilization as well as demographic data. The survey was conducted in 1994/95, 1996/97, and 1998/99 and all three rounds are used in our analysis. For a single-family member, 12 years of age and older, a more detailed survey of health and use of health care is conducted. We use this "health file" and examine individuals 45 years of age and older. The NPHS asks two series of questions

that are particularly useful for our analysis. The first inquires whether an individual needed various forms of home care over the past twelve months. Questions pertain to the need for help with daily activities to the need for more specialized home care. A second set of questions concern whether individuals received home care over the past twelve months. This in-home care is specified to be formal, and the question stipulates that the cost should be partially or fully paid for by the government. Again, the questions range from receiving help with meals to help from medical professionals. We use these questions as well as the other information on health and demographics to examine differences in the need and use of home care by provinces over time in Canada between 1994 and 1998.

The second set of data used was derived from the General Social Survey (GSS) for 1992, 1994, and 1996. Again, this is a national survey that asks a series of questions to a random sample of Canadians. The 1992 survey focused on the use of time, the 1994 survey on education, work and retirement, and the 1996 survey on social and community support. While the surveys did not ask the same set of questions from year to year, in each year the surveys asked individuals about whether or not they provided informal home care. These surveys also collect demographic information about the respondent. We use these surveys to examine differences in delivery of informal home care by households by province and over time between 1992 and 1996. Means and standard deviations for the main variables used are presented in Table 2.

Information on the generosity of public home care programs by province was added to both of these data sets. We used the share of public health spending devoted to in-home care by province as our measure of public home care generosity. One concern

with this measure is that the supply of public home care measured in this fashion is not completely exogenous. However, two points are worth noting. First, demand for public home care exceeds available supply of care in every province (see Table 3). Second, provinces with high demand for home care services will have high demand for service in many areas of the health care system, not just home care. Therefore, the relative spending on home care versus other health care inputs should be a reasonable measure of home care program generosity and not simply a reflection of high use. However to further address concerns over the potential endgoenity of this measure of public generosity, we also instrument for public home care generosity. Three exogenous variables are used as instruments. These are correlated with the generosity of the public home care program, but not with decisions to seek or provide care: the share of the population aged 65 and older in each province over time; the level of provincial spending on education in each province over time; and the provincial tax rate as a share of federal taxes in each province over time[3]. As a specification check, we repeated all analyses using per capita home care expenditures as our measure of public program generosity. Our results are not sensitive to this alternative measure of generosity. As such, we only report the results using shares of public health spending.

6.0 Home Care Trends Across Canada

The NPHS was used to demonstrate differences in home care needs and use across Canada in 1994, 1996 and 1998 (see Table 3). Two features are immediately clear. First, self-reported rates of need exceed the self-reported rates of use for all provinces

[3] For Quebec, which administers its own provincial tax system, we use the top marginal rate in the province for each year.

over the study period. While approximately 6 percent of the population over 45 years of age received in-home care, the proportion reporting need for such services was about 20 percent. Second, there were wide inter-provincial variations in self-reported need and use of home care. While there was a threefold variation in the use of home care over the study period, variation in the need for home care fell from about 2.0 to 1.5 between 1994 and 1998.

Given the differences across provinces in both the perceived need for and use of home care, it is important to control for provincial differences when assessing the impact of home care program generosity on household behavior. We examine the correlates of both the need for and use of in-home care across Canada. Our dependent variable is whether individuals reported in-home service use in the given year and is specified as:

$$(4)\quad homecare_{ijt} = \beta_0 + \beta_1 pubprog_{jt} + \beta_2 X_{ijt} + \beta_3 year_t + \beta_4 prov_j + \varepsilon_{ijt}$$

where individuals are indexed by *i*, time by *t*, and provinces by *j*. *Pubprog* measures the generosity of provincial public home care programs; *X* is a vector of demographic characteristics, including age, sex, marital status, family income, education, home ownership, and self-reported health status. This vector also includes lagged per capita public health care spending in each province to help control for changes in the overall level of spending on health care in a province over time. Dummy variables are also included for year, *year*, and province, *prov*.

The results from examining the determinants of home care use are reported in Table 4. The first column reports the marginal effects from probit estimates of the probability of using home care. Many of the demographic variables influence the use of home care as anticipated. Estimates suggest that men are less likely to use home care

than women. Married individuals are less likely to use home care than single individuals. Both of these results are consistent with families trading off formal for informal care when informal care is available. While individuals with higher family income are less likely to use home care, those with more education are more likely to use home care. One possible explanation for this result in that income is picking up the income cutoff in many provinces, and that conditional on income, individuals with more education are likely to be more aware of publicly available services. Older individuals and individuals who report lower health status are more likely to use home care. Lagged per capita public health care spending is not correlated with the probability of using home care. Home ownership is negatively correlated with the use of home care. This might reflect individuals' discomfort with having potential strangers caring for them in their own home. Previous literature examining the tradeoffs between home care and nursing homes have found that home ownership is a strong predictor for receipt of in-home care (Cutler and Sheiner, 1993). However, our sample does not include institutionalized individuals, and hence, the tradeoff here is between receiving care at home or not receiving care at all. The decision to enter a nursing home was not considered here[4].

The generosity of the public program is positively and significantly correlated with the use of home care. Again, the identifying variation in public program generosity is within provinces over time since the regression includes both province and year dummies. That more individuals receive care when public program generosity increases is not particularly surprising and is consistent with the model outlined above.

[4] In alternate specifications, we control for individual's living arrangements. We find that living alone is a significant predictor of using care, but that it has no effect on the magnitude or significance of the other coefficients of interest.

The instrumental variable (IV) results, after instruments are used for the generosity of public home care programs, are reported in the second column of Table 4. The F-statistic on the excluded instruments (proportion of the population over 65 years, per capita education spending, and average provincial tax rate) is 2142 and the complete first stage results are reported in Appendix B. The IV results (run as linear probability models and correcting for provincial clustering) are similar in sign and significance to the probit results. The coefficient for the public generosity variable is still significant and slightly larger than the probit marginal effect.

A potential concern with increasing the generosity of public home care programs is that there will be a moral hazard response resulting in more individuals reporting the need for care. One way of checking for such as response is to examine whether or not an individual claims to need home care is a function of provincial program generosity (Table 5). Here, as above, the dependent variable takes on a value of one if an individual self-reports a need for home care. Most of the demographic variables have their expected effect on the probability that an individual needs home care. Women are more likely to report needing care than men. Married individuals are less likely to report need. Family income is not a significant determinant of need. More educated and older individuals are more likely to self-report a need for home care, and individuals who report poor health status are also more likely to report need. In this case, the generosity of public home care programs is not significantly correlated with self-reported needs for home care.

The IV results are reported in the second column of Table 5. The results look much the same as the probit results, with no significant correlation between the generosity of public home care programs and the self-reported need for home care.

The model outlined above predicts that more generous public programs will increase the amount of formally provided care, M, regardless of whether individuals are initially using both publicly and privately financed care, $M>m$, or only using publicly financed care, $M=m$. In this case, if provinces increase the generosity of their public programs, more individuals in need of care should receive publicly funded care. That is, conditional on claiming to need care, the generosity of the public program should have a positive effect on the probability of receiving care. To test this hypothesis, we condition the sample on those individuals who claim to need care and generate a dependent variable equal to 1 if the respondent received care. We then estimate the following equation:

$$(5)\ (receive = 1 | need = 1)_{ijt} = \gamma_0 + \gamma_1 pubprog_{jt} + \gamma_2 X_{ijt} + \gamma_3 year_t + \gamma_4 prov_j + \varepsilon_{ijt}$$

The results from estimating equation (5) are reported in Table 6. More generous public programs are positively and significantly correlated with receiving care conditional on needing care, as predicted by the model. When we instrument for the generosity of the public home care program the coefficient is almost identical, but the standard error is large and therefore the coefficient is no longer significantly different from zero. The effects of some of the other covariates are also worth noting. Higher income individuals are less likely to receive care conditional on needing it. This may reflect differences in perceived need, although we do not find that individuals with more education have the same result. As noted above, this may also reflect some of the income restrictions in certain provinces. Lagged per capita health care spending in not significant. Home ownership is negatively correlated with receiving care conditional on needing care. There are significantly negative year effects (not reported in the Table) suggesting that the

probability of receiving care given that you need it decreased significantly throughout the 1990s.

7.0 Health Status and Public Home Care Programs

A further prediction from the model is that an increase in the generosity of public home care programs will result in an increase in a care recipient's "performance ability". While we are unable to fully measure performance ability using the NPHS, we can measure the recipient's self-reported health status. To do this we create a dichotomous variable equal to one if the respondent claims that they are in good health or better (the first three categories on the five category scale) and zero otherwise. We then regress self-reported health status on the set of demographic controls, outlined above, and the generosity of public home care programs. Our results are summarized in Table 7. Our estimates are consistent with the theoretical model, namely that self-reported health status is positively correlated with the generosity of public home care programs. A one percentage point increase in the fraction of public health care budgets devoted to home care correlates with a 1.6 percentage point increase in the probability of self-reporting good health or better. The IV estimates of the effects of the generosity of public home care programs are larger (2.4 percentage points) and also significant and supportive of the hypothesis derived from the simple theoretical model[5].

8.0 Informal Care Givers and Public Home Care Programs

In this Section, we examine whether the generosity of public home care programs effect household time allocations between informal care-giving, leisure and labour

[5] The results reported here are for the entire sample. We also restrict the sample to only those individuals reporting to be in need of care. The results are qualitatively identical for this group.

market activities. The General Social Survey (GSS) yields data on the incidence of informal care-giving, however, the questions posed in each study year are not identical. In 1992, the survey asked whether respondents provided care for someone ill in the last month. The 1994 survey asked about providing unpaid care to seniors or others who are not the respondent's children, and the 1996 survey asked whether the respondent gave any informal care to others in the past 12 months. As such, there may be shifts in the level of care-giving across years due to the domains assessed by each question. The regression analysis controlled for these shifts through use of year effects.

Wide inter-provincial variation in care-giving over the study period is reported in Table 8. While 7.9 percent of Quebecers reported care-giving activities in 1992, 13.3 percent of Ontarians and 22.4 percent of Newfoundlanders reported such activities. The provincial dummies in our regression analysis pick up the differences that are constant over time.

The simple theoretical model suggests that a household's care-giving response to changes in the allocation of public home care is contingent on its resource base. If the household fully exhausts its allocation of public home care and supplements such care with private home care, an increase in the generosity of the public home care program would yield an income effect that results in a complementary increase in informal care-giving activities. However, if a household did not supplement its public allocation, an increase in the generosity of the public home care program would yield a substitution effect that lowers informal care-giving activities.

We use the GSS surveys and a regression specification similar to the ones outlined above to assess the determinants of care-giving activities after controlling for

underlying demographic characteristics and the generosity of public home care programs. Our dependent variable is a dichotomous variable equal to one if the individual reports providing informal care-giving and zero otherwise. To account for the hypothesized differential effect of public programs on care-giving activities, we included an interaction term in the regression equal to the product of the generosity of the public home care program and a dummy variable for family income greater than or equal to $50,000.

The regression results are reported in Table 9. Consistent with the literature, the estimates suggest women are more likely to engage in care-giving activities than men. The relationship between care-giving activities and the respondent's age follows an inverted U-shaped relationship, peaking at age seventy-five. Interestingly, household income is not correlated with providing informal care, however, individuals with more education or working fewer hour are more likely to engage in care-giving activities. These results are consistent with the labor and care-giving tradeoff outlined in the theoretical model.

Theory suggests that an increase in the generosity of public home care programs will increase care-giving activities for high-income households and decrease such care-giving activities for lower income households. This occurs because an increase in the generosity of public home care programs yields an income effect for those who supplement public care with private care, and a substitution effect for those who only fully exhaust their allocation of public care. Our results are consistent with this hypothesis. In our probit results, public program generosity is negatively and significantly correlated with care-giving activities and the interaction effect is positive and significant. For the IV specification, the coefficients are again negative for public

program generosity and positive for the interaction term, but in this case the coefficients are no longer significantly different from zero[6].

In sum, variations in the generosity of the public home care program affect care-giving activities. Our probit estimates suggest that there is an inverse relationship between household care-giving activities and the generosity of public home care programs, and that this relationship is smaller among higher income households. The IV results are similar although the standard errors are larger than in the probit specification. As noted in our theoretical analysis, because the cost of publicly financed care is relatively low and the cost of private care is relatively large, most Canadians fully exhaust their public allocation without supplementing such care with services from the private sector, $M=m$. In this corner solution, the theory predicts that an increase in the generosity of public home care programs lowers the relative cost of formal care, and thereby, results in a substitution away from care-giving time, C, towards m, which is consistent with our empirical findings.

9.0 Summary and Conclusions

We present a simple model of household decision making to better understand how households respond to changes in publicly provided home care services. We then test the predictions of that model using data on home care use and care-giving in Canada.

The theoretical predictions and empirical results are consistent with the anticipated effects of the generosity of public programs on household decision-making. Our results demonstrate that the increased availability of publicly financed home care is

[6] Here our instruments include the three instruments outlined above as well as interactions between the instruments and the dummy variable for family income greater than $50,000.

associated with an increase in its utilization and a decline in informal care-giving, with this effect more pronounced among lower income Canadians. While self-reported health status was positively correlated with the increased availability of publicly financed home care, the perceived need for home care was invariant to this change.

The result that an increase in public program generosity leads to an increase in self-reported health status has not, to our knowledge, been reported in the literature. In itself, this result suggests that increased support for the home as a setting for the provision of care may improve health status. This finding is robust to both our probit estimates and our instrumental variables estimates.

The finding that an increase in the generosity of public programs was correlated with a decline in informal care-giving is consistent with an initial equilibrium in which care recipients' fully exhaust their public allocation of care without supplementing such care with services from the private sector. From a health policy perspective, however, this response by household care-givers undermines, but does not eliminate, the potential benefits derived by care recipients through the increased availability of formal in-home care. This finding suggests that improvements in the generosity of public home care programs are shared by *all members* of the household, both care-giver and care recipient, and are not captured exclusively by the care recipient.

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Table 1: Fraction of Provincial Health Care Budget Devoted to Home Care (in %)

Province/Year	1992	1994	1996	1998
Newfoundland	3.1	4.1	4.4	5.2
PEI	2.0	1.7	2.1	2.3
Nova Scotia	1.5	2.0	4.3	5.1
New Brunswick	4.0	5.1	5.5	5.8
Quebec	1.9	1.9	2.2	2.4
Ontario	3.3	4.8	5.0	5.3
Manitoba	3.5	3.7	5.4	5.0
Saskatchewan	2.2	3.4	3.9	3.9
Alberta	1.6	2.2	2.8	2.8
B.C.	2.7	2.9	3.1	3.1

Source: Statistics Canada and CIHI

Table 2: Means and Standard Deviations of Primary Explanatory Variables

Variable	NPHS	GSS
Number of Obs.	46924	34447
Age: 15-24	--	0.12
		(0.33)
Age: 25-34	--	0.19
		(0.39)
Age: 35-44	--	0.17
		(0.38)
Age: 45-54	0.33	0.11
	(0.47)	(0.32)
Age:55-64	0.25	0.11
	(0.44)	(0.31)
Age:65-69 (NPHS), 65-74 (GSS)	0.12	0.18
	(0.33)	(0.38)
Age:70+ (NPHS), 75+ (GSS)	0.29	0.11
	(0.45)	(0.31)
Less than high school	0.39	0.34
	(0.49)	(0.48)
High School	0.15	0.19
	(0.36)	(0.39)
Some College	0.31	0.33
	(0.46)	(0.47)
College	0.15	0.14
	(0.35)	(0.34)
Income (in 000): 0	0.01	0.00
	(0.08)	(0.05)
Income: 0-5	0.01	0.01
	(0.08)	(0.10)
Income: 5-10	0.05	0.06
	(0.21)	(0.23)
Income 10-15	0.13	0.09
	(0.34)	(0.29)
Income: 15-20	0.12	0.10
	(0.32)	(0.31)
Income: 20-30	0.18	0.17
	(0.38)	(0.37)
Income: 30-40	0.14	0.15
	(0.35)	(0.35)
Income: 40-50	0.10	0.12
	(0.30)	(0.33)
Income: 50-60	0.09	0.10
	(0.28)	(0.30)
Income: 60-80	0.08	0.10
	(0.28)	(0.30)
Income: 80+ (NPHS), 80-100 (GSS)	0.10	0.08
	(0.30)	(0.27)
Income 100+	--	0.02
	--	(0.13)
Male	0.44	0.56
	(0.50)	(0.50)
Married	0.61	0.66
	(0.49)	(0.47)

Notes: Source is NPHS 94,96, 98 and GSS 92,94,96. Means are pooled across three sample years for both NPHS and GSS. All variables represent the proportion of individuals in each category. The sample for the NPHS contains individuals 45 years and older only. The sample for the GSS contains individuals ages 15 years and older. Categories may not sum to 1 due to rounding.

Table 3: Home care need and use by province (in percent)

Province/Year	1994		1996		1998	
	Need	Use	Need	Use	Need	Use
NFLD	16.6	3.0	20.0	2.7	22.5	3.8
PEI	25.1	6.8	32.3	6.6	26.5	3.9
NS	27.6	5.0	28.6	7.3	30.7	8.7
NB	20.1	7.2	27.8	6.8	26.1	6.1
QUE	14.1	4.1	19.1	3.7	21.2	4.3
ONT	20.0	6.9	19.6	6.3	26.1	7.7
MB	18.7	5.1	22.1	5.9	26.8	6.9
SASK	26.3	10.8	26.8	9.4	26.6	9.0
AB	16.3	4.1	19.5	5.0	21.2	3.6
BC	19.8	8.8	25.4	7.7	25.6	6.1
CANADA	19.8	6.4	20.6	6.0	25.1	6.1

Source: NPHS 1994, 96, 98

Table 4: Determinant of Use of Home Care

N=38153	Any Home Care Use - Probit	Any Home Care Use -IV
Public Program Generosity	0.0078**	0.016**
	(0.0018)	(0.005)
Male	-0.0051**	-0.011**
	(0.0011)	(0.002)
Married	-0.0091**	-0.014**
	(0.0015)	(0.002)
Income (in 000): 0	-0.0054	-0.028*
	(0.0060)	(0.011)
Income: 0-5	-0.0054	-0.040**
	(0.010)	(0.022)
Income: 5-10	-0.0017	-0.018**
	(0.0013)	(0.006)
Income: 15-20	-0.0092**	-0.037**
	(0.0018)	(0.007)
Income: 20-30	-0.016**	-0.048**
	(0.0017)	(0.006)
Income: 30-40	-0.017**	-0.047**
	(0.0030)	(0.008)
Income: 40-50	-0.023**	-0.048**
	(0.0024)	(0.007)
Income: 50-60	-0.027**	-0.046**
	(0.0021)	(0.007)
Income: 60-80	-0.025**	-0.042**
	(0.0067)	(0.008)
Income: 80+	-0.030**	-0.041**
	(0.0036)	(0.007)
High school	0.0054**	0.0095**
	(0.0018)	(0.003)
Some college	0.0046**	0.0079**
	(0.0010)	(0.002)
College	0.011**	0.015**
	(0.0025)	(0.004)
Age: 55-64	0.0091**	0.0028**
	(0.0013)	(0.001)
Age: 65-69	0.026**	0.022**
	(0.0017)	(0.003)
Age: 70+	0.057**	0.107**
	(0.0019)	(0.004)
Health: V. Good	0.016**	0.0078**
	(0.0023)	(0.002)
Health: Good	0.030**	0.024**
	(0.0028)	(0.004)
Health: Fair	0.052**	0.081**
	(0.0030)	(0.007)
Health: Poor	0.084**	0.216**
	(0.0040)	(0.012)
Lagged Public Health Care Expenditure	-0.00001*	--
	(0.00001)	--
Own Dwelling	-0.010**	-0.022**
	(0.0025)	(0.007)
Constant	-0.149**	-0.028
	(0.010)	(0.015)

Source: 1994/96/98 NPHS. Robust, cluster corrected standard errors in parentheses. All specifications include province and year fixed effects. Probit Marginal Effects reported for column 1 and linear probability models for column 2. ** and * denote significance at the 5% and 10% levels respectively.

Table 5: Determinants of Reporting to Need Care

N=38153	Need Home Care– Probit	Need Home Care-IV
Public Program Generosity	0.0024	0.030
	(0.0098)	(0.023)
Male	-0.089**	-0.081**
	(0.0058)	(0.006)
Married	-0.028**	-0.030**
	(0.0037)	(0.003)
Income (in 000): 0	-0.038**	-0.059**
	(0.013)	(0.014)
Income: 0-5	-0.0075	-0.023
	(0.029)	(0.035)
Income: 5-10	0.0072	0.0023
	(0.012)	(0.014)
Income: 15-20	-0.026**	-0.041**
	(0.0040)	(0.006)
Income: 20-30	-0.035**	-0.052**
	(0.0047)	(0.007)
Income: 30-40	-0.049**	-0.064**
	(0.0060)	(0.008)
Income: 40-50	-0.070**	-0.071**
	(0.0058)	(0.007)
Income: 50-60	-0.049**	-0.054**
	(0.012)	(0.013)
Income: 60-80	-0.066**	-0.061**
	(0.014)	(0.013)
Income: 80+	-0.080**	-0.064**
	(0.015)	(0.013)
High school	0.0039	0.0068
	(0.011)	(0.009)
Some college	0.036**	0.034**
	(0.0039)	(0.004)
College	0.041**	0.037**
	(0.011)	(0.009)
Age: 55-64	0.040**	0.023**
	(0.0058)	(0.004)
Age: 65-69	0.084**	0.062**
	(0.0090)	(0.009)
Age: 70+	0.207**	0.219**
	(0.011)	(0.016)
Health: V. Good	0.076**	0.034**
	(0.0084)	(0.004)
Health: Good	0.193**	0.138**
	(0.0071)	(0.005)
Health: Fair	0.342**	0.353**
	(0.010)	(0.011)
Health: Poor	0.511**	0.603**
	(0.017)	(0.017)
Lagged Public Health Care Expenditure	-0.00003	--
	(0.00005)	--
Own Dwelling	-0.016**	-0.018**
	(0.0051)	(0.007)
Constant	-0.355**	-0.035
	(0.077)	(0.093)

Source: 1994/96/98 NPHS. Robust, cluster corrected standard errors in parentheses. All specifications include province and year fixed effects. Probit Marginal Effects reported for column 1 and linear probability models for column 2. ** and * denote significance at the 5% and 10% levels respectively.

Table 6: Receiving Care Conditional On Needing Care

N=8072	Receiving Care – Probit	Receiving Care -IV
Public Program Generosity	0.039**	0.037
	(0.012)	(0.022)
Male	0.037**	0.030**
	(0.0084)	(0.008)
Married	-0.023*	-0.017
	(0.013)	(0.014)
Income (in 000): 0	0.013	0.006
	(0.044)	(0.051)
Income: 0-5	-0.0040	-0.027
	(0.050)	(0.051)
Income: 5-10	-0.0092	-0.023
	(0.015)	(0.018)
Income: 15-20	-0.053**	-0.065)
	(0.015)	(0.016)
Income: 20-30	-0.085**	-0.097**
	(0.012)	(0.014)
Income: 30-40	-0.103**	-0.111**
	(0.025)	(0.027)
Income: 40-50	-0.129**	-0.125**
	(0.021)	(0.023)
Income: 50-60	-0.176**	-0.152**
	(0.024)	(0.019)
Income: 60-80	-0.192**	-0.159**
	(0.040)	(0.029)
Income: 80+	-0.179**	-0.149**
	(0.021)	(0.017)
High school	0.0080	0.009
	(0.018)	(0.017)
Some college	-0.0038	-0.005
	(0.0076)	(0.007)
College	0.018	0.012
	(0.025)	(0.024)
Age: 55-64	0.045**	0.021**
	(0.012)	(0.008)
Age: 65-69	0.127**	0.084**
	(0.0099)	(0.014)
Age: 70+	0.242**	0.208**
	(0.0088)	(0.014)
Lagged Public Health Care Expenditure	-0.00012	--
	(0.00008)	--
Own Dwelling	-0.046**	-0.048**
	(0.011)	(0.013)
Constant	-0.350**	-0.036
	(0.123)	(0.080)

Source: 1994/96/98 NPHS. Robust, cluster corrected standard errors in parentheses. All specifications include province and year fixed effects. Probit Marginal Effects reported for column 1 and linear probability models for column 2. ** and * denote significance at the 5% and 10% levels respectively.

Table 7: Being in Good Health and Public Home Care

N=38153	Good Health- Probit	Good Health- IV
Public Program Generosity	0.016**	0.024**
	(0.0042)	(0.0053)
Male	-0.017**	-0.017**
	(0.0046)	(0.0050)
Married	-0.022**	-0.024**
	(0.0034)	(0.0033)
Income (in 000): 0	0.0042	0.0099
	(0.018)	(0.025)
Income: 0-5	-0.045**	-0.061**
	(0.014)	(0.020)
Income: 5-10	-0.060**	-0.086**
	(0.015)	(0.022)
Income: 15-20	0.040**	0.055**
	(0.0087)	(0.011)
Income: 20-30	0.074**	0.096**
	(0.0078)	(0.0086)
Income: 30-40	0.105**	0.129**
	(0.0024)	(0.0042)
Income: 40-50	0.149**	0.168**
	(0.0065)	(0.0063)
Income: 50-60	0.174**	0.183**
	(0.011)	(0.010)
Income: 60-80	0.197**	0.195**
	(0.0077)	(0.0078)
Income: 80+	0.218**	0.204**
	(0.015)	(0.0079)
High school	0.072**	0.079**
	(0.0051)	(0.0059)
Some college	0.062**	0.070**
	(0.0058)	(0.0060)
College	0.108**	0.099**
	(0.0067)	(0.0058)
Age: 55-64	-0.023**	-0.019**
	(0.0052)	(0.0046)
Age: 65-69	-0.0078	-0.0011
	(0.0060)	(0.0062)
Age: 70+	-0.044**	-0.043**
	(0.0049)	(0.0052)
Lagged Public Health Care Expenditure	0.00002	0.043**
	(0.00004)	(0.0079)
Own Dwelling	0.037**	0.609**
	(0.0072)	(0.032)
Constant	0.052	0.024**
	(0.052)	(0.0053)

Source: 1994/96/98 NPHS. Robust, cluster corrected standard errors in parentheses. All specifications include province and year fixed effects. Probit Marginal Effects reported for column 1 and linear probability models for column 2. ** and * denote significance at the 5% and 10% levels respectively.

Table 8: Percentage of Respondents Reporting to Provide Informal Care-Giving by Province

Province/ Year	1992	1994	1996
NFLD	22.4	33.7	18.9
PEI	15.7	33.8	23.6
NS	18.4	31.7	19.8
NB	14.1	24.1	11.4
QUE	7.9	14.8	11.5
ONT	13.3	15.2	11.8
MB	12.7	19.2	13.3
SASK	13.8	22.9	12.3
AB	13.0	16.9	12.1
BC	9.5	20.0	13.4
CANADA	12.7	20.0	13.2

Source: 1992/94/96 GSS

Table 9: Determinants of giving care

N=13870	Give Care-- Probit	Give Care- IV
Public Program Generosity	-0.028*	-0.0088
	(0.015)	(0.055)
Public Program Generosity* Income>50,000	0.0040*	0.0014
	(0.0021)	(0.0032)
Age: 25-34	0.015	0.016*
	(0.010)	(0.0087)
Age: 35-44	0.061**	0.060**
	(0.0085)	(0.0084)
Age: 45-54	0.087**	0.087**
	(0.014)	(0.012)
Age:55-64	0.084**	0.087**
	(0.011)	(0.0086)
Age:65-74	0.069**	0.071**
	(0.012)	(0.015)
Age:75+	0.034**	0.031*
	(0.016)	(0.018)
High School	0.016	0.018
	(0.012)	(0.012)
Some College	0.039**	0.041**
	(0.015)	(0.016)
College	0.042**	0.041**
	(0.015)	(0.016)
Male	-0.028**	-0.028**
	(0.0096)	(0.010)
HH Income (in 000): 0	--	-0.187**
	--	(0.039)
HH Income: <5	-0.026	-0.031
	(0.043)	(0.045)
HH Income:5-10	-0.034	-0.039
	(0.025)	(0.028)
HH Income: 15-20	-0.019	-0.024
	(0.023)	(0.026)
HH Income: 20-30	-0.0062	-0.0090
	(0.012)	(0.014)
HH Income: 30-40	-0.013	-0.015
	(0.017)	(0.019)
HH Income: 40-50	-0.021*	-0.023*
	(0.011)	(0.013)
HH Income: 50-60	-0.019	-0.013
	(0.016)	(0.023)
HH Income: 60-80	-0.013	-0.0076
	(0.021)	(0.026)
HH Income: 80-100	0.0077	0.013
	(0.017)	(0.021)
HH Income:100+	-0.012	-0.0097
	(0.025)	(0.030)
Per Income (in 000): 0	0.072*	0.065
	(0.042)	(0.046)
Per Income: <5	0.018	0.020
	(0.012)	(0.013)
Per Income:5-9	-0.0014	-0.0033
	(0.020)	(0.022)
Per Income: 15-20	-0.0031	-0.0026
	(0.018)	(0.018)
Per Income: 20-30	-0.0039	-0.0053
	(0.019)	(0.021)
Per Income: 30-40	-0.016	-0.016

	(0.021)	(0.022)
Per Income: 40-50	-0.0049	-0.0041
	(0.025)	(0.026)
Per Income: 50-60	-0.033**	-0.033*
	(0.017)	(0.017)
Per Income: 60-80	-0.066**	-0.064**
	(0.030)	(0.030)
Per Income: 80-100	-0.048	-0.048
	(0.043)	(0.041)
Per Income:100+	-0.036	-0.037
	(0.043)	(0.045)
Hours Worked	-0.00060**	-0.00065**
	(0.00030)	(0.00029)
Married	-0.010	-0.012
	(0.0088)	(0.0084)
Lagged Public Health Care Expenditure	0.00008*	0.264
	(0.00004)	(0.194)
Constant	-0.227**	0.016*
	(0.088)	(0.0087)

Source: 1992/94/96 GSS. . Robust, cluster corrected standard errors in parentheses. All specifications include province and year fixed effects. Probit Marginal Effects reported for column 1 and linear probability models for column 2. ** and * denote significance at the 5% and 10% levels respectively.

Appendix A:
Measures of Public Home Care Generosity, 1996-97

Province	Total Home Care Exp/ Capita ($)	Home Care/ Public Health Expenditure (%)	Home Care Expenditure/ Care Recipient ($)
NLFD	78.7	4.4	N/A
PEI	30.8	2.1	1923.9
NS	68.2	4.3	3589.2
NB	90.9	5.5	2273.3
QUE	36.8	2.2	800.8
ONT	89.1	5.0	3073.9
MB	99.3	5.3	4136.5
SASK	66.1	3.9	2359.7
AB	51.2	2.8	2226.6
BC	59.8	3.1	1931.1

Source: Statistics Canada and CIHI

Appendix B

First Stage OLS Results for the Generosity of Provincial Home Care Programs

N=38153	Share of Public Spending Devoted to Home Care
Prov Tax Rate	-8.46**
	(0.134)
Edu spending/ capita	-0.0015**
	(0.00007)
Pop 65+	-0.00002**
	(0.00000)
PEI	-5.04**
	(0.070)
NS	-1.40**
	(0.049)
NB	0.335**
	(0.036)
QUE	7.91**
	(0.179)
ONT	21.7**
	(0.369)
MAN	0.166**
	(0.023)
SAS	-1.40**
	(0.027)
ALB	-0.886**
	(0.025)
BC	4.06**
	(0.092)
Year= 1996	0.999**
	(0.011)
Year=1998	1.41**
	(0.020)
Male	-0.0011
	(0.0023)
Married	-0.0068**
	(0.0026)
Income: 0	-0.0075
(in 000)	(0.016)
Income: 0-5	-0.027
	(0.018)
Income: 5-10	-0.0028
	(0.0069)
Income: 15-20	0.0015
	(0.0048)
Income: 20-30	0.0053
	(0.0044)
Income: 30-40	0.0041
	(0.0047)
Income: 40-50	0.0058
	(0.0051)
Income: 50-60	0.0048

	(0.0053)
Income: 60-80	0.012**
	(0.0053)
Income: 80+	0.0085
	(0.0053)
High school	0.00039
	(0.0033)
Some college	0.00038
	(0.0029)
College	-0.0028
	(0.0037)
Age: 55-64	0.0061**
	(0.0029)
Age: 65-69	0.0035
	(0.0039)
Age: 70+	0.0055*
	(0.0033)
Health: V. Good	0.0091**
	(0.0031)
Health: Good	0.0064*
	(0.0033)
Health: Fair	-0.0017
	(0.0043)
Health: Poor	0.0037
	(0.0060)
Own dwelling	0.0025
	(0.0028)

Source: 1994-1998 NPHS and provincial level data from Statistics Canada. Robust standard errors in parentheses. The excluded instruments are the average provincial tax rate, per capita provincial educational spending, and the percent of the population ages 65 and over. ** and * denote significance at the 5% and 10% levels respectively.