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and Canadian-born Consumers: 1984-1996**

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Abstract: This paper compares the demand for health and personal care for Canadian-born and foreign-born consumers, using 1984, 1986, 1990, 1992, and 1996 Family Expenditure Surveys. An AIDS model for general expenditure categories is first estimated. Engel elasticities and AIDS income and price elasticities for health and personal care are computed. According to the AIDS model, private health care is income unit elastic and consumption of health care increases in a convex fashion during an adult's life cycle. Presence of children and seniors in a household induces a higher expenditure on health care. *Ceteris paribus*, a foreign-born household spends slightly more on private health care during its life cycle.

Key Words: Canada, immigrant demand, health care, personal care, consumption patterns, immigrant assimilation, AIDS model.

I. Introduction

Canadian Immigration policy has changed remarkably since 1967, when the point system was introduced. According to this point system, immigrants have been assessed on the basis of their age, education, occupation, experience, etc. Consequently, the ethnic composition of immigrants has become more varied. While the “old” immigrants came largely from Europe and the United States, in the recent years more and more immigrants came from Asia, Africa and Latin America.

This change in ethnic composition has led to speculations about altering demand conditions. It is argued that immigrants bring with them their own tastes and preferences. They might also differ from the native born in their demographics (age composition, family size, etc). As a consequence of these and other differences, immigrants might behave differently as consumers. This paper looks at differences and similarities between the native and foreign born in the consumption of health and personal care to determine if immigrants affect Canadian health and personal care consumption patterns.

Health care spending patterns have fluctuated over the study period. Total health care spending rose steadily from 1975 until the early 1990s, and resumed its growth in the late 1990s. Canada’s ratio of total health care spending to its GDP was estimated at 9.2 percent in 1999. Canada ranks fourth in terms of level of per capita public spending on health care, although all G7 countries, except US have larger public shares of total health care expenditure (CIHI 2000).

Currently, 70 percent of health care in Canada is publicly funded. However, the private sector has been growing quite rapidly since the early 1990s. “Growth in private spending on health care through supplementary insurance and out-of-pocket health care expenses outpaced growth in public sector spending in the early to mid-1990s” (CIHI 2000). Even given this substantial spending, little discretion on private health care exists.

The most quickly growing health care sector is the pharmaceutical industry, which is largely privately funded. The largest share of out-of pocket expenses on health care goes towards medicinal and pharmaceutical products, eye and dental care; and seniors and young adults are “the least likely to have insurance for these services” (CIHI 2000). Given this distribution between public and private health care expenditure, I will focus on emerging private health care expenditure.

Very little research exists on immigration and health care. In Canada, the aging of population will put increasing demands on the already ailing health care system. Are immigrants mitigating or exacerbating this increasing demand for health care? Gliberman finds “that over a lifetime, an immigrant utilizes about the same amount of health care as a native-born Canadian.” I am trying to answer this question by comparing private health care expenditures by Canadian-born and foreign-born households. Do immigrants influence relative prices of private health care by their spending patterns? Do their consumption patterns assimilate to the Canadian norm after time in Canada?

Of parallel interest are consumption patterns of personal care, which is closely related to health care. In many instances, personal care services and supplies are complements and substitutes for health care products and services. Many types of health and personal care products are overlapping. Among them are herbal supplies, vitamins, massage equipment, eye and dental care, and so on. Personal care consumption patterns are expected to resemble those of health care, and, thus, the same estimation techniques will be applied to both health and personal care consumption.

II. Literature Review

II.1. Demand for Health Studies

Michael Grossman’s seminal work (1972) on health demand provides a foundation for the research on health care consumption. Grossman constructs the model of the demand for “good health.” Within his framework, the commodity “good health” is treated as a durable item. Grossman considers “health capital” to be a component of human capital. Hence, individuals are assumed to “inherit an initial stock of health that depreciates over time and can be increased by investment” (Grossman 1972, xv). Among the direct inputs for the production of good health are time, medical care, exercise, diet, housing, and other market goods. Other important factors are “environmental variables,” the most important of which is the level of education of the producer. Education in turn affects the productivity of time spent on health care. In Grossman’s model, the opportunity cost of time and its productivity enter the individual’s demand function by altering true commodity prices.

Although theory can provide a comprehensive list of determinants of health care demand, there is no agreement over the functional form of the estimating demand equation. Hunt-McCool, Kiker and Ng (1994) estimate price and income elasticities for the demand for physician office

services and hospital services in the US using different functional forms (linear, log-linear, and the almost ideal demand model with and without an adjustment for selectivity bias). They find that estimates of elasticities vary depending on the form of the estimating equation. The estimated income elasticity for physician office visits is 0.6 in the log-linear and linear models, -1.09 in the AIDS model and -1.19 in the AIDS model with a correction for selection bias.¹ Their income elasticity for hospital care ranges from -0.03 to -0.48 . Their estimated price elasticities for physician office visits and hospital care range from -0.52 to 0.06 . Thus the estimated coefficients are very sensitive to the choice of functional form.

The Rand Health Insurance study, a social experiment carried out from 1974 to 1982 under the US federal government sponsorship, was an important step in research on medical care. It is a major source of elasticity estimates. The general contention is that medical services in the US are inelastic. Manning's (1987) estimates of price elasticities ranged between -0.1 and -0.2 and their estimate of income elasticity was around 0.2 . According to Wedig (1988), the price elasticity of health service utilization (US) is -0.32 . Newhouse's (1992) estimates of income elasticity are $0.2-0.4$.

When health care services are disaggregated, their elasticities cover a much larger range as theory would predict because of greater substitutability. Rosko and Broyles report that estimates of price elasticities for physician visits range from -0.14 to -5.1 and estimates of income elasticities lie between -0.03 and 0.85 (US). The large range of elasticities for subcategories of health care can be explained by their heterogeneity and availability of substitutes.

II.2. Health Care Consumption by People of Different Origins

The roles of ethnicity and socioeconomic factors are deemed important in health care research. Some economists argue that the influence of ethnicity cannot be adequately captured by a dummy, and requires more sophisticated methods of investigation (Freiman 2000; Schulman et al. 1995). However, very little research has been done on the differences in health care consumption between the foreign and native born.

Steven Gliberman (1998) looks for potential linkages between immigration and Canadian health care. He suggests that patterns of health care usage might be different for

¹ Note the existence of a large scale private market with many health care substitutes should lead to greater own price elasticity measures than in Canada, *ceteris paribus*.

Canadians and immigrants from different origins due to different demographic factors, “states of health,” genetic characteristics, special language needs and cultural preferences.

This paper will attempt in particular to fill this gap by analyzing the patterns of expenditure on health care for Canadian-born and foreign-born consumers with a special emphasis on private health expenditures² given the Canadian context of publicly insured health care.

In the case of personal care, we also expect different patterns of consumption due to differing demographic factors and tastes. People of different origins are known to have different attitudes towards personal care and appearance. For example Venezuelans spend 20 percent of their household income on personal care products,³ while Canadians spend some 3 percent. I would like to see if immigrants’ patterns of consumption differ from those of Canadians and if there is pressure to conform to the Canadian norm.

II.3. Measurement Problems in Health Care Research

The lack of research on the demand for health care in Canada is particularly explained by the lack of adequate data. It is very hard to observe the stock of health or the exact medical conditions requiring treatment to follow Grossman’s model. The exclusion of these variables from the estimating equation will produce biased coefficients and hence these techniques are avoided. However, demographic variables suggested by Grossman are used in my AIDS model.

Aggregate Canadian health care data leads to problematic estimates. In most cases I have the data on general groupings of health care products or services, which consist of heterogeneous subgroups. Newhouse, Phelps and Marquis (1980) argue that aggregation of heterogeneous expenditures “is likely to produce highly misleading estimates” (p. 379). Thus, when possible I will disaggregate Canadian data.

² Private health care expenditures include direct costs to households such as expenditures on health care supplies, medicinal and pharmaceutical products, physician care, eye-care goods and services, dental care, hospital and other health care services, as well as insurance premiums on private health care plans which include supplementary coverage.

³ *The Economist*, 2 September 2000, p.130.

III. Data Source Description

III.1. General

The data sets used for this analysis with their respective sample sizes (in parentheses) are 1984 (4792), 1986 (10356), 1990 (4569), 1992 (9492) and 1996 (10417) Family Expenditure Surveys (FES). Data were collected by means of filling out a detailed questionnaire during one or several interviews. Thus, the expenditures in the surveys are self-reported. Expenses on smaller items such as personal care were usually estimated on the basis of amount and frequency of purchase.

These Statistics Canada surveys while extensive have shortcomings. The 1986, 1992 and 1996 surveys sampled urban and rural households in the ten provinces of Canada, while in the 1984 and 1990 surveys, only urban households were sampled in Canada's 15 largest Census Metropolitan Areas (CMAs). For the purposes at hand these four surveys are pooled and the non-urban household observations are filtered out to yield a more homogeneous sample. This sample should be representative of the Canadian population, the majority of which lives in cities.⁴

For a variety of reasons I screened many observations to preclude further definitional problems. Only observations with non-zero total expenditures were kept in some regressions.⁵ Observations in which the region of residence variable was masked were excluded from the sample, as well as households with zero or negative income (only 18 observations). Some of the other observations with "not stated" responses were excluded as well (education, etc). Only immigrants who immigrated at age 16 and older have been left in the sample. The rationale behind this is that immigrants arriving at younger ages assimilate quickly and will not differ from non-immigrants when they head a household. Given the above screening, there are 25,090 observations left in the sample with 24,136 observations with non-zero health expenditures, or 96 percent of the total.

The definition of an immigrant household varies. I approach this problem in two steps. The coding of the sample syntax has been modified in such a way that the reference person in a

⁴ The robustness of this statement has been confirmed. The ages on the male heads of households in 1991 Census and 1990 screened FAMEX are 45.08 and 45.46 respectively.

⁵ Zero expenditures on health care are distributed equally across immigrant and non-immigrant households.

more than one person household is the spouse who earns the most income. If this reference person is an immigrant, then that household is classified as an immigrant household.⁶

The health care expenditures recorded in the surveys include direct costs to the households and insurance premiums. The largest direct costs incurred by households are expenditures on medicinal and pharmaceutical products, dental care and eye care. These categories constitute approximately 70 percent of the total direct health care expenditures to households. The other direct costs incurred by a Canadian household are on health supplies, hospital care, etc. The health insurance premiums are classified into two categories: private and public. Since this study is mainly concerned with the demand for private health care in Canada, the total health care expenditure in this analysis excludes public insurance premiums. Only 4 percent of our screened survey households purchase only public insurance.

Private health care consumption patterns by the foreign born could be different from those of the native born due to differential access to public health care. The foreign born have to buy private health care for the first couple months of their stay in Canada. Only later do they have access to public health care. However, this only applies to recent immigrants to Canada, who are a small portion of the sample. Thus, the analysis of health care expenditures of other immigrants should not be complicated by the differential access to public health care.

Only payments made by household members to private insurance plans (or any other plans) were included in the questionnaire. The part paid by the employer was excluded. This means that if employers contribute more to health care plan premiums of the Canadian born than to those of immigrants, empirical results of AIDS and Engel estimations will be biased. The analysis of labor participation rates shows that immigrants and the Canadian born are employed in similar occupations. Thirty-nine percent of heads of immigrant households do not work or are retired vs. 33 percent of heads of Canadian households in 1996 FES. However, according to the age structure analysis (see III.4 *Demographic Variables*), the immigrant population is older, and thus, a larger percent of retired workers could be the source of this small difference.

III.2. Income and Expenditure Variables

Although income does not enter estimating equations (but rather total expenditure), it is of parallel interest, since it is probably correlated with total expenditure and is related to one's

⁶ This excludes partial immigrant households with any foreign-born children and/or foreign-born non-working spouse.

education and occupation. Thus income enters the model indirectly through such variables as total expenditure, occupational status and level of education.

There are different views on how varying income levels affect the consumption of health care. According to Gliberman, higher income individuals are expected to spend less on health care because they can create a better environment around them (can afford better housing and diet) and because they have a higher opportunity cost of time.⁷ However, Grossman thinks that higher income individuals will spend more on prophylactic health care in order to slow down deterioration of health. Since I will be analyzing foreign-born groups it will be instructive to observe differences over time in household incomes by origin.

Table 1: Average Household Income after Taxes (HIAT) (in 1992 dollars)

	1984	1986	1990	1992	1996
Canadians	38717	36965	39324	36919	37184
Immigrants	39014	37946	38111	35024	37408
US, West Europe	39594	36529	39231	35762	
South, East Europe	35373	37170	34402	34434	
Asia	43985	42461	43347	36616	
Other, not stated	39422	38446	35358	31963	

Source: Tables 1-17, calculated by author from FES's.

In 1984 and 1986 surveys, Canadians have a higher household income after taxes (HIAT variable) than immigrants on average. However, the opposite is true for the 1990 and 1992 surveys. Among immigrants, Asians have the highest disposable income. Thus the capacity to spend on private health care does differ over time and across different groups of immigrant households.

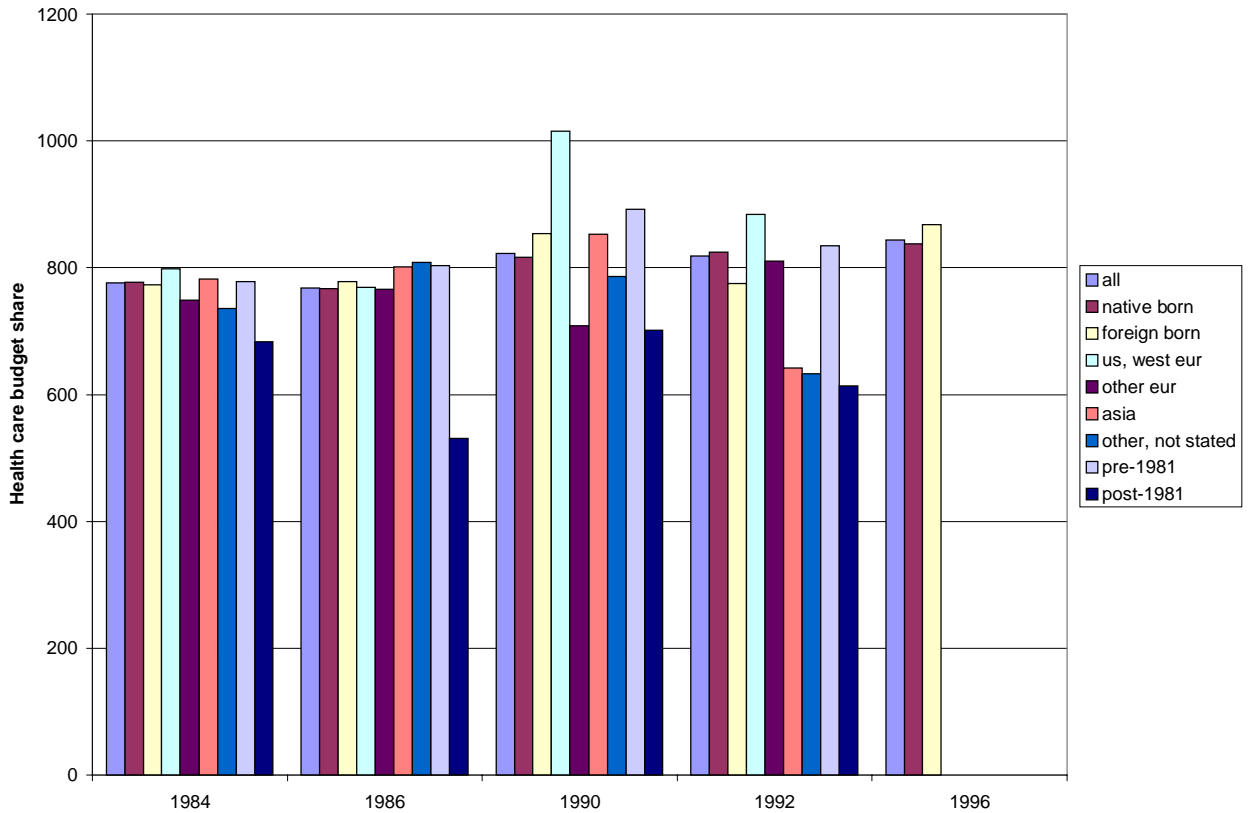
From Figure 1, it can be seen that the real average health care expenditure is almost the same for the foreign born and native born in the pooled sample (some \$800 in 1992 dollars). The real average health expenditure of the Canadian born has been increasing since 1986. In the case of the foreign born, real health care expenditures dropped in 1992. In 1992, the average real health care expenditure of immigrants from US, Western Europe, Asia and other countries (except other European countries) declined. The real health care expenditure was greater for immigrants from the United States and Western Europe on average. The more recent immigrants in the sample spent less on health care on average.

⁷ See Demographic Variables for motivation.

Table 2: Average Health Care Expenditure by Birthplace: 1984-1996 (1992 dollars)

	1984	1986	1990	1992	1996
All	777	769	823	818	844
Native born	777	767	817	825	838
Foreign born	773	779	854	776	868
US, west Europe	799	769	1015	885	
Other Europe	749	766	709	810	
Asia	782	802	853	642	
Other, not stated	735	809	786	633	
pre-1981	778	804	893	835	
post-1981	683	532	701	614	

Figure 1: Average Real Health Care Expenditure by Birth Place: 1984-1996 (1992 dollars)



Source: Figures 1-4, 6-9 are calculated by the author from 1984-1996 FES's.

III.3. Budget Shares

The empirical focus of this paper is an Engel curve estimation and Almost Ideal Demand System analysis (see *Model Specification* for detailed description), where the dependent variables are budget shares. The average shares of health care expenditure range from 1.9 percent to 3.1 percent for Canadians and different groups of immigrants.

Table 3: Health Care Expenditure as Share of Total Expenditure by Birthplace: 1984-1996

	1984	1986	1990	1992	1996
Canadians	0.02	0.02	0.02	0.023	0.024
Immigrants	0.024	0.024	0.024	0.024	0.026
US, West Europe	0.024	0.026	0.031	0.027	
South, East. Europe	0.026	0.023	0.024	0.025	
Asia	0.022	0.019	0.02	0.022	
Other, not stated	0.019	0.021	0.02	0.022	

Health care expenditure as share of total expenditure is a little higher for immigrants on average, with the highest shares for immigrants from the US and Europe. More recent immigrants spend a smaller share of their income on health care (and spend less on health care in real terms: see Figure 2). There could be many reasons for this outcome. However, it must be noted that immigrants from Asia and Other Countries are more “recent” immigrant arrivals, and consequently are younger and more vital than Canadians and immigrants from other origins (see *Demographic Variables*).

The three largest subcategories of health care expenditures are medicinal and pharmaceutical products, dental care and eye care. Those consumers who have non-zero health care expenditures, 7 percent of the native born and 9 percent of the immigrants spend nothing on medicine, while 48.3 percent of the native born and 48.5 percent of the foreign born spend nothing on dental care. 49.5 percent and 50 percent of the native born and foreign born respectively spend nothing on eye care. 23, 624 observations or 97.9 percent are left after filtering out those that have the expenditure on the sum of these three subcategories equal to zero.

Figure 2: Health Care as Share of Total Expenditure by Birth Place: 1984-1996

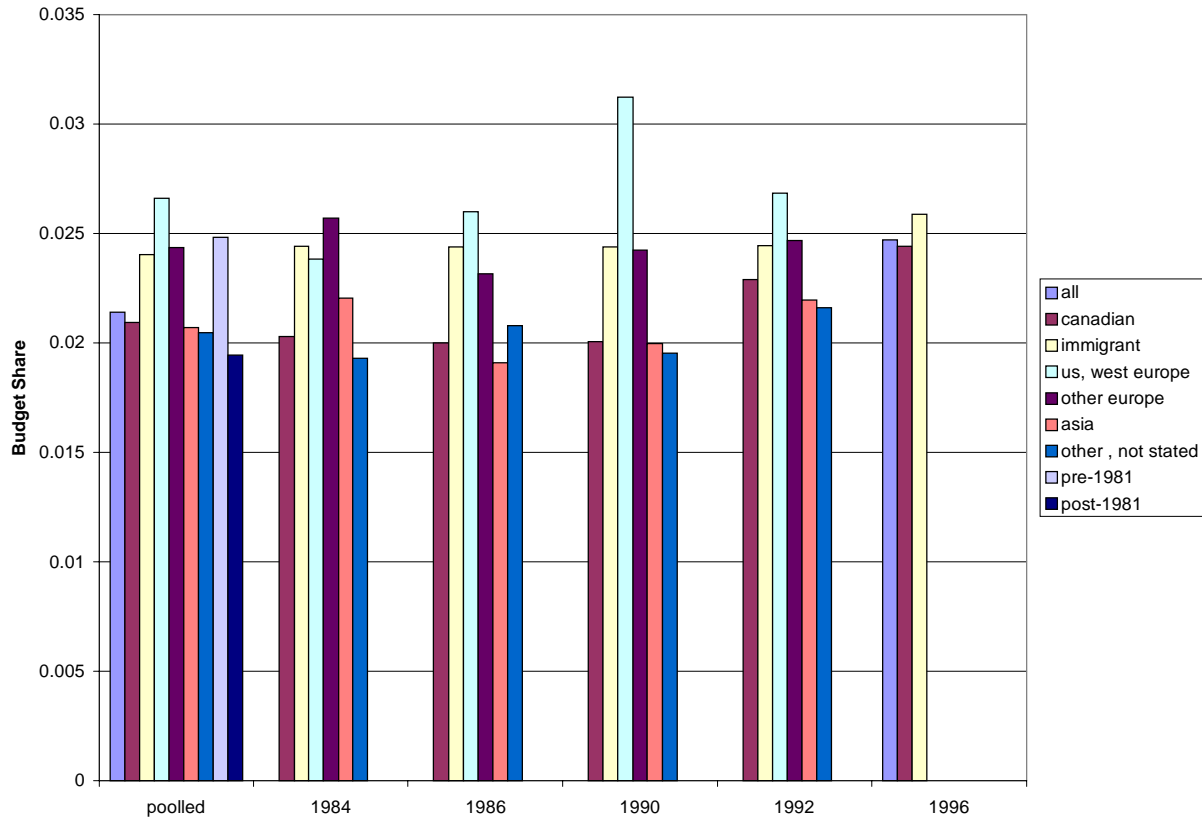


Table 4 illustrates the importance of medicinal and pharmaceutical expenditures, which are twice as large as those on dental or eye care. Moreover, immigrants spend a larger share of their health care budget on all three considered subcategories of health care: medicine, eye and dental care.

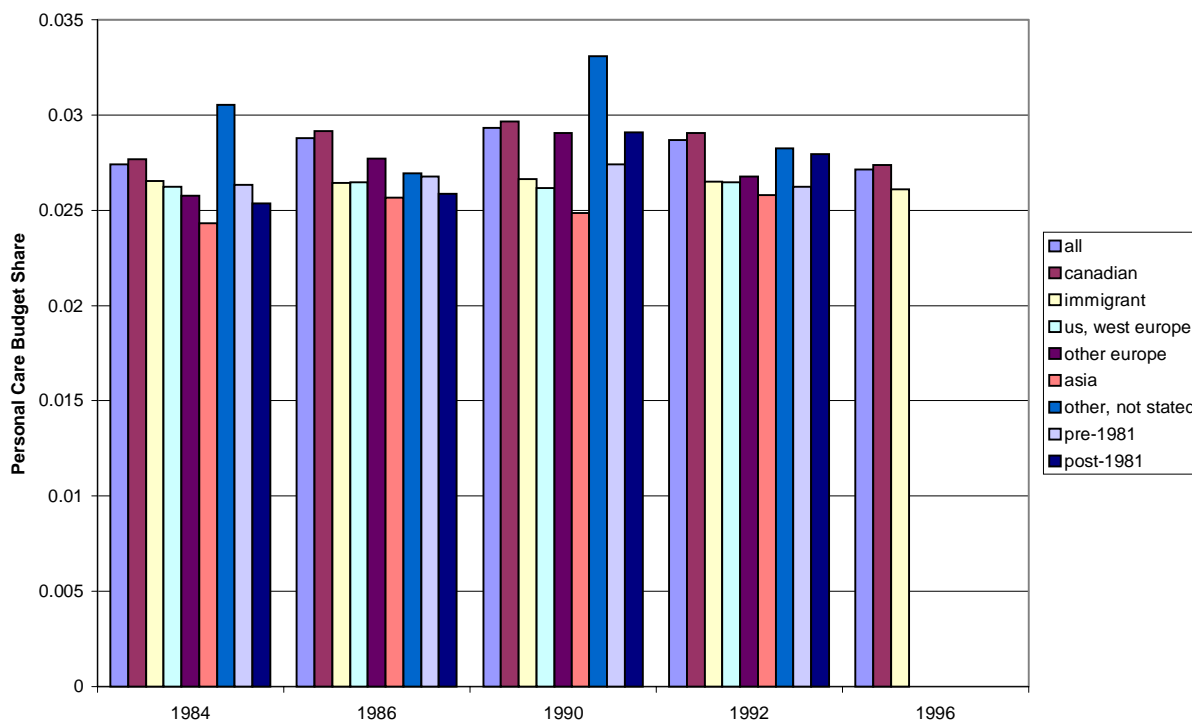
Table 4: Average Shares of Medicinal and Pharmaceutical Products (MPP), Dental Care and Eye Care (as Shares of Health Expenditure)

	MPP	Eye care	Dental care
Canadian	0.348	0.164	0.183
Immigrant	0.367	0.172	0.221
US, West Europe	0.335	0.175	0.209
Other Europe	0.372	0.178	0.24
Asia	0.416	0.161	0.214
Other, not stated	0.384	0.166	0.227
pre-1981	0.36	0.173	0.221
post-1981	0.409	0.164	0.223

More recent immigrants seem to spend slightly more on medicine and less on eye care. Globerman's findings are similar in that immigrants from Europe and Australia are relatively more intensive users of dental care, but that overall differences between the groups of immigrants and Canadian born are quite small (Globerman 1998). His results are in accord with a higher expenditure on dental care for immigrants from Other Europe in our sample (see Table 4). As far as medication and pharmaceutical usage, Globerman reports that immigrants from Asia and Africa are less likely to use conventional medication than other respondents, but more likely to use non-conventional medications. However, no systematic differences in the extent of overall pharmaceutical usage are observed between Canadians and immigrants (Globerman 1998).

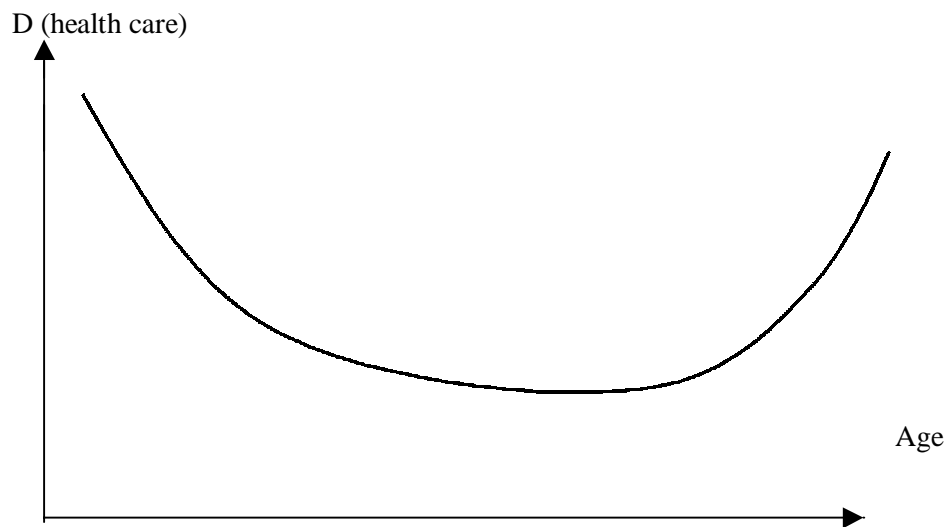
There seems to be little variation in the personal care consumption across different survey years and by place of birth (see Figure 3). Immigrants from origins other than the US, Europe and Asia spend slightly more on personal care in some survey years.

Figure 3: Personal Care as Share of Total Expenditure by Birth Place: 1984-1996



III.4. Demographic Variables

Figure 4: Health Care Consumption during Life Cycle



Demographic variables are important in explaining health care consumption. The demographic variables chosen for our health care demand equation come from the life-cycle model. It is common knowledge that health care expenditure is convex in age (see Figure 4). We would expect the health care consumption to increase with age as a person's physical capital depreciates.

Other demographic variables could shift this life-cycle consumption curve up or down or affect it by altering its slope. Gender of the head of household could reflect the impact of life style on health care utilization decision (Wedig 1988). Women might spend more on health care in their childbearing years, while men might need more health care as they age. Marital status and a larger family size present an opportunity to produce health care at home. However, family size and presence of children should also increase the household's demand for health care services. The level of risk and stress at one's workplace should be positively correlated with the demand for health care. Hence, occupational dummies will be among the demographic regressors. Education is important in determining the level of health care consumption. However, the direction of its influence is not easily determined. According to Grossman, higher education should increase the productivity of producing health, and lead to a higher utilization level. Gliberman notes that more educated individuals practice healthier life styles requiring less health care expenditure, but might want to use more preventative health care services. Also their high opportunity cost of time is an important factor in the decision how much health care to purchase, that is time spent on obtaining health care is costlier for more educated individuals.

Immigrants have a larger family size in the sample, with more recent immigrants - those that immigrated after 1981 - having the largest family size. While the age of the head of the household is higher for immigrants on average, it is apparent that post-1981 immigrants are much younger than Canadians or earlier immigrants, with more children and fewer seniors in their households. Thus, being younger and more vital, they consume less health care on average (see Figures 1 and 2). The more recent immigrants (post-1981) are mostly of Asian and Other origins, owing to shifts in entry patterns. One can observe correlation between the demographic characteristics of “recent” immigrants with those from Asia and Other origins.

Table 5: Means of Some Demographic Variables

	Family size	Children	Children to 6	Seniors	Age of head
All	2.63	0.6	0.24	0.28	46.71
Canadians	2.6	0.57	0.25	0.25	45.48
Immigrants	2.77	0.61	0.21	0.43	53.38
US, Western Europe	2.24	0.31	0.1	0.58	59.43
S and Eastern Europe	2.73	0.45	0.14	0.51	56.35
Asia	3.63	1.02	0.39	0.23	43.66
Other, not stated	3.17	0.92	0.38	0.16	43.73
Pre-81 immigrants	2.69	0.5	0.17	0.49	56.11
Post-81 immigrants	3.23	0.96	0.43	0.12	38.34

III.5 Immigrants by Place of Origin

Table 6: Numbers of Canadian and Immigrant Households in the Sample

	Number	%	1984	1986	1990	1992	1996
Canadian	21212	84.5	3745	7465	3638	6364	8419 ⁸
Immigrant	3878	15.5	837	1260	749	1032	1714
US, Western Europe	1530	6.1	333	557	247	393	
South and Eastern Europe	1067	4.3	261	331	222	253	
Asia	743	3	142	214	167	220	
Other, not stated	538	2.2	101	158	113	166	
Pre-1981	3283	13.1	791	1140	597	755	
Post-1981	595	2.4	46	120	152	277	
All	25090	100	4582	8725	4387	7396	

⁸ 1996 data are not included in the total summation, since there is no data on immigrants of different origins.

III.6. Prices

Since only urban residents are used, regional year-specific price indices for health care are computed using representative cities in each region: (region 1) Halifax, Saint John and St. John's for Maritimes; (region 2) Montreal for Quebec; (region 3) Toronto and Ottawa-Hull for Ontario; (region 4) Edmonton, Winnipeg, and Regina for Prairies, (region 5) Vancouver for British Columbia.⁹

Table 7: Health Care CPI's¹⁰ (1978 – base)

	Halifax	Montreal	Toronto	Edmonton	Vancouver
1984	183.5	164.7	183.2	170.9	180.4
1986	205.6	181.3	208.4	187.4	191
1990	241.8	224.4	265.5	246.2	224.4
1992	257.9	247.3	292.8	271.4	239.5
1996	305.9	298.2	288.8	271.4	256.4

Thus we see a substantial variation in prices of health care across different regions and through time, which should in part explain variations in the health care consumption.

IV. Model Specification

Given the nature of health care system in Canada (mostly publicly funded), it is expected that most Canadians purchase public insurance premiums (unless they are part of employment benefits) and private health care (insurance and/or direct cost). Most consumers will spend the same amount on public health care insurance as required by the provincial government and some private health care. A minority will spend nothing on private health care and only purchase public health insurance. A data analysis shows that only four percent of those who have positive total health care expenditure have zero private health care expenditure. We will focus on explaining the differential patterns of private health care consumption.¹¹

⁹ Statistics Canada, Catalogue numbers 62-010 vv. 7-4 (table 8), 10-4 (21), 12-4 (9, 24), 16-3 (23), 16-4 (9), 18-3 (21), 18-4 (9), 23-4 (10) are used. Inter-city CPI's are averaged to regional values using ratio of population in a given city to sum of populations of cities in the region as weights. Then Canadian CPI for health care with 1978 year as a base is multiplied by these inter-regional CPI's to obtain inter-regional year-specific Health Care CPI.

¹⁰ CPI index for shelter is taken from Pendakur (2001). CPI's for all the other considered groups of goods and services come from Browning and Thomas' papers (1998, 1999).

¹¹ Analysis of consumption of public health care is complicated by insufficient knowledge on whether public insurance was paid by a household in full or was subsidized by the government.

One frequently cited condition for generating a change in an expenditure is alterations in household income (total expenditure), as depicted by an Engel curve. The Engel curve depicts a relationship between the household's absolute total expenditure and its expenditure on a specific commodity, holding all prices constant. Working (1943) and Leser (1963) present a modified semilogarithmic Engel curve as follows:

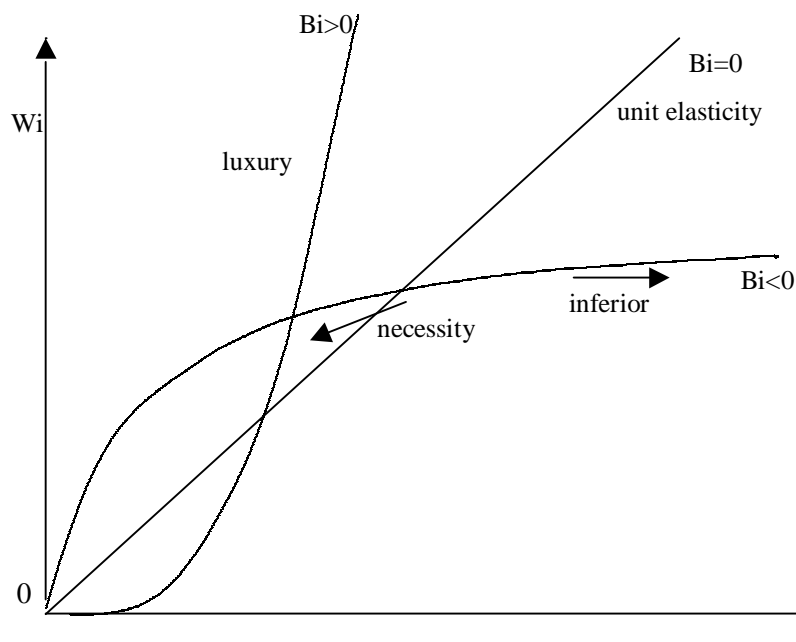
$$w_i = \alpha_i + \beta_i \cdot \log x, \quad (1)$$

where w_i is the budget share of commodity i , and x is total expenditure.¹²

Depending on the value of β_i we can classify goods as luxuries, necessities and inferior goods. If $\beta_i > 0$ the good is defined as a luxury, i.e. its budget share increases with the total expenditure. If $\beta_i < 0$ the good is a necessity in that its budget share decreases as the total expenditure increases. Inferior goods are those, whose both absolute expenditure and budget share decrease as income increases (see Figure 5).

In this study Engel curves are estimated for health care as a share of total expenditure and some subgroups of health care as shares of health care expenditure.

Figure 5: Engel Curves for Working-Leser Model



Source: Deaton and Muellbauer (1980b), p.20.

¹² If estimated by OLS (Ordinary Least Squares), the adding up restrictions ($\sum w_i = 1$, $\sum \alpha_i = 1$ and $\sum \beta_i = 0$) are automatically satisfied (because of the way in which data was constructed).

Deaton and Muellbauer (1980) developed the Almost Ideal Demand System (AIDS), which is an extension of the semi-logarithmic model of Working and Leser and includes the effect of prices. This model has been used extensively to study different product types. In particular, Adrangi and Raffiee (1997) apply a demographically enhanced dynamic AIDS model for their analysis of the health care reform in the US using time-series data. Hunt-McCool et al.(1994) also estimate the demand for medical care in the US (physician office services and hospital services) employing AIDS with cross-sectional data. AIDS has been preferred because of the ease of estimation and favorable qualities. According to the authors, “it satisfies the axioms of choice exactly; it aggregates perfectly over consumers without invoking parallel linear Engel curves, it has a functional form which is consistent with known household-budget data; ... and it can be used to test the restrictions of homogeneity and symmetry through linear restrictions on fixed parameters” (Deaton and Muellbauer 1980a).

The AIDS demand functions are of the following form:

$$w_i = \alpha_i + \sum \gamma_{ij} \log p_j + \beta_i \log \{x/P\}, \quad (2)$$

$$\log P = \alpha_0 + \sum \alpha_k \log p_k + (1/2) \sum \sum \gamma_{kj} \log p_k \log p_j, \quad (3)$$

where w_i is the budget share of the i th good, p_j is the price of the j th good, x is total expenditure. The price index $\log(P)$ can be approximated by the Stone price index $\log(P) = \sum w_i \log p_k$. According to economic theory, the following restrictions on the parameters of (2) must hold:

1. *Adding up*: $\sum_i w_i = 1, \sum_i \alpha_i = 1, \sum_i \beta_i = 0, \sum_i \gamma_{ij} = 0$ (4)

2. *Homogeneity*: $\sum_j \gamma_{ij} = 0$ and (5)

3. *Symmetry*: $\gamma_{ij} = \gamma_{ji}, i \neq j$. (6)

The unrestricted estimation of (2) will satisfy the adding-up restrictions (Deaton et al 1980a). Further, the homogeneity restriction can be imposed by substitution, so that instead of (2) we would have to estimate:

$$w_i = \alpha_i + \sum_{j=1}^{n-1} \gamma_{ij} \log(p_j/p_n) + \beta_i \log \{x/P\}, \quad (7)$$

The final demographically enhanced model that allows for cohort and assimilation effects can be written as follows:

$$w_i = \alpha_i + \sum_{j=1}^{n-1} \gamma_{ij} \log(p_j / p_n) + \beta_i \log\{x / P\} + \sum_{k=1}^r \delta_{ik} Z_k + (\phi_i + \theta_i \text{YSM}) R_i, \quad \forall i=1 \dots 14 \quad (8)$$

where Z_k is a set of demographic variables, such as the age and age square of the head of the household, his/her education level, gender and marital status, the size of the household, and the number of children and seniors. R is a dummy variable that is equal to one if the household is classified as a foreign-born household. YSM denotes years since migration for the head of the immigrant household and approximates the assimilation effect. Thus, ϕ signifies the country-specific entry effect, and θ represents the speed of convergence/assimilation.

Our data as reported in the survey cover several commodities: food from stores, food from restaurants, shelter, household operations, furnishings, clothing, transportation, personal care supplies and equipment, personal care services, tobacco, alcohol and health care. We argue that these groups are weakly separable to ensure that the estimated coefficients will not be biased.¹³ The separability of health care from other groups of services and commodities is not tested in this paper. Rather the extent of bias in the estimated coefficients and elasticities is assumed to be small.

¹³ The goods are weakly separable if “the marginal rate of substitution between any two goods in the same category is a function of only the goods in that category” (Silberberg 345).

V. Empirical results.

V.I. AIDS Model Estimation¹⁴

Testing Symmetry and Homogeneity in Uncontrolled for Demographics AIDS Model

Formal tests are conducted to test the validity of restrictions on the AIDS model. Homogeneity restrictions are tested by running separate OLS regressions with and without the restriction (equation 5). A Likelihood Ratio test is used to test the restriction:

$$\text{Chi Square Statistics with 1 degree of freedom} = (LLFu - LLFr) * 2,$$

where LLFu is the log likelihood function of the unrestricted equation, and LLFr is the log likelihood function of the restricted equation. The results are presented in Table 8. The hypothesis of homogeneity cannot be rejected for nine out of fourteen equations in the system.

To test the restriction of symmetry, the LR test was conducted on the unrestricted and restricted for symmetry Zellner's seemingly unrelated regression estimation. According to the Chi Square statistics, the symmetry restriction should be rejected (Table 8).

Homogeneity and symmetry are imposed on the controlled for demographics AIDS model, in order for economic theory to hold, even though the validity of these restrictions is questionable.

Since the data set is pooled, there might be structural breaks in the sample. The system of equations is run with the interaction of different years and LOGXP variable. However, the coefficients on these slope dummies are quite small, meaning that income elasticity is roughly the same for different years (as supported by F-test). Thus the pooling of the sample is justifiable.¹⁵

¹⁴ AID System is estimated in order to observe patterns of consumption of some general groups of commodities and in particular health care and personal care.

¹⁵ As tested separately one by one, equations in the AIDS system exhibit a lot of heteroskedasticity. This phenomenon is expected when the data set is quite large and panel-like. The nature of heteroskedasticity is uncertain. Such checks for heteroskedasticity, as LM tests, Breush-Pagan, Harvey and Gleiser reject the null of homoskedasticity. Weighing the OLS regressions by the deflated logarithm of expenditure does not eliminate heteroskedasticity.

Table 8: Test Results for Restrictions on the AIDS

	<i>Restrictions</i>					
	Homogeneity		Symmetry		Symmetry and homogeneity	
Equation	Chi-stat	p-value	Chi-stat	p-value	Chi-stat	p-value
food from stores	2.5	0.11	N/A		N/A	
food from restaurants	0.01	0.91				
shelter	5.49	0.02				
furnishings	1.06	0.30				
car/truck purchase	4.14	0.04				
car/truck operation	5.58	0.02				
clothing	0.81	0.36				
public transportation	16.24	0				
personal care services	0.29	0.59				
personal care supplies and equipment	0.89	0.34				
recreation, education, reading material	1.21	0.27				
tobacco products	1.2	0.27				
alcohol beverages	6.58	0.01				
health care	2.57	0.10				
household operation	3.34	0.07				
AIDS			1424.53	0	168910	0

AIDS Uncontrolled for Demographics

The expenditure elasticities from uncontrolled for demographics model¹⁶ are summarized in Table 9, and own price elasticities in Table 10. Health care is income inelastic, according to the uncontrolled (for demographics) AIDS regression, but its income elasticity is very close to one. According to the controlled for demographics AIDS, health care is income unit elastic. Food from the stores, shelter, public transportation, tobacco products and personal care seem to be inelastic (in both uncontrolled and controlled for demographic effects AIDS). Food from restaurants, furnishings, car/truck purchase, clothing, and the combined bundle of recreation, education and reading materials are income elastic.

¹⁶ Regression results can be obtained upon request.

Table 9: Expenditure Elasticities Calculated from AIDS Regressions

	Restricted AIDS w/ Demographics	Unrestricted AIDS without Demographics	AIDS with Symmetry w/o Demographics	Restricted AIDS w/o Demographics
Food from stores	0.43	0.66	0.66	0.66
Food from restaurants	1.26	1.22	1.23	1.23
Shelter	0.76	0.66	0.67	0.67
Furnishings	1.47	1.35	1.35	1.35
Car/truck purchase	3.3	2.38	2.37	2.37
Car/truck operation	0.99	1.25	1.25	1.25
Public transportation	0.74	0.72	0.73	0.73
Clothing	1.23	1.32	1.32	1.32
Household operation	3.89	0.92	0.92	2.74
Recreation, education, reading material	1.27	1.38	1.38	1.38
Tobacco products	0.29	0.55	0.56	0.56
Alcohol beverages	1.15	1.07	1.07	1.07
Personal care supplies and equipment	0.81	0.99	0.99	0.99
Personal care services	0.92	0.82	0.82	0.82
Health care	1.08	0.87	0.87	0.87

The estimates of the income and price elasticities of the Canadian health care are larger than those of the US medical care, which are generally considered to be inelastic (see Literature Review). This is a plausible result, since Canada has a very well developed public system of health care, and thus private health care consumption is more income and price elastic. In other words consumption of private health care, which may be less of a necessity in Canada, is quite sensitive to changes in prices and income.

AIDS Model with Demographics Variables

The results of the controlled for demographics AIDS are presented in Tables 1A-3A (Appendix). When compared with the restricted but uncontrolled for demographics AIDS model, some of the coefficients on price and expenditure variables differ substantially (mostly cross-price coefficients, but not expenditure coefficients). Thus, some of the coefficients in the uncontrolled for demographics model are biased and the demographic variables should be included in the analysis.¹⁷

¹⁷ For some commodities elasticity estimates from controlled and uncontrolled for demographic effects AIDS vary substantially.

Table 10: Own Price Elasticities Calculated from AIDS Regression¹⁸

	Restricted AIDS w/ Demographics	Unrestricted AIDS without Demographics	AIDS with Symmetry Imposed w/o Dem.	Restricted AIDS w/o Demograph.
Food from stores	-1.25	-2.09	-2.15	-2.14
Food from restaurants	-0.06	-0.24	-0.19	-0.32
Shelter	-0.81	-0.61	-0.81	-0.81
Furnishings	-0.61	-2.02	0.16	0.18
Car/truck purchase	-2.87	1.37	-0.7	-1.03
Car/truck operation	-0.97	-0.98	-0.99	-0.99
Clothing	-0.3	-1.56	-0.47	-0.7
Public transportation	-1.03	-0.77	-1.72	-1.67
Personal care services	-0.07	-0.38	-0.34	-0.31
Personal care supplies and equipment	0.73	4.46	3.26	4.09
Recreation, education, reading material	-0.21	-0.45	0.4	0.47
Tobacco products	0.07	0.95	0	0.01
Alcohol beverages	-0.63	-2.33	-0.47	-0.59
Health care	-1.05	-1	-1.05	-1.05
Household operation	-1.17	-1.48	-0.98	-1.1

Price differences can only explain a small portion in variation of health care consumption. The R square for the health equation of the uncontrolled for demographics AIDS model is quite low. Thus, in my results, health care does not behave like most market goods do. R square rises from 1 percent to 6 percent when demographic variables are included into the regression equations. So a significant portion of health care consumption can be explained by demographic variables. However, a very large portion of health care consumption remains unexplained.

Male-headed households tend to spend less on health care, according to the regression ($\beta_{\text{male}} = -0.003$, $t\text{-stat} = -7.7$). Marital status presents an opportunity to produce health care at

¹⁸ Note: In Italics are statistics which absolute value is less than 1.64 (5 per cent significance level of normal distribution). The elasticities are calculated as follows: Own-price elasticity - $e_{ii} = -1 + (\text{coefficient on own price} / \text{mean share}) - \text{coefficient on LOGXP}$; Cross-price elasticity - $e_{ij} = (\text{coefficient on price of good } j \text{ in } i\text{'th equation} / \text{mean share of good } i) - \text{coefficient on LOGXP}$ (mean share of good j / mean share of good i); Income elasticity - $\eta_i = 1 + \text{coefficient on LOGXP} / \text{mean share of good } i$.

home, and thus we would expect the coefficient to be negative. However, in our estimated system it is positive ($\beta_{\text{married}} = 0.002$, $t\text{-statistics} = 3.8$). The coefficient on the TOMEM (family size) is negative, possibly reflecting the opportunity to produce health care at home when there are more members present in the household. However, the family size variable has a coefficient of a relatively small magnitude ($\beta_{\text{totmem}} = -0.0008$, $t\text{-statistics} = -3.4$). The coefficients on TOTCHIL (the number of children) and SENR (seniors) are positive, reflecting a greater demand for healthcare for the older and the younger.

According to Grossman's theory, higher education should increase the productivity of producing health, and thus the coefficient on education is expected to be positive. However, a higher level of education also means a greater opportunity cost of time investment into obtaining health care services and a healthier life style (a negative coefficient would be expected). Four dummies on education are included into the regression, with the base category being the highest level of education – a university degree. All the coefficients are positive (although two of them are quite insignificant). Thus a person with a university degree (relatively higher level of education) spends less on health care, on average. The results support the second hypothesis of a greater opportunity cost of time investment in connection with a higher education level. They also support the idea that more educated individuals practice healthier lifestyles.¹⁹

¹⁹ Occupational dummies are included into the AIDS regression, as the demand for health care is expected to depend on the quality of one's working life. The base category is a person that was unemployed during the reference year. Only one dummy is significant at 5 per cent significance level (FARMER) and has a positive coefficient. Possibly farmers suffer from a poorer health. The coefficient on the managerial type of occupations (OCMAN) is negative and next in line in terms of significance ($t\text{-statistics} = -1.6$), reflecting a lower demand for health care by those who occupy those high positions (and are wealthier individuals at the same time). We expect occupational dummies to be highly correlated with educational dummies and income, which should explain their low significance.

Table 11: Price Elasticities from AIDS Regression with Controls for Demographic Effects*

Equation → Variable ↓	food from store	food from restaurants	shelter	furnishings	car purchase	car operation	clothing	public transport	personal care services	personal care supplies	recreation, education etc.	tobacco	alcohol	health care	household operations
food from store	-1.25	1.26	-0.26	0.22	-0.95	0.13	-0.92	-4.63 E-02	0.13	-1.59	1.20	-1.05	2.35	-3.94 E-03	-0.46
food from restaurants	0.40	-6.15 E-02	3.13 E-02	-0.82	-0.63	0.20	-0.19	1.14	-1.56	-1.47	1.03	-8.04 E-02	-1.72	8.85 E-03	-0.13
shelter	-0.36	4.81 E-02	-0.81 E-02	3.78 E-02	-0.96	0.20	-0.35	0.80	-0.40	0.14	0.14	-6.43 E-02	0.77	6.97 E-02	-0.76
furnishings	8.96 E-02	-0.65	3.16 E-02	-0.61 E-02	-8.73 E-02	-7.48 E-02	3.76 E-02	-0.46	1.09	0.60	-0.48	8.85 E-02	0.12	-9.03 E-03	-0.11
car purchase	-0.15	-0.56	-4.70 E-02	-2.39 E-02	-2.87 E-02	8.62 E-04	0.33	0.16	-0.54	1.53	3.68 E-02	1.98	0.84	-7.78 E-02	-0.16
car operation	0.11	0.32	7.84 E-02	-0.20	-0.19	-0.97	0.29	-2.05 E-02	-1.00 E-01	-0.35	-0.18	0.18	-0.19	-0.12	-0.28
clothing	-0.37	-0.31	-6.09 E-02	5.76 E-02	0.36	0.28	-0.30	-0.34	-0.33	1.28	-0.35	0.69	-0.65	4.37 E-03	-0.21
public transportation	3.81 E-04	0.44	5.30 E-02	-0.24	1.28 E-02	-9.12 E-03	-9.25 E-02	-1.03	-0.33	-0.33	0.26	0.12	-0.17	3.26 E-02	-4.25 E-02
personal care services	1.41 E-02	-0.36	-1.36 E-02	0.30	-0.14	-1.37 E-02	-5.0 E-02	-0.19	-6.56 E-02	0.80	-0.30	-4.35 E-02	0.42	-3.45 E-03	-3.18 E-02
personal care supplies	-0.20	-0.66	1.15 E-02	0.32	0.60	-9.25 E-02	0.34	-0.37	1.54	0.73	-0.77	0.42	-0.36	-1.66 E-02	-6.49 E-02
recreation, education etc.	0.71	1.89	8.73 E-02	-1.10	-0.10	-0.16	-0.40	1.23	-2.38	-3.11	-0.21	-2.05	-0.59	0.10	-0.21
tobacco	-0.16	1.14	-0.25	-6.74 E-03	1.00	3.55 E-02	0.20	0.15	-0.11	0.48	-0.60	7.07 E-02	-0.96	-3.48 E-02	-8.10 E-02
alcohol	0.35	-0.83	7.21 E-02	6.36 E-02	0.34	-4.84 E-02	-0.20	-0.19	0.88	-0.39	-0.16	-0.87	-0.63	-1.21 E-02	-6.85 E-02
health care	1.27 E-02	2.06 E-04	1.17 E-02	-1.30 E-02	-7.89 E-02	-2.91 E-02	-1.94 E-03	4.31 E-02	-3.51 E-03	-1.10 E-02	2.16 E-02	-1.33 E-02	-1.26 E-02	-1.05	-0.20
household operations	0.36	-2.92	0.29	0.56	0.43	-0.43	7.12 E-02	-1.61	1.24	0.88	-0.90	0.32	-0.37	3.55 E-02	-1.17

* Footnote 18 of Table 10 also applies to Table 11.

Figure 6: Health Care Consumption by Canadian and Foreign-born Households during Life Cycle

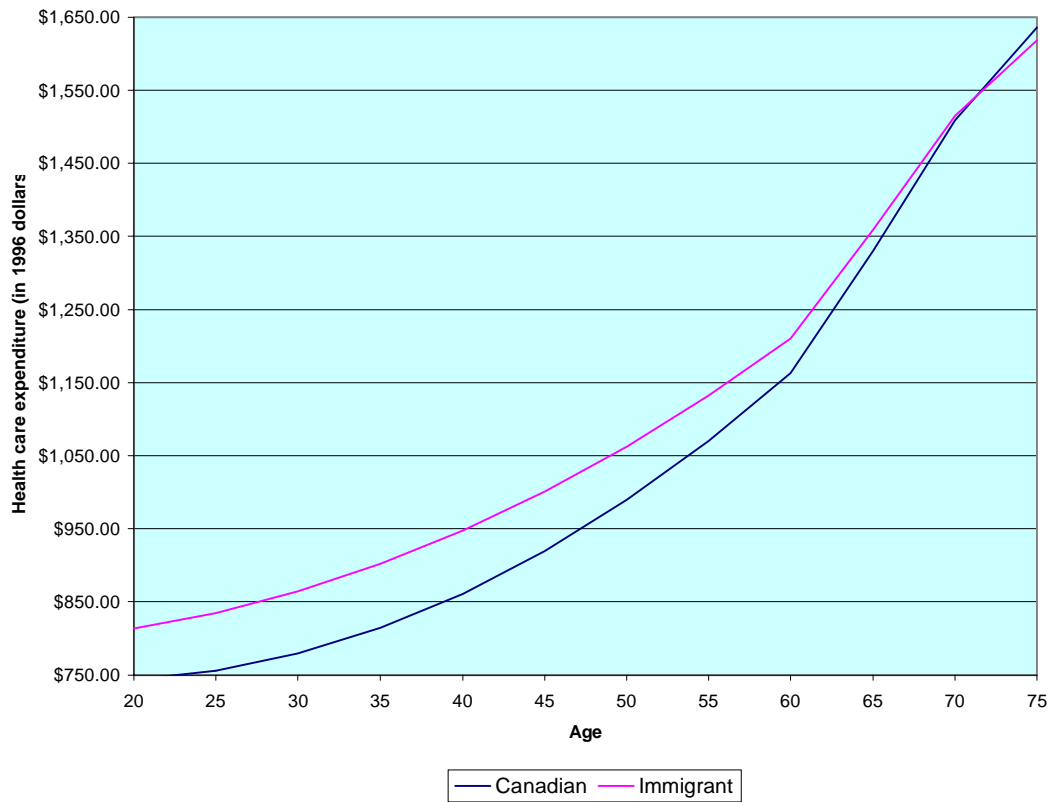
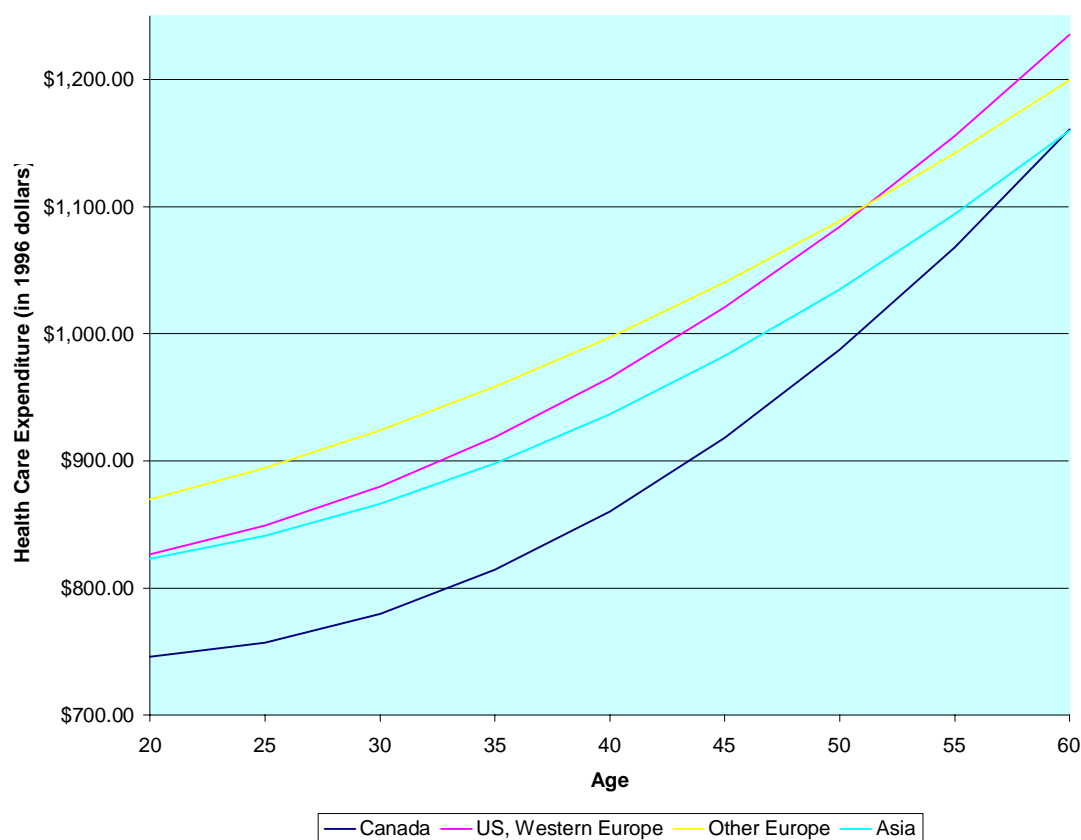


Figure 6 (Figures 6 through 9 are simulated at age, holding everything else constant) illustrates a simulation for the average Canadian household's consumption of health care during his life cycle (20 to 60 years old). It is of an increasing nature, because as people age, the depreciation of health capital requires a greater investment into their health.²⁰

²⁰ The signs on the demographic variable coefficients are much the same as those in the controlled for demographics Engel regressions.

Figure 7: Health Care Consumption during Life Cycle by Birth Place



Immigrants and Canadians in Comparison

Immigrants' patterns of health care consumption could be different from those of the Canadian-born for three reasons: (1) different demographic and socioeconomic characteristics; (2) different "states of health" and heredity factors; and (3) cultural differences. While I control for most demographic and socioeconomic factors in the AIDS model (family size, age, occupation, education, etc), I can not observe cultural factors, and do not have information on the health status of individuals. An example of cultural differences could be a different mother tongue. Gliberman notices that limited proficiency in English/French of the foreign-born could lead to their inability to utilize health care services to a desired degree. Immigrants' attitudes toward Canadian health care system could be a reason for a different pattern of health care consumption as well (for instance preference for non-traditional health care).

A higher level of private health care consumption by immigrants could be due to a different health state of immigrants and/or more favourable attitudes toward private health care services. According to Globerman, immigrants are less likely than the Canadian-born to have chronic health problems: 50 percent versus 57 (Globerman 1998, p.16). Thus a poorer state of health is not likely an explanation for a higher expenditure on health services by immigrants. A higher level of private health care consumption by immigrants could be explained by their greater preferences for some health care services which are not covered by public insurance (e.g. dental care) or some non-traditional health care services (e.g. massage therapy). These differences in consumption could also reflect some unobservable factors, such as relative prices and quality of health care at home.

The coefficients on IMMIGRANT dummy and YSM (years since migration) variable have opposite signs in all the equations of the AIDS model, but the *personal care services* equation and *food from stores* equation. This means that patterns of consumption of a foreign born converge to those of a Canadian-born consumer for most groups of goods and services. However, some of the coefficients are insignificant. Table 12 presents the estimated coefficients and their t-statistics for *health care*, *personal care services* and *personal care supplies and equipment* equations.

Table 12: Estimated Coefficients on Immigrant Dummy (REFIMM) and Year since Migration Variable (YSM).

<i>Equation</i>	<i>β-coefficients</i>		<i>t-statistics</i>	
	REFIMM	YSM	REFIMM	YSM
Health care	0.0012	-0.86E-05	1.6	-0.3
Personal care services	-0.0012	-0.9E-05	-3.7	-0.7
Personal care supplies and equipment	-0.0013	0.23E-04	-6	1.4

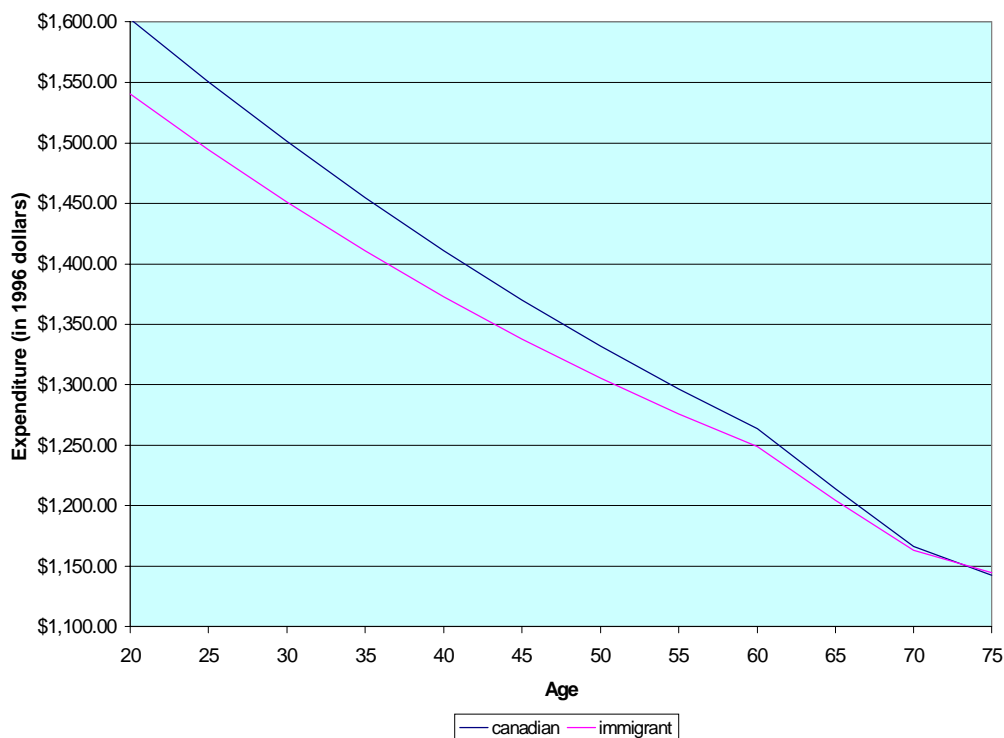
The coefficient on the immigrant dummy in the health equation is positive (0.0012), which means that immigrants spend slightly more (0.12% of their income) on health care, ceteris paribus (See Tables 1A-3A in the Appendix). The consumption of personal care by an immigrant household is lower, however, than that of a Canadian-born household. I see some evidence of convergence.

Life-cycle consumption of health care for immigrants and Canadians is compared in Figure 6, which is simulated at age while holding other coefficients constant. As it can be seen, throughout the whole life cycle, an average immigrant household's consumption of health care is slightly higher than that of a Canadian household. Immigrants and Canadians might consume

health care in different proportions as they age. When immigrant slope dummies on AGE and AGE SQUARE (IMAGE and IMAGE2) are entered into the regression, all the coefficients do not change by much, but the immigrant dummy coefficient becomes insignificant. The coefficients on the foreign-born reference person's age and age square (IMAGE and IMAGE2) are significant, and their magnitude is equivalent to the magnitude of the immigrant dummy coefficient.

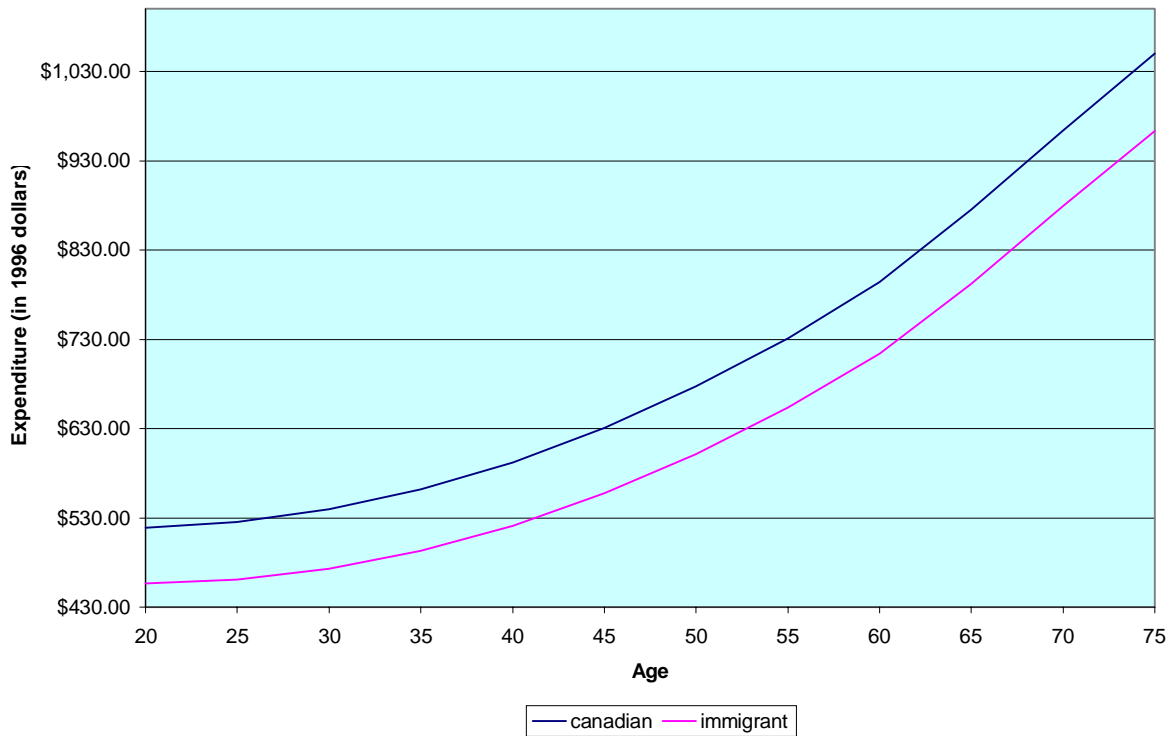
Allowing for differences between immigrants from different origins does not change the results of the health care equation. The coefficients on the ORIGIN (REFCOB1-5) dummies are insignificant and of a small magnitudes.²² However, when controlled for the cross-products of age and age squared and origin dummies, significant t-statistics are obtained, but the magnitude of their differences is quite small (See Figure 7). Thus, if controlled for demographic factors, immigrants coming from different origins do not exhibit distinctive patterns of health care consumption

Figure 8: Life Cycle Consumption of Personal Care Supplies and Equipment by Birth Place



²¹ Regression results can be obtained upon request.

Figure 9: Life-cycle Consumption of Personal Care Services by Birthplace



Figures 8 and 9 depict life-cycle consumption of personal care by households of different origins. Immigrant households seem to spend slightly less on both personal care products and personal care supplies and equipment. There is some convergence in the patterns of consumption of personal care supplies and equipment. Expenditure elasticities do not differ by much for immigrant and non-immigrant households. In the case of personal and health care they are almost identical (see Table 13).

Table 13: Expenditure elasticities for immigrant and Canadian households (AIDS model)

Expenditure Elasticities	Canadian	Immigrant
Food from stores	0.45	0.36
Food from restaurants	1.25	1.28
Shelter	0.76	0.75
Furnishings	1.46	1.51
Car purchase	3.32	3.24
Car operation	0.98	1.02
Public transportation	0.74	0.69
Clothing	1.23	1.20
Household operation	3.82	4.25
Recreation, education, reading	1.27	1.28
Tobacco	0.19	0.83
Alcohol	1.14	1.20
Personal care supplies	0.80	0.84
Personal care services	0.92	0.94
Health care	1.09	1.00

V.II. Engel Elasticities

After running the regression (1), Engel expenditure elasticities are calculated according to the following formula:

$$e_i = 1 + \beta_i / w_i,$$

where w_i is the mean share.

Goods with elasticity higher than one are luxuries, those with elasticity less than one are necessities, and goods whose elasticity is equal to one are unit elastic.

Uncontrolled Engel Expenditure Elasticities

β coefficients for total health care expenditures are small negative numbers, so health care can be classified as a necessity, according to Engel curve analysis when uncontrolled for demographic effects. The health care expenditure elasticity is approximately 0.7, which means that health care is income inelastic, according to this model. The expenditure on health care of the foreign born is slightly less inelastic.

**Table 14: β Coefficients and Health Care Engel (Expenditure) Elasticities
Calculated at the Mean Health Care Share.**

	Engel Elasticities	β coefficients	t-statistics	R-square- adjusted
All	0.74	-0.01	-21	0.02
Native born	0.75	-0.01	-18.8	0.02
Foreign born	0.69	-0.01	-9.32	0.02
US, Western Europe	0.67	-0.01	-5.53	0.02
Other Europe	0.75	-0.01	-4.1	0.02
Asia	0.71	-0.01	-4.66	0.03
Other, not stated	0.71	-0.01	-4.66	0.03
Pre-1981	0.68	-0.01	-8.77	0.02
Post-1981	0.85	0	-2.24	0.01

Engel Expenditure Elasticities Controlled for Demographics

More refined Engel elasticity estimators, which control for different regions, years of the survey, age, age squared, sex, marital status and education level of the head of the household, the number of children under 6, other children, adults and seniors,²² are reported in Table 15. *Years since migration* variable is included into the regressions for the foreign born.²³ The regressions control for different regions in Canada in order to capture possible differences between the consumption patterns of their residents. The REGION variables should capture in part price variations across Canada.²⁴

**Table 15: β Coefficients and Health Care Engel (Expenditure) Elasticities
Calculated at the Mean Health Care Share (Controlled for Demographics)**

	Engel Elasticities	β coefficients	t-statistics	R-square- adjusted
All	0.881152	-0.25430E-02	-6.726	0.0728
native born	0.890378	-0.23456E-02	-5.792	0.0731
Foreign born	0.817981	-0.38948E-02	-3.715	0.0666
US, Western Europe	0.776929	-0.47731E-02	-2.310	0.0525
Other Europe	0.871237	-0.27552E-02	-1.413	0.0472
Asia	0.7482	-0.53879E-02	-3.115	0.0894
Other, not stated	0.7482	-0.53879E-02	-3.115	0.0894
Pre-1981	0.801771	-0.42416E-02	-3.486	0.0603
Post-1981	0.885159	-0.24573E-02	-1.393	0.0768

²² See Demographic Variables for rationale.

²³ Total expenditure is deflated by year-specific CPI's for all items for Canada, and total health expenditure is deflated by year-specific and region-specific CPI's for health care (see *Prices*).

²⁴ AIDS model incorporates prices directly.

Income elasticity for health care is slightly higher, after having been controlled for demographics, but nonetheless still below unity.

Table 16: Engel Expenditure Elasticities for Medicinal and Pharmaceutical Products (MPP), Dental Care and Eye Care (Controlled for Demographics)

	MPP	Dental care	Eye care
All	0.620447	1.311342	1.085967
Canadian	0.620536	1.289092	1.094601
Foreign born	0.625501	1.426875	1.046319
US, Western Europe	0.652185	1.338504	1.057752
Other Europe	0.622444	1.505309	1.032201
Asia	0.598294	1.459718	1.061841
Other, not stated	0.598294	1.459718	1.061841
Pre-1981	0.628872	1.424757	1.046419
Post-1981	0.606657	1.445695	1.055249

A larger range of income elasticities is observed for subcategories of health care (Table 16). According to the estimates of Engel elasticities, medicinal and pharmaceutical products (MPP) can be classified as a necessity and dental care can be classified as a luxury. Eye care expenditure is close to elasticity of unity. Expenditure elasticities by birthplace (Canadian or foreign born) are similar.

So how do these elasticities translate into absolute expenditures? For instance, what is the impact of a one percent increase in household expenditure on total private health care consumption? As shown by calculations in Table 17, a one percent increase in household income would lead to an additional \$760 million expenditure on private health care by immigrant households and \$4 billion by Canadian-born households. Even with a larger average total expenditure, an increase in immigrant households' expenditures on private health care will constitute a smaller share of the increase in total health care expenditures than the ratio of immigrants to total population.

Table 17: Interpretation of Engel Elasticities in Absolute Terms (1996 dollars)

	Canadian households	Immigrant households
Average total expenditure	47,398.22	50,281.38
Engel elasticities for private health care	0.89	0.82
Ratio to total population	83	17
Number of households	9,576,923	1,841,155
Change in absolute expenditure on health care if total expenditure increases by 1 percent	4,039,969,052	759,121,773
Ratio to total change in private health care expenditure due to increase in income	0.84	0.16

Given that private health care expenditures by an average immigrant household are \$953.22 (in 1996 dollars) vs. \$917.83²⁵ for Canadian-born households, an additional hundred thousand immigrants would mean a \$95 million increase in total private health care consumption for the Canadian economy. This is a reasonable figure and with a healthy growth in the economy it would cause no great shock on the health care system in Canada.

VI. Summary and Conclusions

This study compares patterns of health care consumption for immigrant and non-immigrant households. While there is some variation in the consumption of some health care services across different groups of immigrants, the general level of health and personal care consumption is similar for foreign-born and Canadian-born households. In sum, the average private health care consumption is but a small share of total consumption: some two to three percent.

Even given the mundane findings above, some interesting results emerge. First, consumption of health care increases during an adult's life cycle in a convex fashion. Also as predicted, the presence of children and seniors in a household induces a higher expenditure on health care.

According to my AIDS model, health care is unit income and price elastic, which means that the level of utilization is sensitive to changes in prices and income. The responsiveness of personal care to changes in income is slightly lower. The estimated Engel income elasticities for health care and some subgroups of health care are similar for immigrant and non-immigrant households.

These results allow me to reflect on the current debate over immigrant health care expenses. Recently there has been voiced some concern over new health care policies. In particular, it has been noted that some new types of non-traditional medicine should be introduced and covered under traditional health care products because of the presence of immigrants. I find no evidence for the need of this new coverage, as little difference in spending patterns by birthplace is found.

In sum, *ceteris paribus*, a household with a foreign-born head of the household spends more on health care during its life cycle, and slightly less on personal care than a Canadian-born

²⁵ Calculations come from 1996 Family Expenditure Survey.

household. I see some convergence in the expenditures on health care and personal care supplies and equipment at the end of the life cycle for all households. However, these differences are quite small, which leads me to believe that immigrants will not influence relative prices of private health care due to distinct patterns of consumption.

The fact that consumption patterns of private health care by immigrant households differ from those by non-immigrant households only slightly, according to my AIDS model, can be explained by the existence of the large public sector and by the fact that a relatively small share of total income goes towards personal and private health care in Canada. This result is in contrast to other Canadian immigrant expenditure studies. In the case of food consumption, which is the second largest expenditure for the households, large differences are found between consumption patterns of foreign- and Canadian-born (see Werner 2000). Substantial differences are also found in the transportation consumption by immigrant and non-immigrant households, which is mostly privately funded and takes a large portion of household income (see Shahabi-Azad 2000).

Convergence in consumption of health care can be explained not only by immigrants adapting to the Canadian norm, but also by Canadians' patterns of health care consumption assimilating to those of the foreign born. For instance, immigrants bring with them some new types of health care such as alternative medicine. In time, Canadians might acquire a taste for them and use them in a manner similar to that of immigrant consumers. The direction of assimilation could be a topic of future research.

Distinct patterns of consumption by immigrant households of different origins could be explained by their different preferences and such unobservable factors as relative prices and quality of services and products at home. However, these differences in consumption by the foreign born could also be due to different health care regimes in the home country. For example, immigrants from China could be used to the fact that their health care is provided by the government and unwilling to refer to any other private health care provider. On the contrary, immigrants from Singapore could depend on private health care services to a greater degree due to the fact that the Singaporean system of health care is largely privately funded. The causes of distinct patterns of consumption by immigrants of different origins need to be investigated further.

APPENDIX

Tables 1A-3A: Selected Results from the Controlled for Demographics AIDS Model²⁶

Table 1A

DEPENDENT VARIABLE = **PERSONAL CARE SERVICES** 24552 OBSERVATIONS

R-SQUARE = 0.1124

Variable Name	Estimated Coefficient	T-Statistics
Relative price of food from the stores	0.12912E-02	0.1974
Relative price of food from the restaurants	-0.16746E-01	-2.725
Relative price of shelter	-0.44429E-02	-3.735
Relative price of furnishings	0.11631E-01	3.859
Relative price of car purchase	-0.58018E-02	-1.079
Relative price of car operation	-0.11375E-02	-0.6601
Relative price of public transportation	-0.35137E-02	-1.487
Relative price of personal care services	0.10005E-01	4.527
Relative price of personal care supplies and equipment	0.16525E-01	4.193
Relative price of recreation, education and reading materials	-0.25579E-01	-3.006
Relative price of tobacco	-0.12459E-02	-0.3575
Relative price of alcohol	0.94391E-02	1.927
Relative price of clothing	-0.35980E-02	-0.9315
Relative price of health care	-0.54250E-04	-0.4016
Natural logarithm of expenditure/P	-0.80518E-03	-4.919
Family size	0.19273E-03	2.073
Number of children	-0.44698E-03	-4.057
Number of seniors	0.21452E-03	1.103
Age of the head of the household	-0.11837E-03	-3.583
Age squared	0.31985E-05	-5.658
Less than 9 years of education	-0.15562E-02	-5.658
Secondary school	-0.12110E-03	-0.5499
Some post secondary education	0.26189E-03	0.9633
Post secondary certificate (base- university diploma)	0.26737E-03	1.151
Male	-0.36689E-02	-23.21
Married	0.21147E-02	11.16
Immigrant head of household	-0.12313E-02	-3.686
Years since migration of the head	-0.91422E-05	-0.7371
Survey year 1984	-0.48370E-02	-1.245
Survey year 1986	-0.32170E-02	-1.091
Survey year 1990	-0.10051E-02	-0.7423
Constant	0.15143E-01	3.721

²⁶ Occupational dummies are included into the regression but not presented here. Complete regression results can be obtained from author upon request.

Table 2ADEPENDENT VARIABLE = **PERSONAL CARE SUPPLIES**

24552 OBSERVATIONS

R-SQUARE = 0.2239

Variable Name	Estimated Coefficient	T-Statistics
Relative price of food from the stores	-0.33708E-01	-1.947
Relative price of food from the restaurants	-0.30726E-01	-2.165
Relative price of shelter	0.17941E-02	0.9904
Relative price of furnishings	0.12402E-01	1.976
Relative price of car purchase	0.31629E-01	3.486
Relative price of car operation	-0.76409E-02	-2.302
Relative price of public transportation	-0.70309E-02	-1.633
Relative price of personal care services	0.16525E-01	4.193
Relative price of personal care supplies and equipment	0.35965E-01	2.024
Relative price of recreation, education and reading materials	-0.64998E-01	-3.108
Relative price of tobacco	0.99661E-02	1.111
Relative price of alcohol	-0.81255E-02	-0.6577
Relative price of clothing	0.26251E-01	4.105
Relative price of health care	-0.31014E-03	-1.697
Natural logarithm of expenditure/P	-0.39476E-02	-18.70
Family size	0.26176E-02	21.84
Number of children	-0.93174E-03	-6.561
Number of seniors	-0.39996E-03	-1.595
Age of the head of the household	-0.25709E-03	-6.036
Age squared	0.10976E-05	0.10976E-05
Less than 9 years of education	0.16432E-02	4.634
Secondary school	0.23430E-02	8.253
Some post secondary education	0.19846E-02	5.662
Post secondary certificate (base- university diploma)	0.14245E-02	4.759
Male	-0.49338E-02	-24.22
Married	0.22188E-02	9.081
Immigrant head of household	-0.12593E-02	-2.924
Years since migration of the head	0.23349E-04	1.460
Survey year 1984	-0.16749E-01	-2.109
Survey year 1986	-0.14398E-01	-2.391
Survey year 1990	-0.10387E-01	-3.449
Constant	0.58735E-01	7.694

Table 3ADEPENDENT VARIABLE = **HEALTH CARE** 24552 OBSERVATIONSR-SQUARE = **0.0594**

Variable Name	Estimated Coefficient	T-Statistics
Relative price of food from the stores	0.17274E-03	0.2154
Relative price of food from the restaurants	0.25712E-03	0.4748
Relative price of shelter	0.18759E-02	2.119
Relative price of furnishings	-0.12684E-03	-0.2373
Relative price of car purchase	-0.15284E-02	-1.259
Relative price of car operation	-0.24193E-02	-4.028
Relative price of public transportation	0.70165E-03	2.010
Relative price of personal care services	-0.54250E-04	0.1351E-03
Relative price of personal care supplies and equipment	-0.31014E-03	-1.697
Relative price of recreation, education and reading materials	0.23160E-02	2.669
Relative price of tobacco	-0.67960E-03	-1.426
Relative price of alcohol	-0.21448E-03	-0.4839
Relative price of clothing	0.20982E-03	0.3718
Relative price of health care	-0.10353E-02	-4.186
Natural logarithm of expenditure	0.15891E-02	4.256
Family size	-0.81781E-03	-3.846
Number of children	0.99569E-03	3.939
Number of seniors	0.12791E-02	2.864
Age of the head of the household	-0.12569E-03	-1.659
Age squared	0.42082E-05	5.052
Less than 9 years of education	0.43405E-03	0.6907
Secondary school	0.12587E-04	0.2492E-01
Some post secondary education	0.19329E-02	3.097
Post secondary certificate (base- university diploma)	0.13272E-02	2.490
Male	-0.28125E-02	-7.748
Married	0.16600E-02	3.815
Immigrant head of household	0.11910E-02	-0.3014
Years since migration of the head	-0.85818E-05	-0.3014
Survey year 1984	-0.21491E-02	-3.362
Survey year 1986	-0.26700E-02	-5.192
Survey year 1990	-0.18591E-02	-4.005
Constant	0.12529E-01	5.592

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