Factors Associated with Medicine Use and Non-use by Ontario Seniors

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RÉSUMÉ

Bien qu'il y ait de plus en plus de preuves d'une augmentation de la consommation de médicaments par les personnes âgées, il y a relativement peu de recherches entreprises pour effectuer un examen critique des différences entre les types de consommateurs de médicaments au sein de cette population. À l'aide de données sur la population, nous étudions l'influence des facteurs sociaux, démographiques et de santé sur la probabilité de ne pas consommer de médicaments, de consommer uniquement des médicaments sans ordonnance ou de consommer uniquement des médicaments délivrés sur ordonnance. Nous avons relevé des indications selon lesquelles les médicaments étaient utilisés de façon rationnelle (c'est-à-dire que ceux qui étaient en meilleure santé avaient plus de chances de ne pas en consommer ou de consommer des médicaments sans ordonnance que ceux qui avaient une mauvaise santé) ainsi que des explications rationnelles pour l'utilisation déclarée (c'est-à-dire que les femmes avaient moins de chances que les hommes de ne pas consommer de médicaments ou de consommer uniquement des médicaments sans ordonnance). D'autres analyses sur les habitudes et les décisions relatives à la consommation de médicaments par des hommes âgés ainsi que par des personnes âgées dont le conjoint est décédé, qui sont séparées ou divorcées, seraient nécessaires.

ABSTRACT

While there is growing evidence of the increasing use of medicines by the elderly, research undertaken to critically examine differences among types of medicine users in this population is limited. Using population data, we examine the influence of social, demographic, and health-related factors on likelihood of being a non-user, a user of non-prescribed medicines only, or a user of prescription medicines only. We find some evidence of the rational use of drugs (i.e., those who are in better health are more likely to be non-users or to use non-prescribed medicines than those who are in poor health) and of rational explanations for reported use (i.e., being female is associated with less likelihood of non-use or exclusive use of non-prescription medicines than being male). Further analysis of the medicine-use patterns and decisions of elderly men and of those of elderly persons who are widowed or separated/divorced is warranted.

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Introduction

Concern about the use of medicinal drugs by the elderly can be understood within the context of overall rising health care costs and of the increasing reliance on drugs in health care systems in the developed world. In Canada and elsewhere, drug expenditure studies show that drug costs are growing faster than any other type of health care expenditure (Commission on the Future of Health Care in Canada, 2002; O'Neill, Hughes, Jamison, & Schweizer, 2003; Anderson, Petrosyan, & Hussey, 2002). Rising costs are attributed to there being more (and more expensive) drugs on the market and to greater use of drugs in the context of population aging (Canadian Institute for Health Information [CIHI], 2002, 2003; Shah, Hoffman, Vermeulen, Hunkle, & Hontz, 2003; Lexchin, 1997), with numerous studies illustrating that the elderly receive more prescriptions and report using prescription and prescription/non-prescription combinations more often than other age groups (CIHI, 2002; Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002; Linjakump et al., 2002; Chen, Dewey, Avery, & Analysis Group of the MRCCFA Study, 2001).

Drug use prevalence rates among the elderly may reflect, in part, the health status and health care needs of this population (Health Canada, 1999). However, they cannot be explained by *need* or health status alone. Rather, medicinal drug use appears to be influenced by a variety of additional factors. For example, in one study, it was documented that becoming eligible for prescription drug insurance itself is associated with an increased use of prescription drugs among seniors. The authors concluded that this finding primarily reflects the increased volume of use among individuals with lower health status who are already using prescription drugs when they become eligible for public drug benefit insurance (Grootendorst, O'Brien, & Anderson, 1997). This conclusion implies that physicians' prescribing decisions may be influenced by a patient's insurance status, a factor that is particularly relevant to our discussion of drug use among the elderly in Canada because almost all persons aged 65 and over are covered by provincial drug benefit insurance plans (Anis, Guh, & Wang, 2001).

Other factors appear to influence individual decisions about whether to use medicines and which types to use, including direct cost as well as the availability of insurance coverage for prescription drugs (Stuart & Grana, 1998), co-payments for insured prescription medicines (Harten & Ballantyne, 2004; Lexchin & Grootendorst, 2004; Tamblyn et al., 2001), exposure to direct-to-consumer advertising of prescription medicines (Mintzes et al., 2003), and the accessibility of a rapidly growing number of over-the-counter medicines that are suitable for the management of symptoms frequently reported by the elderly (Covington, 2000; Stoller, Forster, & Portugal, 1993). Indeed, the rapid expansion of the non-prescription medicines and natural health products industries (Covington, 2000; Ramsay, Walker, & Alexander, 1999) suggests strong *consumer motivation* to bear the costs of these products, presumably because consumers believe them to be effective in relieving symptoms or enhancing health.

Finally, normative *rules* and age-generational norms of autonomy and control that lead to the avoidance of medicines (Ballantyne, Hawker, & Radoeva, 2001; Lumme-Sandt & Virtanen, 2002), self- and body perceptions (Scherman & Löwhagen, 2004), the individual's health beliefs and attitudes toward her or his own condition (Fuller, Dudley, & Blacktop, 2004; Scherman & Löwhagen, 2004), perceived well-being, and the presence of symptoms (Al-Windi, Elmfeldt, & Svärdsudd, 2000) all appear to influence individual decisions about whether to use medicines and about which types to use. Further, norms, perceptions, and decisions about medicinal drug use may vary with cultural heritage, values, beliefs, and commitment to traditional health care practices (Chung Pang, 1996; Kim, Hae-Ra, Kim, & Duong, 2002; Lee, Charn, Chew, & Ng, 2004); with the cultural "distance" between patients and health care providers (Kraut, 1990; Sung, 1999); or with an individual's ease in moving between "traditional" and western health care (Kim et al., 2002; Ma, 1999; Pearl, Leo, & Tsang, 1995).

Understanding the complex factors that influence medicine use by the elderly is important because of the particular risks associated with that use in this population. For example, in a study based in Quebec, it was estimated that drug-related illness was the primary reason for 1–5 per cent of medical visits, 3–23 per cent of hospital admissions, and 1/1,000 deaths among elderly patients. In this study, elderly patients were 2–3 times more likely than younger people to be admitted to hospital because of a drug-related illness (Tamblyn et al., 1994). The authors reasoned that the elderly are particularly at risk for the iatrogenic illness associated with drug use because of age-related changes in drug metabolism and excretion and an increased likelihood of multiple health problems requiring medication; high-risk combinations of drugs for specific disease conditions; unintentional misuse of medication because of impaired visual, motor, and memory abilities; and inappropriate prescribing to the elderly (Tamblyn et al., 1994). While the inappropriate use of medicines

poses particular risks for the elderly patient, the elderly may also be at risk of under-treatment in situations where medicinal therapy is indicated but not prescribed or recommended (Nilsson, Johansson, & Wennberg, 1995).

In earlier research, we distinguished among types of medicines and examined the prevalence and relative balance of use of prescription (Rx) and over-the-counter (OTC) medicines and natural health products (NHPs) among seniors (Ballantyne, Clarke, Marshman, Victor, & Fisher, 2005). Our findings were somewhat surprising. For example, we determined that a large proportion (50%) of community-dwelling seniors in Ontario reported using no prescription medicines or no medicines at all at the time they were surveyed, a finding that suggests that the effect of age or aging populations on the (rising) costs of prescription drugs in national health care budgets is confounded by other factors. Further, in the senior population of Ontario, use of over-the-counter medicines was more prevalent than use of prescription medicines. Prescription drugs were more commonly used in combination with non-prescribed drugs than on their own, although a proportion of elderly Ontarians reported exclusive use of prescription drugs. We considered several questions that might explain these patterns. Did non-use reflect health status and a limited need for medications or the prohibitive out-of-pocket costs of prescription or non-prescription medicines? Were those reporting exclusive non-prescribed medicine use prevented from accessing prescription medicines because they did not have access to a physician or other health care professional who might recommend their use? Were there distinctive characteristics of those elderly who reported the exclusive use of prescription medicines?

While we were unable to address all of these questions with the available data in our previous research, in the current article we problematize medicinal drug use by the elderly – a subpopulation that may be particularly vulnerable to the potential negative effects of inappropriate use (or inappropriate non-use) of medicines. Specifically, we investigate the relationship of demographic, social, and health-status variables and individuals' likelihood of falling into one of three medicine-user groups: non-users, users of non-prescribed medicines only, and users of prescription medicines only. These specific groups of users are worthy of our attention, given (a) the prevalence of chronic disease and availability of many medicinal drugs for conditions common among the elderly (rendering non-users of interest), (b) the availability of insurance coverage for prescription drugs and the out-of-pocket burden

of non-prescribed products (rendering exclusive non-prescribed drug users of interest),[1] and (c) the availability of an expansive array of non-prescription medicines (OTCs and NHPs) and the preponderance of conditions amenable to self-medication (rendering exclusive Rx users of interest).

The health-status variables included as predictor variables in our analyses included self-reported health, number of annual physician (M.D.) visits, and home care utilization. We include these as proxies for need for health care and medicines. Other indicators, such as disease status, are not suitable for use in our models, due to reporting prohibitions for categories containing small proportions of a sample, such as we found among rates for specific diseases. Based on the evidence reviewed earlier that drug use is influenced by more than health status and need and following a social-determinants-of-health approach (Evans, Barer, & Marmor, 1994), demographic and social status variables with demonstrated associations with health and health care utilization – including age, sex, marital status, education, income, and region of residence – were included as predictors in our models. We hypothesize that these factors may also be associated with medicines-related health care utilization and may raise "red flags" for those concerned with the unequal distribution of medicinal drug use or the inappropriate use (or non-use) of medicines.

Methods

Building on our previous analyses demonstrating aggregate levels of use of different medicine types among the community-dwelling elderly (Ballantyne et al., 2005), we use data from Canada's National Population Health Survey (NPHS) (household component 1996/97) (Tambay & Catlin, 1995) to model the factors associated with the three common use patterns identified above. In Canada, *prescription* status for individual medicines varies across provinces (and over time). For the purposes of our analysis, prescription status had to be verified for every drug reported. Therefore, we selected a single province – Ontario – for our study. Ontario is the most populous province of Canada, representing 37.3 per cent of the country's population in 1996. In 1996, about 12.4 per cent of the Ontario population was aged 65 and over, similar to the national average of 12.1 per cent and midway between the "oldest" (Saskatchewan, at 14.7%) and the "youngest" (Alberta, at 9.9%) provinces (Statistics Canada, 1996).

While the NPHS includes a health-care-institutions component, most elderly Canadians live in the

community (Health Canada, 1999) and community-dwelling elderly are distinguished from the institutionalized elderly on the basis of health and functional status (Hays, Pieper, & Purser, 2003). Thus, we restrict our analysis to the community-dwelling elderly.

NPHS Questions on Medicine Use and Analytic Categories

The health component of the NPHS includes a section on medication use, with two streams of questions focused on (a) the use of twenty-two *categories of drugs* indicated for certain conditions *during the past month* and (b) self-reported use of *specific medicines and natural health products during the past two days*. The data reported in this study are based on analysis derived from the latter set of questions. The 1996/97 panel of the NPHS is based on telephone interviews. NPHS telephone interviewers, specifically trained for this survey, asked respondents *to retrieve and read the exact name of each medicine or health product* and recorded the names of up to 12 drugs and up to 12 health products per respondent. Specifically, in asking each respondent whether and what medicines she/he took, the following question was posed:

> What is the exact name of the medication that [the respondent] took (in the last two days)?
>
> (ask person to retrieve and look at the bottle, tube or box)

In asking each respondent whether she/he took health products, the following question was posed:

> There are many other health products such as ointments, vitamins, herbs, minerals or protein drinks which people use to prevent illness or to improve or maintain their health. Does [the respondent] use any of these or other health products?
>
> What is the exact name of the health product? (ask respondent to retrieve and look at the bottle, tube or box).

All medicines and health products recorded at the time of the telephone interviews were recoded (by Statistics Canada) according to the Anatomical Therapeutic Chemical Classification System for Human Medicines–Canada (ATC-C). Given the very high overall response rate (94.3%), the small proportion of respondents reporting 12 or more medicines or natural health products (<0.1%), and the use of post-interview checks to minimize non-sampling error (Swain, Catlin, & Beaudet, 1999; Statistics Canada, 1995), we are confident that the data we report are reliable estimates of two-day prevalence-of-use for this population.

In our previous analysis, we allocated all ATC-coded medicines to one of three categories: (1) *prescription medicine* (Rx), (2) *non-prescription or over-the-counter medicine* (OTC), and (3) *natural health products* (NHP). Data falling into a fourth, residual category, *other* (containing unidentifiable drugs and drugs whose status as an Rx or OTC medicine is dose-dependent, so their status as an Rx or OTC drug for a given respondent could not be verified because dosage information was not collected in this survey) are excluded from the current analyses. Table 1 (reproduced from Ballantyne et al., 2005) illustrates the prevalence and relative distribution (combinations) of prescription and over-the-counter medicines and natural health products, estimated for the population of Ontario seniors (in 1996/97) using Statistics Canada's bootstrap estimation technique.

The data illustrated in Table 1 represent the distribution of non-use and use of Rx and OTC medicines and NHPs and of combinations of these medicine-types for the Ontario population aged 65 and over. Summing the percentages in different use categories, it is evident that about 50 per cent of respondents reported using any prescription medicines, including 34 per cent using prescriptions in combination with

Table 1: Distribution and combinations of Rx/OTC/NHP use and non-use (Ontario 65+) (N = 823,833)

Type of Medicine	Rx[a]	OTC[a]	NHP[a]	Rx/OTC/NHP[a]	NONE[a]
Rx	15.6% (14.22, 16.92)	30.1 (28.36, 31.92)	0.7[b] (0.33, 0.85)	—	—
OTC	—	21.8 (20.28, 23.34)	2.50 (1.99, 3.06)	—	—
NHP	—	—	1.2[b] (0.78, 1.60)	—	—
Rx/OTC/NHP	—	—	—	3.1 (2.49, 3.72)	—
NONE	—	—	—	—	25.0 (23.29, 26.72)

Source: Ballantyne et al. (2005). Reproduced with permission of the publisher.
[a] Numbers in parentheses are the upper and lower confidence intervals for these estimates. Overlap between groups' intervals indicates non-significant difference in rate of use between those groups; non-overlapping intervals indicate significant differences (p = 0.05) between two groups.
[b] High sampling variability associated with these estimates.

non-prescribed medicines (OTCs and NHPs), and 16 per cent using only prescription medicines. About 59 per cent of respondents reported using any non-prescribed medicines (OTC/NHP alone or in combination with Rx medicines), including 25.5 per cent using only non-prescribed medicines (OTC/NHP) – that is, medicines available without a prescription. One quarter of the respondents reported using no medicines during the two days prior to their interview.

Multivariate Analysis

In the present study, we used SAS to conduct logistic regression analysis to model the factors associated with non-use of medications, use of non-prescribed medicines (OTCs and NHP) only, and use of prescription medicines (Rx) only, based on the data illustrated in Table 1. Data represent the estimated likelihood of being in a specific user group (non-users, OTC- and NHP-only users, or Rx-only users), contrasted with all respondents in the population (Ontario, aged 65+).

In the multivariate analyses, demographic variables include *sex* (male as reference category) and *age*. In addition to testing for a linear relationship, we also tested for a curvilinear relationship between age and drug use/non-use. However, the addition of dummy categories of age (ages 65–69, ages 70–74, ages 75–79 and ages 80+) failed to produce significant change in the overall model fit (indicated by the −2 log likelihood statistic) for any of the three regression models (data not shown). Therefore, we model a linear relationship between age and drug use/non-use in each multivariate model.

Social status variables include *marital status*, *education*, *family income*, and *dwelling-region*. For marital status, *married* is the reference category for three other marital categories: *ever-single*, *widowed*, *separated/divorced*. For education, *graduated with post-secondary education* is the reference category for four other education categories: *primary or less education*, *some secondary completed*, *graduated with secondary education*, *some post-secondary completed*.

Family income is reported as a continuous dollar income figure. As is usual with income data, non-reporting was evident; 31.5 per cent of respondents in this study did not provide income data. To address the potential limitation of a high proportion of missing data, we ran all regression models in two ways: (a) excluding cases with missing income data; and (b) imputing missing data. The latter technique was based on methods described in Rubin (1987). First, a predictive regression equation based on age, gender, education level, marital status, occupational status, and main source of household income was run to estimate missing family income data. Then a distribution of potential income values for each missing value was created. Finally, the mean of these values was used as the imputed value (multiple imputation). The exclusion of income-missing cases produced no differences in logistic regression models (in terms of the significance or direction of income or other predictor variables) as compared to the models with imputed income data. Thus, we include only the imputed income variable in the multivariate models.

Given the possibility that the relationship between income and drug use or non-use is non-linear, we tested the fit of income as a predictor of drug use, as both a linear (entering income as a continuous variable) and a curvilinear function (adding dummy categories of income representing approximately equal proportions of the elderly population: (CAN$17,999; $18,000 to $29,999; and $30,000+). In all regression models (predicting non-use, exclusive non-Rx use, and exclusive Rx use), the test for a non-linear fit for income was non-significant (there was no significant change in the overall model fit indicated by the -2 log likelihood statistic when the income categories were contrasted against the linear model). Therefore, in this paper, we illustrate the data showing a linear relationship between family income and drug use/non-use. In the NPHS, *area of residence* is derived from the enumeration area of a respondent's address. *Urban* is defined as a region with a population concentration of 1,000 or more and a density of 400 or more persons per km^2, based on the previous census; in our analysis, urban is the reference category, contrasted with *rural/small town region*) (Statistics Canada, 1995).

Health status variables include *self-reported health* (*poor health* is the reference category, contrasted with *fair/good* and *excellent health*), *number of visits with a medical doctor in last year* (*12+* is the reference category, contrasted with *0*, *1–2*, *3–6*, or *7–11* annual M.D. visits), and *use of home care over last year* (categories of *yes/no*, with *no* as the reference category).

Details of all predictor variables, their frequencies based on population estimates, and confidence intervals (means and standard deviations for continuous variables) are outlined in Table 2.

Results

Predictors of Non-use, Use of Non-prescribed Medicines Only, and Use of Prescription Medicines Only

In Table 3, we illustrate the multivariate logistic regression analyses modelling the relationship of

Table 2: Independent variables in logistic regression models—Frequencies (confidence intervals)

Age (mean)	72.87 (*sd* 83.53) (CI 72.63, 73.11)
Gender (% female)	56.76 (CI 55.59, 57.93)
Marital Status (%)	
Ever single	4.88% (CI: 4.14, 5.62)
Widowed	28.65 (CI: 27.01, 30.29)
Separated/Divorced	5.58 (CI: 4.81, 6.35)
Married	60.89 (CI: 59.12, 62.65)
Education	
Primary or less	24.51% (CI 22.89, 26.12)
Some secondary	17.92 (CI 16.54, 19.29)
Graduated secondary	20.48 (CI 18.94, 22.01)
Some post-secondary	14.15 (CI 12.91, 15.40)
Graduated post-secondary	22.95 (CI 21.38, 24.52)
Family Income (mean in '000s)	CAN$31.05 (*sd* 247.5) (CI 30.27, 31.83)
Residence (% urban dwelling)	88.09% (CI 87.07, 89.12)
Self-Reported Health (%)	
Excellent	44.72% (CI 42.82, 46.61)
Good	34.22 (CI 32.36, 36.07)
Poor	21.07 (CI 19.38, 22.76)
M.D. Visits (last year) (%)	
0	9.85% (CI 8.72, 10.99)
1–2	27.98 (CI 26.32, 29.64)
3–6	33.59 (CI 31.88, 35.31)
7–11	11.44 (CI 10.24, 12.65)
12+	17.13 (CI 15.64, 18.62)
Home Care Utilization	
% yes	8.74% (CI 7.84, 9.63)

demographic, social, and health-status variables to use of non-prescribed medicines only, use of prescribed medicines only, and non-use of any medicines.

Use of Non-prescribed Medicines

Being male, having completed post-secondary education, being previously married (separated/divorced/widowed), being in excellent or good/fair health, and having made fewer (0–11) annual M.D. visits in the previous year are associated with higher odds of reporting exclusive use of non-prescribed medicines than are being female, having an incomplete

secondary education, being married, being in poor health, or having made 12+ M.D. visits in the previous year. None of age, income, being single rather than married, having primary education or having completed secondary education rather than having completed post-secondary education, having an urban rather than a non-urban residence, or utilizing home care is associated with the exclusive use of non-prescribed medicines.

Use of Prescription Medicines Only

Seniors who completed post-secondary education and those who had 12 or more M.D. visits in the previous year have higher odds of reporting exclusive use of prescription medicines than those with secondary/incomplete post-secondary education or those reporting two or fewer M.D. visits in the previous year. There is no relationship between age, gender, marital status, income, residence, self-reported health, or home care utilization and likelihood of exclusive use of prescription medicines, and there are no differences between those reporting 3–11 and those reporting 12+ annual M.D. visits.

Non-use of Medicines

Being male, being single rather than married, being in good/fair or excellent health rather than poor health, having a higher educational level, and making fewer (0–6 vs. 12+) annual M.D. visits are all associated with higher odds of reporting non-use of medicines. Age is not a significant predictor of likelihood of non-use of medicines. There is no difference between being widowed, being separated/divorced, and being married on the odds of reporting non-use of medicines, and there is no association between income, urban/non-urban residence, or home care utilization and the likelihood of reporting non-use of medicines, in this model.

Discussion

The findings in this study need to be considered in light of several limitations. First, we offer only a snap shot of self-reported medicinal drug use by Ontario seniors, so that we cannot make assumptions about the use of medicines over time. Further, our findings are based on self-report data, and the capacity to verify the validity and reliability of the data is impeded because data collection was based on telephone interviews. However, Statistics Canada included design and implementation strategies intended to minimize non-response, assure reliable responses to the drug questions, and minimize non-sampling error, leaving us highly confident that the

Table 3: Logistic regression: Likelihood of taking *no medications*, *non-Rx medications only*, or *Rx medications only* (last two days)

	Likelihood of Taking No Meds (24%) *B* Odds Ratio (CI)	Likelihood of Taking Non-Rx Only (OTC/NHP) (25.5%) *B* Odds Ratio (CI)	Likelihood of Taking Rx Meds Only (16%) *B* Odds Ratio (CI)
Age	−0.009	0.007	−0.007
	0.991 (0.990, 0.992)	1.007 (1.006, 1.008)	0.993 (0.992, 0.994)
Gender (female)	−0.3713***	−0.166*	0.146
	0.690 (0.682, 0.698)	0.847 (0.838, 0.857)	1.157 (1.142, 1.173)
Marital Status			
Single vs. married	0.477**	0.010	−0.166
	1.611 (1.571, 1.652)	1.001 (0.976, 1.026)	0.847 (0.821, 0.873)
Widowed vs. married	−0.078	0.257**	−0.185
	0.837 (0.824, 0.849)	1.294 (1.277, 1.311)	0.831 (0.818, 0.845)
Separated/divorced vs. married	0.308	0.423**	−0.279
	1.361 (1.328, 1.349)	1.526 (1.493, 1.560)	0.757 (0.735, 0.779)
Education			
Primary vs. completed post-secondary	−0.271*	−0.090	−0.037
	0.762 (0.750, 0.776)	0.914 (0.899, 0.929)	0.963 (0.946, 0.981)
Some second vs. completed post-secondary	−0.164	−0.233*	0.063
	0.849 (0.835, 0.863)	0.792 (0.780, 0.805)	1.065 (1.046, 1.084)
Grad secondary vs. completed post-secondary	−0.729***	0.108	−0.344*
	0.482 (0.473, 0.492)	1.114 (1.095, 1.133)	0.709 (0.694, 0.725)
Some post-second vs. completed post-secondary	−0.755***	0.014	−0.293*
	0.470 (0.462, 0.478)	1.014 (0.999, 1.030)	0.746 (0.732, 0.760)
Income	−0.003	0.003	−0.003
	0.997 (0.997, 0.998)	1.003 (1.003, 1.004)	0.998 (0.997, 0.998)
Residence (small town/rural vs. urban)	0.0620	0.0872	−0.0897
	1.064 (1.046, 1.082)	1.091 (1.074, 1.109)	0.914 (0.897, 0.931)
Self-Reported Health			
Excellent vs. poor	0.839***	0.293**	0.055
	2.313 (2.271, 2.356)	1.340 (1.319, 1.361)	1.056 (1.038, 1.075)
Fair/good vs. poor	0.544***	0.289**	0.096
	1.722 (1.690, 1.755)	1.335 (1.315, 1.356)	1.101 (1.082, 1.120)
M.D. Visits			
0 vs. 12+	2.114***	0.677***	−1.688***
	8.279 (8.088, 8.475)	1.968 (1.926, 2.012)	0.185 (0.178, 0.192)
1–2 vs. 12+	1.278***	0.716***	−0.592***
	3.590 (3.518, 3.663)	2.046 (2.010, 2.082)	0.553 (0.542, 0.564)
3–6 vs. 12+	0.467**	0.304**	−0.062
	1.595 (1.563, 1.628)	1.355 (1.332, 1.379)	0.940 (0.923, 0.956)

(Continued)

Table 3: Continued

	Likelihood of Taking No Meds (24%) B Odds Ratio (CI)	Likelihood of Taking Non-Rx Only (OTC/NHP) (25.5%) B Odds Ratio (CI)	Likelihood of Taking Rx Meds Only (16%) B Odds Ratio (CI)
7–11 vs. 12+	−0.603**	0.296*	0.078
	0.547 (0.530, 0.901)	1.345 (1.317, 1.373)	1.081 (1.058, 1.104)
Home Care Utilization (yes)	−0.130	−0.043	−0.070
	0.878 (0.855, 0.901)	0.958 (0.939, 0.978)	0.933 (0.912, 0.954)
N	793366	793366	793366
Chi^2	117997.05***	18770.20***	21345.72***
Intercept	−1.2857**	−2.3666***	−0.6829

***significance $p \leq 0.0001$; **significance $p \leq 0.01$; *significance $p \leq 0.05$.

data reflect accurate estimates of two-day drug use prevalence among Ontario's elderly (see ''Methods'').

Among the elderly reporting use of medicinal drugs, we distinguish between those reporting exclusive use of non-prescribed medicines and those reporting exclusive use of prescription medicines. With respect to the first group, given that virtually all seniors living in Ontario in 1996/97 were insured for a wide range of formulary-listed prescription medicines[2] and assuming that the costs of non-prescribed products (purchased out-of-pocket) is potentially burdensome, the fact that about one quarter of Ontario elderly report exclusive use of non-prescribed medicines (primarily OTC use, but including NHPs) warrants further analysis. Similarly, that 16 per cent of elderly Ontarians reported exclusive use of prescription medicine, despite extensive marketing of, and easy access to, a great number of non-prescription medicines and despite there being many conditions amenable to self-medication in the elderly population, also warrants further consideration of this group.

The exclusive use of non-prescribed medicines (OTC/NHP) reflects the self-medication practices of Ontario's elderly (Amoako, Richardson-Campbell, & Kennedy-Malone, 2003; Hughes, McElnay, & Fleming, 2001) and, potentially, the substitution of informal for formal care (Greene, 1983). The significance of several predictors of exclusive non-prescribed drug use may be explained by this interpretation. For example, two groups shown to have a higher likelihood of exclusive non-prescribed drug use are also less likely to seek and use formal health care services: men (Parslow, Jorm, Christensen, Jacomb, & Rodgers, 2004; Green & Pope, 1999) and persons with higher educational levels (van der Meer & Mackenbach, 1998, 1999; Wiggers, Sanson-Fisher, & Halpin, 1995). Similarly, the

fact that previously married persons (widowed and divorced/separated) are more likely to report exclusive use of non-prescribed medicines than married persons may reflect their relative social isolation and lower general health help-seeking among the previously married (Joung, van der Meer, & Mackenbach, 1995; Prior & Hayes, 2003). Finally, the greater likelihood of exclusive use of non-prescribed medicines by those in better health – measured as higher self-rated health and fewer M.D. visits – likely reflects the self-care practices of healthier elderly persons, treating more minor health problems or symptoms.

That income is not associated with the likelihood of exclusive non-prescribed drug use is unexpected and is not consistent with other studies indicating an association between income (Stuart & Grana, 1998), insurance co-payments (Harten & Ballantyne, 2004; Lexchin & Grootendorst, 2004), and the use of *prescription* medicines. This finding could indicate that the costs of non-prescribed drugs are no more prohibitive for lower-income than for the higher-income elderly. Given the out-of-pocket purchase of non-prescribed medicines, this finding leads us to wonder whether lower- and higher-income elderly persons effectively ''subsidize'' provincial drug-benefit programs when they engage in self-care using non-prescribed medicines, in the same way that savings are realized in programs involving the generic substitution of patented prescription drugs (Fischer & Avorn, 2004; Grootendorst, Goldsmith, Hurley, O'Brien, & Dolovich, 1996). This is an important question, given the estimate reported in one (U.S.) study that the elderly consume 25 to 35 per cent of over-the-counter medicines (cited in Stephens & Johnson, 2000).[3] Potentially even more important than the cost burden of non-prescribed

medicines, however, is the potential for misuse and harm among those reporting exclusive use of non-prescribed medicines, given that these products are available without consultation with a health care professional (De Smet, Keller, Hansel, & Chandler, 1997; Fugh-Berman, 2000; Johnson & Drungle, 2000; Hughes et al., 2001). Further analysis of the health effects (benefits and harms) of exclusive use of non-prescribed medicines by the elderly is needed, particularly because this aspect of their health care utilization is relatively invisible within the health care system.

With respect to the second group of drug users examined in this study, the exclusive use of prescription medicines appears to be linked to (higher) frequency of interaction with a physician. Net of self-reported health and home care utilization, gender, age, marital status, income, and residence, the likelihood of reporting exclusive use of prescription medicines is greater for those who had 12+ than for those who had two or fewer annual visits with their M.D. We suggest that, particularly for those elderly who rely exclusively on physician recommendations for medicines, the responsibility of the prescribing physician for assuring the appropriateness of the medicines prescribed and for patient counselling around the use of prescriptions and non-prescribed medicines cannot be over-emphasized. This is a significant issue, given research suggesting that, while elderly persons may be suspicious about drugs, they value the doctors who prescribe them (Pound, Compertz, & Ebrahim, 1998; Lumme-Sandt & Virtanen, 2002) and that their acceptance of prescription medicines has been linked to their trust in the physician, even in the face of the severe side effects of some prescription drugs (Hervé, Mullet, & Sorum, 2004). Further research examining the nature and outcome of interactions between elderly patients and their physicians (and between elderly patients and pharmacists[4]) on the negotiation of prescription medicines is warranted.

Turning to the third group examined in the current study, despite the abundant literature indicating that the elderly are heavy users of medicines, fully one quarter reported using no medicines in the two days prior to being surveyed. There are several compelling explanations for this finding. First, while not consistent with current estimates of the rate of drug *prescribing* to the elderly,[5] the level of non-use is consistent with the rates of prescription drug "compliance" – reported to range between only 33 and 66 per cent (Vermeire, Hearnshaw, van Royen, & Denekens, 2001; Coambs et al., 1995; Morris & Schultz, 1992). This would suggest that the high rate of self-reported non-use reflects, in part,

non-compliance or non-use that is *against medical advice*. Another logical explanation is that non-use reflects health status and (lack of) need for medicines. For example, non-use is significantly more likely among persons who report being in excellent or good/fair health and for those who had fewer annual M.D. visits. The greater likelihood of non-use of medicines by the ever-single elderly is also consistent with other research reporting relatively better health status of ever-single persons (Gijsbers, Kolk, van den Bosch, & van den Hoogen, 1995; Wyke & Ford, 1992; Verbrugge, 1979) as compared to married and previously married persons and low health care utilization rates for ever-single persons (Joung et al., 1995). On the other hand, women – found in the current study to be less likely than men to report non-use of medicines – are consistently reported to be heavier users of all types of health care (Health Canada, 1999; Green & Pope, 1999).

Another explanation for non-use of medicinal drugs (or non-use of prescription medicines provided by a health care professional) is the possibility that non-use reflects unequal access to or use of health care and medicines that is differentiated by social, rather than health or medical status. For example, that elderly women are significantly less likely than elderly men to be non-users may indicate that elderly men are not receiving necessary medicines (or other health care).

Related to the above, non-use may be explained by the meaning given to drugs and to reliance on them and may reflect elderly persons' *negotiation* of medicinal drug use in the context of social and cultural norms and expectations. For example, normative rules and age norms of autonomy and control (Ballantyne et al., 2001) may lead to resistance to or avoidance of medicines by older persons (Carder, Vuckovic, & Green, 2003; Lumme-Sandt & Virtanen, 2002; Fuller et al., 2004), reflecting personal self- and body-perceptions (Scherman & Löwhagen, 2004), perceived well-being, the presence of symptoms (Al-Windi et al., 2000) and familiarity with them (Hurwitz, 1995), perceptions of personal sensitivity to the adverse effects of taking medications (Horne et al., 2004), and beliefs and attitudes about the condition being treated (Fuller et al., 2004; Scherman & Löwhagen, 2004).

The negotiation of medicinal drug use may be influenced by cultural values, beliefs, and commitment to traditional health care practices (Chung Pang, 1996; Kim et al., 2002; Lee et al., 2004); by the cultural "distance" between patient and health care provider (Kraut, 1990; Sung, 1999); or by an individual's ease in moving between "traditional" or "complementary" and conventional health care (Kim et al., 2002;

Ma, 1999; Pearl et al., 1995; Thorne, Paterson, Russell, & Schultz, 2002). The relationship between avoidance, substitution, or use of conventional health care and use/non-use of medicines by Ontario's elderly, on the one hand, and individual, social, and culture beliefs, perceptions, and practices, on the other, could not be pursued with the available data. Given the multicultural diversity of the elderly in Ontario[6] and Canadians' (and particularly Ontarians') growing inclination to use alternative medicine (Ramsay et al., 1999), this is a worthwhile area for future research.

Implications for Future Research

Four variables were not relevant to the prediction of medicinal drug use/non-use in this study: *age*, *income*, *residence*, and *home care utilization*. While a U.S. population study reports a negative relationship between age and self-medication using OTCs (Hanlon, Fillenbaum, Ruby, Gray, & Bohannon, 2001), in our data, no age effect on drug use/non-use was evident. The lack of an income effect on prescription drug use and non-use might seem encouraging, but given the importance and persistence of income as a determinant of health (and, therefore, of need for health care), the relationship of income and medicinal drug use should be re-examined in subsequent research on this topic. We are encouraged to note that there are no differences in likelihood of non-use or exclusive use of Rx or non-Rx medicines by urban/non-urban setting, given the potential problems of accessing physicians (and thus prescriptions from them) in many non-urban Ontario settings (Coyte, Catz, & Stricker, 1997). Home care utilization was not associated with use or non-use of medicines; thus, while it may substitute for institution-based health care, the potential effect of receiving or needing home care on use/non-use of medicines requires further consideration.

We submit that our findings have two central implications. First, given the variability and the opportunity for individual selection of the different types of medicines on the market (Rx, OTCs, and NHPs), there is a need to know more about elderly self-care and self-medication and the *habitus* of the elderly medicine user outside the health care setting where most drugs are consumed (Lumme-Sandt & Virtanen, 2002). Further, there is a need for research examining the short- and long-term health effects of seniors' selective use of medicinal drugs and the mediating role of the physician or pharmacist with respect to surveillance of, or counselling about, the use of non-prescription as well as prescription medicines by the elderly.

Second, given the extent of non-use of medicines in a population where chronic and long-term conditions are the norm; of use of non-prescribed medicines that are commonly purchased out-of-pocket; and of use of prescriptions that typically include small, out-of-pocket user charges[7] there is a need to better understand the influence of out-of-pocket costs of medicines as possible deterrents to use. That higher- and lower-income seniors are equally likely to be non-users of medicines may reflect a norm favouring autonomy and the avoidance of medicines rather than an economic factor. Or, it may be that higher- and lower-income seniors are equally disinclined to purchase (higher-cost) prescription drugs that are only partially covered by provincial drug insurance or not covered at all because of an assumption that, for many conditions, medicines are optional. Further, it would be interesting to consider whether elderly patients "subsidize" provincial drug benefit programs when they engage in self-care using non-prescribed medicines – or when they avoid, delay, or cease using medicines altogether. We are pursuing this question in ongoing work involving osteoarthritis patients' use of OTCs/NHPs and their reported non-use of medicines, examined against *best drug therapy practices*. Consideration of these cost-related issues could make an important contribution to discussions in health research of the value of drugs in the care of the elderly.

Notes

1   While, in our previous work, we distinguished between natural health products and non-prescription or over-the-counter medicines, in the multivariate analyses shown here, *non-prescribed medicines* includes all over-the-counter and natural health products – a group of drug products that are of interest because they are purchased out-of-pocket and do not require a prescription from an M.D. Further, the small proportion of seniors using natural health products prevented our inclusion of a single model predicting likelihood of exclusive use of natural health product (see Table 1).

2   New immigrants are entitled to Ontario Health Insurance and thus to Ontario Drug Benefit coverage after a 3-month waiting period.

3   We were unable to find an equivalent Canadian estimate.

4   Lumme-Sandt and Virtanen (2002) indicated that elderly people did not hold the same expectations of pharmacists as of physicians in the realm of medicine-use decision making. (Pharmacists were viewed by elderly people in this study in a dispensing role rather than in a counselling role.) There is need for further research on the nature and outcome of elderly patient–pharmacist relations, given our report on the use of non-prescribed as well as prescribed drugs by the

elderly and given the gate-keeping role of the community pharmacist.

5   For example, in a recent study, it was reported that approximately 90 per cent of Ontario elderly received prescription medications in each year from 1993 to 1997 (Mamdani, Parikh, Austin, & Upshur, 2000).

6   In Ontario in 2001, 19.5 per cent of the population (all ages) are of visible minority status, and Ontario is home to 54 per cent of visible minorities in Canada (Ontario Ministry of Finance, 2003).

7   For example, Ontario's Drug Benefit Plan, which insures all seniors (65+) for a formulary of prescription drugs, introduced a cost-sharing scheme in 1996 (Ontario College of Pharmacists, 1996; Hux & Fielding, 1997).

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