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Jeremiah Hurley
Taha Jamal
Michel Grignon
Sara Allin

RDC Research Paper No. 23

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Telephone: 905-525-9140 ext. 27967/27968 e-mail: rdc@mcmaster.ca

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The Relationship between Self-reported Unmet Need for Health Care and Health Care Utilization

Jeremiah Hurley+[1,2,3]
Taha Jamal[1]
Michel Grignon[1,3,4]
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+Corresponding author:

Department of Economics, KTH 430
McMaster University
1180 Main Street West
Hamilton, Ontario L8S 4M4
hurley@mcmaster.ca

[1]Department of Economics, McMaster University
[2]Department of Clinical Epidemiology and Biostatistics, McMaster University
[3]Centre for Health Economics and Policy Analysis, McMaster University
[4]Department of Health, Aging and Society, McMaster University
[5]School of Public Policy and Governance, University of Toronto
[6]Canadian Institute for Health Information

Executive Summary

Equity of access to care is a critical dimension of health system performance in Ontario. Population-based health surveys that include questions related to unmet health care needs offer a promising way to understand better the extent of access problems, the reasons for an unmet need, and the characteristics of those most likely to experience an unmet need. Understanding the relationship between utilization and unmet need is necessary to identifying both the policy challenges presented by unmet needs and the policy prescriptions required to address those unmet needs that result from poor system performance. Too much of the literature on unmet need proceeds as if the presence of an unmet need automatically signifies a failure of the health care system. But unmet need can arise for many reasons, only some of which are of policy concern.

This study builds on the work of Allin, Grignon, and Le Grand (2008) to investigate the relationship between self-reported unmet need and a variety of measures of health care utilization. It exploits a linked Ontario Canadian Community Health Survey-administrative data that includes individual-level information on self-reported unmet needs and a person's actual use of physician and hospital services, which permits a number of improvements over existing research. We measure utilization using the dollar value of services received, which: provides a more accurate measure of volume of care obtained (because it is not subject to recall error and because it adjusts for the nature of the services received); allows us to combine general practitioner, specialist physician services and hospital services to examine the relationship between unmet need and total service use; and allows us to study both inpatient services and day procedures, the latter of which constitute an increasing proportion of hospital utilization (CIHI 2007b).

Key findings include:

- Among those who report an unmet, about 40 percent cite personal factors (e.g., "too busy," "didn't get around to it," etc.) and about 60 percent system factors (e.g., "wait time too long," "service not available," etc.)

- Patterns of health care use differ notably between those with no unmet needs, those with unmet needs due to personal reasons and those with unmet needs due to system factors
    - Individuals who report an unmet need due to a system problem on average use more health care than expected given their observable health care needs and the provincial norm relationship between need and use. They are not only high users (which is not surprising); they are higher-than-expected users. And, other things equal, the difference between actual use and needs-predicted use is larger for an individual with an unmet need due to system problems than it is for an individual without an unmet need.
    - In contrast, those who report an unmet need due to personal reasons tends to either use the same or fewer services than expected given their observed need-related characteristics.
- The policy implications of unmet needs are quite distinct across these two sub-groups.
    - Unmet needs that arise for personal reasons require little policy response
    - Unmet needs that arise from system factors potentially require policy response, but even in these cases it is necessary to further identify the true cause of the self-reported unmet need. It may arise from poor system performance, but it may also arise from unreasonable patient expectations. Our evidence is consistent with a mixture of these reasons.

These preliminary results only partially tap the potential of linked survey-administrative data to generate policy-informing evidence relating to unmet health care needs. Planned work, for example, will exploit a number of additional strategies to more fully elucidate the nature and extent of the policy issues associated with self-reported unmet need. These strategies include condition-specific analyses based jointly on the self-reported chronic conditions and diagnostic information from the utilization data; and within subgroups of patient with a particular condition or who receive a particular procedure, types of case-control analysis that compares in more detail the patterns of use between those who report an unmet need (cases) and those who do not (controls).

1. Introduction

Equity of access to care is a critical dimension of health system performance in Ontario. Long wait times for selected specialist services and procedures, and a perceived shortage of general practitioners challenge the ability of the health care system to provide timely, equitable access to care and highlight the need to monitor access.

Population-based health surveys that include questions related to unmet health care needs offer a promising way to understand better the extent of access problems, the reasons for an unmet need, and the characteristics of those most likely to experience an unmet need. National health surveys administered by Statistics Canada — the National Population Health Survey and the Canadian Community Health Survey — have documented a growing prevalence in unmet health care needs in Canada (e.g., Sanmartin et al. 2002). Research has further documented the systematic relationship between unmet needs and a small set of observable individual characteristics (discussed in more detail below).

Less studied and more poorly understood, however, is the relationship between utilization of health care and the presence of an unmet need. Yet the relationship between utilization and unmet need is critical for understanding both the policy challenges presented by unmet needs and the policy prescriptions required to address those unmet needs that result from poor system performance. Much of the literature on unmet need proceeds as if the presence of an unmet need automatically signifies a failure of the health care system. But unmet need can arise for many reasons, only some of which are of policy concern. Some individuals, for instance, may have a poor understanding of what services are effective, be denied unnecessary care, and perceive an unmet need. Others may have a strong "taste" for health care, demand more care than the norm provided by the system to similarly situated individuals, and again perceive an unmet need when that demand is not fully satisfied (see Allin et al. 2008 for a fuller discussion of different types of unmet need). Policy concern, however, should focus

on those unmet needs that represent a person's inability to obtain an appropriate service in a timely manner.

This study builds on the work of Allin, Grignon, and Le Grand (2008) to investigate the relationship between self-reported unmet need and a variety of measures of health care utilization. Although it adopts a slightly different methodological approach to aspects of the analysis than does Allin et al. (2008), the most important difference is the measures of utilization employed. Allin et al. (2008) measured utilization using three self-reported variables: visits to a general practitioner, visits to specialist physicians and inpatient nights in hospital. We exploit a linked Ontario CCHS-administrative data file that includes individual-level information on the actual use of physician and hospital services. This permits a number of improvements in how utilization is measured: we measure utilization using the dollar value of services received, which: provides a more accurate measure of volume of care obtained (because it is not subject to recall error and because it adjusts for the nature of the services received); allows us to combine general practitioner, specialist physician services and hospital services to examine the relationship between unmet need and total service use; and allows us to study both inpatient services and day procedures, the latter of which constitute an increasing proportion of hospital utilization (Canadian Institute for Health Information 2004; Canadian Institute for Health Information 2007b).

We report preliminary results based on initial analyses. The analyses will be refined and extended as we investigate these issues in more depth.

2. Unmet Need: A Brief Review of What We Know

We provide a very brief overview of previous research on unmet needs for health care. Allin *et al.* (2008) provide a more extensive review of this literature.

Most studies of unmet need for health care investigate the characteristics of individuals and the health care system correlated with unmet needs. Much of this research emanates from the United

States, for which, given their system of financing, there is particular policy concern regarding the relationship between income and unmet need, insurance status and unmet need, and the cost of services and unmet need. The research documents a strong, unequivocal gradient in the United States between income or insurance status and unmet needs (Allin et al. 2008).

The patterns in the US differ notably from countries, including Canada, with universal systems of coverage. Studies of the prevalence of unmet needs even in systems with universal coverage display a large range of estimates, from 1% in Denmark to 13% in Sweden (Koolman 2007, cited in Allin et al. 2008). Studies from Canada document a growing prevalence of self-reported unmet needs especially beginning in the late 1990s (Sanmartin et al. 2002). Prevalence rates in recent years have been estimated at approximately 13-15%, with estimates as high as 18-19% in parts of Quebec (Levesque et al. 2008). The individual characteristics commonly associated with reporting an unmet need in Canada include being female, being younger, being in poor health status, being a native-born Canadian (though evidence on this is mixed; some find higher rates among immigrants), and, somewhat surprisingly, having relatively high education (Allin et al. 2008; Levesque et al. 2008).

Very few studies have examined the relationship between reporting an unmet need and health care utilization, and those that do tend to focus on the use of a single type of service such as the emergency room (Zuckerman and Shen 2004, in a US-based study) or mental health care services (Nelson and Park 2006, in a Canadian study), or rely on measures of the probability of reporting a visit to a general practitioner or specialist in the past year (Chen and Hou 2002; Kasman and Badley 2004).[1] The most detailed study to date is Allin et al. (2008), which used the 2005 Canadian Community Health Survey to examine the relationship between self-reported unmet needs and unexplained utilization, as well as the impact of unmet needs on estimated income-related inequity in the utilization of health care in Canada. The study disaggregated unmet needs into those due to system barriers, wait times, personal choice and "other." Utilization was measured as self-reported visits to general practitioners, self-

[1] Kasman and Badley (2004) measure the probability of reporting three or more GP visits.

reported visits to specialists, and self-reported inpatient nights. The study found that the relationship between unmet needs and utilization varied among the different reasons for having an unmet need and with the specific measure of utilization analysed.

The present study builds explicitly on Allin et al. (2008) to provide insight into the relationship between unmet needs and utilization.

3. Methodology and Data

3.1 Methodology

We seek to understand more fully the relationship between the presence of an unmet need and the use of health care services. As we describe below, the data for our analysis includes individual-level information on a person's demographic, health and socio-economic characteristics; use of health care; and whether the individual reported an unmet health care need in the twelve months prior to being interviewed. Given these individual-level data, the analysis proceeds in three basic steps.

a. estimate a full model of health care utilization for each of the services being analysed, including both need-related (e.g., age, sex, self-assessed health status, chronic conditions) and non-need-related variables (e.g., income, immigrant status, employment status)
b. obtain the needs-predicted levels of utilization and the associated needs-predicted residuals between actual use of care and needs-predicted care, where variation across individuals in needs-predicted care arises only from variation in values of the needs-related variables in the model
c. analyse the relationship between survey-based, self-reported unmet needs and the difference between actual and need-predicted use.

3.1.1 Analyzing the Determinants of Utilization

The first step is to estimate, for each type of service analysed, a model of health care utilization. The goal of this step is to obtain unbiased estimates of the effects of the co-variates on utilization and to

obtain unbiased predictions of a person's utilization given their observed characteristics. Doing this presents a challenge because health care utilization data exhibit two features that can bias results unless the relationship is modeled carefully: a large proportion of observations are zero (i.e., a person does not use any of the service) and a high degree of right skewness. We address the problem of a high proportion of zeroes by estimating a two-part utilization model that estimates separate equations for the decision to seek care (Part 1) and the amount of care used conditional on being a user (Part 2) (Jones 2000). We address the problem of skewness by assessing which of a family of models that can accommodate skewed data best fit our utilization data (following procedures to identify the best model – see (Basu and Rathouz 2005; Buntin and Zaslavsky 2004; Manning and Mullahy 2001; Manning 1998; Manning et al. 2005)).

The general utilization model can be written as follows:

$$U_i = G(\alpha + X_i\beta + Z_i\gamma; \varepsilon_i) \qquad (1)$$

where U_i is a measure of the utilization of health care by individual i, X_i is a vector of need-related characteristics of individual i, Z_i is a vector of non-need-related characteristics of individual i, ε_i is a random error term, and α, β, and γ are parameters to be estimated. It is essential that the model include both need and non-need-related variables to obtain unbiased estimates of the parameters.

For part 1 of the model, U_i is a dichotomous variable taking on the value of 1 if an individual used a positive amount of the service in question. The model is estimated using a probit regression. Part 2 of the model is estimated on only the subset of individuals who used at least one service, and U_i is measures as the dollar value of the services used conditional on being a user. As noted, the specific estimator used to estimate part 2 depends on the exact properties of the data (e.g., the degree of skewness, extent of kurtosis, etc.). For each individual, the product of the probability of any use (part 1) and the amount of use conditional on being a user (part 2) provides an estimate of the total expected utilization of the service in question:

$$\text{Expected Total Expenditures} = \text{Prob}(\text{Use} = 1)\bullet(\text{Expenditures}|\text{Use} > 0) \qquad (2)$$

3.1.2 Obtaining Needs-predicted Use and Need-standardized residuals

The second step in the analysis is to calculate each individual's needs-predicted utilization: the amount of utilization a person would be predicted to have if utilization was driven only by need-related factors. This prediction is based on the coefficients estimated from the utilization model described above. To obtain needs-related predictions we plug in individual-specific values of the need-related variables (X_i) but substitute the sample mean values for the non-need-related variables ($\overline{Z}$).

$$\text{Need-predicted Use}_i = \hat{U}_{N,i} = \hat{\alpha} + \hat{\beta}X_i + \hat{\gamma}\overline{Z} \qquad (3)$$

This ensures that variation across individuals in predicted values arises only from variation in needs. The predictions are obtained for each of the probability of any utilization, the amount of utilization conditional on being a user, and the total expected utilization. The resulting predictions can be interpreted as the person's expected utilization given their need characteristics and the provincial norm for the relationship between need and use.

The needs-predicted residual is then calculated as actual use minus needs-predicted use:

$$\text{Needs-predicted Residual}_i = R_{N,i} = (U_i - \hat{U}_{N,i})^2$$

Again, for each type of service, three needs-predicted residuals are calculated, one for each of the probability of use, the conditional amount of use, and the total expected utilization. The needs-predicted residual allows us to examine the relationship between unmet needs and the difference between actual use and needs-predicted use.

3.1.3 Analyzing the Relationship Between the Unmet Need and the Difference Between Actual Use and Needs-predicted Use

The third step includes two types of analyses regarding the relationship between unmet needs and the needs-predicted residuals. The first analysis regresses the needs-predicted residual on variables representing unmet needs plus other non-need variables from the utilization model:

[2] These residual contain exactly the same information as the measure of indirectly standardized utilization employed in the concentration-index approach to estimating horizontal equity in health care utilization (O'Donnell et al. 2008).

$$R_{N,i} = a + b \bullet Unmet_i + c \bullet Z_i + e_i$$

where "$Unmet_i$" indicates whether an individual reported an unmet need in the survey, Z_i is non-need variables as before, e_i is an error term and a, b and c are parameters to be estimated. The parameter b reflects the impact that having an unmet need has on the difference between actual and needs-predicted utilization. It indicates whether, *after controlling for need*, actual utilization for those with an unmet need is higher or lower than an identical person who does not report an unmet need. A positive value indicates that, other things equal, those with unmet needs have a larger residual than those without an unmet need, i.e., if the residual is positive, actual use for a person with an unmet need exceeds that for a person without an unmet need; if the residual is negative, actual use is closer to needs-predicted use for those with an unmet need than it is for those without an unmet need.

The second analysis follows Allin et al. (2008) by examining the relationship between unmet need and the sign of the residual. This tells us whether, on average, those with an unmet need use more or less than would be predicted on the basis of their needs. This is done using a logistic regression where the dependent variable takes on a value of 1 if the residual is positive and a value of 0 if it is non-positive.

3.2 Data

The data for the study are drawn from a dataset that links individual-level information from the Ontario Component of the Canadian Community Health Survey (CCHS) Masterfile, cycle 1.1, and data from the Ontario Ministry of Health and Long-term Care regarding the utilization of physician and hospital services. The CCHS is a cross-sectional survey of Canadians 12 years and older who reside in a private dwelling (approximately 98% of the Canadian population) (Statistics Canada 2003). The survey collects information on respondents' health status, health determinants, and demographic and socioeconomic characteristics. Survey interviews were administered between September 2000 and August 2001. The linked administrative-CCHS 1.1 sample for the province of Ontario contains 32,848

respondents; 3122 observations were dropped because of incomplete records, leaving an analysis sample of 29726.[3]

Utilization data from the Ontario Ministry of Health and Long-term Care pertains to publicly funded physician and hospital services. Such services constitute over 98% of all physician services provided in the province and approximately 95% of all hospital services (Canadian Institute for Health Information 2007a). All utilization data pertain to the 12-month period prior to the survey interview. The information on physician services are drawn from the claims files of the Ontario Health Insurance Plan and include the number of times each service was received, the dollar value of the payments to the providing physician, and the specialty of the providing physician. The information on hospital utilization was drawn from the Canadian Institute for Health Information Discharge Abstract Database (DAD) and includes all inpatient and day procedures received by survey respondents. The hospital data include detailed information on the services provided, patient diagnoses, and related matters. However, it does not include the cost of individual services as hospitals are funded by global budgets. We assigned costs to each hospitalization using standard methods for Canadian data based on a case-mix classification system and information on costs per case-mix adjusted case. All hospitalizations in Canada are classified using a grouper system called Case-Mix Groups (CMG). Each CMG has associated with it a resource-intensity weight (RIW) (day-procedure weight for day procedures), which reflects the relative cost of treating a patient in that CMG (day procedure). The average cost of treating a patient in a given CMG is simply the product of the CMG's resource-intensity weight and a province's mean cost per weighted case. Mean cost-per-weighted-case was obtained from Ontario's hospital funding body regarding the number of weighted cases and actual costs per weighted case by hospital (Joint Policy and Planning Committee 2000). Hospitalizations in all years were calibrated to the 1998 average cost information.

[3]2789 observations were dropped because they included no information on income; 133 were dropped because of missing information on education. The remaining 200 were dropped due to missing data for a variety of other covariates. The missing data are not random: they come disproportionately from elderly women.

3.2.1 Dependent Variables

The utilization analysis includes ten dependent variables — two utilization measures for each of five types of health care. The two measures of utilization are as follows: (1) a dichotomous variable taking on the value of 1 if the individual received at least one unit of the service in question in the twelve months prior to the survey interview; and (2) the dollar value of services received during the same twelve-month period among those who used at least one service. The five services analysed are:

- General practitioner physician services
- Specialist physician services
- Total physician services
- Hospital services
- Total physician and hospital services

The analysis of needs-predicted residuals and unmet need specified two dependent variables. The first is the dollar value of the difference between the actual utilization (measured as above) and needs-predicted utilization (i.e., actual – needs-predicted). The second is a dichotomous variable that takes on the value of 1 if the needs-predicted residual is positive and a value of 0 if it is zero or negative.

3.2.2 Independent variables

The primary independent variables of interest are those pertaining to self-reported unmet need. The CCHS asks the following two questions regarding unmet need:

> *During the past 12 months, was there ever a time when you felt that you needed health care but didn't receive it?* (Yes, No, Do not know, refuse)

Directly after this, they asked:

> *Thinking of the most recent time, why didn't you get care?*

Respondents were then presented with a list of 13 possible reasons and also allowed to specify a reason not listed. They were allowed to cite more than one reason.

Using responses to these two questions, we created two dichotomous measures of self-reported unmet need: the presence of an unmet need due to personal reasons — factors for which the individual might reasonably be held responsible — and the presence of an unmet need due to system factors — factors beyond the control of the individual that would reasonably be interpreted as a failure of the health care system. Table 1 presents our classification of reasons into personal and system factors. The classification of many of them, such as "lack of availability", "cost", or "too busy" is uncontroversial; the classification of others, such as "felt it would be inadequate" or "didn't know where to go," is more debatable – if they didn't know where to get the service is that a personal reason (most people can learn such information through a basic inquiry) or a system problem (the system should make sure everyone know where services are available)?[4]

Other independent variables included in the analysis are those commonly found in studies of utilization: health status indicators (self-assess health status, activity limitations, self-assessed stress, chronic conditions, disability status, injury status, and a measure of the impact of health problem on everyday activities), health-related behaviours (smoking , drinking), demographic characteristics (age, sex, marital status, immigrant status, ethnicity), socio-economic characteristics (equivalized household income, education), and geographic measures (5-category urban/rural variable, regional dummy variables). Table 2 identifies which are classified as need-related (basically age, sex and health status measures) and which are classified as non-need.

4. Results

4.1 Descriptive Statistics

Table 2 presents descriptive statistics for all variables used in the analysis, aggregated for the full sample and then separately for those who report no unmet need and those who report an unmet need.

[4] Only nine respondents listed "Other", so these were dropped. Allin et al. (2008) present a four-part classification scheme.

The discussion below focuses on the differences between those who report do and those who do not report an unmet need.

4.1.1 Unmet Need and Health Care Utilization

As expected, those who report an unmet need use more services than those who do not. The largest relative difference arises for specialist services, for which those who report an unmet need utilize 63% more services than do those who do not report an unmet need. The smallest relative difference arises for hospital use conditional on being hospitalized, for which those who report an unmet need use only 8% more services than those who do not report an unmet need. Overall, those who report an unmet need use over 50% more services than do those who do not report an unmet need. Lastly, those who report an unmet need for system reasons use substantially more services than those who report an unmet need for personal reasons: over 40% more specialists services and over 20% more services overall.

Table 3 displays the gradient between level of utilization and the prevalence of unmet needs. Consistent with the descriptive results already noted, the prevalence of unmet needs increases with use for each of the services examined. Furthermore, the gradient is considerably steeper for unmet needs due to system reasons than for unmet needs due personal reasons.

4.1.2 Unmet Need and Demographic, Health and Socio-economic Characteristics

Reporting an unmet need is systematically related to a number of personal and health-related characteristics (Table 2). Middle-aged females have the highest rates of unmet needs: the proportions of females aged 18-34, 35-44 and 45-64 reporting an unmet need are 54%, 28% and 31% higher than would be the case if they arose at the same rate as in the general population. The proportion of individuals reporting an unmet need is negatively related to health status for every one of the health status measures: self-assessed health status, heath problems, activity limitations, self-reported stress, chronic conditions, injury status, and disability days. All of this is precisely as one would expect.

The relationship of unmet needs to demographic and socio-economic characteristics is more varied. Perhaps surprisingly, unmet need bears no relationship to income. Those with less education are less likely to report an unmet need, while those with some post-secondary education are most likely. Those who are unemployed are more likely and those who are retired are less likely; immigrants are less likely to report an unmet need than are native-born Canadians; formerly married are more likely than currently married or never married; aboriginal are particularly more likely to report an unmet need than are other Canadians; there is a gradient whereby reporting an unmet need is positively related to smoking status and to drinking status. There is no strong urban/rural geographic pattern to self-reported unmet needs, but the rate of reporting varies substantially across health regions in Ontario, with the highest rate occurring in Windsor-Essex (70% above expected) and the lowest in Elgin-St. Thomas (only 52% of expected).

Table 4 presents the results of a multinomial logit analyzing the correlates of having an unmet need due to personal reasons and an unmet need due to system factors. They results largely confirm the univariate descriptive statistics discussed above. With the exception of males 18-34, who are more likely to report an unmet need due to a personal reason than are males aged 12-17, none of the odds ratios for males are significant. We see the strong correlation between being female and reporting an unmet need, the strong relationship with health status, and he generally weak relationship with other demographic and socio-economic characteristics, with the exception of education and occupational status. As we will discuss in greater detail below, there do not appear to be many characteristics that strongly distinguish those who report an unmet need due to personal reasons from those who report one due to system reasons.

4.1.3 Reasons for an Unmet Need

Tables 5 and 6 present the distributions of stated reasons for an unmet need. Respondents were allowed to provide more than one reason. Approximately 84% of those reporting an unmet need cited only one reason; the most common reason was that the wait was too long; this was followed by their

judgment that the service would in inadequate (no explanation of this is provided), the service was not available when required, they were too busy or didn't get around to it, cost, unavailability of the service in the area, simply decided not to seek the care, dislikes or were afraid of doctors, and didn't know where to go. 12% of the sample cited two reasons, 3% three reasons, and a small proportion cited more than 3 reasons.

Based on our classification, about 40% of people with an unmet need experienced it for personal reasons, about 60% for system inadequacies.

Finally, we examined the type of service for which a need was not met (Table 7). It is difficult to learn much without knowing the underlying rates of need for the different types of services, but the one notable pattern is the comparatively higher rate of unmet needs for a mental health services due to personal reasons — 63% of those reporting an unmet need for a mental health service is for personal reasons, versus 48%, 50%, 52% and 42% of unmet needs for services to treat a physical health problem, regular check up, injury and other.

4.2 Multivariate Results

4.2.1 Unmet Need and Utilization of Health Care Services

Table 8 presents a summary of the results from the multivariate regression models for general practitioner services, specialist services, total physician services, hospital services and total expenditures on physician and hospital services. The full results (not reported) are consistent with conventional findings regarding utilization of these services: an age-sex gradient in which females on average use more health care than men and distinct age-patterns for the two sexes, with females displaying an inverted U-shape over the life-cycle; strong health status gradients; and a mixture of effects among socio-economic and other demographic characteristics, with a positive income gradient for use of specialist services.

The relationship between unmet need and use of services displays distinct patterns for unmet needs due to personal reasons and unmet needs due to system factors. For each type of service, the probability of having any use is negatively associated with an unmet need arising from personal reasons, though the relationship is statistically significant only for specialist services, physician services in total and total health care costs. Individuals with an unmet need for personal reasons, for example, are predicted to have a 7% lower probability of using a specialist service than is an individual without an unmet need. In contrast, for each type of service, the probability of having any use is positively associated with having an unmet need due to system factors, and this effect is statistically significant for general practitioner services, specialist services and hospital services. Those with an unmet need arising from system problems, for example, are predicted to have 3% higher probability of seeing a general practitioner, a 6% higher probability of seeing a specialist, and a 2% higher probability of having an inpatient hospitalization.

The relationships between unmet needs and the conditional use of services are less strong than for the probability of use. For all services, having an unmet need for personal reasons is predicted to have no impact on the quantity of use among users. Having an unmet need due to system factors is statistically significant for specialist services, total physician services and total physician and hospital costs. The magnitudes of the effects are substantial. The mean conditional dollar value of services of a person with no unmet need is $377 (see Table 2); those who report an unmet need due to a system factor have, on average, costs that are $81 (21.5%) higher; for total physician services the corresponding figures are $95 (20.6%); and for total expected costs they are $110 (12%).

4.2.2 The Relationship Between Unmet Needs and the Difference Between Actual Use and Needs-predicted use

Table 9 presents a summary of the results of the analyses of the relationship between the residual between actual use and needs-predicted use and the presence of an unmet need. The table presents two types of analyses for each service: an analysis of the relationship between unmet need and the dollar

value of the residual (measured on a continuous scale) and an analysis between unmet need and the sign of the residual. For each analysis, we again observe different patterns of results for those who experience an unmet need for personal reasons and those who experience an unmet need because of system failures.

Consider first the estimated relationships for the probability of using a general practitioner. The point estimate of -0.020 means that the needs-predicted residual — the difference between whether a individual actually used any general practitioner service and the predicted probability that they would given their measured health care needs — is on average 0.02 smaller (less positive or more negative) for a person with an unmet need due personal reasons that the residual is for someone who does not report an unmet need, though this difference is not statistically different from zero. The second set of estimates indicates that the odds that this residual is positive (implying that a person with such unmet needs uses more care then predicted based on their measured health care needs) for a person with such an unmet need are 17% higher than are the odds for a person without an unmet need, though again the estimate is not statistically significant. Overall therefore, there is no systematic relationship between a person's needs-based residual for the probability of using a general practitioner service and the presence of an unmet need due to personal reasons.

The pattern differs for those with unmet needs due to system failures. The needs-based residuals are predicted to be 0.03 larger for an individual with such an unmet need and the odds that the residual is positive rather than negative is just over twice the odds (2.002) for a person without unmet needs. Hence, those with unmet needs due to system factors are, on average, more likely to use a general practitioner than the provincial norm for someone with their measured health care needs.

Both of these residual analyses point to different patterns of results between those with unmet needs due to personal reasons and those with unmet needs due to system reasons. The impact on the needs-predicted residuals of having an unmet need due to personal reasons is smaller in magnitude than the corresponding estimates for unmet need due to system factors; they are in general negative and,

with the exception of the probability of seeing a specialist or using any physician service, not statistically significant. Furthermore, such unmet needs are only weakly related to actual use being systematically above or below the needs-predicted level. The exception to this is the total value of services used, for which the actual use of those with an unmet need due to personal reasons is less likely to exceed the needs-predicted value than is the case for those without an unmet need. For example, the odds that actual use exceeds needs-predicted use for a person with unmet needs due to personal reasons are only 82% as high as they are for a person without an unmet need.

The residuals for those with unmet needs due to system factors are in general larger than the corresponding residuals for those without an unmet need and they are systematically more likely to be positive, indicating that actual use exceeds that predicted based on the individual's observed needs. This is particularly notable for specialist services: the difference between the actual and the needs-based predicted probability of use is 0.046; the difference in the value of services used by those seeing a specialist is $168; and in combination, this leads to a difference of $143, implying that, on average, the difference between actual use and needs-predicted use is $143 larger for a person with an unmet need due system factors than it is for a person with no self-reported unmet need. Similarly, the odds that the residual is positive, implying that they are using more services than expected given their health care needs, is higher (2.07, 1.35 and 1.58) for individuals with such an unmet need than it is for those without an unmet need.

5 Discussion

This research reveals two very distinct relationships between utilization and self-reported unmet needs: that between utilization and unmet needs due to system factors and that between utilization and unmet needs due to personal reasons. Individuals who report an unmet need due to a system problem on average use more health care than expected given their observable health care needs and the provincial norm relationship between need and use. That is, not only are they high users (which is not surprising),

they are higher-than-expected users. And, other things equal, the difference between actual use and needs-predicted use is larger for an individual with an unmet need due to system problems than it is for an individual without an unmet need.

In contrast, a person who reports an unmet need due to personal reasons tends to either use the same or fewer services than expected given their observed need-related characteristics. This is consistent with Allin et al. (2008) who found that people who report an unmet need due to waiting times (which is the predominant reason for a system-related unmet need) also report more physician visits than would be expected on the basis their observable characteristics, and those with unmet need for personal reasons report fewer visits than expected.

The obvious question is why these patterns arise. Given the personal reasons cited by respondents, which indicate that such individuals either does not like obtaining health care (e.g., fear of doctor), put a low priority on obtaining care (e.g., too busy, didn't get around to it) or face a personal barrier (e.g. transportation problem; family responsibilities), other things equal one would expect such individuals to be relatively low users of health care. Although we cannot rule out some deeper system problems in some cases (maybe they don't get around to it because the service is not offered at a convenient time and location), taken at face value such self-reported unmet needs (which constitute close to half of all self-reported unmet needs) do not represent a serious policy problem.

The situation is potentially quite different for unmet needs due to system factors, but even in these cases further work is required to identify the full policy implications. The relationship we document between self-reported system-related unmet needs, actual utilization and needs-predicted utilization may arise from at least three different phenomena. First, the deviation between actual use and needs-predicted use may arise from a measurement problem: such individuals may have legitimate, unmeasured needs not being captured by our needs-adjustment, their "above-expected" use is appropriate, and the system is still failing to respond fully to their needs. This is a true system problem of policy concern. Second, the higher-than-expected use may actually result from an unmet

need. An individual waiting for a specialist visit or procedure must be monitored through regular visits and in some cases, continued testing for certain underlying disease processes. Their higher-than-expected use arises during this wait period and is caused by the wait: if they received the service in a timely manner, their utilization profile would not differ from others with their same needs. If this use arises while waiting for a specialist appointment, the extra monitoring is normally done by their family physician; if it arises while waiting for a specialized procedure recommended by a specialist, the extra monitoring would often be done by the specialist. We observe this relationship for both of these types of services. Lastly, individuals with unmet needs due to system factors may have higher-than-average tastes for care (or expectations of what the system should provide) given their needs, and the system is appropriately denying them care beyond that which is normally provided to individuals with their needs. Of course, it is unlikely that any one of these explanations accounts for what we observe; rather what we observe is likely a mixture of all three.

Distinguishing these hypothesized explanations is critical for policy, very difficult, and not fully possible with the data available. The evidence we have does point to a mixture of reasons. The primary reason for a system-related unmet need is too long of a wait time; the second most common is the unavailability of the needed service. Both of these are consistent with the first two explanations that point to a true system problem.[5] The fact that being more educated is a risk factor for reporting a system-related unmet need points to the possibility of the third explanation. To the extent that education is correlated with unmeasured aspects of need, those with higher education have lower needs and consequently report fewer unmet needs. But higher education is also associated with a preference for investing in oneself, and attitude that would also influence the desired level of health care consumption. Those who are more highly educated may also be more effective in expressing this demand within a complex, supply-constrained system. But to the extent that the system pushes back

[5] Even here a caveat is in order: citing "unavailability of a service" may simply reflect that the person's condition is not treatable with current medical practice (Kasman and Badley 2004).

against what it judges unreasonable demand given the normal standards of care, the individual will experience a self-perceived unmet need.

It would be useful for policy purposes to distinguish, based on observable characteristics, those whose unmet needs are more likely to be due to personal factors from those for which the unmet needs are more likely to be due to system factors. Unfortunately, this does not appear to be simple. A logistic regression on the sub-sample that reported an unmet need shows that few characteristics distinguish the two groups (Table 10). Compared to those who report an unmet need due to personal reasons, those who report unmet needs due to system factors tend to be in poorer health (but the relationship is not strong); tend to have higher education; and are less likely to be a student or retired; and (somewhat surprisingly) are less likely to live in a rural area outside a census metropolitan area.

Self-reported unmet need is an easily and inexpensively collected indicator of system access and performance. The premise of this research, however, is that too much policy discussion proceeds on the *prima facie* assumption that all self-reported unmet need constitutes a policy problem. We argue instead that a greater understanding of the relationship between reporting an unmet health need and health care utilization is required to make useful policy inferences. These preliminary analyses have only partially tapped the potential of linked survey-administrative data to provide policy-relevant insight into self-reported unmet health care needs. The data permit a number of additional strategies that can help elucidate the nature and extent of the policy issues associated with self-reported unmet need. Condition-specific analyses based jointly on the self-reported chronic conditions and diagnostic information from the utilization data might be particularly useful in this respect. Within subgroups of patient with a particular condition, or who receive a particular procedure, one could do a type of case-control analysis that compares in more detail the patterns of use between those who report an unmet need (cases) and those who do not (controls). On a longer time horizon, collection of additional information in the survey on attitudes regarding health and health care consumption, linked to the administrative data, would allow us to distinguish relevant sub-groups.

Table 1: Classification of Reasons for Unmet Need

Personal Reason	System-related Reason
• Too busy • Didn't get around to it • Didn't know where to go • Transportation problems • Personal/family responsibilities • Dislikes doctors/afraid • Decided not to seek care • Felt it would be inadequate	• Not available in area • Not available when required (e.g., doctor on holiday, inconvenient hours) • Wait time too long • Cost • Language problems

Table 2. Variable Means by total sample and unmet need sub-samples

	Total	No unmet needs	Unmet needs	Unmet/ No Unmet	Unmet needs (personal)	Unmet needs (system)	System/ Personal
		(a)	(b)	(b)/(a)	(c)	(d)	(d)/(c)
N	29753	25917	3836		1881	2285	
Utilization ($)							
GP costs	151	146	193	1.320	176	212	1.203
GP costs (conditional)	188	183	227	1.240	215	240	1.118
Specialist costs	261	242	394	1.628	353	498	1.410
Specialist costs (conditional)	399	377	544	1.444	530	637	1.202
Physician costs	412	388	587	1.513	529	710	1.341
Physician costs (conditional)	486	461	664	1.443	618	778	1.258
Hospital costs	412	386	599	1.551	572	719	1.258
Hospital costs (conditional)	3182	3141	3388	1.078	3655	3518	0.963
Total costs	824	774	1186	1.532	1101	1429	1.298
Total costs (conditional)	971	918	1341	1.461	1286	1564	1.216
Need variables							
m12-17	0.044	0.047	0.018	0.378	0.025	0.014	0.551
m18-34	0.138	0.137	0.146	1.067	0.177	0.113	0.641
m35-44	0.110	0.112	0.095	0.846	0.096	0.088	0.918
m45-54	0.088	0.089	0.081	0.907	0.073	0.089	1.217
m55-64	0.052	0.054	0.036	0.671	0.022	0.048	2.194
m65plus	0.057	0.060	0.033	0.553	0.031	0.036	1.168
f12-17	0.043	0.044	0.033	0.748	0.042	0.023	0.561
f18-34	0.138	0.130	0.199	1.535	0.202	0.198	0.981
f35-44	0.112	0.108	0.139	1.284	0.124	0.152	1.224
f45-54	0.089	0.085	0.112	1.314	0.112	0.111	0.989
f55-64	0.052	0.053	0.046	0.870	0.037	0.056	1.522
f65plus	0.070	0.072	0.057	0.793	0.055	0.068	1.228
Excellent SAH	0.270	0.287	0.147	0.511	0.154	0.130	0.847
Very good SAH	0.370	0.375	0.336	0.896	0.327	0.333	1.018
Good SAH	0.241	0.234	0.293	1.250	0.305	0.283	0.928
Fair SAH	0.083	0.076	0.136	1.793	0.131	0.152	1.161
Poor SAH	0.036	0.029	0.089	3.102	0.083	0.102	1.223
Health problem Impact - sometimes	0.136	0.123	0.227	1.844	0.221	0.236	1.068
Health problem Impact - often	0.101	0.085	0.218	2.567	0.223	0.236	1.056
Health problem Impact - never	0.763	0.792	0.555	0.701	0.556	0.528	0.951
Activity limitations - sometimes	0.153	0.143	0.222	1.550	0.218	0.220	1.011
Activity limitations - often	0.108	0.094	0.208	2.205	0.200	0.237	1.185
Activity limitations - never	0.739	0.762	0.570	0.747	0.583	0.543	0.932
Extremely stressed	0.044	0.036	0.103	2.873	0.096	0.110	1.151
Quite stressed	0.191	0.176	0.295	1.675	0.316	0.274	0.868
A bit stressed	0.384	0.389	0.345	0.888	0.328	0.359	1.095
Not very stressed	0.200	0.207	0.151	0.731	0.138	0.160	1.160

Not stressed	0.182	0.192	0.105	0.548	0.122	0.096	0.788
Chronic conditions - 1	0.267	0.269	0.251	0.933	0.252	0.247	0.982
Chronic conditions - 2 or 3	0.269	0.260	0.334	1.283	0.296	0.356	1.204
Chronic conditions - 4 or more	0.124	0.109	0.233	2.136	0.238	0.245	1.032
No chronic conditions	0.340	0.362	0.182	0.504	0.214	0.151	0.704
Injury	0.135	0.123	0.220	1.785	0.236	0.204	0.865
Disability days - 1 or 2	0.062	0.059	0.087	1.486	0.091	0.079	0.868
Disability days - 3 or more	0.107	0.088	0.243	2.750	0.250	0.248	0.994
Disability days - None	0.831	0.853	0.670	0.785	0.659	0.673	1.021
Non-need variables							
ln(income)	10.197	10.206	10.135	0.993	10.102	10.149	1.005
Less-than-secondary education	0.257	0.263	0.211	0.801	0.227	0.198	0.874
Secondary education	0.202	0.205	0.177	0.862	0.163	0.185	1.134
Some post-secondary education	0.079	0.076	0.106	1.393	0.104	0.108	1.040
Post-secondary education	0.462	0.456	0.507	1.111	0.506	0.508	1.005
Employed	0.709	0.705	0.737	1.045	0.743	0.705	0.949
Student	0.173	0.172	0.174	1.010	0.212	0.132	0.624
Retired	0.150	0.155	0.111	0.714	0.102	0.128	1.252
Unemployed	0.078	0.072	0.120	1.678	0.123	0.119	0.971
Inactive	0.189	0.188	0.197	1.047	0.183	0.233	1.275
Recent immigrant (<=10 years)	0.086	0.090	0.056	0.626	0.060	0.058	0.969
Non-recent immigrant (>10 years)	0.204	0.209	0.168	0.806	0.154	0.188	1.218
Canadian born	0.710	0.701	0.775	1.106	0.786	0.755	0.960
No english/french	0.029	0.030	0.025	0.822	0.027	0.029	1.103
Married	0.605	0.610	0.567	0.930	0.536	0.584	1.089
Formarly married	0.115	0.112	0.141	1.258	0.131	0.160	1.218
Single	0.280	0.278	0.292	1.050	0.333	0.256	0.770
Race -white	0.829	0.823	0.870	1.057	0.875	0.866	0.989
Race -aboriginal	0.008	0.007	0.015	2.176	0.014	0.015	1.069
Race - other	0.163	0.170	0.115	0.678	0.111	0.119	1.077
Heavy smoker	0.204	0.192	0.285	1.480	0.281	0.289	1.027
Occasional smoker	0.046	0.044	0.056	1.265	0.062	0.049	0.791
Former smoker	0.364	0.365	0.361	0.989	0.353	0.368	1.043
Never smoked	0.386	0.398	0.298	0.749	0.304	0.294	0.967
Heavy drinker	0.088	0.089	0.081	0.906	0.063	0.099	1.581
Occasional drinker	0.792	0.784	0.850	1.084	0.867	0.827	0.953
Never drank	0.119	0.126	0.069	0.544	0.070	0.074	1.049
Urban core	0.767	0.767	0.767	0.999	0.778	0.759	0.976
Urban fringe	0.026	0.026	0.027	1.032	0.024	0.029	1.176
Rural fringe	0.076	0.076	0.071	0.934	0.066	0.072	1.078

Urban area outside CMA/CA	0.063	0.062	0.069	1.106	0.066	0.072	1.099
Rural area outside CMA/CA	0.068	0.069	0.066	0.970	0.066	0.069	1.047
Region: Algoma	0.011	0.011	0.012	1.092	0.011	0.012	1.141
Brant	0.010	0.010	0.010	0.991	0.008	0.013	1.662
Durham	0.042	0.043	0.037	0.860	0.046	0.027	0.584
Elgin-St Thomas	0.007	0.007	0.004	0.522	0.004	0.003	0.907
Bruce-Grey-Owen Sound	0.013	0.012	0.017	1.412	0.018	0.016	0.873
Haldimand-Norfolk	0.009	0.009	0.009	0.997	0.008	0.009	1.084
Haliburton-Kawartha-Pine Ridge	0.014	0.015	0.012	0.846	0.011	0.015	1.335
Halton	0.032	0.033	0.027	0.816	0.019	0.032	1.635
Hamilton-Wentworth	0.044	0.043	0.048	1.105	0.057	0.041	0.713
Hastings and Prince Edward	0.012	0.012	0.015	1.268	0.010	0.017	1.672
Huron	0.004	0.005	0.003	0.724	0.004	0.003	0.689
Kent-Chatham	0.009	0.009	0.008	0.881	0.007	0.008	1.144
Kingston-Frontenac-Lennox-Addington	0.015	0.015	0.018	1.247	0.014	0.021	1.487
Lambton	0.010	0.010	0.013	1.290	0.013	0.011	0.879
Leeds-Grenville-Lanark	0.014	0.014	0.014	1.003	0.016	0.012	0.765
Middlesex-London	0.037	0.036	0.041	1.131	0.050	0.031	0.625
Muskoka-Parry Sound	0.007	0.007	0.007	1.096	0.007	0.009	1.222
Niagara	0.037	0.036	0.044	1.226	0.043	0.045	1.040
North Bay	0.008	0.007	0.009	1.205	0.006	0.012	1.893
Northwestern	0.005	0.005	0.007	1.460	0.005	0.009	1.923
Ottawa Carleton	0.070	0.068	0.080	1.171	0.091	0.068	0.746
Oxford	0.009	0.009	0.010	1.088	0.012	0.009	0.755
Peel	0.085	0.087	0.074	0.850	0.062	0.079	1.267
Perth	0.007	0.007	0.005	0.698	0.004	0.005	1.110
Peterborough	0.010	0.010	0.008	0.799	0.009	0.008	0.941
Porcupine	0.007	0.007	0.010	1.406	0.007	0.012	1.774
Renfrew	0.008	0.008	0.007	0.911	0.008	0.007	0.911
Eastern Ontario	0.016	0.017	0.011	0.641	0.014	0.008	0.565
Simcoe	0.031	0.030	0.035	1.144	0.037	0.032	0.865
Sudbury	0.017	0.017	0.020	1.171	0.015	0.024	1.599
Thunder Bay	0.014	0.013	0.019	1.494	0.013	0.027	2.077
Timiskaming	0.003	0.003	0.004	1.234	0.003	0.005	1.446
Waterloo	0.040	0.039	0.052	1.337	0.049	0.055	1.127
Wellington-Dufferin-Guelph	0.021	0.021	0.026	1.244	0.028	0.025	0.891
Windsor-Essex	0.032	0.030	0.051	1.703	0.039	0.064	1.640
York	0.060	0.059	0.067	1.125	0.061	0.069	1.126
City of Toronto	0.229	0.237	0.167	0.707	0.192	0.159	0.829

Table 3. Prevalence of unmet needs by levels of health care utilization

	Unmet need	Unmet need (personal reasons)	Unmet need (system reasons)
GP costs			
none	9.2	5.7	4.1
Q1	10.0	5.7	5.1
Q2	10.8	6.1	5.7
Q3	12.5	6.4	7.4
Q4	13.7	6.0	9.0
Q5	16.8	7.7	10.7
Specialist costs			
none	9.5	6.0	4.3
Q1	10.7	5.9	5.6
Q2	13.6	6.8	8.0
Q3	12.4	6.1	7.4
Q4	13.5	5.5	8.9
Q5	16.5	7.4	11.1
Physician costs			
none	9.2	5.9	3.9
Q1	9.7	6.3	4.4
Q2	10.7	5.9	5.5
Q3	12.2	6.0	7.2
Q4	13.3	5.7	8.9
Q5	16.9	7.7	11.0
Hospital costs			
none	11.4	6.1	6.3
Q1	14.8	6.5	10.0
Q2	15.8	7.4	10.9
Q3	14.9	8.0	9.3
Q4	15.6	6.1	10.2
Q5	21.9	10.3	14.1
Total costs			
none	9.2	5.9	3.9
Q1	9.8	6.4	4.3
Q2	10.8	6.0	5.6
Q3	12.6	6.2	7.6
Q4	13.3	5.5	8.7
Q5	16.5	7.6	11.0

Table 4: Multinomial Logit Odds Ratios Associated with Unmet Needs for Personal and System Reasons (Reference category is no unmet need)

	OR: personal reasons	95% CI		OR: system reasons	95% CI	
Need variables						
m18-34	**2.405**	1.396	4.145	1.644	0.859	3.148
m35-44	1.477	0.847	2.577	1.263	0.668	2.389
m45-54	1.332	0.758	2.341	1.365	0.720	2.589
m55-64	0.575	0.299	1.107	1.100	0.554	2.182
m65plus	0.751	0.370	1.526	0.708	0.349	1.437
f12-17	**2.107**	1.303	3.405	2.028	0.899	4.571
f18-34	**2.416**	1.442	4.048	**2.626**	1.401	4.922
f35-44	**1.823**	1.064	3.122	**2.163**	1.146	4.083
f45-54	**1.805**	1.038	3.139	1.594	0.834	3.045
f55-64	0.852	0.462	1.569	1.086	0.558	2.112
f65plus	0.921	0.415	2.046	1.050	0.523	2.110
Very good SAH	**1.303**	1.045	1.624	**1.619**	1.302	2.012
Good SAH	**1.888**	1.477	2.415	**1.774**	1.404	2.241
Fair SAH	**1.887**	1.361	2.616	**2.169**	1.630	2.886
Poor SAH	**2.176**	1.445	3.276	**2.930**	1.997	4.298
Impact of health problems - sometimes	**1.543**	1.164	2.045	**1.529**	1.249	1.871
Impact of health problems - often	**1.714**	1.260	2.333	**1.395**	1.058	1.839
Activity limitations - sometimes	1.206	0.921	1.578	**1.289**	1.062	1.565
Activity limitations - often	1.231	0.927	1.635	**1.556**	1.181	2.051
Extremely stressed	**2.003**	1.292	3.105	**2.505**	1.754	3.579
Quite stressed	**1.684**	1.154	2.458	**1.605**	1.182	2.182
A bit stressed	0.910	0.624	1.326	1.247	0.922	1.686
Not very stressed	0.895	0.590	1.356	1.191	0.859	1.653
Chronic conditions - 1	1.265	1.000	1.602	**1.907**	1.518	2.395
Chronic conditions - 2 or 3	**1.299**	1.006	1.677	**2.326**	1.867	2.896
Chronic conditions - 4 or more	**1.850**	1.354	2.528	**2.569**	1.985	3.327
Injury	**1.668**	1.375	2.023	**1.494**	1.250	1.785
Disability days - 1 or 2	**1.377**	1.075	1.763	1.145	0.920	1.424
Disability days - 3 or more	**1.838**	1.482	2.280	**1.656**	1.362	2.014
Non-need variables						
ln(income)	0.965	0.869	1.072	1.019	0.924	1.123
Secondary education	1.019	0.791	1.312	1.216	0.977	1.514
Some post-secondary education	1.313	0.956	1.803	**1.794**	1.368	2.353
Post-secondary education	**1.454**	1.136	1.860	**1.607**	1.330	1.941
Student	**1.664**	1.241	2.232	1.018	0.774	1.338
Inactive	0.949	0.740	1.216	0.982	0.787	1.227
Unemployed	**1.534**	1.140	2.065	**1.684**	1.302	2.178
Retired	0.887	0.513	1.533	**0.571**	0.381	0.856
Recent immigrant (<=10 years)	0.949	0.607	1.483	0.846	0.573	1.249
Non-recent immigrant (>10 years)	0.864	0.675	1.106	1.026	0.831	1.268
No english/french	1.283	0.614	2.681	0.989	0.540	1.813
Married	0.926	0.742	1.154	0.907	0.742	1.107
Formarly married	1.058	0.791	1.416	1.141	0.882	1.475
Race -aboriginal	1.283	0.706	2.334	1.427	0.920	2.214
Race - other	0.822	0.571	1.184	1.096	0.801	1.498

Heavy smoker	0.974	0.655	1.449	1.166	0.827	1.645
Occasional smoker	0.928	0.706	1.219	0.956	0.749	1.219
Former smoker	1.057	0.825	1.356	1.139	0.911	1.424
Heavy drinker	1.059	0.797	1.406	1.051	0.838	1.318
Occasional drinker	**1.261**	1.018	1.563	**1.390**	1.133	1.705
Urban fringe	1.289	0.843	1.970	1.193	0.843	1.690
Rural fringe	1.099	0.893	1.352	**1.224**	1.014	1.477
Urban area outside CMA/CA	1.482	0.925	2.375	1.140	0.753	1.724
Rural area outside CMA/CA	**1.932**	1.335	2.795	1.031	0.732	1.451
HR: Algoma	0.639	0.394	1.037	1.160	0.725	1.854
Brant	**0.473**	0.284	0.787	1.400	0.812	2.414
Durham	0.873	0.549	1.388	0.644	0.403	1.031
Elgin-St Thomas	**0.442**	0.247	0.792	0.674	0.372	1.222
Bruce-Grey-Owen Sound	1.319	0.792	2.198	**1.693**	1.014	2.828
Haldimand-Norfolk	0.645	0.378	1.104	1.195	0.706	2.022
Haliburton-Kawartha-Pine Ridge	**0.472**	0.245	0.908	1.200	0.728	1.978
Halton	**0.524**	0.314	0.874	1.244	0.802	1.929
Hastings and Prince Edward	0.679	0.399	1.154	**1.750**	1.091	2.808
Huron	0.623	0.306	1.268	0.734	0.371	1.451
Kent-Chatham	0.651	0.365	1.163	1.137	0.711	1.819
Kingston-Frontenac-Lennox-Addington	0.725	0.449	1.169	**1.717**	1.092	2.699
Lambton	1.041	0.668	1.622	1.382	0.848	2.254
Leeds-Grenville-Lanark	0.657	0.385	1.123	0.801	0.471	1.362
Middlesex-London	1.057	0.720	1.552	0.866	0.554	1.355
Muskoka-Parry Sound	0.605	0.343	1.067	1.391	0.797	2.427
Niagara	0.927	0.623	1.378	1.407	0.931	2.128
North Bay	**0.521**	0.289	0.939	**1.583**	1.014	2.472
Northwestern	0.639	0.360	1.133	**1.987**	1.245	3.171
Ottawa Carleton	1.045	0.727	1.503	1.240	0.834	1.844
Oxford	1.053	0.651	1.703	1.121	0.673	1.867
Peel	0.658	0.433	1.000	1.178	0.775	1.791
Perth	0.646	0.374	1.116	1.133	0.657	1.954
Peterborough	0.580	0.326	1.032	0.899	0.527	1.534
Porcupine	0.647	0.333	1.260	**1.850**	1.162	2.945
Renfrew	0.571	0.322	1.012	0.848	0.484	1.484
Eastern Ontario	0.602	0.361	1.002	**0.475**	0.281	0.803
Simcoe	0.942	0.611	1.453	1.130	0.725	1.763
Sudbury	**0.604**	0.383	0.950	**1.626**	1.070	2.471
Thunder Bay	**0.591**	0.355	0.983	**2.224**	1.444	3.423
Timiskaming	0.736	0.422	1.283	1.587	0.925	2.721
Waterloo	0.976	0.658	1.448	**1.780**	1.197	2.646
Wellington-Dufferin-Guelph	1.023	0.669	1.563	1.423	0.931	2.176
Windsor-Essex	1.059	0.699	1.605	**2.597**	1.745	3.866
York	0.855	0.562	1.300	1.485	0.975	2.262
City of Toronto	0.739	0.499	1.094	0.819	0.539	1.243
N	29726					
chi2	1946.86					
Prob> chi2	0.00					
Pseudo R2	0.1188					

Bold signifies significant at 5% level

Table 5. Number of reasons reported for unmet need

	Frequency	Percent
1	3211	83.7
2	446	11.6
3	124	3.2
4	35	0.9
>5	20	0.5

Table 6. Most common combinations of reasons for unmet need

	Freq.	Percent
wait too long	684	17.8
felt would be inadequate	470	12.2
not av. when require	462	12.0
too busy	320	8.4
didn't get around it	313	8.2
Cost	297	7.8
not avail. in area	254	6.6
Decided not to seek	224	5.8
Dislikes dr./afraid	85	2.2
didn't know where	76	2.0
not av. when require AND wait too long	74	1.9
transportation prob	37	1.0
too busy AND didn't get around it	31	0.8
felt would be inadequate AND wait too long	23	0.6
not avail. in area AND wait too long	22	0.6
felt would be inadequate AND not av. when require	20	0.5
pers./fam. resp	19	0.5
too busy AND wait too long	19	0.5
wait too long AND cost	18	0.5
didn't know where AND not avail. in area	14	0.4
not avail. in area AND not av. when require AND wait too long	13	0.3
not avail. in area AND not av. when require	12	0.3
didn't know where AND not av. when require	11	0.3
felt would be inadequate AND dislikes dr./afraid	11	0.3

Table 7. Unmet need and type of service not received

	Physical		Mental		Regular check-up		Injury		Other	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Unmet need	2659	69.3	342	8.9	352	9.2	423	11.0	246	6.4
Personal reasons	1267	67.4	214	11.4	177	9.4	221	11.7	105	5.6
System reasons	1618	70.8	166	7.3	203	8.9	244	10.7	168	7.4

Table 8. Impact of Unmet Need on Health Care Utilization

	Marginal Effect	SE
GP costs		
Probability of Use		
Unmet need: personal	-0.028	0.016
Unmet need: system-related	**0.032**	0.012
Conditional Amount of Use ($)		
Unmet need: personal	-$7.82	7.12
Unmet need: system-related	$11.20	6.89
Specialist costs		
Probability of Use		
Unmet need: personal	**-0.068**	0.019
Unmet need: system-related	**0.059**	0.016
Conditional Amount of Use ($)		
Unmet need: personal	$5.84	29.34
Unmet need: system-related	**$80.73**	29.83
Physician costs		
Probability of Use		
Unmet need: personal	**-0.035**	0.015
Unmet need: system-related	0.017	0.011
Conditional Amount of Use ($)		
Unmet need: personal	-$5.39	29.88
Unmet need: system-related	**$95.46**	31.46
Hospital costs		
Probability of Use		
Unmet need: personal	-0.008	0.01
Unmet need: system-related	**0.023**	0.011
Conditional Amount of Use ($)		
Unmet need: personal	$162.4	256.00
Unmet need: system-related	-$108.78	215.09
Total costs		
Probability of Use		
Unmet need: personal	**-0.036**	0.015
Unmet need: system-related	0.018	0.011
Conditional Amount of Use ($)		
Unmet need: personal	$18.43	59.00
Unmet need: system-related	**$109.46**	55.39

Notes: - Estimates adjusted for full set of independent variables

- Bold signifies significant at 5% level
- Model for probabilty of use estimated using probit regression; model of conditional use estimated with general linear model using a log-link and gamma family

Table 9. Relationship Between Unmet need and Needs-predicted Residuals

	OLS on the residuals		Probability of a positive residual		
	Coef	**SE**	**OR**	**95% CI**	
GP costs					
Probability					
Unmet need: personal	-0.020	0.014	1.17	0.96	1.43
Unmet need: system-related	**0.030**	0.010	**2.01**	1.65	2.44
Conditional					
Unmet need: personal	-12.08	9.34	0.86	0.72	1.02
Unmet need: system-related	10.68	9.32	**1.26**	1.09	1.46
Total					
Unmet need: personal	-15.57	8.11	**0.83**	0.71	0.97
Unmet need: system-related	12.40	8.50	**1.25**	1.09	1.44
Specialist costs					
Probability					
Unmet need: personal	**-0.052**	0.015	1.08	0.93	1.26
Unmet need: system-related	**0.046**	0.012	**2.07**	1.78	2.40
Conditional					
Unmet need: personal	34.04	90.79	0.84	0.70	1.02
Unmet need: system-related	**168.64**	76.93	**1.35**	1.15	1.58
Total					
Unmet need: personal	2.57	61.93	**0.84**	0.70	0.99
Unmet need: system-related	**142.80**	61.36	**1.58**	1.37	1.82
Physician costs					
Probability					
Unmet need: personal	**-0.026**	0.013	1.12	0.89	1.40
Unmet need: system-related	**0.019**	0.009	**2.05**	1.64	2.57
Conditional					
Unmet need: personal	0.08	76.48	**0.77**	0.65	0.92
Unmet need: system-related	**168.23**	70.59	**1.36**	1.18	1.57
Total					
Unmet need: personal	-15.51	66.06	**0.77**	0.66	0.91
Unmet need: system-related	**154.88**	64.89	**1.54**	1.34	1.77
Hospital costs					
Probability					
Unmet need: personal	-0.011	0.012	**1.27**	1.05	1.53
Unmet need: system-related	**0.027**	0.013	**1.72**	1.46	2.03
Conditional					
Unmet need: personal	67.14	541.02	1.22	0.86	1.74
Unmet need: system-related	-192.42	420.27	1.06	0.79	1.44
Total					
Unmet need: personal	-11.52	92.52	1.07	0.87	1.32
Unmet need: system-related	103.91	88.96	**1.41**	1.17	1.71
Total costs					
Total					
Unmet need: personal	-46.34	123.56	**0.76**	0.63	0.91
Unmet need: system-related	**245.40**	122.87	**1.27**	1.09	1.48

Note: Regression results and odds ratios are adjusted for all other non-need variables

Bold signifies significant at 5% level

Table 10: Logistic Regression: Unmet Need due to System Reasons vs. Unmet Need due to Personal Reason (reference category)

	OR (system vs. personal)	95% CI	
Need variables			
m18-34	0.604	0.277	1.317
m35-44	0.810	0.369	1.778
m45-54	0.912	0.407	2.043
m55-64	1.831	0.736	4.550
m65plus	1.063	0.441	2.559
f12-17	1.063	0.434	2.603
f18-34	0.996	0.468	2.120
f35-44	1.110	0.513	2.399
f45-54	0.838	0.380	1.848
f55-64	1.372	0.591	3.185
f65plus	1.294	0.551	3.038
Very good SAH	**1.453**	1.079	1.956
Good SAH	1.078	0.789	1.472
Fair SAH	1.257	0.853	1.853
Poor SAH	1.512	0.940	2.432
Impact of health problems - sometimes	0.961	0.729	1.267
Impact of health problems - often	0.742	0.519	1.061
Activity limitations - sometimes	1.073	0.809	1.423
Activity limitations - often	1.393	0.992	1.958
Extremely stressed	1.154	0.683	1.952
Quite stressed	0.859	0.542	1.360
A bit stressed	1.253	0.793	1.979
Not very stressed	1.137	0.693	1.865
Chronic conditions - 1	**1.496**	1.100	2.034
Chronic conditions - 2 or 3	**1.829**	1.350	2.477
Chronic conditions - 4 or more	1.418	0.998	2.014
Injury	0.926	0.732	1.172
Disability days - 1 or 2	0.823	0.604	1.122
Disability days - 3 or more	0.874	0.678	1.127
Non-need variables			
ln(income)	1.027	0.919	1.148
Secondary education	1.308	0.955	1.793
Some post-secondary education	**1.545**	1.046	2.281
Post-secondary education	1.233	0.934	1.628
Student	**0.599**	0.417	0.861
Inactive	1.005	0.735	1.375
Unemployed	1.155	0.808	1.652
Retired	**0.539**	0.299	0.970
Recent immigrant (<=10 years)	0.902	0.537	1.515
Non-recent immigrant (>10 years)	1.109	0.811	1.517
No english/french	0.957	0.434	2.109
Married	1.026	0.783	1.346
Formarly married	1.092	0.768	1.552
Race -aboriginal	1.303	0.715	2.372

Race - other	1.313	0.859	2.008
Heavy smoker	1.388	0.838	2.299
Occasional smoker	0.966	0.683	1.366
Former smoker	1.153	0.837	1.587
Heavy drinker	1.012	0.715	1.432
Occasional drinker	1.141	0.871	1.496
Urban fringe	1.075	0.659	1.755
Rural fringe	1.164	0.901	1.505
Urban area outside CMA/CA	0.849	0.483	1.490
Rural area outside CMA/CA	**0.592**	0.378	0.930
HR: Algoma	**1.909**	1.019	3.576
Brant	**3.279**	1.519	7.078
Durham	0.698	0.372	1.309
Elgin-St Thomas	1.799	0.786	4.114
Bruce-Grey-Owen Sound	1.183	0.626	2.236
Haldimand-Norfolk	1.853	0.931	3.691
Haliburton-Kawartha-Pine Ridge	**2.563**	1.181	5.564
Halton	**2.590**	1.384	4.847
Hastings and Prince Edward	**2.471**	1.298	4.702
Huron	1.315	0.475	3.643
Kent-Chatham	1.821	0.909	3.650
Kingston-Frontenac-Lennox-Addington	**2.510**	1.307	4.820
Lambton	1.337	0.710	2.518
Leeds-Grenville-Lanark	1.230	0.600	2.520
Middlesex-London	0.788	0.452	1.373
Muskoka-Parry Sound	2.000	0.960	4.168
Niagara	1.415	0.822	2.436
North Bay	**3.181**	1.551	6.526
Northwestern	**2.830**	1.453	5.511
Ottawa Carleton	1.234	0.746	2.042
Oxford	1.044	0.550	1.984
Peel	**1.976**	1.136	3.438
Perth	1.741	0.824	3.680
Peterborough	1.775	0.828	3.801
Porcupine	**3.245**	1.495	7.047
Renfrew	1.285	0.608	2.712
Eastern Ontario	0.726	0.363	1.453
Simcoe	1.143	0.622	2.103
Sudbury	**2.607**	1.448	4.696
Thunder Bay	**3.868**	2.070	7.228
Timiskaming	1.899	0.918	3.925
Waterloo	**1.824**	1.069	3.112
Wellington-Dufferin-Guelph	1.351	0.773	2.362
Windsor-Essex	**2.405**	1.414	4.091
York	**1.901**	1.074	3.363
City of Toronto	1.101	0.648	1.870
N	3829		
chi2	209.15		
Prob> chi2	0.00		
Pseudo R2	0.0702		

Bold signifies significant at 5% level

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