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# Socioeconomic Inequalities in Waiting Times for Primary Care across ten OECD countries

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## Abstract

Waiting times for health care are a major policy concern across OECD countries. Waiting times are generally tolerated in publicly-funded health systems and perceived as equitable if access to care is not based on socioeconomic status. Although a growing literature has documented that socioeconomic status is negatively associated with waiting times for secondary care in several countries, less is known about waiting time inequalities in primary care, which is the focus of this study. We exploit the Commonwealth Fund's International Health Policy Survey of Adults in 2010, 2013 and 2016 and include ten OECD countries (Australia, Canada, France, Germany, Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom). Waiting time for primary care is measured by the time reported to get an appointment to see a doctor or a nurse. We employ interval regression models to investigate for each country whether socioeconomic status (household income and education) are associated with the waiting time for a primary care appointment. We control for age, gender, chronic conditions, and whether the individual holds private health insurance. We find a negative association between household income and waiting times in Canada, Germany, Norway and Sweden.

*Keywords*: waiting times, primary care, socioeconomic status, income, high-income countries, inequalities.

## Introduction

Waiting for health care is a major concern for patients and policymakers across OECD countries (Siciliani et al., 2013). In several countries, patients have to wait weeks or months for elective (non-emergency) treatment or for a specialist visit. In the presence of compulsory public insurance and limited co-payments, the demand for treatment exceeds the supply in many countries leading to long waiting lists. It has been argued that imposing a wait to the patient acts as a form of non-price rationing (Martin and Smith, 1999) and helps to contain demand by dissuading some patients to seek treatment and to bring together demand and supply.

One possible rationale for rationing publicly-funded healthcare by waiting time, rather that price, is an equity concern. Under rationing by waiting, access should not depend on ability to pay. In contrast, when significant co-payments are present, patients with higher income will be able to afford health care more easily. In turn, these may contribute to inequalities in access. Several studies however find waiting time inequalities by socioeconomic status in publicly-funded health systems (see Siciliani, 2016; Landi et al., 2018, for reviews), and this is using both administrative and survey data.

Although waiting times inequalities by socioeconomic status have been documented for *secondary* care across countries such as Australia, England, Norway and Italy (Siciliani, 2016; see more detailed review of the literature below), less is known about waiting times in *primary* care, which is the focus of this study. Waiting times for primary care tend to be much shorter than for secondary care. Still the patient journey starts very often with a contact with the primary care physician, and this may also be source of further inequalities for secondary and tertiary care, or other community services and long term care.

In this study, we exploit the Commonwealth Fund's International Health Policy Survey of Adults to investigate waiting time inequalities by socioeconomic status in primary care across ten OECD countries (Australia, Canada, France, Germany, Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom). To ensure an adequate sample size we pool the sample from the three surveys in 2010, 2013 and 2016.

We measure the waiting time for primary care as the time to get an appointment to see a doctor or a nurse. Socioeconomic status is measured with household income and education. We control for age, gender and chronic conditions (arthritis, asthma or chronic lung disease, cancer, depression, diabetes, chronic heart disease, hypertension). Given that some inequalities may be due to patients opting for a private provider, we also control for whether the patient holds a private health insurance, which by itself may be a source of inequality but may also reflect certain individual preferences or circumstances (such as high disutility from waiting or risk aversion, which induces individuals to buy private health insurance, or whether the employer provides private health insurance). Ideally, we would also like to observe whether patients opt for a private provider even if they do not hold private health insurance but this is not observed in the survey. Moreover, we exclude the US from our analysis because the 2016 survey does not contain information about private health insurance. We conduct country-level analysis and we report the association between socioeconomic status and waiting times for primary care, controlling for other factors.

As far as the authors are aware, this is the first international study on waiting time inequalities by socioeconomic status that focuses on primary care. Existing studies have instead focused on secondary care. The literature can be split into studies that use survey data and those that use administrative data. Since our study uses survey data, we review in detail studies using survey data, starting with the international ones, and then briefly those using administrative data.

*International evidence*. Using survey data from Survey of Health, Ageing and Retirement in Europe (SHARE), Siciliani and Verzulli (2009) test whether waiting times for specialist consultation and non-emergency surgery in 2004 differ by socioeconomic status in nine European countries (Austria, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain and Sweden). For specialist consultation, they find that individuals with high education are associated with a reduction in waiting times of 68% in Spain, 67% in Italy and 34% in France. There is also evidence of a negative and significant association between educational level and waiting times for non-emergency surgery in Denmark, the Netherlands and Sweden. High education is negatively associated with waiting times by 66%, 32% and 48%, respectively. There is some evidence of income effects, although these are generally modest. Unfortunately, SHARE did not include a question related to waiting times in subsequent waves, and therefore these findings cannot be replicated with more recent data.

Schoen et al. (2010) use data from the 13th annual health policy survey conducted in 2010 by the Commonwealth Fund in eleven countries (Australia, Canada, France, Germany, New Zealand, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States). Waiting times are measured for a specialist visit and for elective surgery. Socioeconomic status is proxied by a dummy variable equal to one if income is above average. Controlling for age, health status, and in the US for private insurance status, they employ logistic regression and show that individuals with above-average income have a lower probability of waiting more than two months for a specialist visit in Australia, New Zealand and the Netherlands. They also have a higher probability of waiting less than 4 weeks for a specialist visit in Australia, Canada, New Zealand and the United States. No marked differences in waiting times by socioeconomic status are found for elective surgery. Using 2010 data, they show that the proportion of individuals being able to see a doctor or a nurse on the same or the following day was higher for individuals with income above the average in Canada

and the Netherlands. Schoen et al. (2013) and Osborn (2016) show variations across countries in waiting times to see doctor or a nurse the same day, or the waiting time for a specialist appointment using the 2013 and 2016 Commonwealth Fund International Health Policy Survey in Eleven Countries, but not by socioeconomic status.

*Spain*. Using the 2006 Spanish National Health Survey, Abasolo et al. (2014) finds that an increase of 10% of the income is associated with a reduction in waiting times for diagnosis visits of publicly-funded patients by 2.6%. Primary education is associated with an increase in waiting times of 28% compared to individuals with university studies.

*Italy*. Landi et al. (2018) use data from the 2013 Italian Health National Survey and find that individuals with lower education and economic resources have a higher risk of experiencing excessive waiting times for diagnostic and specialist visits, while for elective surgery, socioeconomic inequalities less pronounced.

*Canada*. Carriere and Sanmartin (2010) use the 2007 Canadian Community Health Survey and find that compared with men in the top income quintile, those in the lowest income quintile were less likely to see a specialist within a month, after controlling for possible confounders. This was not the case for women. Sutherland et al (2019) use survey data from patients sampled in six hospitals in the Vancouver Coastal Health Authority in 2013-2017 with a sample of about 1300 patients, and find no association between socioeconomic status and wait times for elective general surgery, defined as weeks between being registered and surgery date, after adjusting for health status, cancer status, surgical priority, comorbidity burden and demographic characteristics. Similarly, Thind et al. (2012) find no association between income, measured at small area level, and waiting time for a specialist visit using a sample of over 29,000 patients visiting 23 family physicians in Ontario between 2005-2010.

*Germany*. Using survey data from Bertelsmann Healthcare Monitor between 2007 and 2009, Roll et al. (2012) find that individuals with a household income above 2000 Euro per month were associated with a reduction in waiting time for a GP appointment by 1 day (or 28% given a sample mean of 3 days) relative to those with less than 500 Euro. Individuals with household income above 5000 Euro per month were associated with a reduction of waiting time for a specialist appointment by 5 days (or 28% less, given a sample mean of 30 days). The analysis controls for type of insurance, which is critical in Germany given the multi-payer health system divided into statutory and private health insurance. Sundmacher and Kopetsch (2013) use data for ambulatory care from the 2010 Representative Survey conducted by the National Association of Statutory Health Insurance Physicians for chronically ill patients, and find that patients with the lowest secondary school unexpectedly waited 25% less than those with the highest education attainment.

There is also evidence of waiting time inequalities by socioeconomic status in favour of those with higher income and level of education from studies using administrative data across a range of countries and non-emergency hospital procedures, such as hip replacement in England (Laudicella et al., 2012) and Norway (Monstad et al., 2014), coronary bypass in England (Moscelli et al., 2018), cataract surgery in Sweden (Smirthwaite et al., 2016) or across larger pools of elective treatments in Australia (Johar et al., 2013, and Sharma et al., 2013), Norway (Kaarboe and Carlsen, 2014), Sweden (Tinghög et al., 2010), and Italy (Petrelli et al., 2012). No association was found in Canada for paediatric care in relation to specialist visit appointment, surgical procedures and inguinal hernia (Szynkaruk et al., 2014; Jaakkimainen et al., 2014; Gawad et al. 2014).

Our contribution to the literature is as follows. First, we augment the very small international literature that compares socioeconomic inequalities in waiting times across high-income

countries. The international study by Siciliani and Verzulli (2009) does not focus on primary care.

Second, we build on Schoen et al. (2010) in several ways. Since we are concerned about small sample size, we pool data from three surveys (and this is also the reason why we do not focus on specialist visits or inpatient care, where the sample remains relatively small despite pooling). This allows us to use more recent data from 2013 and 2016 and to investigate the income gradient in a more granular way. Pooling data and increasing the sample size is in our view critical. With a small sample, the lack of statistical significance in the gradient on income or education could be either due to the lack of a gradient or to small sample size.

The larger sample size also allows us i) to investigate the education gradient, which has been highlighted in previous literature as a possible separate determinant of waiting, but was not used in Schoen et al. (2010); ii) to allow estimation of the gradient in a more granular way (rather than comparing patients above or below the mean income); and iii) to explore the association of private health insurance with faster access. Finally, rather than estimating the effect of socioeconomic status at a specific waiting time threshold, we use all the information across different time bands. To allow for the discretized continuous nature of the waiting time variable, we employ interval regression models (see Siciliani and Verzulli (2009) who use negative binomial models but then compare the results with an Interval Regression model, footnote 9).

## Data

The Commonwealth Fund is a private foundation that undertakes several regular surveys of health care consumers, health professionals and health system leaders. Here, we focus on the Fund's International Health Policy Survey of Adults. Every three years this survey focuses on

health care coverage and access to primary and secondary care amongst the general population. The survey is carried out by telephone in eleven high-income countries (Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, and the United States) and the respondents comprise national samples of non-institutionalised adults aged over 18 years. For further details see the Fund's website at https://www.commonwealthfund.org/. We employ the 2010, 2013 and 2016 international health policy surveys to estimate the impact of socioeconomic status on the length of wait to see a primary care doctor, which we sometimes refer to as a general practitioner (GP).

*Waiting times*

We use responses to question Q1110 to construct our waiting time variable for primary care appointment. This question asks: "Last time you were sick or needed medical attention, how quickly could you get an appointment to see a doctor or a nurse? Please do not include a visit to the hospital. Did you get an appointment…?

1 On the same day

2 The next day

3 In 2 to 5 days

4 In 6 to 7 days

5 In 8 to 14 days

6 After more than two weeks

7 Or were you never able to get an appointment".

We use interval regression in our specifications. This approach is designed specifically for discretized continuous variables. We attach the following intervals [lower bound, upper bound] to the survey responses: On the same day: [0, 1]; The next day: [1, 2]; In 2 to 5 days: [2, 6]; In

6 to 7 days: [6, 8]; In 8 to 14 days: [8, 15]; After more than two weeks: [15, ∞]. Table 1 presents the percentage of respondents for each group by country and year.

Four groups of responses were excluded from the analysis: the small number of those patients who were never able to get an appointment (0.8%, 1.7%, 1.1% in 2010, 2013, 2016); those who did not need to make an appointment (6.8% in 2016; this information is not available for 2010, 2013); those that were not sure how long they waited (4.1%, 7.3%, 4.3% in 2010, 2013, 2016); and those that declined to answer the question (0.3%, 0.5%, 0.2% in 2010, 2013, 2016).

[Table 1 here]

Figure 1 illustrates the proportion of respondents waiting less than two days for a primary care appointment, by country, for the three study years (2010, 2013 and 2016) combined and after the above exclusion restrictions have been applied. Canada and Norway have the smallest proportion waiting less than two days with respectively 45% and 48% of respondents. New Zealand has the largest proportion waiting less than two days with 76% of respondents, followed by the Netherlands and Switzerland both with 73% of respondents.

[Figure 1 here]

*Age and gender*

All survey respondents are over 18 years of age. For the purposes of the regression analysis, respondents are allocated to one of five age groups: 18 to 35 years; 36 to 50 years; 51 to 65 years; 66 to 80 years; and over 81 years of age. Table 2 reports the proportion of survey respondents in each age group for all three study years combined. Table 2 also shows the proportion of survey respondents in each gender group. With the exception of the UK, the majority of respondents in each country is female. We use individuals in the 18-35 years groups and women as the reference groups.

*Previous and current diagnosis of a chronic illness*

For each of the three study years, the survey asks each respondent whether they 'have ever been told by a doctor that they have or have had: Arthritis; Asthma or chronic lung disease (e.g., COPD); Cancer; Depression; Diabetes; Chronic Heart disease; and Hypertension. We use responses to these questions to create seven dummy variables – one for each condition – that take the value of one if the respondent has been told that they have a particular condition. We use individuals with no chronic conditions as the reference group. Table 2 shows that, for example, 21% of Australian respondents have been diagnosed with arthritis and that just over 16% of respondents have been diagnosed with depression.

There was a self-assessed health question in both the 2010 and 2013 surveys. This asked 'in general, how would you describe your own health' and offered 'excellent', 'very good', 'good', 'fair', and 'poor' as possible answers. We use individuals with "poor" health as the reference group. However, this question was dropped from the 2016 survey and hence we do not include variables reflecting responses to this question in our main empirical analysis, using it only in the robustness checks.

[Table 2 here]

*Household income*

To generate the household income data, we use the following question included in the Fund's International Health Policy Survey of Adults: "The average household income of families in this country is around […] a month. By comparison, is your household income…? 1) Much above average; 2) Somewhat above average; 3) Average; 4) Somewhat below average; 5) Much below average; 6) Not sure; 7) Decline to answer." We merge the last two groups into "unspecified", and then constructed six income dummy variables (e.g. the first dummy variable

is equal to one for those responding 'much below average', etc). We use "much below average" as our reference group.

The proportion of each country's survey respondents in each income group is shown in the bottom half of Table 3. In each country, between 7-26% respond that their income is much below average, and between 5-20% that it is much above. Between 17-38% respond that their income is average.

*Education*

To generate the education variables, we use the following question included in the Fund's International Health Policy Survey of Adults: "What is the highest level of education you have completed to date?" Respondents are offered a list of options and this varies from one country to another (Table A1). To facilitate cross-country comparison, we have condensed the available educational levels into a four category grouping: primary and lower secondary (1), upper secondary (2), post-secondary and tertiary (3), and unspecified (4) where the respondent is "not sure" or "declines to disclose" the highest level of education that they have completed (Table A1). The proportion of each country's survey respondents in each education group is shown in the top half of Table 3. In each country, between 13-22% of respondents have primary education, and 24-54% have tertiary education. We use "primary and lower secondary" as our reference group.

[Table 3 here]

*Private health insurance*

Because different health care systems have different health care coverage, the question about the presence of private health insurance varies by country. For Australia, Canada, New Zealand and France, the relevant question (Q1405) asks: "In addition to government funded health services, are you currently covered by any private health insurance that you or your family pays

for or that an employer or association provides?" If the respondent answers 'yes' then we assume the presence of private health insurance. Table 2 shows the proportion of positive survey responses to this question (eg just under one-half of all Australian respondents responded positively to this question). We use individuals with no private health insurance as our reference group.

For Germany, the question (Q1415) asks what kind of health insurance the respondent has. Five options are offered: 1) Social or statutory health insurance (zum Beispiel AOK, Barmer GEK, TK, BKK, IKK etc.) without any private insurance; 2) Social or statutory insurance and also supplementary private insurance; 3) Private comprehensive insurance; 4) Insured through system of "freie Heilfürsorge", system of Beihilfe, social assistance; 5) No health insurance or other form of coverage in case of illness. We assume the presence of private health insurance if the respondent replies with either the second or third options with just over 23% of respondents falling in these groups.

For Norway and the UK, the relevant question (Q1420) asks: "In addition to the National Health Service (NHS), are you currently covered by private health insurance that you or your family pays for or that an employer or association provides?" If the respondent answers 'yes' then we assume the presence of private health insurance. One–third of Norwegian and one-eighth of UK respondents answered 'yes' to this question.

For the Netherlands, the relevant question (Q1425) asks: "In addition to the 'basic insurance' are you currently covered by an additional health care insurance package that you or your family pays for or that an employer or association provides?" If the respondent answers 'yes, they have an additional insurance package' then we assume the presence of private health insurance. Over three-quarters of all Dutch respondent have private health care insurance.

For Switzerland, Q1430 asks: What type of personal health insurance (compulsory basic insurance) do you have? Five options are offered: 1) General health insurance with deductible; 2) Bonus insurance; 3) HMO insurance; 4) Family GP model; 5) Insurance model with telephone consultation prior to every visit to the doctor's (telephone model). If the respondent answers that they have option 2 (bonus insurance) we assume the presence of private health insurance. One-eighth of Swiss respondents have this type of private health insurance.

For Sweden, Q1460 asks: "Do you have a private health care insurance either paid by yourself, your Household, by your employer or by a union?" We use a 'yes' response to this question to indicate the presence of private health insurance and just under one-quarter of all Swedish respondents answered 'yes' to this question.

## Methods

We employ an Interval Regression model, which is specifically designed for discretized continuous variables. For each country, we model waiting time for patient $i$ as

$$w_i = \alpha + s'_i\beta_s + y'_i\beta_y + \beta_{PHI}PHI_i + \gamma_1 d_{2013} + \gamma_2 d_{2016} + \varepsilon_i \,, \qquad (1)$$

where $w_i$ is the patient's waiting time for a primary care appointment, $s_i$ is a vector of patient characteristics (age, gender, chronic conditions), $y_i$ is a vector of patient socioeconomic status (education and household income), $d_{2016}, d_{2013}$ are two categorical variables equal to one if the patient was respectively surveyed in 2016 and 2013 (relative to 2010), $PHI_i$ is a categorical variable equal to one if the patient reports holding private health insurance, and $\varepsilon_i$ is an idiosyncratic error term.

Our estimate of interest is $\hat{\beta}_y$ which provides the association between patients' waiting time for a primary care appointment and their socioeconomic status. We expect some patient

characteristics to be related to underlying health status, as poorer health status may mean a patient is more likely to experience a shorter waiting time ($\hat{\beta}_s < 0$). Since individuals with higher socioeconomic status tend to have better underlying health status, it is important to control for these. Note however that unobserved dimensions of health would lead to a downward estimation of the relation between socioeconomic status and waiting times $\hat{\beta}_y < 0$, if wealthier and more educated individuals are in better health (and therefore likely to wait longer, not less).

One of the reasons that individuals with higher socioeconomic status might gain quicker access is that they can more easily afford care from a private or alternative provider. We are not able to control for whether patients had access to a publicly-funded or a private provider. We can however control for whether individuals have private health insurance. We therefore expect individuals holding private health insurance to wait less, $\hat{\beta}_{PHI} < 0$, for countries where it buys quicker access to alternative providers, though the decision to buy private health insurance may also be related to unobserved individual characteristics, i.e. high disutility from waiting, higher expected waiting times or risk aversion.

As an alternative to the Interval Regression model, we have also employed the negative binomial model (NBM) (Cameron and Trivedi, 2005, 2010; Jones, 2007) with a quadratic variance function (NBM-2), which we estimate for each country using the maximum likelihood approach. This model is appropriate to deal with the heavily skewed distribution of waiting times but it is designed for count data, not a discretized continuous variable. The results of this model are however very similar to the ones obtained with the Interval Regression model (in line with Siciliani and Verzulli, footnote 9), both in terms of partial effects and statistical significant, and are therefore omitted (but available from the authors).

## Results

Table 4 provides our key results. They support the proposition that in some countries there is a negative association between socioeconomic status and waiting times for primary care. In four countries, the negative gradient relates to household *income* (Canada, Germany, Norway and Sweden). In three countries, coverage by *private health insurance* is negatively associated with waiting times for primary care (Australia, Germany and France). We describe the quantitative size of these association in more detail below.

[Table 4 here]

*Household income.* There is a negative income gradient in Canada, Sweden, Germany, and Norway. In *Canada* patients with average or above average income wait 1-1.8 fewer days relative to patients with much below average income. The gradient is monotonically decreasing in income. This is also the case for *Sweden*, where patients with average or above average income wait 0.7-1.1 fewer days relative to patients with much below average income, and in *Germany*, where patients with average or above average income wait 1.3-1.9 fewer days relative to those whose income is much below average. In *Norway* patients with income much below average wait 1.2-1.6 days more relative to the other income groups. There are differences across some income groups in Australia, New Zealand, the Netherlands and Switzerland, and Norway but the gradient is less pronounced (less than 0.4 days), non-monotonic and significant only at 10% level.

*Education*. There is a negative association between educational level and waiting times for primary care in Australia and France but this is only significant at 10% level and respectively equal to 0.3 and 0.9 fewer days for patients with post-secondary and tertiary education relative to those with primary and lower secondary education. Perhaps surprisingly, in *Germany* those with primary and lower secondary education wait less than patients with higher educational

attainments (see next section for discussion). Similarly, in *Switzerland* patients with post-secondary and tertiary education wait 0.5 more days relative to those with primary and lower secondary education. The positive association with education may be explained by unobserved dimensions of health, with more educated individuals being in better health and needing less urgent care leading to longer waiting times for a primary care appointment, controlling for income and private health insurance status.

*Private health insurance.* Holding private health insurance is negatively associated with waiting times in Australia (0.4 days), Germany (0.7 days), France (1.1 days) and Switzerland (0.2 days) though the effect is only significant at 10% level (see next section for a detailed discussion).

*Age, gender and chronic conditions.* Male patients are generally not associated with shorter waiting time, except for Canada. There is no systematic pattern between age groups and waiting times. There is also no clear association between chronic disease and waiting times. Exceptions include a positive association with depression and arthritis (in Sweden) and a negative association with coronary heart disease (in Sweden and Switzerland).

*Time trends.* Waiting times for primary care, as perceived by patients, have increased in Switzerland and declined in Australia and Canada. They have been stable in France, New Zealand, Norway and Sweden, with no clear pattern for the remaining countries.

In terms of goodness of fit measure, we follow Long and Freese (2006) and compute the correlation between the actual and predicted waiting times. Given that within each waiting time category there is a lower and an upper bound, the actual waiting time is computed by first using the lower bound in each category (zero, two, six, eight days, 15 days) and then the upper bound (one, five, seven days etc). We use this procedure rather than more common goodness of fit measures because we do not have a single measure of waiting time as the dependent variable.

Instead, we have an interval as the actual measure of wait. The correlation between the actual and predicted waiting time based on the upper value varies between 0.09 (for Sweden) and 0.28-0.29 for Switzerland and Germany, and 0.13-0.16 for the remaining countries. The correlation based on the lower bound have the same order of magnitude. Although the goodness of fit is low, our focus is on estimating differences in waiting times by socioeconomic status, rather than to form precise predictions in waiting times. The low values could also reflect measurement error as waiting time is based on a subjective measure.

## Discussion

Our results support the hypothesis that patients with higher income tend to wait less for access to primary care across four high-income countries: Canada, Germany, Norway and Sweden. There are various mechanisms through which income may be associated with waiting times.

First, individuals with higher income may live in neighbourhoods with higher availability of primary care, which translates into easier access. This is because primary care doctors are likely to be more willing to locate or open a practice in more affluent and urban areas, and this may be the case also for other medical staff working in the practice. In turn, this will translate into a higher supply of doctors, and into shorter waiting times for an appointment. There is evidence from secondary care that higher supply reduces waiting times (Martin and Smith, 1999; 2003).

Second, patients with higher socioeconomic status may be able to exercise more choice and look for primary care providers who provide more responsive care. Doctors with a better reputation may attract more patients, but individuals with higher socioeconomic status may be more responsive to such information. This is because they either belong to better informed networks, which translates into lower search costs, or because they have lower switching costs

making them more likely to change primary care provider. Recent evidence from secondary care however shows that patient choice of hospital plays only a limited role in explaining the gradient (Moscelli et al., 2018).

Third, they may be more insistent when booking an appointment, and articulate their needs more fully, resulting in higher perceived urgency and a shorter wait (Laudicella et al., 2012; Moscelli et al., 2018). They may exercise more pressure in case of undue delay (Landi et al., 2018) and be more aware of their entitlements for example if a primary care waiting time guarantee is in place (Siciliani et al., 2013). They may also be more aware of how the booking system works and of different modes of booking an appointment, e.g. if appointments can be booked directly online.

Fourth, they may be more likely to have flexible jobs which allow them to take time off and attend the first available appointment. Such flexibility may not be available to poorer people in occupations with rigid schedules.

Fifth, they may be able to afford the fees charged by private or alternative providers to gain quicker access (if they do not hold private health insurance for which we account for), or be able to afford alternative forms of health care e.g over-the-counter medicines. Evidence from secondary care in Australia for example suggests that richer individuals are more likely to choose a private hospital with shorter waiting times (Sharma et al., 2013).

We find that higher educational attainment is associated with longer rather than shorter waiting times only in Germany. Although the result is counter-intuitive, it is consistent with the two previous studies by Roll et al. (2012) and Sundmacher and Kopetsch (2013). Roll et al. (2012) find that higher household income is associated with a reduction in waiting time for a GP appointment, while individuals with low or no education waiting less relative to those with high education. The authors interpret education as a proxy of healthy lifestyle. Sundmacher

et al. (2013), which focuses on chronically ill patients, also find that patients with the lowest secondary school waited less than those with the highest education and reported this result as 'unexpected' and in contrast with the literature. Germany has a multi-payer insurance system divided into statutory health insurance and private health insurance, where the latter is for high-income individuals. Our results are consistent with individuals with high income holding private insurance obtaining quicker access, while individuals with lower income but high education being less prioritised within the statutory system and therefore waiting longer. Education in this context may capture unobserved dimensions of health with more educated individuals being in better health and needing less urgent care leading to longer waiting times for a primary care appointment.

We find that in three of the ten countries (Australia, Germany and France), holding a private health insurance is negatively associated with waiting times for primary care. For countries whose PHI coverage is not primary (as in the US), private health insurance can be duplicative, complementary or supplementary (OECD, 2004). Private insurance duplicates coverage in Australia, the UK, New Zealand, Sweden and Norway to increase choice of provider and reduce waiting times mostly for secondary care. Coverage is highest in Australia (with 49% of population covered by PHI in our sample). Private insurance can supplement coverage for care not covered by public coverage (e.g. some dental care). The Netherlands has the largest supplementary market (84% of the population). Private insurance can be complementary to absorb some out of pocket payments (e.g. France).

We find no association between PHI and waiting times in the Netherlands, where PHI is supplementary, and in New Zealand, Norway, Sweden and the UK, where PHI is duplicative and mostly aimed at secondary rather than primary care (moreover, in Norway and Sweden it is mostly offered by the employer); or in Switzerland, where bonus insurance is part of the

personal compulsory insurance. Instead, we find a negative association in Australia, where PHI is duplicative and more than half of the population holds this coverage; in Germany, where private insurance is supplementary (on top of social or statutory insurance) or is private comprehensive insurance; and in France, where PHI is mainly complementary to cover out of pocket payments.

*Robustness checks*

We perform several robustness checks. First, we run the models by adding self-reported health as an additional control variable. However, self-reported health is only available for 2010 and 2013 which reduces the sample size. In the Appendix, in Table A2 we report a model with the smaller sample, where we first control for self-assessed health and then omit it. The table shows that adding self-assessed health does not affect the income and education coefficients. However, the coefficients are less precisely estimated due to the smaller sample size. There is still an income gradient for Canada, Germany, Norway and Sweden but it is systematically statistically significant at the 5% level only for Canada. Instead, the gradient for Australia which before was significant only at 10% level, it is now significant at the 5% level.

Second, we may be concerned that the lack of the gradient in some countries may be due to the correlation between income and education. In Table A3 in the Appendix we show that this is not the case by reporting the model when first we include only the income variables (excluding education) and then we include only the education variables (excluding income). We find that the estimates of the income and education gradient is very similar to the one reported in Table 4. To further check that multicollinearity between income and education is not an issue, we have computed variance inflation factors (VIFs) for each country (not reported by available from the authors). These are all below the value of five, which suggests that collinearity does not materially affect results. Moreover, we have also investigated the proportion of each

income category by education group. Although there is a positive relation, as we would expect, there are marked variations in income for each education group, which is consistent with the above findings.

Third, we have run the models by omitting the private health insurance dummy (in Table A3, bottom part). This is because part of the income gradient may be due to PHI allowing easier access to a private or alternative provider. The decision to buy private health insurance may reflect unobserved individual characteristics, such as high disutility from waiting or high expected waiting times. The results are substantially unaltered. The only exception is Australia, for which respondents with average or somewhat above average income wait about 0.4-0.5 fewer days relative to those with much below average income, and the effect is significant at least at the 5% level. This is also the case for respondents with much above average income, but the effect is significant only at the 10% level. Therefore, holding PHI is not what generally drives the associations between waiting times for primary care and socioeconomic status, except for one country.

*Limitations*

The analysis has several limitations. First, it relies on relatively small sample sizes, which was the reason for pooling data across three different years, and this also precluded further analysis of waiting times for secondary care (e.g. specialist or hospital visit). In this respect, studies using administrative data have generally access to much larger samples (e.g. the whole population of patient in need of a certain treatment). However, we are not aware of any study that uses administrative data on primary care and investigates the socioeconomic gradient. Moreover, in some countries (like England and Australia) socioeconomic status can only be proxied at small area level when using administrative data.

Second, the sample is likely to include patients with very different health conditions, and we are only able to partially adjust for these. The study therefore lacks detailed controls for health status. These additional controls can be more easily included in studies using administrative data, at least to some extent. Third, we are only able to control for whether the patient has private health insurance, but we do not know if the patient attended a private provider and paid out of pocket, or a public provider.

Fourth, we are not able to distinguish whether inequalities in waiting times arise within primary care practices, or across practices, as it has been investigated by studies with administrative data for secondary care (reviewed in the Introduction). Neither are we able to explore whether inequalities are due to differential provision of primary care over the territory, for example if poor people live in more deprived neighbourhoods with fewer primary care providers translating into longer waiting times. This would entail controlling for provider fixed effects or region fixed effects, which are not available in the surveys.

## Conclusions

In summary, our results are suggestive of socio-economic inequalities in waiting times for primary care in several countries. This implies that inequalities in waiting times may start early in the patient pathway, and could extend or be the source of inequalities in secondary care. Some of these inequalities could be due to better-off individuals being able to afford to pay fees charged by private providers or to being able to travel to providers with shorter wait. But they may also reflect inequalities within publicly funded systems that are due to disparities of services and accessibility within the territory, different ability to engage with booking systems or to pressure the provider for a quicker appointment, and different attitudes in describing the urgency of their symptoms.

The policy implications of our analysis relate to the possible mechanisms behind the gradient. If the gradient is due to reduced availability of supply in less affluent areas, additional policy effort may be devoted in encouraging primary care doctors to locate in more disadvantaged areas (e.g. rural areas or urban deprived areas). If inequalities are due to better-off individuals being more insistent, then more robust booking systems may be designed. If instead they are due to worse-off individuals being less flexible in attending an appointment, arranging more flexible appointment schedules out of traditional working hours may help reducing such disparities. This highlights the importance of understanding in more depth the different pathways and causes underlying such inequalities that could not be investigated in this international study, due to data limitations, but can be investigated in future research.

## References


Abasolo., I., Negrin-Hernandez, M.A., Pinilla, J. 2014. Equity in specialist waiting times by socioeconomic groups: evidence from Spain. European Journal of Health Economics. 15, 323-334.

Carrière G, Sanmartin C. 2010. Waiting time for medical specialist consultations in Canada. 2007. Statistics Canada, Catalogue no. 82-003-XPE. Health Reports. 2010; 21(2).

Cameron, C.A., Trivedi, P.K. 2005. Microeconometrics: Methods and applications. Cambridge: Cambridge University Press.

Cameron, C.A., Trivedi, P.K. 2010. Microeconometrics using Stata, Revised Edition, Stata press, Texas.

Gawad, N., Davies, D., Langer, J.. 2014. Determinants of wait time for infant inguinal hernia repair in a Canadian children's hospital. Journal of Pediatric Surgery, 49(May 5), 766–9.

Jaakkimainen, L., Glazier, R., Barnsley, J., Salkeld, E., Lu, H., Tu, K. 2014. Waiting to see thespecialist: patient and provider characteristics of wait times from primary to specialty care. BMC Family Practice, 25(January (15)):16.

Johar, M., Jones, G., Keane, M., Savage, E., Stavrunova, O. 2013. Differences in waiting times for elective admissions in NSW public hospitals: A decomposition analysis by non-clinical factors. Journal of Health Economics. 32, 181–194.

Jones, A.M. 2007. Applied econometrics for health economists: A practical guide. Oxford: Radcliffe Medical Publishing.

Kaarboe, O., Carlsen, F. 2014. Waiting times and socioeconomic status. Evidence from Norway. Health Economics. 23, 93–107.

Landi, S., Ivaldi, E., Testi, A. 2018. Socioeconomic status and waiting times for health services: an international literature review and evidence from the Italian National Health System. Health Policy, 122, 334-351.

Laudicella, M., Siciliani, L., Cookson, R. 2012. Waiting Times and Socioeconomic Status: Evidence from England. Social Science and Medicine. 74(9), 1331-1341.

Long, J. S., Freese, J. 2006. Regression Models for Categorical and Limited Dependent Variables Using Stata, Second Edition. College Station, TX: Stata Press.

Martin, S., Smith, P.C. 1999. Rationing by waiting lists: an empirical investigation. Journal of Public Economics. 71, 141-164.

Martin, S., Smith, P.C. 2003. Using panel methods to model waiting times for National Health Service surgery, Journal of the Royal Statistical Society Series A, 166, 369-387.

Monstad, K., Engeaeter, L.B., Espehaug, B. 2014. Waiting time socioeconomic status - an individual level analysis. Health Economics. 23, 446–461.

Moscelli, G., Siciliani, L., Gutacker, N., Cookson, R. 2018. Socioeconomic Inequality of Access to Healthcare: Does Choice Explain the Gradient? Journal of Health Economics. 57, 290-314.

Osborn, R., Squires, D., Doty, M.M., Sarnak, D.O., Schneider, E.C. 2016. In New Survey of 11 Countries, U.S. Adults Still Struggle with Access to and Affordability of Health Care, Health Affairs, 35(12):2327-2336.

Petrelli, A., De Luca, G., Landriscina, T., Costa, G. 2012. Socioeconomic differences in waiting times for elective surgery: a population-based retrospective study. BMC Health Services Research. 12, 268.

Roll, K., Stargardt, T., Schreyogg, J. 2012. Effect of type of insurance and income on waiting time for outpatient care, The Geneva Papers. The International Association for the Study of Insurance Economics. 37, 609–632.

Schoen, C., Osborn, R., Squires, D., Doty, M.M., Pierson, R., Applebaum, S. 2010. How health Insurance Design Affects Access To Care And Costs, By Income, in eleven countries. Health Affairs. 29(12), 2323-2334.

Schoen, C., Osborn, R., Squires, D., Doty, M.M. 2013. Access, Affordability, And Insurance Complexity Are Often Worse In The United States Compared To Ten Other Countries, Health Affairs, 32(12), 2205-15.

Sharma, A., Siciliani, L., Harris, A. 2013. Waiting times and socioeconomic status: does sample selection matter? Economic Modelling, 33, 659-667.

Siciliani, L. 2016. Waiting times: evidence of social inequalities in access for care. Data and measures in health services research, 1-17.

Siciliani, L., Borowitz, M., Moran, V. (Editors). 2013. Waiting Time Policies in the Health Sector. What works?, OECD Book, Paris, France.

Siciliani L, Moran V, Borowitz M. 2014. Measuring and Comparing Health Care Waiting Times in OECD Countries. Health Policy. 118, 292-303.

Siciliani, L., Verzulli, R. 2009. Waiting times and socioeconomic status among elderly Europeans: evidence from SHARE. Health Economics. 18(11), 1295-1306.

Sundmacher, L. Kopetsch, T. 2013. Waiting times in the ambulatory sector - the case of chronically Ill patients. International Journal for Equity in Health, 12(1), 77.

Sutherland, J., Kurzawa, Z., Karimuddin, A. et al. 2019. Wait lists and adult general surgery: is there a socioeconomic dimension in Canada?. BMC Health Service Research, 19, 161. https://doi.org/10.1186/s12913-019-3981-9

Szynkaruk, M., Stephens, D., Borschel, G.H., Wright, J.G. 2014. Socioeconomic status andwait times for pediatric surgery in Canada. Pediatrics, 134(2).

Thind, A., Stewart, M., Manuel, D., Freeman, T., Terry, A., Chevendra, V., et al. 2012. What are wait times to see a specialist? An analysis of 26, 942 referrals in southwestern Ontario. Healthc Policy, 2012, 8(August (1)), 80–91.

Tinghög, G., Andersson, D., Tinghög, P., Lyttkens, CH. 2014. Horizontal inequality when rationing by waiting lists. International Journal of Health Services. 44 (1), 169-184.

## Table 1. Proportion of national survey respondents by waiting time response, by country and year

| Response to waiting time question: 2010 | Australia | Canada | France | Germany | Netherlands | New Zealand | Norway | Sweden | Switzerland | UK |
|---|---|---|---|---|---|---|---|---|---|---|
| On the same day | 41.56 | 27.75 | 42.40 | 42.22 | 44.94 | 48.63 | 30.80 | 35.33 | 85.75 | 30.30 |
| The next day | 23.23 | 14.51 | 17.90 | 22.40 | 23.78 | 28.57 | 11.47 | 13.17 | 5.41 | 38.47 |
| In 2 to 5 days | 20.64 | 20.40 | 20.37 | 17.27 | 22.39 | 16.16 | 24.56 | 16.12 | 4.79 | 22.20 |
| In 6 to 7 days | 5.35 | 7.78 | 3.49 | 6.51 | 1.33 | 2.40 | 10.06 | 8.17 | 0.47 | 5.75 |
| In 8 to 14 days | 4.00 | 6.85 | 4.57 | 3.54 | 1.00 | 1.63 | 7.37 | 4.21 | 0.60 | 1.48 |
| After more than two weeks | 4.07 | 14.38 | 8.43 | 4.90 | 1.77 | 1.15 | 8.54 | 7.49 | 0.63 | 0.33 |
| Never able to get an appointment | 0.33 | 2.50 | 0.09 | 0.57 | 0.28 | 0.05 | 0.57 | 1.12 | 0.09 | 0.18 |
| Not sure | 0.80 | 5.31 | 2.77 | 1.34 | 4.25 | 1.03 | 5.63 | 14.19 | 2.26 | 1.16 |
| Decline to answer | 0.02 | 0.50 | 0.00 | 1.26 | 0.25 | 0.36 | 1.00 | 0.20 | 0.00 | 0.13 |
| **Response to waiting time question: 2013** | **Australia** | **Canada** | **France** | **Germany** | **Netherlands** | **New Zealand** | **Norway** | **Sweden** | **Switzerland** | **UK** |
| On the same day | 33.70 | 24.94 | 34.17 | 65.69 | 25.92 | 45.29 | 31.27 | 36.27 | 47.16 | 25.75 |
| The next day | 21.08 | 13.38 | 18.47 | 6.56 | 34.02 | 23.11 | 14.29 | 11.73 | 20.16 | 24.13 |
| In 2 to 5 days | 26.02 | 24.37 | 24.87 | 8.37 | 21.43 | 21.85 | 18.04 | 16.39 | 22.48 | 30.25 |
| In 6 to 7 days | 6.36 | 7.98 | 3.32 | 3.77 | 10.38 | 2.74 | 9.40 | 6.81 | 5.01 | 9.32 |
| In 8 to 14 days | 2.24 | 6.67 | 2.90 | 2.76 | 0.87 | 0.74 | 8.48 | 5.27 | 1.77 | 3.96 |
| After more than two weeks | 3.25 | 12.31 | 6.48 | 6.25 | 0.34 | 0.54 | 6.78 | 5.33 | 0.52 | 1.53 |
| Never able to get an appointment | 1.23 | 3.64 | 1.87 | 1.37 | 1.61 | 1.01 | 0.16 | 0.28 | 0.13 | 0.91 |
| Not sure | 6.03 | 5.82 | 7.71 | 4.26 | 5.28 | 4.24 | 10.97 | 17.55 | 2.74 | 3.83 |
| Decline to answer | 0.09 | 0.90 | 0.21 | 0.97 | 0.15 | 0.48 | 0.60 | 0.38 | 0.02 | 0.30 |
| **Response to waiting time question: 2016** | **Australia** | **Canada** | **France** | **Germany** | **Netherlands** | **New Zealand** | **Norway** | **Sweden** | **Switzerland** | **UK** |
| On the same day | 40.74 | 27.31 | 22.69 | 24.49 | 47.52 | 47.81 | 29.19 | 31.62 | 27.96 | 39.65 |
| The next day | 21.06 | 11.93 | 32.75 | 28.30 | 24.46 | 25.31 | 12.19 | 12.88 | 25.01 | 15.38 |
| In 2 to 5 days | 20.86 | 21.65 | 26.06 | 20.17 | 12.70 | 17.61 | 23.03 | 15.38 | 30.83 | 22.65 |
| In 6 to 7 days | 4.48 | 7.72 | 12.78 | 7.80 | 1.26 | 1.76 | 9.70 | 9.01 | 3.74 | 5.52 |
| In 8 to 14 days | 1.57 | 6.11 | 4.19 | 11.90 | 1.24 | 1.23 | 7.43 | 4.97 | 2.68 | 4.16 |
| After more than two weeks | 1.31 | 10.35 | 1.23 | 7.28 | 0.98 | 0.74 | 7.24 | 7.36 | 2.20 | 4.79 |
| Never able to get an appointment | 0.14 | 2.75 | 0.12 | 0.00 | 1.69 | 0.24 | 0.03 | 1.18 | 0.50 | 2.06 |
| Not sure | 2.69 | 3.36 | 0.00 | 0.00 | 3.46 | 1.14 | 5.48 | 9.01 | 0.34 | 2.10 |
| Decline to answer | 0.04 | 0.36 | 0.00 | 0.00 | 0.13 | 0.46 | 0.89 | 0.07 | 0.00 | 0.23 |
| No appointment necessary | 7.1 | 8.48 | 0.18 | 0.06 | 6.55 | 3.7 | 4.83 | 8.52 | 6.73 | 3.45 |

**Table 2. Descriptive statistics: Control variables (three years combined, weighted)**

| | Australia | Canada | France | Germany | Netherlands | New Zealand | Norway | Sweden | Switzerland | UK |
|---|---|---|---|---|---|---|---|---|---|---|
| **Age groups** | | | | | | | | | | |
| 18-35 years | 0.313 | 0.273 | 0.291 | 0.257 | 0.273 | 0.284 | 0.295 | 0.275 | 0.279 | 0.321 |
| 36-50 years | 0.273 | 0.290 | 0.263 | 0.268 | 0.286 | 0.283 | 0.285 | 0.250 | 0.282 | 0.257 |
| 51-65 years | 0.235 | 0.262 | 0.244 | 0.253 | 0.260 | 0.242 | 0.239 | 0.238 | 0.240 | 0.228 |
| 66-80 years | 0.139 | 0.132 | 0.178 | 0.201 | 0.146 | 0.144 | 0.149 | 0.172 | 0.157 | 0.148 |
| Older than 80Age group 5: 81+ | 0.037 | 0.036 | 0.024 | 0.022 | 0.036 | 0.044 | 0.030 | 0.065 | 0.043 | 0.043 |
| **Gender** | | | | | | | | | | |
| Male | 0.493 | 0.475 | 0.480 | 0.486 | 0.484 | 0.466 | 0.488 | 0.483 | 0.486 | 0.480 |
| **Chronic illness** | | | | | | | | | | |
| Cancer | 0.074 | 0.071 | 0.049 | 0.048 | 0.049 | 0.065 | 0.073 | 0.073 | 0.051 | 0.044 |
| Chronic Heart Disease | 0.075 | 0.071 | 0.089 | 0.084 | 0.075 | 0.084 | 0.093 | 0.096 | 0.082 | 0.060 |
| COPD | 0.118 | 0.138 | 0.128 | 0.082 | 0.118 | 0.139 | 0.152 | 0.142 | 0.079 | 0.071 |
| Arthritis | 0.210 | 0.250 | 0.115 | 0.108 | 0.114 | 0.194 | 0.157 | 0.170 | 0.113 | 0.115 |
| Depression | 0.161 | 0.191 | 0.143 | 0.093 | 0.118 | 0.129 | 0.172 | 0.197 | 0.098 | 0.085 |
| Diabetes | 0.084 | 0.095 | 0.086 | 0.090 | 0.084 | 0.072 | 0.065 | 0.074 | 0.069 | 0.089 |
| Hypertension | 0.228 | 0.239 | 0.216 | 0.257 | 0.201 | 0.234 | 0.242 | 0.247 | 0.212 | 0.183 |
| **Year dummies** | | | | | | | | | | |
| 2010 | 0.342 | 0.258 | 0.365 | 0.322 | 0.322 | 0.343 | 0.346 | 0.186 | 0.323 | 0.443 |
| 2013 | 0.198 | 0.413 | 0.340 | 0.348 | 0.314 | 0.328 | 0.311 | 0.206 | 0.364 | 0.283 |
| 2016 | 0.460 | 0.329 | 0.295 | 0.331 | 0.365 | 0.329 | 0.342 | 0.608 | 0.312 | 0.274 |
| **Private health care** | | | | | | | | | | |
| Has private care insurance | 0.459 | 0.602 | 0.896 | 0.264 | 0.751 | 0.359 | 0.391 | 0.279 | 0.131 | 0.189 |
| Observations | 10,189 | 11,796 | 3,752 | 3,038 | 2,971 | 2,880 | 2,829 | 9,491 | 3,836 | 3,367 |

**Table 3. Proportion of survey respondents in each education and income group, by country (2010, 2013, 2016)**

| | Australia | Canada | France | Germany | Netherlands | New Zealand | Norway | Sweden | Switzerland | UK |
|---|---|---|---|---|---|---|---|---|---|---|
| *Education* | | | | | | | | | | |
| Primary and lower secondary | 0.220 | 0.133 | 0.143 | 0.178 | 0.162 | 0.131 | 0.139 | 0.191 | 0.162 | 0.147 |
| Upper secondary | 0.405 | 0.312 | 0.609 | 0.425 | 0.503 | 0.419 | 0.516 | 0.472 | 0.534 | 0.422 |
| Post-secondary and tertiary | 0.340 | 0.541 | 0.245 | 0.381 | 0.326 | 0.390 | 0.339 | 0.333 | 0.278 | 0.400 |
| Unspecified | 0.035 | 0.014 | 0.003 | 0.017 | 0.009 | 0.059 | 0.006 | 0.004 | 0.026 | 0.031 |
| *Income* | | | | | | | | | | |
| Much below average | 0.167 | 0.175 | 0.265 | 0.140 | 0.097 | 0.138 | 0.177 | 0.157 | 0.209 | 0.069 |
| Somewhat below average | 0.193 | 0.181 | 0.213 | 0.188 | 0.146 | 0.197 | 0.165 | 0.176 | 0.207 | 0.152 |
| Average | 0.260 | 0.226 | 0.227 | 0.321 | 0.226 | 0.277 | 0.169 | 0.173 | 0.245 | 0.378 |
| Somewhat above average | 0.193 | 0.214 | 0.175 | 0.184 | 0.253 | 0.216 | 0.244 | 0.263 | 0.189 | 0.201 |
| Much above average | 0.072 | 0.119 | 0.055 | 0.066 | 0.148 | 0.102 | 0.197 | 0.161 | 0.062 | 0.058 |
| Unspecified | 0.115 | 0.085 | 0.065 | 0.100 | 0.130 | 0.070 | 0.048 | 0.070 | 0.088 | 0.142 |

**Table 4. Interval regression estimates for days waited for primary care appointment, pooled sample (2010, 2013, 2016); marginal effects by country**

| VARIABLES | (1) Australia | (2) Canada | (3) NZ | (4) UK | (5) Germany | (6) Netherlands | (7) France | (8) Norway | (9) Sweden | (10) Switzerland |
|---|---|---|---|---|---|---|---|---|---|---|
| *Income* | | | | | | | | | | |
| Somewhat below average | -0.200 | -0.471* | -0.195 | -0.361 | -0.656* | -0.191 | 0.132 | -1.201** | -0.146 | -0.117 |
| Average | -0.329* | -0.990*** | -0.336* | -0.432 | -1.324*** | -0.271 | -0.146 | -1.420*** | -0.694** | -0.212 |
| Somewhat above average | -0.362* | -1.536*** | -0.262 | -0.038 | -1.577*** | -0.205 | -0.044 | -1.637*** | -0.885*** | -0.247 |
| Much above average | -0.241 | -1.805*** | -0.265 | -0.538 | -1.982*** | -0.377* | -0.053 | -1.218*** | -1.059*** | -0.345* |
| Unspecified | -0.165 | -0.716** | -0.278 | -0.251 | -1.786*** | 0.112 | -0.737* | -1.653*** | -0.132 | -0.130 |
| *Education* | | | | | | | | | | |
| Upper secondary | -0.079 | -0.445 | -0.170 | 0.246 | 0.841*** | 0.178 | -0.702 | -0.527 | -0.054 | 0.144 |
| Post-secondary and tertiary | -0.273* | -0.372 | -0.046 | 0.040 | 2.065*** | 0.133 | -0.929* | -0.527 | 0.261 | 0.463*** |
| Unspecified | -0.320 | 1.563* | -0.154 | 1.078* | 0.854 | 0.391 | -1.041 | 0.592 | 1.616 | -0.407* |
| *Age and gender* | | | | | | | | | | |
| Age group 2 (30-50 years) | 0.270** | 0.357* | -0.035 | -0.190 | 0.792*** | -0.108 | 0.253 | 0.466 | -0.235 | -0.212* |
| Age group 3 (51-65 years) | 0.563*** | 0.441** | 0.153 | -0.106 | 0.389 | 0.014 | 0.422 | 1.121*** | 0.128 | -0.190 |
| Age group 4 (66-80 years) | 0.104 | -0.127 | -0.181 | 0.142 | 0.326 | -0.243 | 0.967*** | 1.193*** | 0.173 | -0.242 |
| Age group 5 (above 80) | -0.546** | -0.989** | -0.291 | 0.302 | 0.288 | -0.619** | -0.123 | -0.556 | -0.269 | -0.151 |
| Male | -0.071 | -0.304** | 0.057 | -0.043 | -0.181 | 0.099 | 0.023 | 0.121 | 0.000 | -0.001 |
| *Chronic illness* | | | | | | | | | | |
| Cancer | 0.386* | 0.149 | 0.224 | -0.103 | -0.356 | 0.030 | 0.584 | -0.230 | 0.038 | 0.300 |
| Coronary Heart Disease | 0.450* | -0.151 | -0.044 | 0.050 | 0.558 | 0.208 | -0.115 | 0.286 | -0.450** | -0.334** |
| COPD | 0.049 | -0.101 | 0.298* | -0.099 | 0.003 | 0.246 | -0.609* | -0.713** | 0.141 | 0.185 |
| Arthritis | 0.036 | 0.397** | 0.078 | -0.332 | 0.379 | 0.114 | -0.012 | 0.102 | 0.860*** | -0.107 |
| Depression | -0.020 | 0.141 | 0.291* | 0.409 | -0.070 | 0.119 | -0.011 | 0.056 | 0.884*** | 0.279* |
| Diabetes | 0.315 | -0.084 | 0.108 | -0.097 | 0.653* | 0.151 | 0.782* | -0.678 | -0.365 | 0.005 |
| Hypertension | 0.074 | 0.253 | 0.033 | 0.178 | -0.023 | -0.111 | 0.452 | -0.009 | 0.188 | -0.245** |
| *Year dummies* | | | | | | | | | | |
| 2013 | 0.144 | -0.228 | -0.004 | 0.840*** | -0.735*** | 0.395*** | -0.021 | -0.331 | -0.321 | 1.050*** |
| 2016 | -0.533*** | -0.519*** | -0.077 | 0.829*** | 1.062*** | -0.385*** | -0.218 | -0.231 | 0.129 | 1.718*** |
| *Private health insurance* | -0.363*** | -0.069 | -0.093 | 0.030 | -0.676*** | -0.144 | -1.123*** | -0.133 | -0.005 | -0.194* |
| Observations | 10,189 | 11,796 | 2,880 | 3,367 | 3,038 | 2,971 | 3,752 | 2,829 | 9,491 | 3,836 |

Note: The baseline groups are: much below average income, primary and lower secondary education, age group 1 (18-35 years), gender=female, no chronic illness, and year=2010.

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.