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Affordability of Medicines and Patients' Cost-Reducing Behaviour

Empirical Evidence Based on SUR Estimates from Italy and the UK

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Abstract

Introduction: Studies have demonstrated that co-payments on medication reduce the consumption of both non-essential and essential drugs, and that the latter can lead to worse health outcomes. Far less is known about how patients cope with the cost of medication, particularly if affordability is an issue, and how this compares across two countries with different prescription charge policies. Therefore, the aim of this article is to explore empirically how, and to what extent, costs incurred by patients influence their decision-making behaviour in accessing medicines.

Methods: Based on the findings from focus groups, a questionnaire was designed that addressed medication cost issues relevant to patients in both the UK and Italy. Using an econometric model, several hypotheses are tested regarding patients' decision-making behaviour and how it is influenced by health status, sociodemographic characteristics and the novel concept of a self-rated affordability measure.

Results: Quite a large percentage of patients (70.3% in the UK and 66.5% in Italy) stated they have to think about the cost of medicines at least sometimes. Respondents adopted numerous cost-reducing strategies, subdivided into (i) those initiated by patients and (ii) those involving self-medication. Their use was strongly influenced by income and drug affordability problems, but the self-rated affordability measure was a stronger predictor. Commonly used strategies were not to get prescribed drugs dispensed at all, prioritising by not getting all prescribed items dispensed or delaying until the respondent got paid. Furthermore, respondents with affordability issues were also cost-conscious when self-medicating with over-the-counter (OTC) products for minor conditions such as dyspepsia. Despite patients in both countries using cost-reducing strategies, their use was more pronounced in the UK, where the prescription charge was significantly higher than in Italy.

Discussion/conclusion: The results from this study provide detail on the kinds of strategies patients use to reduce the cost burden of prescription charges, and support previous research showing they may be foregoing essential medication. Because the same questionnaire was applied in two European countries, where the national health systems aim to provide healthcare services that are accessible to all citizens in need, it offers interesting insights for policy makers in other countries, where patients may have to pay a larger share of their drugs out-of-pocket, such as the US.

The continuous increase in the cost of healthcare services recorded over the last 2 decades in many countries has produced serious concerns among policy makers, who have been forced to adopt new restrictive measures in order to reduce public budget deficits. The EU governments have been particularly sensitive to this issue, given the strict requirements imposed on their budgets by the Maastricht Treaty signed in 1991. Although prescription drugs represent only a relatively small part of healthcare spending in most OECD (Organisation for Economic Cooperation and Development) countries, the increasing trends in both their volumes and their prices have been greater than in other major components of healthcare spending.[1]

A variety of co-payment systems, where patients are required to contribute in some way towards the cost of their medication and healthcare use, have therefore been introduced by most countries in order to reduce demand for non-essential drugs and thus manage drug expenditure. Several empirical contributions[1] (mostly from the US and the UK) confirm that the demand for prescription drugs is reduced by a direct contribution from the patient, even though the overall impact of co-payments remains quite limited, with price elasticity ranging from –0.1 to –0.6. As noted by Freemantle and Bloor,[15] the key concern with policies on drug reimbursement is that they will, besides reducing the use of non-essential drugs, also result in a reduction of the use of essential drugs. Even though the reduction in 'discretionary' (or non-essential) drugs has been shown to be differentially greater than the reduction in uptake of essential prescribed medicines,[16] the concern remains that essential medication is affected.

We know very little about how the cost of medication (through co-payment systems) affects individual patients, and how they manage medication costs. We also know little about the characteristics that would make some patients more likely to use various strategies to reduce their drug consumption.

The goal of this article is to explore empirically how, and to what extent, costs incurred by patients influence their decision-making behaviour in accessing medicines. This is a novel study in that it uses an *ad hoc* survey to inform the descriptive and empirical analysis of the influence of costs on patient decision making. Besides socioeconomic factors and health attributes that influence patient decision making, this survey uses several questions and statements about patients' ability to afford medication and their use of strategies to reduce medication costs.

The definition of costs[2] used in this study is the price paid for medicines, given that in both Italy and the UK visits to general practitioners (GPs) are free of charge.[3] Costs associated with medicines would therefore include prescription charges, co-payments on medicines and the expense of over-the-counter (OTC) products purchased in pharmacies and other retail outlets.

Prescription Charge Systems in Italy and the UK[4]

Italy and the UK are countries that provide a good basis for comparison in terms of their healthcare and prescription charge systems. The principle of free access based on need underlies the National Health Service (NHS) in both countries. In the Italian NHS, most of the funds are generated through payroll taxes, whereas in the UK the largest source of funding is general taxation.[18]

In terms of prescription charges, the two countries are also not dissimilar. The current UK prescription charge is a fixed flat fee, payable for each item prescribed, irrespective of the actual drug cost, the amount prescribed or the type of pharmaceutical preparation. The Italian prescription charge is rather more complicated. In 1995, products were classified into three reimbursement groups: class A contained drugs for severe and chronic illnesses, and the patient was required to pay only a fixed prescription charge, which applied to each single package and was independent of amount and price; for drugs deemed to be non-essential but potentially useful (class B), the patient paid 50% of the retail price; other drugs (class C) were fully paid for by the patient. Given the reduced importance of the class B category of drugs (8.2% of total drug specialties reimbursed by the Italian NHS), the Italian system is not dissimilar to the UK system. This means that, in most instances, Italian patients pay either the full cost of medicines or a fixed charge, as with UK patients. The L3000 (about €1.7) flat rate charge for class A drugs in Italy was considerably lower than the UK prescription charge, even if the data are adjusted for 'purchasing power parity'. In 2000, when this survey was conducted, UK patients incurred a prescription charge of £6.00 (€9.80) per item. This cost was also high in comparison with many other countries in the EU.[19]

In both countries a number of exemptions exist. In Italy, disabled persons were fully exempt from paying any charges on both class A (fixed charge) and class B drugs. In the UK, exemptions exist on the basis of age (≤16 and ≥60 years old), income and benefit-related reasons, and a number of medical conditions. Approximately 86% of prescription items are now exempt from charges, covering approximately 50% of the population.[20] Furthermore, pre-payment certificates (PPCs) exist, which can be

1 Main studies on the topic include Leibowitz et al.,[2] Soumerai et al.,[3] O'Brien,[4] Harris et al.,[5] Ryan and Birch,[6] Huttin,[7] Hughes and McGuire,[8] Tamblyn et al.,[9] Atella[10,11] and Atella and Rosati.[12] Lexchin and Grootendorst[13] and Rice and Matsuoka[14] provide reviews of the impact of cost sharing on drug use by vulnerable populations.

2 All costs and nominal values expressed in this article refer to the period June–November 2000, when the field study was conducted.

3 In Italy, visits to specialists may incur a relatively high charge (about €35) for the patient. In the UK, these are free of charge if patients are treated under the National Health Service (NHS).

4 For more detail on the history and current organisation of the health services in Italy and the UK, see Hassell et al.[17]

Table I. Sociodemographic characteristics of the population samples

Sociodemographic characteristic	Italy (%) [n]		UK (%) [n]	
	dyspepsia	hypertension	dyspepsia	hypertension
Sex				
Male	33.0	51.7	53.2	51.1
Female	67.0	48.3	46.8	48.9
[Not answered]	[8]	[6]	[1]	[3]
Age (y)				
≤49	34.2	12.2	47.2	29.0
50–64	42.1	43.9	43.5	67.9
≥65	23.7	43.9	9.3	3.1
[Not answered]	[6]	[5]	[2]	[3]
Household income: below/above average[a]				
Below average or average	55.4	67.3	67.0	62.0
Above average	44.6	32.7	33.0	38.0
[Not answered]	[28]	[40]	[10]	[13]
Household composition				
Single	15.0	21.6	10.0	11.3
Couple	30.7	36.6	50.9	47.4
3 persons	24.3	12.7	20.0	23.3
>3 persons	30.0	28.1	19.1	18.0
[Not answered]	[13]	[19]	[0]	[1]
Educational level[b]				
Low	47.3	58.0	53.7	54.6
High	52.7	42.0	46.3	45.4
[Not answered]	[8]	[10]	[2]	[4]
Health status				
Very good	4.5	1.6	14.8	16.4
Good	37.5	30.9	42.6	47.0
Fair	51.8	61.8	37.0	28.4
Poor	5.4	5.7	4.6	28.4
Very poor	0.9	0.0	0.9	1.5
[Not answered]	[8]	[30]	[2]	[0]
Exemption status Italy[c]				
Full exemption	2.8	4.8		
Pays prescription charges only	68.2	83.6		
Pays for drugs	27.1	11.0		
Don't know	1.9	0.7		
[Not answered]	[123]	[141]		
Exemption status UK				
Full exemption			19.6	6.0

Continued next page

Table I. Contd

Sociodemographic characteristic	Italy (%) [n]		UK (%) [n]	
	dyspepsia	hypertension	dyspepsia	hypertension
Pays prescription charges			68.2	75.9
Pre-payment certificates			12.1	18.0
[Not answered]			[3]	[1]
Chronic conditions apart from hypertension and dyspepsia				
No	38.9	49.7	16.7	29.1
Yes	61.1	50.3	83.3	70.9
Acute minor conditions during the last 4 weeks				
No acute minor condition	15.9	20.8	17.3	16.4
One acute minor condition	36.3	35.8	27.3	26.1
Two acute minor conditions	21.2	21.7	25.5	26.1

a In Italy, net average annual household income was approximately €15 000, as reported in the Bank of Italy 1998 Survey on Household Income and Wealth.[37] Average household income was defined as follows: L2.5 million (about €1290).[37] In the UK, gross average annual household income was defined as £20 000 (about €33 333).[38]

b Definition of low/high education level: Italy: ≤14 years of age/≥15 years; UK: ≤15 years of age/≥16 years.

c Only half of the Italian sample answered this question.

bought to cover the cost of all prescriptions dispensed during a subsequent period of 4 or 12 months.[5]

The Dataset: Methodological Issues, Questionnaire Design and Description of the Relevant Variables

In order to explore consumer decision-making behaviours in a non-hypothetical manner, patients with two distinctly different conditions, hypertension and dyspepsia, were targeted. These provide examples of conditions with very different symptom profiles, long-term health implications and treatment options (both for GPs and patients). Hypertension is an example of a chronic condition with important implications for long-term morbidity and mortality, affecting about 20–22% of the adult population in both countries.[21] Hypertension is an asymptomatic condition, i.e. patients do not generally feel ill because of high blood pressure, but medication can have adverse effects, and compliance with antihypertensive medication is often problematical.[22] Furthermore, treatment is generally long term. With regard to cost, this means that patients will receive regular, sometimes multiple, prescriptions with associated prescription charges.

Dyspepsia is a condition presenting with acute symptoms in the upper gastrointestinal tract, caused by a range of pathologies.[23] The prevalence of dyspepsia is about 30%.[24] Besides using prescribed medication, many patients self medicate with OTC products, which are available in both Italy and the UK. In the UK, 75% of dyspepsia sufferers do not consult their GP.[24]

To inform the design of the survey instrument, a series of focus groups were conducted with physicians[11,17,25,26] and patients[27,28] in both participating countries, thus ensuring cross-country relevance of the issues explored. The English source questionnaire was translated into Italian, re-translated into English and any mismatches corrected.[29] [6] The piloted questionnaire was structured in four sections containing information on the patients' general health status and their use of medical services, condition-related questions (not presented in this article), questions and statements addressing the patients' behaviour and views with respect to medication cost issues and, finally, information on demographics and income. Attitude statements explored strategies patients used to cope with medication cost, and were grouped into two types: (i) those that were patient initiated; and (ii) those where patients used self medication with products purchased OTC. Patient affordability was measured 'subjectively'. Some of the questions asking for health status and sociodemographic characteristics were based on existing large-scale surveys, such as the ISTAT (Istituto Nazionale di Statistica) multipurpose survey (Italy 1998),[30,31] the European Community Household Panel (ECHP 1998),[32] the Health Survey for England 1999,[33] the National Survey of NHS Patients 1998 (UK)[34] and the Survey of Activity and Health 1990 (UK).[35]

5 The cost of PPCs at the time of the study was £31.40 (€52.00) and £86.20 (€144.00) for 4 and 12 months, respectively. They make financial sense for people who receive two or more prescription items per month.

6 The questionnaire is available from the authors upon request. It is also appears as Appendix 4 in Huttin (2003).[28]

Patients were eligible if they had either dyspepsia or mild hypertension. They were sampled as successive patients who visited 51 physicians in Italy and 21 community pharmacies in the UK during a set period of time in 2000. Italian physicians handed questionnaires to patients they diagnosed as having dyspepsia or mild hypertension. Of the 550 dyspepsia and 600 hypertension questionnaires distributed during July and November, 122 and 153 were returned – a response rate of 22.2% and 25.5%, respectively. In the UK, 296 dyspepsia and 277 hypertension questionnaires were distributed between June and September, targeting dyspepsia sufferers who bought OTC medicines, and dyspepsia and hypertension patients[7] who had to pay prescription charges or had a PPC; 110 dyspepsia and 134 hypertension questionnaires were returned, giving respective response rates of 37.2% and 48.4%. Follow-up mailings to increase response rates were not possible, as patient contact details were not available to the research team because of existing data protection policies in both countries.[36] [8]

The main sociodemographic characteristics of the sample are reported in table I. In both countries, most respondents were not exempt.[9] In Italy, this is due to the relatively low prevalence of full exemption, whereas in the UK the sampling specifically targeted patients who were not exempt.

It is quite difficult to compare these findings with official Italian and UK data, since our samples were drawn from limited areas of Rome and Manchester and parts of their suburbs. Furthermore, the samples comprise only individuals with either dyspepsia or hypertension and therefore cannot be compared with national statistics such as census data. However, our aim is not to generalise our findings beyond the population from which our samples were drawn, but to give a general impression of the level of importance of the findings and how they compare across the two samples.

Theoretical Framework

The data gathered through the survey allow us to explore several aspects of patients' behaviour. For illustrative purposes, the theoretical framework was developed in the form of a flow chart (figure 1). This summarises the main factors that can be expected to influence patients' decision making with respect to the use of medication. Some of these relationships (such as between income and health) have been widely researched in previous studies and evidence is available in the published literature.[10] Other relationships were identified in the exploratory focus groups forming part of the preliminary stages of this project. There is little, if any, published evidence about these other relationships, and our survey questionnaire was developed to address these gaps in knowledge. Among them is the relationship existing between patient 'affordability' and patient 'cost-reducing strategies'. Furthermore, as shown in figure 1, the data obtained from the survey allow the testing of an even more complex structure of determinants that can influence patients' decision-making behaviour. The different relationships (as shown in figure 1) will be discussed in more detail below, using six hypotheses (H1–H6) formed during method development.

- H1: Income level (Y) is one of the main factors influencing the patient's level of affordability (AF). It is assumed that lower income groups are more likely to have affordability problems.

This hypothesis is crucial for our study. To our knowledge, the concept of a self-rated measure of patient affordability is new in this type of analysis. It is then important to check the relationship between this measure and an indicator such as income, where income is only likely to be one of several factors that could influence patient affordability. Conditioning patient affordability on a wider set of variables could be important for policy reasons. In fact, individual demographic characteristics (age, sex, educa-

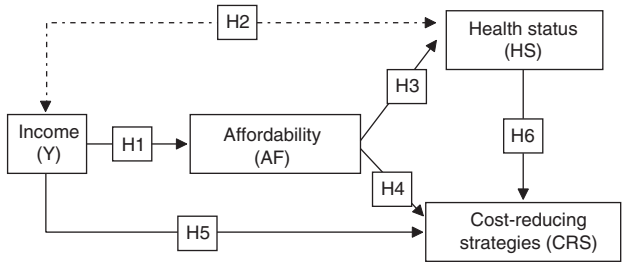

Fig. 1. The theoretical framework. Direction of arrow represents direction of causation; dashed line with arrows at both ends shows that there may be reverse causation. **H1**…**H6** = hypothesis 1 … hypothesis 6.

7 UK pharmacists were provided with a list of drugs indicated in the two conditions, and were then asked to check with patients that they were indeed taking their medication for either dyspepsia or hypertension.

8 In this respect, it is useful to note that the Italian response rate may be considerably underestimated. In fact, in several circumstances we have not been able to recover from GPs the questionnaires that were not distributed, and in four cases GPs decided to withdraw from the study after receiving the questionnaires (accounting for 100 questionnaires). UK studies where questionnaires were handed out in pharmacies achieved similar response rates, ranging between 34% and 88% (median 50%).

9 We define an exempted patient as a patient with full exemption from any payment for prescribed medicine.

10 The book *Equity in the Finance and Delivery of Health Care: an International Perspective* by van Doorslaer et al.[39] includes some of the best known articles on this subject; also see Wolfe,[40] the recent *Future of Children*[41] on child health and managed care, and Blackburn[42] and Blaxter.[43] An extensive review of the causality relationship existing between health and income has been provided by Adams et al.[44]

Table II. Proportions of patients who use various strategies to reduce the cost of their medication, by country, condition and affordability problems[a]

Strategy group	Italy				UK			
	dyspepsia		hypertension		dyspepsia		hypertension	
	no affordability problems	affordability problems	no affordability problems	affordability problems	no affordability problems	affordability problems	no affordability problems	affordability problems
Patient-initiated strategies								
Avoids GP visit	0.059	0.154	0.019	0.161	0.000	0.263	0.000	0.205
Drug not dispensed	0.206	0.474	0.038	0.376	0.000	0.313	0.023	0.227
Takes less drug, i.e. reduces dose	0.059	0.192	0.019	0.204	0.000	0.200	0.000	0.148
Drug not dispensed until patient gets paid	0.029	0.308	0.058	0.247	0.000	0.363	0.000	0.443
Only some of the items of the prescription dispensed, i.e. prioritises	0.088	0.256	0.077	0.194	0.000	0.350	0.023	0.364
Borrows money	0.000	0.128	0.000	0.097	0.000	0.338	0.023	0.273
Self-medication strategies								
Gets prescription because OTC product too expensive	0.471	0.590	0.327	0.570	0.036	0.288	0.023	0.295
Asks pharmacist to recommend cheaper OTC product	0.147	0.256	0.038	0.258	0.036	0.275	0.070	0.193
Considers price of OTC product	0.353	0.538	0.173	0.452	0.214	0.588	0.256	0.682
Prefers OTC product to GP visit	0.206	0.282	0.212	0.312	0.536	0.538	0.442	0.614
Does not takes anything	0.029	0.179	0.019	0.129	0.000	0.100	0.000	0.148
Buys cheaper of two OTC products	0.176	0.397	0.077	0.204	0.107	0.413	0.140	0.489

a The complete wording of the attitude statements can be found in Schafheutle et al.[49]

GP = general practitioner; **OTC** = over the counter.

tion, etc.) could provide more important determinants than income.

- H2: Income level (Y) influences the patient's health status (HS). It is assumed that lower income groups are more likely to have health problems.

There is extensive literature on the links between income and health. Many researchers have also questioned whether there is a reverse causation between health and income, whereby people with poor health status work less and therefore have a lower income.[44] In this study, we presume that causation proceeds from income to health. In order to test this, a number of indicators were used in the questionnaire to the measure health status and the comorbidity of respondents. Three 'subjective' health status variables were based on existing and validated large-scale national surveys (see section titled 'The Dataset: Methodological Issues, Questionnaire Design and Description of the Relevant Variables'), and two further health status variables measured the number of acute (minor) and chronic conditions, besides dyspepsia or hypertension.

- H3: The level of affordability (AF) influences patients' health status (HS). It is assumed that patients with affordability problems have poorer health status.

As already discussed, while the literature is extensive regarding the links between income and health, no similar evidence seems to exist on the relationship between patient affordability and health status.

- H4: The level of affordability (AF) influences cost-reducing strategies (CRSs). It is assumed that patients with affordability problems are higher users of cost-reducing strategies.

Very little is known about whether and how medication costs influence the way patients deal with their conditions and if they do anything to help them cope with medication cost issues, particularly if they experience affordability problems. This study is unique in addressing this, and the following section will concentrate on reporting the relevant results obtained from the survey.

- H5: Income level (Y) influences the use of cost-reducing strategies. It is assumed that lower income groups are higher users of cost-reducing strategies.

Even though in H4 we have already discussed the relationship between patient affordability and patient cost-reducing behaviour, we believe that it is interesting to understand what the direct effect of income level is on patient cost-reducing behaviour. Nevertheless, we believe that a subjective measure of patient affordability may constitute a better explanatory variable than income in explaining cost-reducing behaviour. In fact, we know that income measures normally include errors due to under-reporting in surveys, while patient affordability, being a subjective, self-rated variable, should be more dependable. Furthermore, we believe that our affordability measure may represent a multidimensional indicator of patients' economic, financial and social situations, compared with the unidimensionality of income.

- H6: Health status (HS) influences the use of cost-reducing strategies. It is assumed that patients with a poor health status are higher users of cost-reducing strategies.

It is has been observed in the literature that a poor health status has a positive effect on demand for hospitalisation[45-47] and physician visits.[48] No evidence seems to exist on the relationship between health status and medication cost-reducing strategies adopted by patients.

Patient Affordability and Cost-Reducing Strategies: Some Stylised Facts

Our self-rated affordability measure showed that quite a large percentage of patients in our sample (70.3% in the UK and 66.5% in Italy) have to think about the cost of medicines at least sometimes. As many as 24.3% and 16.3%, respectively, said they always have to think about how much money they have available to spend when they obtain medicines. Nearly two-thirds of respondents declared a level of household income on or below the average of the income distribution (table I).

Table II shows the proportion of respondents who used individual strategies, subdivided as follows, to reduce the cost of medication: (i) those initiated by patients and (ii) those involving self medication. The results show that patients with affordability problems adopt numerous strategies, and use them more frequently. Cost-reducing behaviour is more pronounced in the UK than Italy, particularly with respect to patients failing to have their drug(s) dispensed.

According to the results shown in table II, the patient-initiated strategy most commonly used by Italian respondents with affordability problems is not having a medicine dispensed. In the UK, respondents with affordability problems most commonly delay the dispensing of drugs until they get paid. Other relatively commonly used strategies identified by these respondents were not visiting the GP to avoid incurring the cost of prescribed medication, and reducing the dose below that prescribed to extend the course of medication.

More important findings emerge when examining the use of self-medication strategies. Both Italian and UK respondents were cost conscious when choosing strategies involving OTC products. Respondents with affordability problems were more likely to

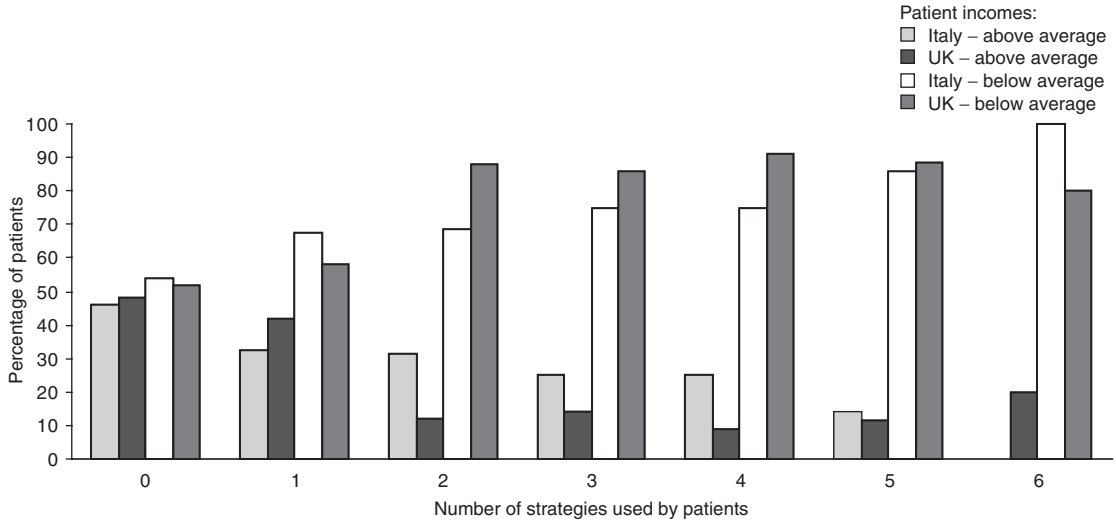

Fig. 2. Percentage of patients using patient-initiated strategies.

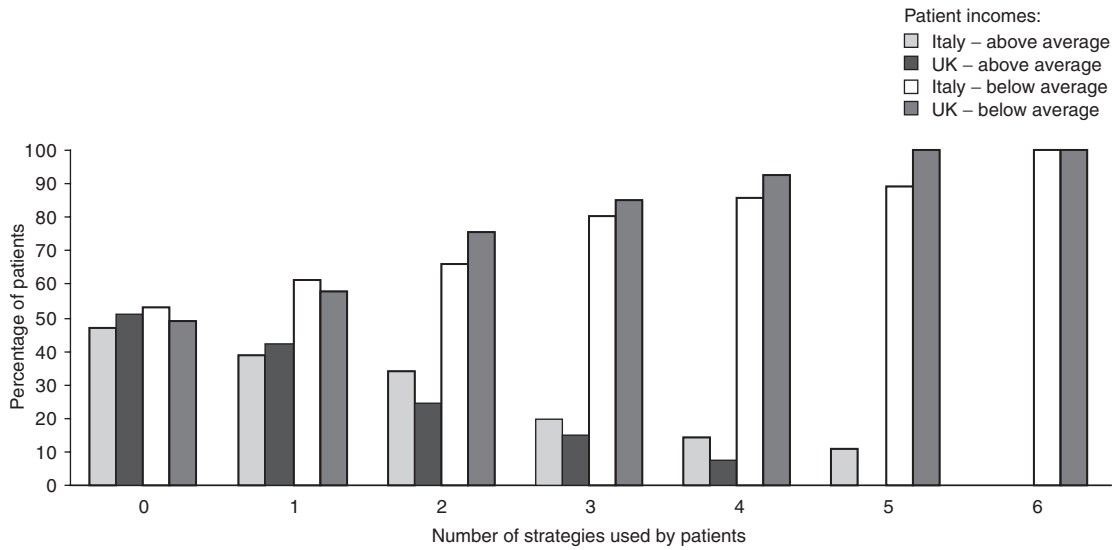

Fig. 3. Percentage of patients using self-medication strategies.

consider the price of an OTC product before buying it, or they would ask for something cheaper if they could not afford a particular OTC product. Again, affordability appears to have a stronger effect on UK than Italian respondents. There are two possible reasons for this.

Firstly, this may be due to the different ways in which Italian and UK patients were sampled. Italian patients with dyspepsia were sampled only through GPs and may therefore be those more severely affected and/or less likely to be disposed towards self medication. Secondly, and importantly, in Italy OTC products are much more expensive in relation to the relatively low prescription charge than they are in the UK, where the prescription charge is high.[19] **11** This may also explain the finding that, independent of affordability, about half of all Italian respondents stated they get a prescription because an OTC product is too expensive.

In figure 2 and figure 3 we report, by country and income level, the percentage of respondents who adopt a certain number of patient-initiated and self-medication strategies. This shows, for both countries, that respondents with a below-average household income use more strategies. Furthermore, in the UK, respondents generally use a larger number of strategies than in Italy. This phenomenon is more marked for self-medication strategies.

On the basis of this evidence, we ran an econometric analysis to test the theoretical hypotheses discussed in the section titled Theoretical Framework. The theoretical framework depicted in figure 1 was analysed through a set of structural relationships. In some cases, such as *H*1, *H*5 and *H*6, the relationship is quite straightforward and could be modelled in the following way (equation 1–3):

$$H1: \quad AF_i = f(Y_i, DEM_i) \qquad \text{(Eq. 1)}$$

$$H5: \quad CRS_{ji} = f(Y_i, DEM_i) \qquad \text{(Eq. 2)}$$

$$H6: \quad CRS_{ji} = f(HS_i, DEM_i) \qquad \text{(Eq. 3)}$$

where the index *j* represents the *j*-th cost-reducing strategy employed by the *i*-th patient and where *DEM* is a vector of patient sociodemographic characteristics upon which the relationship is conditioned to take into account patient heterogeneity. The analysis becomes more complex by recognising, for example, that *HS* is a function of *AF*, which in turn is a function of *Y*. By exploiting the econometric properties of the recursive systems it is interesting to test the joint hypothesis of *H*1 and *H*3 (equation 4):

$$H1 \;\&\; H3: \quad \begin{cases} HS = f(AF, Y, DEM) \\ AF = f(Y, DEM) \end{cases} \qquad \text{(Eq. 4)}$$

An even more complex structure appears when CRSs become the dependent variable. In this case, the system of structural equations becomes (equation 5):

$$H1 \,\&\, H2 \,\&\, H3 \,\&\, H4 \,\&\, H5 \,\&\, H6: \quad \begin{cases} CRS_j = f(HS, Y, AF, DEM) \\ HS = f(AF, Y, DEM) \\ AF = f(Y, DEM) \end{cases} \qquad \text{(Eq. 5)}$$

11 In the UK, prices for OTC products for dyspepsia vary between approximately €0.60 and €3.50 for small packs of antacids, alginates and peppermint water, and approximately €3.30 to €4.00 for a small course of H_2 antagonists.[50] Italian prices for the cheapest OTC products range from €4.20 for antacids to €5.90 for H_2 antagonists.

Table III. Econometric results from seemingly unrelated regression (SUR) estimation (simultaneous variance covariance matrix [VCE])

Explanatory variables	Italy (n = 242)			UK (n = 239)		
	parameter	t-test	p > |t|	parameter	t-test	p > |t|
Equation 1. Dependent variable: level of income						
Probit model						
Age	−0.2246	−4.390	0.000	0.2334	3.310	0.001
Age squared	0.0020	4.670	0.000	−0.0026	−3.340	0.001
Sex	0.1817	0.980	0.328	−0.4359	−2.520	0.012
Education	0.5589	4.930	0.000	0.2978	3.840	0.000
Health status	−0.2320	−1.630	0.104	−0.2881	−2.280	0.023
Family size	0.3048	3.330	0.001	0.0690	0.780	0.434
Number of acute conditions	−0.1371	−2.290	0.022	−0.1301	−2.120	0.034
Constant	4.9642	2.860	0.004	−5.6348	−3.170	0.002
Equation 2. Dependent variable: patient affordability						
Ordered probit model						
Household income	0.7129	4.040	0.000	1.0469	5.850	0.000
Age	0.0441	1.300	0.192	−0.0758	−1.480	0.140
Age squared	−0.0003	−1.110	0.268	0.0010	1.840	0.066
Education	0.1475	2.110	0.035	0.0403	0.810	0.417
Family size	−0.0879	−1.150	0.249	−0.0068	−0.100	0.920
κ_1 – cut-off point	1.3958	1.370	0.172	−0.4496	−0.350	0.728
κ_2 – cut-off point	1.9521	1.900	0.057	0.0344	0.030	0.979
κ_3 – cut-off point	3.0312	2.960	0.003	0.9176	0.720	0.472
Equation 3. Dependent variable: health status – number of chronic conditions						
Poisson model						
Level of patient affordability	−0.0782	−2.170	0.030	−0.1281	−3.270	0.001
Age	−0.0257	−2.870	0.004	0.0406	3.690	0.000
Age squared	0.0002	2.610	0.009	−0.0004	−2.680	0.007
Condition	0.7450	7.890	0.000	0.1518	1.800	0.073
Sex	0.0364	0.560	0.578	0.0980	1.190	0.235
Education	−0.0471	−1.770	0.077	−0.0696	−2.170	0.030
Family size	−0.0454	−1.670	0.094	−0.0092	−0.230	0.821
Equation 4. Dependent variable: number of patient-initiated strategies						
Poisson model						
Number of health problems	0.0267	0.580	0.564	−0.0550	−1.660	0.098
Number of chronic conditions	−0.0085	−0.150	0.881	0.0464	0.630	0.532
Number of acute conditions	0.1907	3.620	0.000	0.0675	1.450	0.148
Level of patient affordability	−0.4177	−6.160	0.000	−0.7865	−10.960	0.000
Age	0.0233	1.180	0.238	0.1133	5.220	0.000
Age squared	−0.0002	−1.110	0.266	−0.0016	−5.930	0.000
Sex	0.1762	1.010	0.313	0.1341	0.970	0.330
Condition	−0.0913	−0.510	0.607	−0.0146	−0.090	0.930

Continued next page

Table III. Contd

Explanatory variables	Italy (n = 242)			UK (n = 239)		
	parameter	t-test	p > |t|	parameter	t-test	p > |t|
Equation 5. Dependent variable: number of self-medication strategies						
Poisson model						
Number of health problems	−0.0254	−0.630	0.530	−0.0075	−0.290	0.771
Number of chronic conditions	−0.0614	−0.770	0.439	−0.0631	−1.430	0.153
Number of acute conditions	0.0896	2.070	0.038	0.0870	2.390	0.017
Level of patient affordability	−0.2651	−5.110	0.000	−0.2104	−4.770	0.000
Age	0.0502	3.580	0.000	0.0386	2.820	0.005
Age squared	−0.0005	−3.140	0.002	−0.0006	−3.060	0.002
Sex	0.0569	0.470	0.637	0.1913	2.060	0.039
Condition	−0.0676	−0.490	0.626	0.2068	1.880	0.060

By simply looking at the signs and statistical significance of the parameters, it was possible to make a formal test of the earlier-mentioned hypotheses. From an econometric point of view, a reasonable way to explore the data was to model the categorisation that took place when the data were created. In the case of dichotomous dependent variables, a logit or probit model was used, whereas in the case of polytomous dependent variables, an ordered logit or probit model was used for this purpose.[12] For those cases where a count variable exists, a count data model was employed. Furthermore, as shown above, the existence of a recursive structure in the theoretical model has allowed us to use a seemingly unrelated regression (SUR) estimation approach.

The results obtained for Italy and the UK (table III and table IV) clearly confirm almost all the theoretical framework presented in figure 1. This is even though significant differences exist between respondents' behaviour in Italy and the UK.[13]

Discussion

Our econometric model has allowed us to test several hypotheses. As a measure of respondents' ability to pay for their medication, referred to here as 'affordability', we have introduced the novel concept of a self-rated measure, rather than simply relying on proxy measures such as income. In fact, even though our self-rated affordability measure is linked to income, we have found it to be a stronger predictor of respondents' use of cost-reducing strategies than income. The fact that the same survey questionnaire was applied in two European countries, i.e. Italy and the UK, has allowed us to explore and compare respondents' adoption of drug cost-containment strategies with an international perspective.

We explored two types of strategies that patients use to cope with medication cost: (i) those they initiated themselves in relation to prescribed medication; and (ii) those involving self medication with OTC products. The latter adds an innovative dimension, particularly in terms of the level of detail examined in this survey. Self medication can be an important alternative to prescribed medication, as in the case of dyspepsia, and may provide an important way of managing cost.[54]

There is a strong tendency for both Italian and UK respondents to use medication cost-reducing strategies, and this is strongly influenced by income and cost-related difficulties (i.e. patient affordability problems). Even though important in both countries, patient affordability affects the adoption of cost-reducing strategies differently in the samples from the two countries. For *patient-initiated* strategies, patient affordability has almost double the influence in the UK than is observed in Italy. Even though there may be several reasons for this, we believe that it may be accounted for by the large difference between the levels of prescription charges in Italy and the UK. The UK prescription charge (€9.80 per item) is much higher than that paid by Italian patients for class A (€1.7), the most commonly prescribed category, even if costs are adjusted for purchasing power parity.

Similar conclusions can be derived for *self-medication* strategies, yet there are marked differences between the two countries. In Italy, the most commonly used strategy is to get a prescription, because buying an OTC product is too expensive. Again, this can probably be explained by the relatively low Italian prescription charge. UK respondents, on the other hand, most commonly considered the cost of particular OTC products before buying them. Therefore, the results show that respondents with affordability problems are conscious of the cost of different management

12 See Greene[51] and *Stata 8.0 Reference Manual*.[52]

13 Discussion of the full set of results is available in Atella et al.[53]

options and employ different strategies accordingly. The types of strategies vary depending on the constraints operating and the options available within individual countries (and reimbursement systems). Self-medication strategies may be a reasonable and affordable alternative (when an OTC product is available, i.e. for self-treatable conditions), particularly for UK patients.

There is evidence in the published literature that supports our findings. Studies have shown that price elasticity can vary between different therapeutic groups of drugs[55,56] and that increases in co-payments affect essential drugs to a lesser extent than non-essential drugs.[3,9] In addition, some of these studies showed a link to socioeconomic groups[56] or income.[55] Kennedy et al.[57] provide the most recent self-reported evidence for medication cost-related noncompliance and variation between subgroups. For example, working-age adults, Medicaid and Medicare beneficiaries, those with low incomes and those without health insurance were most severely affected. Furthermore, Lexchin and Grootendorst[13] and Rice and Matsuoka[14] have recently reviewed the literature specifically exploring the impact of cost sharing on vulnerable groups such as seniors, the poor and those with chronic conditions. The strength of these US studies is that they demonstrate that, without aid or protection, those populations on the lowest incomes have the lowest uptake of prescription medicines and thus the poorest outcomes. Similar conclusions have recently been reached by Atella et al.,[58] who explore the effect of co-payment changes on drug compliance using a large panel of Italian patients treated for hypertension (about 75 000 followed over 6 years).

It should be noted that noncompliance with medication because of affordability issues can have serious implications for health outcomes. Although research linking issues of medication cost to health outcomes is scarce, two North American studies have demonstrated just such a negative impact. Soumerai et al.[59] showed increases in mental health service use, and Tamblyn et al.[9] linked increased adverse events (e.g. emergency department visits or death) among low-income patients, to increases in cost sharing.

Conclusions

This cross-country survey has proven to be an important contribution to the existing literature on the (potentially negative) impact of co-payment systems on the uptake of prescribed medication. The study is innovative in its approach, seeking individual patients' views and experiences in coping with the cost of medication, linking these with socioeconomic and health attributes, and allowing the level of heterogeneity existing at the patient level to be properly taken into account. Furthermore, by providing insight into the range of behaviours adopted by patients who are unable to meet the cost of prescribed medication given the competing de-

Table IV. Marginal effects of patient affordability on the probability of adopting patient-initiated strategies or self-medication strategies

Strategies	Italy		UK	
	dyspepsia	hypertension	dyspepsia	hypertension
Patient-initiated strategies				
Avoids GP visit	0.05[a]	0.04[a]	0.12	0.08
Drug not dispensed	0.14	0.17	0.14	0.10
Takes less drug, i.e. reduces dose	0.07[a]	0.10	0.07	0.04
Drug not dispensed until patient gets paid	0.13	0.05	0.19	0.20
Only some of the items of the prescription dispensed, i.e. prioritises	0.09	0.08	0.19	0.14
Borrows money	0.05	0.01[a]	0.15	0.10
Self-medication strategies				
Gets prescription because OTC product is too expensive	0.12	0.09	0.06	0.03[a]
Asks pharmacist to recommend cheaper OTC product	0.11	0.07	0.15	0.04[a]
Considers price of OTC product	0.19	0.15	0.16	0.09
Prefers OTC product to GP visit	0.03[a]	0.05[a]	0.00[a]	0.02[a]
Does not take anything	0.09	0.03[a]	0.00	0.05
Buys cheaper of two OTC products	0.18	0.09	0.11	0.11

a Nonsignificant at 5%.

GP = general practitioner; **OTC** = over the counter.

mands on their finances, it adds to the existing literature on medication co-payment and the associated problems of reduced consumption and affordability. It introduces the notion of a self-rated affordability measure and explores its relationship with income, health status and cost-containment behaviour.

It is important to note that our results are not merely relevant to the two countries from which the samples were drawn. Evidence is emerging from US and Australian surveys that patients in very different healthcare systems, when faced with the same problem, i.e. that of affordability problems, use many similar cost-reducing strategies.[60-62] However, some strategies differ, reflecting the cultures or systems in which they occur.

The findings from this study have important policy implications. Buying an equivalent OTC product for less than a prescription charge is a reasonable substitution. However, the use of many of the cost-reducing strategies detailed in this study would suggest that patients, when faced with affordability problems, do not comply with prescribed therapy. This is the situation, for example, when patients use a lower than prescribed dose, or do not obtain some or any of their medication.

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