19 Janssens KAM, Oldehinkel AJ, Rosmalen JGM. Parental overprotection predicts the development of functional somatic symptoms in young adolescents. *J Pediatr* 2009; 154:918–23.

20 van Gils A, Janssens KA, Rosmalen JG. Family disruption increases functional somatic symptoms in late adolescence: The TRAILS Study. *Health Psychol* 2014;33:1354–61.

21 Chapman MV. Neighborhood quality and somatic complaints among American youth. *J Adolesc Health* 2005;36:244–52.

22 Seeman T, Epel E, Gruenewald T, et al. Socio-economic differentials in peripheral biology: cumulative allostatic load. *Ann N Y Acad Sci* 2010;1186:223–39.

23 Gustafsson PE, Janlert U, Theorell T, et al. Social and material adversity from adolescence to adulthood and allostatic load in middle-aged women and men: results from the Northern Swedish Cohort. *Ann Behav Med* 2012;43:117–28.

24 Gustafsson PE, Janlert U, Theorell T, et al. Socioeconomic status over the life course and allostatic load in adulthood: results from the Northern Swedish Cohort. *J Epidemiol Community Health* 2011;65:986–92.

25 van Ockenburg SL, Tak LM, Bakker SJ, et al. Effects of adverse life events on heart rate variability, cortisol, and C-reactive protein. *Acta Psychiatr Scand* 2014. (in press).

26 Hammarstrom A, Stenlund H, Janlert U. Mechanisms for the social gradient in health: results from a 14-year follow-up of the Northern Swedish Cohort. *Public Health* 2011;125:567–76.

27 Statistics Sweden. Reports on statistical coordination: Swedish socioeconomic classification. Stockholm: Statistics Sweden; 1984. Report No.1982:4.

28 Stafford M, Cummins S, Macintyre S, et al. Gender differences in the associations between health and neighbourhood environment. *Soc Sci Med* 2005;60:1681–92.

29 Hammarström A, Janlert U. Cohort profile: the Northern Swedish Cohort. *Int J Epidemiol* 2012;41:1545–52.

30 Merlo J, Ohlsson H, Lynch KF, et al. Individual and collective bodies: using measures of variance and association in contextual epidemiology. *J Epidemiol Community Health* 2009;63:1043–8.

31 Curry A, Latkin C, Davey-Rothwell M. Pathways to depression: the impact of neighborhood violent crime on inner-city residents in Baltimore, Maryland, USA. *Soc Sci Med* 2008;67:23–30.

32 Sundquist K, Theobald H, Yang M, et al. Neighborhood violent crime and unemployment increase the risk of coronary heart disease: a multilevel study in an urban setting. *Soc Sci Med* 2006;62:2061–71.

33 Afari N, Ahumada SM, Wright LJ, et al. Psychological trauma and functional somatic syndromes: a systematic review and meta-analysis. *Psychosom Med* 2014;76:2–11.

34 Gustafsson PE, San Sebastian M, Janlert U, et al. Residential selection across the life course: adolescent contextual and individual determinants of neighborhood disadvantage in mid-adulthood. *PLoS One* 2013;8:e80241.

European Journal of Public Health, Vol. 25, No. 4, 597–603

doi:10.1093/eurpub/cku179 Advance Access published on 13 November 2014

Socioeconomic determinants of prescribed and non-prescribed medicine consumption in Austria

Susanne Mayer[1,2], August Österle[2]

1 Department of Health Economics, Centre for Public Health, Medical University of Vienna, Vienna, Austria
2 Institute for Social Policy, Department of Socioeconomics, WU Wien, Vienna, Austria

Correspondence: Susanne Mayer, Department of Health Economics, Centre for Public Health, Medical University of Vienna, Kinderspitalgasse 15/1, Vienna 1090, Austria, Tel: +43 (0) 1 40160 34843, Fax: +43 (0) 1 40160 934840, e-mail: susanne.mayer@meduniwien.ac.at

Background: Equitable access to health care is a goal subscribed to in many European economies. But while a growing body of literature studies socioeconomic inequalities in health service use, relatively little is still known about inequalities in medicine consumption. Against this background, this study investigates the (socioeconomic) determinants of medicine use in the Austrian context. **Methods:** Multivariate logistic regressions were estimated based on the European Health Interview Survey, including representative information of the Austrian population above age 25 ($n = 13\,291$) for 2006/2007. As dependent variables, we used prescribed and non-prescribed medicine consumption as well as prescribed polypharmacy. Socioeconomic status was operationalized by employment status, education and net equivalent income. Health indicators (self-assessed health, chronic conditions), demographic characteristics (age, sex) and outpatient visits were included as control variables. **Results:** Socioeconomic status revealed opposing utilization patterns: while individuals with higher education and income were more likely to consume non-prescribed medicines, the less educated were more likely to take prescribed medicines. Lower socioeconomic groups also showed a higher likelihood for prescribed polypharmacy. For the consumption of both medicine types, the main socioeconomic determinant was high income. In an additional analysis, lower socioeconomic groups were found to more likely report prescription purposes as the main reason for consulting a practitioner. **Conclusion:** These results point to different behavioural responses to ill health, not least determined by institutional incentives in the Austrian health care system.

Introduction

Equitable access to health care is a goal subscribed to across Europe.[1] In the past decade, a great deal of research has been devoted to socioeconomic inequalities in health service utilization.[2–4] Surprisingly little, despite its importance for individual health, however, is still known about socioeconomic differences in medicine consumption, which may stem from various sources: inequalities in access to pharmacies/physicians, physicians' treatment strategies, communication barriers, differences in self-treatment strategies or compliance to medical advice, be it based on individual preferences or financial barriers.[5]

Existing research mainly concentrated on the socioeconomic determinants of prescribed medicine use for specific symptoms[6–8] and/or was restricted to certain age groups.[9–11] Only a handful of studies focused on prescribed pharmaceutical use by socioeconomic position in general,[12–14] and also only limited evidence is available on non-prescribed medicine consumption.[15] Even fewer publications have yet explored the association between socioeconomic position and prescribed vs. non-prescribed pharmaceutical use.[16,17]

From a policy point of view, however, such an analysis may provide valuable insights. In the case of Austria, as addressed in this article, it may not only allow for conclusions on which socioeconomic groups more likely use mostly publicly funded (prescribed medicines) or privately funded (non-prescribed medicines) health care services, but also on socioeconomically influenced behavioural responses to ill health. Furthermore, such analysis may help explore the congruence of utilization patterns with the health system's implicit incentive structure.

The Austrian health care system is based on a social insurance model. It covers 98% of the population and guarantees almost free access to most forms of medical care: for instance, no gatekeeping is in place and for the vast majority of the insured and their dependants (80%), outpatient consultations do not incur co-payments. Its main sources of funding are income-based social insurance contributions, followed by taxes and private payments.[18] Around 13% of the total health care expenditure, in 2007, was spent on pharmaceuticals. About 65% of pharmaceutical spending is publicly funded.[19] About 80% of authorized pharmaceuticals are prescription medicines. Over-the-counter (OTC) medicines account for around 20% of the average pharmacy turnover.[20]

Regarding pharmaceutical supply, the insured population is granted access to all medicines specified on a positive list. Prescribed medicines (which may also include OTC medicines when prescribed by a doctor) can be obtained at any pharmacy with a valid prescription. Per prescribed item, patients pay a flat fee (2006: €4.60; 2007: €4.70), except for medicines costing less than this fee, for which only their (lower) price is to be paid. The remaining costs are fully covered by the social insurance agencies. Individuals (and their co-insured dependants) in particular need of financial protection, including asylum seekers, people with certain communicable diseases and recipients of specific social benefits, are a priori exempt from paying prescription fees. People below certain net income thresholds can likewise apply for such exemption. Non-prescribed medicines are (only) available at pharmacies for the (self-) treatment of less severe illnesses and have to be fully paid out of pocket. In rural regions, for easier access, practitioners can also dispense prescribed and non-prescribed medicines to their patients. In exceptional circumstances, pharmaceuticals not included in the positive list may also be prescribed and then reimbursed.[19–21]

Against this background, the objective of this article is to investigate the socioeconomic determinants (approximated by employment status, education, income) of prescribed and non-prescribed medicine use in the Austrian outpatient sector. For prescribed pharmaceuticals, we additionally look at polypharmacy to determine socioeconomic differences in the intensity of medicine use. Given the institutional context, in particular private funding requirements, equitable access for equal need is expected for prescribed medicine consumption, while for non-prescribed medicines, people with higher socioeconomic position are hypothesized to more likely report such use. The results are discussed not only in light of institutional incentives but also regarding socioeconomic differences in behavioural responses to ill health based on reasons for general practitioner (GP) consultations, thus adding new insights to the literature.

Methods

Data collection and sample

The study draws on cross-sectional data from the European Health Interview Survey (EHIS), collected in Austria between March 2006 and February 2007 (response rate: 63.1%),[22] with sample stratification by geographic region and weighting by geographic region, age and sex.[23] Trained interviewers conducted home-based, computer-assisted personal interviews on health-related topics and sociodemographic characteristics, resulting in data on 15 474 individuals above age 15. However, as socioeconomic status is not fully established at this young age,[14] we restrict our analysis to those aged 25 and over ($n = 13\,291$).

Variables

The dependent variables are based on the following questions: 'During the past 2 weeks, have you used any medicines that were prescribed for you by a doctor?' and 'During the past 2 weeks, have you used any medicines not prescribed for you by a doctor?' Prior to asking these questions, medicines were verbally defined as including homeopathic products, vitamins and minerals, sleeping and anodyne pills, unguents or injections. If a positive answer was given, the respondents were presented a list with specific groups of medicines (prescribed medicines: medicines for asthma; chronic bronchitis, chronic obstructive pulmonary disease, emphysema; high blood pressure; lowering the blood cholesterol level; other cardiovascular disease; joint pain; headache or migraine; other pain; diabetes; allergic symptoms; stomach trouble; depression; tension or anxiety; sleeping tablets; antibiotics; contraceptive pills; menopausal hormones, andropause or osteoporosis; other medicine; non-prescribed medicines: medicines for joint pain; headache or migraine; other pain; cold, flu or sore throat; allergic symptoms; stomach trouble; vitamins, minerals or tonics; other type of medicine or supplement). In this context, it seems noteworthy that prescribed and non-prescribed medicines may not be considered as perfect substitutes for each other: whereas prescribed (reimbursable) alternatives may be available for non-prescribed medicines, non-prescribed medicines are typically used in case of malaise and thus less severe health problems.[24]

For each individual group of medicines listed, respondents were asked to declare their use by stating yes or no. For our analysis, this information was summarized into non-prescribed medicine use (only), prescribed medicine use (only) and use of both types of medicines. To allow for unbiased gender comparisons, use of contraceptives and medication for menopause, andropause or osteoporosis ($n = 155$) were treated as 'no medicine consumption'.

Regarding polypharmacy, that is, the use of multiple prescribed medicine 'groups' in the last 14 days, we distinguished between minor polypharmacy (prescribed medicine use of two or three groups) and major polypharmacy (four groups or more).[12]

As independent variables of interest, we opted for three commonly used[25] proxies for socioeconomic status. First, employment status was categorized into employed (reference group), unemployed, homemaker/other (e.g., in parental leave) and retired, and may thus be considered as a proxy for individual time constraints, which supposedly also affect individual health behaviour. Second, education potentially relates to health literacy (despite not being a perfect measure), as they are commonly found to be correlated.[26] Education was measured by the highest level completed: basic education (reference group), apprenticeship/ vocational school, secondary education without diploma, secondary education with diploma or post-secondary education, and tertiary education. Third, as a link to financial barriers, we included income, approximated by the monthly net equivalent income in Euro based on the Organisation for Economic Co-operation and Development (OECD)-modified scale[27] and summarized into $\leq$700 (reference group), 701–1050, 1051–1400, and $\geq$1401.

Physician contacts were included as a control variable, as they are expected to be a strong predictor especially for prescribed medicine consumption. They were measured by the number of outpatient physician (GP, specialist, or in hospital outpatient ward) consultations in the last 4 weeks,[28] categorized into no such visit (reference group), one visit and two or more visits. To control for demographic factors, we included age (in six categories) and sex, with the youngest and men being the respective reference groups.

Finally, since a socioeconomic gradient in health disadvantaging the poor is well-established,[29,30] we took account of the number of chronic diseases (none as reference group vs. one, two and three or more chronic conditions) prevalent in the last 12 months and also introduced self-perceived health status. The latter variable is based on the following question: 'How is your health in general? Is it very good, good, fair, bad or very bad?' Answers were summarized into three dimensions: poor (including bad and very bad), mediocre (fair) and good (very good, good) as reference group.

In an additional analysis, the reported main reason for the last GP consultation was included as dependent variable. Responses were categorized into preventive motives (preventive check-up or administrative causes; reference group), acute treatment (treatment of an accident, disease, check-up or others) and prescription of pharmaceuticals. As differences in demographic and health characteristics may partly explain differences in respective responses, we controlled for these variables.

Statistical analysis

To determine the association between socioeconomic status and pharmaceutical consumption, multinomial multivariate logistic regressions were carried out (using Stata 13.1). In these models, the probability was estimated of falling into certain categories compared with the reference category. To check the statistical significance of the calculated relative-risk ratios, z-statistics were used. Only results with $P < 0.05$ were considered statistically significant and thus discussed further. As a measure of model fit, McFadden's R^2 is reported.

Results

Descriptive analysis

In terms of general medicine use (table 1), during the 2 weeks before the interview, 64% reported taking some medicine; while 1 in 10 Austrians of the sample (10%) consumed non-prescribed medicines, 4 in 10 (41%) consumed prescribed pharmaceuticals. The remaining 13% used both types. As for prescribed medicines, taking two or three groups was most common (43%).

Both women (43%) and men (39%) took more prescribed medicines than non-prescribed medicines (11% and 9%, respectively), and women showed a higher share of pharmaceutical use in general. This holds especially true for the consumption of both types of medicines (women: 16%; men: 8%).

Overall, except for non-prescribed pharmaceuticals, medicine use increases with age.

Logistic regressions

Differentiating between prescribed and non-prescribed medicines (table 2), an opposing socioeconomic gradient emerges: while lower education increases the probability for prescribed medicine use, non-prescribed medicine use increases with higher levels of education and for the highest income group. Regarding other influencing factors, the general patterns are similar for both types of medicines, albeit with differences in magnitude. Health-related factors exert a much higher impact on the relative risk of prescribed medicine use than on non-prescribed medicine consumption. Furthermore, outpatient visits are a strong predictor for prescribed medicine use.

For prescribed polypharmacy (table 3), the impact of socioeconomic characteristics only becomes apparent at the point at which four or more groups of medicines are being consumed.

Finally, regarding the main reason for the last doctor consultation (table 4), lower socioeconomic status increases the chance of primarily seeing a GP for prescription purposes only. Also, lower socioeconomic groups more likely consult a GP because of acute treatment in contrast to prevention.

Discussion

In terms of key findings, the logistic regression analyses on the influence of socioeconomic position (controlling for health, physician consultations and demographic characteristics) may be summarized as follows. Opposing utilization patterns are identified: for non-prescribed medicines, both high income and even more so high education increased the likelihood of taking these medicines. For prescribed medicine use, in contrast, we found an education gradient suggesting that the less educated have a higher chance of such medicine consumption. Also, individuals outside the employment market, presumably owing to fewer time constraints, are more likely to take prescribed medicines. Regarding prescribed and non-prescribed pharmaceuticals combined, the wealthy are attributed to a higher consumption likelihood. In these contexts, higher use is generally considered as proxy for access to pharmaceuticals. However, an opposing interpretation is typically associated with polypharmacy due to potential health risks. According to our analysis, the use of four or more groups of prescribed pharmaceuticals was related to both lower education and income.

As for age and gender, our results are in line with previous studies,[31–33] whereas international evidence is mixed on the socioeconomic gradient. While a Danish study[16] likewise found an increase in prescription medicine use among lower socioeconomic groups, no such correlation existed for OTC medicines. In Barcelona, another study[17] concluded that among those with poor health, social class is positively associated with prescribed medicine use. Also, among men with good health, the more advantaged classes more likely took non-prescribed medicines. In a similar analysis of Austrians in poor health (data and results not shown), non-

Table 1 Share of medicine use (%) by demographic characteristics

	Non-prescribed only		Prescribed only		Both		Prescribed: 1 group		Prescribed: 2–3 groups		Prescribed: 4+ groups	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Total (*n* = 13 291)	1337	10.1	5457	41.1	1685	12.7	2022	37.1	2287	41.9	1148	21.0
Sex												
Men (*n* = 5910)	513	8.7	2310	39.1	489	8.3	870	37.7	997	43.2	443	19.2
Women (*n* = 7381)	824	11.2	3147	42.6	1196	16.2	1152	36.6	1290	41.0	705	22.4
Age												
25–34 (*n* = 1995)	350	17.5	317	15.9	124	6.2	197	62.1	101	31.9	19	6.0
35–44 (*n* = 2912)	443	15.2	693	23.8	229	7.9	385	55.6	253	36.5	55	7.9
45–54 (*n* = 2537)	286	11.3	859	33.9	273	10.8	402	46.8	319	37.1	138	16.1
55–64 (*n* = 2283)	166	7.3	1209	53.0	373	16.3	439	36.3	534	44.2	236	19.5
65–74 (*n* = 1930)	64	3.3	1235	64.0	348	18.0	366	29.6	569	46.1	300	24.3
75 + (*n* = 1634)	28	1.7	1144	70.0	338	20.7	233	20.4	511	44.7	400	35.0

Notes: Share of prescribed polypharmacy (1 group, 2–3 groups, 4+ groups) based on users of prescribed medicine only.

Table 2 Prescribed medicine use (only), non-prescribed medicine use (only), medicine use of both types vs. no medicine use

Variables	Non-prescribed only		Prescribed only		Both	
	n	RRR (95% CI)	*n*	RRR (95% CI)	*n*	RRR (95% CI)
Employment status						
Employed	971	1.00	1731	1.00	548	1.00
Unemployed	36	1.06 (0.72–1.58)	190	1.34 (0.99–1.83)	62	1.50 (1.02–2.21)**
Homemaker	171	0.96 (0.78–1.18)	601	1.11 (0.93–1.33)	226	1.21 (0.96–1.52)
Retired	159	0.94 (0.70–1.27)	2935	1.51 (1.24–1.85)***	849	1.52 (1.18–1.96)***
Highest education						
Basic education	196	1.00	2087	1.00	613	1.00
Apprenticeship/vocational school	495	1.13 (0.93–1.37)	1940	0.80 (0.70–0.93)***	523	0.83 (0.69–0.99)**
Secondary education without diploma	267	1.40 (1.12–1.74)***	749	0.77 (0.65–0.92)***	292	0.97 (0.79–1.20)
(Post-)secondary education	213	1.26 (0.99–1.59)	443	0.78 (0.65–0.95)**	156	0.96 (0.75–1.23)
Tertiary education	116	1.71 (1.32–2.21)***	238	0.69 (0.55–0.86)***	101	1.05 (0.78–4.41)
Net equivalent income						
≤700	230	1.00	1233	1.00	309	1.00
701–1050	322	1.15 (0.95–1.39)	1626	0.93 (0.80–1.08)	461	1.06 (0.87–1.30)
1051–1400	331	1.12 (0.92–1.36)	1424	0.89 (0.76–1.04)	517	1.32 (1.08–1.60)***
≥1401	454	1.34 (1.11–1.62)***	1174	0.97 (0.83–1.13)	398	1.30 (1.06–1.61)***
Age						
25–34	350	1.00	317	1.00	124	1.00
35–44	443	0.92 (0.78–1.08)	693	1.50 (1.26–1.78)***	229	1.26 (0.98–1.63)
45–54	286	0.74 (0.62–0.90)***	859	1.89 (1.58–2.25)***	273	1.47 (1.14–1.90)***
55–64	166	0.88 (0.68–1.14)	1209	3.63 (2.95–4.48)***	373	2.64 (1.98–3.52)***
65–74	64	0.67 (0.45–1.00)**	1235	5.23 (4.00–6.84)***	348	3.51 (2.49–4.96)***
≥75	28	0.60 (0.36–0.99)**	1144	6.99 (5.13–9.53)***	338	4.69 (3.20–6.87)***
Sex						
Men	513	1.00	2310	1.00	489	1.00
Women	824	1.84 (1.60–2.10)***	3147	1.39 (1.25–1.56)***	1196	2.40 (2.07–2.79)***
Outpatient visits						
0	903	1.00	1671	1.00	435	1.00
1	345	1.21 (1.04–1.40)**	2655	4.03 (3.60–4.51)***	837	4.51 (3.88–5.25)***
≥2	89	1.22 (0.94–1.58)	1131	5.35 (4.47–6.40)***	413	6.95 (5.60–8.61)***
Chronic conditions						
None	491	1.00	591	1.00	132	1.00
1	438	1.84 (1.59–2.13)***	1307	3.49 (3.06–3.97)***	323	3.98 (3.19–4.96)***
2	232	2.55 (2.11–3.07)***	1265	6.31 (5.41–7.35)***	355	8.58 (6.79–10.83)***
≥3	176	4.01 (3.17–5.09)***	2294	10.45 (8.71–12.53)***	875	20.3 (15.87–26.07)***
Self-perceived health						
Good	1182	1.00	2953	1.00	909	1.00
Mediocre	138	1.08 (0.86–1.35)	1842	1.98 (1.71–2.30)***	589	1.89 (1.58–2.27)***
Poor	17	1.29 (0.70–2.39)	662	4.26 (2.87–6.33)***	187	3.31 (2.16–5.07)***
Constant		0.10 (0.08–0.13)***		0.06 (0.05–0.07)***		0.01 (0.01–0.01)***

Notes: Multinomial logistic regression with no medicine use as reference group ($n = 4812$). Likelihood-ratio chi-square = 7770.99 (df = 69, $P < 0.0001$) and McFadden's $R^2 = 0.24$, $n = 13\,291$.
CI = confidence interval; df = degrees of freedom; *n* = number of cases; RRR = relative-risk ratios.
**Significant at 5%; ***significant at 1%.

prescribed medicine use was also more likely among the highly educated population, whereas there was no association for prescribed medicine consumption. In a Greek study,[12] university education increased the likelihood of prescribed medicine consumption; for prescribed polypharmacy, though, no social gradient was found. The same applies to a Swedish study[11] on polypharmacy among elderly people, whereas for elderly men in South Wales, polypharmacy was related to a lower socioeconomic position.[34]

This study sheds light on a variety of previously rather uncharted aspects of equity in health care utilization. Nevertheless, several limitations apply. First, since the data used are based on self-reported information from EHIS, measurement errors may be an issue, especially for medicine consumption. To minimize these risks, interviewers were instructed to define medicines broadly and present a list with specific groups of medicines. Together with a recall period of 2 weeks, this likely increases the reliability of the information given. Generally, interviewer trainings, the use of a handbook including extensive explanations and the use of computer-assisted personal interviewing software enhance the data quality. Regarding self-reported health, this does not perfectly control for socioeconomic variations in health. However, including chronic conditions in our analysis will partly capture respective differences. As for the income variable, suffering from item non-response in 25% of cases, imputation was based on the estimated income distribution derived from the European Union Statistics on Income and Living Conditions (EU-SILC) survey.[23] Finally, in the context of medicine use, household surveys are an acknowledged standard tool in health policy research.[35]

Second, polypharmacy as used in this study is based on the number of medicine groups consumed. It is thus to be seen as a (conservative) indication for the 'number' of medicines, which is the commonly applied definition of polypharmacy.

Third, our findings do not allow for final inferences on whether the socioeconomic inequalities in prescribed medicine use are physician mediated or patient mediated: in the case of no medicine use, we cannot differentiate among an individual's lacking receipt of

Table 3 Prescribed polypharmacy: medicine use of 2–3 groups, 4+ groups vs. use of 1 group

Variables	2–3 groups		4+ groups	
	n	RRR (95% CI)	*n*	RRR (95% CI)
Employment status				
Employed	642	1.00	150	1.00
Unemployed	70	1.14 (0.76–1.71)	67	1.98 (1.20–3.28)***
Homemaker	255	1.19 (0.93–1.52)	113	1.28 (0.87–1.89)
Retired	1320	1.20 (0.95–1.50)	818	1.50 (1.07–2.10)**
Highest education				
Basic education	891	1.00	609	1.00
Apprenticeship/vocational school	788	0.84 (0.71–0.99)**	341	0.75 (0.60–0.94)***
Secondary education without diploma	325	0.97 (0.79–1.20)	120	0.77 (0.57–1.04)
(Post-)secondary education	174	0.91 (0.70–1.18)	59	0.76 (0.51–1.15)
Tertiary education	109	1.02 (0.74–1.40)	19	0.46 (0.25–0.83)***
Net equivalent income				
≤700	514	1.00	316	1.00
701–1050	680	0.81 (0.67–0.98)**	366	0.67 (0.52–0.86)***
1051–1400	599	0.90 (0.74–1.09)	300	0.89 (0.69–1.16)
≥1401	494	0.87 (0.71–1.07)	166	0.68 (0.50–0.92)***
Age				
25–34	101	1.00	19	1.00
35–44	253	1.10 (0.81–1.49)	55	0.80 (0.42–1.52)
45–54	319	1.14 (0.84–1.54)	138	1.30 (0.71–2.35)
55–64	534	1.40 (1.02–1.92)**	236	1.27 (0.69–2.33)
65–74	569	1.60 (1.13–2.26)***	300	1.62 (0.86–3.03)
≥75	511	1.94 (1.35–2.78)***	400	2.34 (1.24–4.41)***
Sex				
Men	997	1.00	443	1.00
Women	1290	0.88 (0.76–1.01)	705	0.95 (0.77–1.16)
Outpatient visits				
0	650	1.00	184	1.00
1	1147	1.39 (1.20–1.60)***	560	2.04 (1.63–2.57)***
≥2	490	2.26 (1.85–2.76)***	404	4.90 (3.72–6.45)***
Chronic conditions				
None	190	1.00	11	1.00
1	465	1.10 (0.89–1.36)	43	1.44 (0.72–2.88)
2	639	2.27 (1.83–2.82)***	139	6.14 (3.22–11.71)***
≥3	993	3.93 (3.14–4.93)***	955	34.52 (18.39–64.81)***
Self-perceived health				
Good	1,212	1.00	209	1.00
Mediocre	851	1.59 (1.36-1.85)***	569	3.73 (3.00-4.65)***
Poor	224	2.01 (1.48-2.72)***	370	9.10 (6.51-12.71)***
Constant		0.31 (0.22-0.45)***		0.01 (0.00-0.02)***

Notes: Multinomial logistic regression with use of 1 group as reference group ($n = 2022$). Likelihood-ratio chi-square = 2375.86 (df = 46, $P < 0.0001$) and McFadden's $R^2 = 0.21$, $n = 5457$.
CI = confidence interval; df = degrees of freedom; *n* = number of cases; RRR = relative-risk ratios.
**Significant at 5%; ***significant at 1%.

a prescription, an individual's lacking need for medicines or an individual's choice not to fill a prescription. For instance, only about 70% of Austrians fully comply with pharmaceutical advice.[36]

Fourth, cross-sectional data as well as the statistical approach chosen may evoke problems with endogeneity. On the one hand, since we assumed health conditions to be explanatory variables for medicine consumption, one might argue that causality also runs in the opposite direction. In our data, however, the question on medicine use covers the last 14 days, whereas self-perceived health relates to an individuals' general assessment (rather than the present state) and chronic conditions are long lasting by definition. For the time frames given, it thus seems unlikely that the health indicators used are highly affected by (recent) medicine use. On the other hand, using both socioeconomic characteristics and health conditions as explanatory variables does not account for their potential interrelation. Given the aim of our analysis, however, and in line with the literature,[6] we consider this to be outweighed by the importance of including health indicators so as not to overestimate any potential inequities in medical use.

This study indicates a socioeconomic gradient in the reliance on different pillars of the Austrian health care system. For instance, lower socioeconomic groups by using prescribed medicines are more likely to rely on publicly subsidized resources. This can be partially explained by differences in the financial ability, an unequal distribution of health literacy across socioeconomic groups[26] and related differences in health-seeking behaviour.[28] Our analysis of the main reason for the last doctor consultation attributes lower socioeconomic groups a higher chance for seeing a GP for prescription purposes or acute treatments. These findings thus add evidence to earlier interpretations on medicine use as to a socioeconomic gradient in responses to ill health.[10] Given that prescribed and non-prescribed medicines are not perfect substitutes, but serve as treatment for medical conditions of varying severity, our findings also hint at an inherent time dimension driving individual behaviour: higher socioeconomic groups, due to their increased financial means and health literacy, seem to be more likely to opt for timely, self-initiated treatment strategies (including the use of non-prescribed medicines) instead of having to wait for a doctor's appointment.

Table 4 Main reason for last GP consultation: acute treatment and prescription vs. preventative motives

Variables	Acute treatment		Prescription	
	n	RRR (95% CI)	*n*	RRR (95% CI)
Employment status				
Employed	3588	1.00	805	1.00
Unemployed	250	0.89 (0.62–1.30)	67	1.02 (0.66–1.57)
Homemaker	797	1.06 (0.84–1.33)	322	1.49 (1.15–1.93)***
Retired	2317	0.75 (0.59–0.94)***	1416	1.34 (1.04–1.73)**
Highest education				
Basic education	2114	1.00	885	1.00
Apprenticeship/vocational school	2639	0.81 (0.68–0.96)**	921	1.00 (0.83–1.22)
Secondary education without diploma	1016	0.67 (0.54–0.81)***	455	0.96 (0.77–1.20)
(Post-)secondary education	731	0.61 (0.48–0.76)***	254	0.88 (0.68–1.14)
Tertiary education	452	0.52 (0.41–0.67)***	95	0.47 (0.34–0.64)***
Net equivalent income				
≤700	1508	1.00	525	1.00
701–1050	1914	0.75 (0.62–0.91)***	746	0.79 (0.64–0.98)**
1050–1400	1836	0.80 (0.66–0.96)**	727	0.84 (0.68–1.04)
≥1401	1694	0.70 (0.58–0.85)***	612	0.80 (0.64–1.00)**
Age				
25–34	1087	1.00	171	1.00
35–44	1569	0.95 (0.77–1.16)	330	1.25 (0.96–1.64)
45–54	1296	0.60 (0.49–0.73)***	395	1.09 (0.83–1.41)
55–64	1124	0.57 (0.44–0.73)***	597	1.34 (1.00–1.81)**
65–74	957	0.72 (0.53–0.98)**	621	1.87 (1.31–2.67)***
≥75	919	1.03 (0.73–1.45)	496	2.20 (1.49–3.24)***
Sex				
Men	3077	1.00	949	1.00
Women	3875	1.01 (0.88–1.15)	1661	1.39 (1.20–1.61)***
Chronic conditions				
None	1796	1.00	380	1.00
1	1768	1.18 (1.01–1.38)**	618	1.67 (1.38–2.03)***
2	1274	1.31 (1.09–1.57)***	584	2.11 (1.71–2.62)***
≥3	2114	1.58 (1.30–1.93)***	1028	2.29 (1.83–2.87)***
Self-perceived health				
Good	4687	1.00	1564	1.00
Mediocre	1670	1.59 (1.33–1.91)***	821	1.59 (1.31–1.93)***
Poor	595	2.67 (1.87–3.81)***	225	1.93 (1.32–2.80)***
Constant		8.89 (6.76–11.69)***		0.65 (0.47–0.91)***

Notes: Multinomial logistic regression with preventive motives as reference group ($n = 1300$). Likelihood-ratio chi-square = 950.66 (df = 42, $P < 0.0001$) and McFadden's $R^2 = 0.05$, $n = 10\,862$.
CI = confidence interval; df = degrees of freedom; n = number of cases; RRR = relative-risk ratios.
**Significant at 5%; ***Significant at 1%.

In theory, the accruing out-of-pocket pharmaceutical co-payments (2007: €4.70) may seem a tax on the financially disadvantaged ill.[37] In practice, however, around one out of four insured Austrians are exempt from prescription fees.[38] In addition, in 2008, a regulation mandated an out-of-pocket cap at 2% of the preceding year's total annual net income to further disburden those with high medication needs. Once exceeded, patients are then charged no prescription fees until the end of that calendar year. In 2008, this regulation benefitted 273 000 Austrians.[39] Consequently, and as confirmed by our analysis even for the year prior to introduction, prescribed medicine use seems no matter of income. On the other hand, due to lacking incentives in the pharmaceutical reimbursement system, Austrians are rather price insensitive and typically not aware of actual pharmaceutical costs.[24] Indeed, increasing medicine consumption and thus rising costs have, in the last decade, also caused political concern.[39]

Conclusion

Public health policy in Austria seems successful in guaranteeing lower socioeconomic groups equitable access to prescribed pharmaceuticals, which account for 80% of authorized pharmaceuticals in this country. A pro-rich gradient, however, is observed for non-prescribed medicine use which may indicate a worse treatment of minor health problems or delayed treatment among the worse off. These results together with the analysis of the main reasons for consulting a GP point to different behavioural responses to ill health that are not least determined by institutional incentives in the Austrian health care system. For future research, both results and limitations of this study indicate a need to also use claims data to overcome the shortcomings of self-reported data and point at the importance of disentangling responses to ill health and the impact of the institutional context when investigating the determinants of inequalities observed.

Acknowledgements

We thank the participants at the CINCH Summer School on Health Economics in Essen (2–6 June 2013) and at the 9th International Health Economics Conference in Sydney (4–7 July 2013) for their constructive comments and feedback. Also, we thank our colleagues for their valuable input at the Scientific Seminar held at the Institute for Social Policy (20 January 2014). Finally, we gratefully acknowledge the suggestions made by three anonymous reviewers which greatly improved this article.

Conflicts of interest: None declared.

Key points

- This article is the first to investigate the social determinants of non-prescribed and prescribed medicine consumption (including polypharmacy) for Austria—a research field which is still, even internationally, comparatively uncharted.
- In line with institutional incentives, we find lower socioeconomic groups to be more likely to consume prescribed medicines and higher socioeconomics groups to be more likely to use non-prescribed pharmaceuticals.
- An additional analysis of the main reason for doctor consultations also adds new evidence to earlier interpretations in this context in terms of a socioeconomic gradient in behavioural responses to ill health.
- Public health policy seems successful in guaranteeing lower socioeconomic groups equitable access to prescribed pharmaceuticals. However, the observed pro-rich gradient in non-prescribed medicine use may still cause a worse treatment of minor health problems or delayed treatment among the worse off.

References

1 Van Doorslaer E, Masseria C. *Income-Related Inequality in the Use of Medical Care in 21 OECD Countries*. OECD Health Working Paper No. 14. Paris: OECD Publishing, 2004.

2 Van Doorslaer E, Jones A. Income-related inequality in health and health care in the European Union. *Health Econ* 2004;13:605–8.

3 Bago d'Uva T, Jones A, Van Doorslaer E. Measurement of horizontal in equity in health care utilisation using European panel data. *J Health Econ* 2009;28:280–9.

4 Devaux M, De Looper M. *Income-Related Inequalities in Health Service Utilisation in 19 OECD Countries, 2008-2009*. OECD Health Working Paper No. 58. Paris: OECD Publishing, 2012.

5 Brown MT, Bussell JK. Medication adherence: WHO cares? *Mayo Clin Proc* 2011;86: 304–14.

6 Nielsen M, Hansen E, Rasmussen N. Patterns of psychotropic medicine use and related diseases across educational groups: national cross-sectional survey. *Eur J Clin Pharmacol* 2004;60:199–204.

7 Manderbacka K, Keskimäki I, Reunanen A, Klaukka T. Equity in the use of antithrombotic drugs, beta-blockers and statins among Finnish coronary patients. *Int J Equity Health* 2008;7:16.

8 Butterworth P, Olesen S, Leach LS. Socioeconomic differences in antidepressant use in the PATH Through Life Study: evidence of health inequalities, prescribing bias, or an effective social safety net? *J Affect Disord* 2013;149:75–83.

9 Hjern A, Haglund B, Rosen M. Socioeconomic differences in use of medical care and antibiotics among schoolchildren in Sweden. *Eur J Public Health* 2011;11:280–3.

10 Holstein BE, Hansen EH, Pernille D. Social class variation in medicine use among adolescents. *Eur J Public Health* 2004;14:49–52.

11 Haider S, Johnell K, Thorslund M, Fastbom J. Analysis of the association between polypharmacy and socioeconomic position among elderly aged > or =77 years in Sweden. *Clin Ther* 2008;30:62–9.

12 Pappa E, Kontodimopoulos N, Papadopoulos AA, et al. Prescribed drug utilization and polypharmacy in a general population in Greece: association with socio-demographic, health needs, health services utilization and lifestyle factors. *Eur J Clin Pharmacol* 2010;67:185–92.

13 Thorell K, Skoog J, Zielinski A, et al. Licit prescription drug use in a Swedish population according to age, gender and socioeconomic status after adjusting for level of multi-morbidity. *BMC Public Health* 2012;12:575.

14 Nordin M, Dackehag M, Gerdtham U. Socioeconomic inequalities in drug utilization for Sweden: evidence from linked survey and register data. *Soc Sci Med* 2013;77: 106–17.

15 Du Y, Knopf H. Self-medication among children and adolescents in Germany: results of the National Health Survey for Children and Adolescents (KiGGS). *Br J Clin Pharmacol* 2009;68:599–608.

16 Nielsen M, Hansen E, Rasmussen N. Prescription and non-prescription medicine use in Denmark: association with socio-economic position. *Br J Clin Pharmacol* 2003;59:677–84.

17 Daban F, Pasarin M, Rodriguez-Sanz M, et al. Social determinants of prescribed and non-prescribed medicine use. *Int J Equity Health* 2010;9:12.

18 Österle A. Austria: a health care system between continuity and gradual changes. In: Pavolini E, Guillén AM, editors. *Health Care Systems in Europe under Austerity: Institutional Reforms and Performance*. Basingstoke: Palgrave Macmillan, 2013: 147–68.

19 Vogler S, Leopold C. *WHO Pharmaceutical Country Profile—Austria*. Vienna: Gesundheit Österreich GmbH, 2010.

20 Zimmermann N, Vogler S. *PPRI/PHIS Pharma Profile AUSTRIA*. Vienna: PPRI/ PHIS, 2012.

21 Hofmarcher M, Quentin W. Austria: health system review. *Health Syst Transit* 2013; 15:1–291.

22 Klimont J, Kytir J, Leitner B. *Österreichische Gesundheitsbefragung 2006/2007: Hauptergebnisse und Methodische Dokumentation [Austrian Health Interview Survey 2006/2007: Main Results and Methodological Documentation]*. Vienna: Statistik Austria, 2007.

23 Statistik Austria. *Standard-Dokumentation Metainformationen (Definitionen, Erläuterungen, Methoden, Qualität) zu Österreichische Gesundheitsbefragung 2006/ 2007 [Standard Documentation Metainformation (Definitions, Explanations, Methods, Quality) for Austrian Health Interview Survey 2006/07]*. Vienna: Statistik Austria, 2009.

24 Böheim M, Pichler E. Der österreichische Selbstmedikationsmarkt [The market for self-medication in Austria]. *Wirtschaftspolitische Blätter* 2011;2:347–68.

25 De Looper M, Lafortune G. *Measuring Disparities in Health Status and in Access and Use of Health Care in OECD Countries*. OECD Health Working Paper No. 43. Paris: OECD Publishing, 2009.

26 HLS-EU CONSORTIUM. Comparative Report of Health Literacy in Eight EU Member States. The European Health Literacy Survey HLS-EU, 2012.

27 OECD. What Are Equivalence Scales? OECD Project on Income Distribution and Poverty, 2009. Available at: http://www.oecd.org/social/family/35411111.pdf (9 May 2013, date last accessed).

28 Hoffmann K, Stein VK, Maier M, et al. Access points to the different levels of health care and demographic predictors in a country without a gatekeeping system. Results of a cross-sectional study from Austria. *Eur J Public Health* 2013;23:933–9.

29 Mackenbach JP, Stirbu I, Roskam AJ, et al. Socioeconomic inequalities in health in 22 European countries. *N Engl J Med* 2008;358:2468–81.

30 Burkert N, Rasky E, Freidl W. Social inequalities regarding health and health behaviour in Austrian adults. *Wien Klin Wochenschr* 2012;124:256–61.

31 Eggen A. Patterns of medicine use in a general population (0-80 years): the influence of age, gender, diseases and place of residence on drug use in Norway. *Pharmacoepidemiol Drug Saf* 1997;6:179–87.

32 Metge C, Black C, Peterso S, Kozyrskyj A. The population's use of pharmaceuticals. *Med Care* 1999;37:JS42–59.

33 Fernandez-Liz E, Modamio P, Catalan A, et al. Identifying how age and gender influence prescription drug use in primary health care environment in Catalonia, Spain. *Br J Clin Pharmacol* 2008;65:407–17.

34 Thomas H, Sweetnam P, Janchawee B, Luscombe D. Polypharmacy among South Wales. *Eur J Clin Pharmacol* 1999;55:411–5.

35 WHO. Manual for the Household Survey to Measure Access and Use of Medicines. Available at: http://www.who.int/medicines/areas/coordination/household_manual_february_2008.pdf (26 May 2014, date last accessed).

36 Larsen J, Stovring H, Kargstrup J, Hansen DG. Can differences in medical drug compliance between European countries be explained by social factors: analyses based on data from the European Social Survey, round 2. *BMC Public Health* 2009;9:145.

37 Gemmill M, Thomson S, Mossialos E. What impact do prescription drug charges have on efficiency and equity? Evidence from high-income countries. *Int J Equity Health* 2008;7:12.

38 Habl C, Bachner F, Klinser D, Ladurner J. *The Austrian Health Care System: Key Facts*. Vienna: Austrian Federal Ministry of Health, 2010.

39 Czypionka T, Riedel M, Röhrling G, et al. Mengenkontrolle im Arzneimittelbereich: internationale Evidenz für Österreich [Controlling the quantity in pharmaceutical use: international evidence for Austria]. *Health Syst Watch* 2010;3:1–16.