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Effect of type of insurance and income on waiting time for outpatient care

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tient Care**

Kathrin Roll, Tom Stargardt and Jonas Schreyögg

Research Paper

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<http://www.hche.eu>

Abstract

This paper analyzes the impact of type of insurance, income, and reason for appointment on waiting time for an appointment and waiting time in the physician's practice in the outpatient sector. Data were obtained from a German patient survey conducted between 2007 and 2009. We differentiated between GP and specialist and controlled for socioeconomic, structural, and institutional characteristics as well as interactions between type of insurance and control variables. Our results reveal that private health insurance plays a significant role in faster access to care at GP and specialist practices. Access to care is also highly influenced by the reason for an appointment. We also found that increased income had a negative effect on waiting time in practices and on waiting time for an appointment in GP practices. Whether inequalities in access to health care also impact overall quality of treatment needs to be investigated in future research.

Keywords: Access to care, outpatient care, private health insurance, public health insurance, waiting times

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Background

In several countries, health system objectives include the provision of equal access to health care for equal need. Disparities in access are assumed to negatively affect health outcomes due to delays in diagnosis and treatment and to generate dissatisfaction and uncertainty among patients.¹ Because waiting times for medical care are considered an implicit form of rationing within the health care sector, they pose a serious health policy issue. Unlike through rationing by price, the loss of consumer welfare due to waiting times is not offset by any gain by the producer. The cost imposed on patients is thus a deadweight loss.²

In previous studies, waiting time for elective surgery has often been considered as a measure for access to care.³ Several studies provide evidence that waiting time for elective surgery is associated with socioeconomic characteristics, such as education, income, or residence.⁴ In addition, the type of insurance is considered as relevant criterion for access to medical care.⁵ Despite the importance of ensuring timely

¹ Prentice and Pizer (2007).

² Barzel (1974).

³ DeCoster *et al.* (1999); Pell *et al.* (2000); Schoen and Doty (2004).

⁴ Siciliani and Verzulli (2009); Sudano and Baker (2006).

⁵ Aday and Andersen (1974); Calvin *et al.* (2006); Hargraves and Hadley (2003).

access to outpatient care, only a few studies have so far examined the determinants of access to outpatient care.⁶

Germany, with its multi-payer health care system, seems to be the ideal case to study the effect of type of insurance and income in the outpatient sector. The health insurance system in Germany is divided into two main components, statutory health insurance (SHI) and private health insurance (PHI). While SHI is financed by income-related contribution rates, PHI is financed by risk-based rates. Nearly 85.2 % of the German people are members of the SHI as compulsorily or voluntarily insured persons or as non-contributory family members. There is a dynamic income threshold (49,500€ for the year 2011), above which employees no longer are insured compulsorily. Above this threshold employees can either be a voluntary member of the SHI or opt out and take up PHI. Self-employed persons have the choice between SHI and PHI without having to consider any threshold while civil servants de facto have to opt for PHI. Approximately 10.8% of the population holds full PHI.⁷

Differences in health care between persons with SHI and PHI may result from deviating reimbursement schemes. For outpatient care SHI reimburses physicians at lower rates (on average PHI reimbursement is 2.28 times the SHI reimbursement for

⁶ Newacheck, Hughes, and Stoddard (1996); Resneck *et al.* (2004); Schellhorn (2007); Zuvekas and Taliaferro (2003).

⁷ The Federal Ministry of Health (2010).

the same service⁸), imposes volume restrictions on the overall amount of services, and has a less generous benefit package than PHI. Thus, the argument is made that differences in physician reimbursement rates create incentives for the preferential treatment of patients with PHI in the outpatient setting. SHI patients may face longer waiting times for outpatient appointments as well as longer waiting times in the doctors' practice.⁹ Therefore, an on-going debate is taking place in Germany about the assumption that access to care differs between patients according to their insurance status.

In this study, we analyzed the effect of type of insurance, income, and reason for the appointment on waiting times in outpatient care controlling for other socioeconomic variables as well as for institutional characteristics in a large, representative sample of the German population from the Bertelsmann Healthcare Monitor. We measured waiting time as waiting time prior to an outpatient appointment with the general practitioner (GP) and specialist and waiting time in practices of the GPs and specialists.

⁸ Walendzik *et al.* (2008).

⁹ Breyer (2004).

Methods

We measured waiting time in two ways at practices of GPs (models Ia and Ib) and specialists (models IIa and IIb). Waiting time for an appointment was measured by the days patients, who had an outpatient contact in the previous 12 months, had to wait for an appointment with a GP or specialist. We interpreted waiting time for an appointment with the GP (model Ia) and with the specialist (model IIa) as an indicator of access to care.¹⁰

Waiting time within the practice was assessed by the number of minutes patients had to wait until they were examined, treated, or consulted by the physician. In this context it is important to note that usually no nurses are present in physicians practices in Germany. Thus, patients must see the physician in person to be examined, treated, or consulted. We also interpreted waiting time in GP practices (model IIa) and in specialist practices (model IIb) as an indicator for access to care.

To avoid bias from miscoding and extreme outliers, waiting times for an appointment were truncated at 3 months for GPs and at 6 months for specialists, and waiting times within the practice were truncated at 3 hours for GPs and at 4 hours for specialists. The truncation of waiting time had no effect on the results.

For all four models, we hypothesized that waiting time (Y_i) is a function of type of insurance (INS_i), household income (INC_i), the reason for an appointment with the

¹⁰ Campbell *et al.* (1998); Gravelle and Siciliani (2008); Siciliani and Verzulli (2009).

GP (RFA_i) (for model 1a and model 1b), and the control variables for socioeconomic, structural, and practice characteristics as described above (X_i) as well as interactions between type of insurance and control variables ($INS_i \times X_i$). While β_0 , β_1 , β_2 , β_3 , β_4 and β_5 represent vectors of parameter estimates, e_i represents the error term:

$$Y_i = \beta_0 + \beta_1 INS_i + \beta_2 INC_i + \beta_3 X_i + \beta_4 RFA_i + \beta_5 (INS_i \times X_i) + e_i$$

Waiting time for an appointment in days or waiting time in the practice in minutes is a classical parameter for the application of count data regression models because the four dependent variables a) have non-negative integer values and b) their distribution is highly skewed to the left (overdispersed). The majority of individuals waited for only a short time, whereas a small number of individuals waited for longer periods. Therefore, we used negative binomial regression (Negbin) models to investigate the association between waiting time and our explanatory variables. The Negbin regression model provides a generalization of the Poisson model, allowing for heterogeneity in the mean function, thereby relaxing the restriction on the variance.¹¹ We used the ln alphas to control for overdispersion and the Akaike Information Criterion (AIC) to select and compare Poisson regression and Negbin.¹² In addition, the Vuong test was used to test if a zero-inflated Negbin model was an improvement compared to the standard Negbin model. The four regression models were developed using a forward stepwise regression technique. At first, univariate

¹¹ Cameron and Trivedi (1998).

¹² Akaike (1974).

regression models with each explanatory variable were run to determine the order of variables entering the final model. Sequentially, variables and interactions were included into the models if the models improved significantly according to the likelihood ratio test ($P < 0.05$). In all four models, a weighted regression approach was applied to adjust for differential response rates with respect to age, gender, and federal state.

To test for overall goodness of fit for the four models, we estimated our models with log likelihood ratio tests and compared the empty model to the full model. Marginal effects for the variable of interests were calculated with all variables set to their mean. To check robustness of results, multiple sensitivity analysis were conducted. Statistical analyzes were performed using SAS 9.2.

Data

Sample and Setting

We used data from a patient survey of the Bertelsmann Healthcare Monitor. The survey was conducted in Germany in five waves between 2007 and 2009. The survey included five cross-sectional samples of approximately 1500 persons aged 18 to 79 years that previously was shown to be representative for the German

population.¹³ The survey included information on health status, socioeconomic characteristics, and treatment provided along with characteristics of the physicians and their practices. The average response rate of each survey wave was approximately 70%.

Variables of interest

The main explanatory variables included in the four waiting time models are type of health insurance and household income. In the GP models, we also included self-reported reason for the appointment. For type of health insurance, we differentiated between (1) SHI, (2) PHI, (3) SHI with refund, and (4) other schemes. The “with refund” option of SHI allows patients to use the PHI reimbursement rates either by paying the difference between the SHI and PHI reimbursement out of pocket or through complementary insurance. Other schemes include special schemes for farmers, miners, and sailors.

Household income captures the socioeconomic status of the respondent and was measured as the gross household income. It includes income from employment, self-employment, pensions, public benefits, private regular transfers, long-term care, capital income, rents, and housing benefits. Along with income serving as socioeconomic variable, this variable also acts as a proxy for the ability to pay for

¹³ Potthoff, Heinemann, and Güther (2004).

health services that are not covered by SHI but are to be paid for either through PHI or out of pocket.

The reason for an appointment at the GP was originally assessed in 13 categories. We aggregated these into four categories: acute severe disease (original categories: acute severe disease, accident), acute mild disease (original categories: general discomfort, counseling), chronic condition (original categories: chronic disease, disability), and others (original categories: check-up, medical estimate, visit without seeing the doctor).

Other explanatory variables

Throughout the model, we controlled for a number of variables reflecting socioeconomic characteristics that can influence access to health care in general or waiting time for physician appointments in particular in previous studies.¹⁴ Besides including variables for age and gender, we controlled for migration-specific sociocultural characteristics, by including a dummy variable for nationality. Another dummy variable indicated whether residency of the respondent was in an urban area (population >50,000 inhabitants) or in a rural area (population <50,000 inhabitants) to approximate supply and structural characteristics of health care services. We also included a dummy variable for handicap.

¹⁴ Cooper *et al.* (2009); Siciliani and Hurst (2004); Siciliani and Verzulli (2009); Van Doorslaer, Masseria, and Koolman (2006).

As a proxy for healthy lifestyle, we used the level of education.¹⁵ The Bertelsmann Healthcare Monitor captures education as 16-categorical variable. These were grouped into six categories following the International Standard Classification (ISCED-97): high education (first and second stage of tertiary education), middle education, (upper secondary, post-secondary, and non-tertiary education), low education, (primary and lower secondary education), in school (ongoing education), no education, and other. In addition, employment status was included. We differentiated between training on-the-job, full-time employed, part-time employed, and unemployed.

Besides characteristics of the respondent, we included the number of GP visits in the prior 12 months, the specialty of the GP, type of organization (i.e., single practice, group practice, or outpatient department of a hospital), and duration of the GP–patient relationship (categories: <1 year, <5 years, >5 years) into the GP models (models Ia and Ib) to control for structural characteristics of the care setting. Accordingly, the following variables were included in the specialist models (model IIa and IIb): number of specialist visits in the previous 12 months, specialty of the physician, and whether or not the respondent obtained a referral from a GP to visit a specialist. In addition, we included waiting time for an appointment with the GP in model Ib (waiting time in GP practice) and waiting time for an appointment with the specialist in model IIb (waiting time in specialist practice). Finally, we used time-fixed

¹⁵ Lantz *et al.* (1998).

effects to control for differences between the five survey waves. In case of missing value, we assumed missing at random (MAR). The basic idea of MAR is that the probability that a response variable is observed can depend on the values of those other variables which have been observed.¹⁶ In case of missing values, we applied listwise deletion for the data which is analyzed for the GP models and the specialist models.¹⁷

Results

Table 1 displays the descriptive characteristics of the study sample. In total, the dataset comprised data from 5122 respondents in the GP models (model Ia and Ib) and 4626 respondents in the specialist models (model IIa and IIb) who were evenly distributed among the survey periods. Descriptive statistics revealed that respondents reported waiting 2.8 days on average for an appointment with the GP and an average of 15.6 days for an appointment with the specialist. Respondents waited about the same amount of time at both types of practices, 31.5 minutes at the GP practice compared to 37.5 minutes at the specialist's practice.

¹⁶ Cheng (1994).

¹⁷ Jones (1996).

The results of the executed likelihood ratio tests revealed, that for all of the four regression models the p-values were highly significant with $P < 0.001$; which meant that the full models constituted an improvement against the empty models.¹⁸ Table 2 shows the results of the regression models.

¹⁸ White and Bennett (1996).

Table 1: Baseline characteristics of the study population

Variables	Weighted N (GP-Model)	Unweighted N (GP-Model)	Weighted % or Mean (SD) (GP-Model)	Unweighted % or Mean (SD) (GP-Model)	Weighted N (Specialist-Model)	Unweighted N (Specialist-Model)	Weighted % or Mean (SD) (Specialist-Model)	Unweighted % or Mean (SD) (Specialist-Model)
Survey wave								
Spring, 2007	1140.91	1130	22.1%	22.1%	1085.9	1070	23.2%	20.1%
Autumn, 2007	1001.49	994	19.4%	19.4%	864.14	863	18.4%	18.7%
Spring, 2008	1048.58	1052	20.3%	20.5%	920.74	907	19.6%	19.6%
Autumn, 2008	998.76	966	19.4%	18.9%	870.02	858	18.6%	18.6%
Spring, 2009	973.13	980	18.9%	19.1%	948.38	928	20.2%	20.1%
Type of Insurance								
SHI	4136.62	4093	80.1%	79.9%	3725.00	3661	79.4%	79.1%
PHI	749.87	753	14.5%	14.7%	720.76	716	15.4%	15.5%
SHI with refund	98.06	109	1.9%	2.1%	86.6	98	1.9%	2.1%
Other Insurance Schemes	178.31	167	3.5%	3.3%	156.55	151	3.3%	3.3%
Reason for an appointment with the GP								
Acute severe disease	2376.11	2232	43.6%	43.6%				
Acute mild disease	320.21	327	6.4%	6.4%				
Chronic condition	750.23	837	16.3%	16.3%				
Other	1716.32	1726	33.7%	33.7%				
Houshold income €								
<500	71.78	68	1.4%	1.3%	68.05	66	1.5%	1.4%
500-999	339.44	339	6.6%	6.6%	306.7	299	6.5%	6.5%
1000-1499	692.56	695	13.4%	13.6%	663.52	652	14.2%	14.1%
1500-1999	840.59	884	16.3%	17.3%	740.66	774	15.8%	16.7%
2000-2499	960.49	951	18.6%	18.6%	878.95	851	18.7%	18.4%
2500-2999	851.8	830	16.5%	16.2%	765.04	757	16.3%	16.4%
3000-3999	838.9	808	16.3%	15.8%	753.56	731	16.1%	15.8%
4000-4999	329.17	326	6.4%	6.4%	297.05	298	6.3%	6.4%
≥5000	238.14	221	4.6%	4.3%	215.66	198	4.6%	4.3%
Level of Education								
High	1075.94	1128	20.8%	22,00%	975.5	1027	20.8%	22.2%
Middle	787.38	789	15.3%	15.4%	701.25	690	15,0%	14.9%
Low	2280.9	2305	44.2%	45,00%	2095.34	2097	44.7%	45.3%
In School	341.01	232	6.6%	4.4%	328.57	231	7,0%	4.9%
No Education	245.54	224	4.8%	4.5%	224,00	199	4.8%	4.3%
Other	432.1	444	8.4%	8.7%	364.24	382	7.8%	8.3%
Nationality								
German	5097.91	5060	1.3%	1.2%	4627.28	4569	98.7%	98.8%
Other	64.96	62	98.7%	98.8%	61.90	57	1.3%	1.2%
Age	5122.00	5122	46.07 (15.38)	48.66 (15.08)	4626.00	4626	45.24 (15.39)	47.74 (15.14)
Gender								
Female	2605.03	2805	50.5%	54.8%	2252.01	2611	50.6%	56.4%
Male	2557.84	2317	49.5%	45.2%	2437.16	2015	49.4%	43.6%
Employment Status								
Full-time employed	2444.21	2111	47.3%	41.2%	2225.9	1932	47.5%	41.8%
Part-time employed	1023.33	1101	19.8%	21.5%	977.19	1023	20.8%	22.1%
Training on-the-job	135.21	90	2.6%	1.8%	127.54	88	2.7%	1.9%
Unemployed	1560.13	1820	30.2%	35.5%	1358.55	1583	29,0%	34.2%

continued on the next page

Table 1 continued

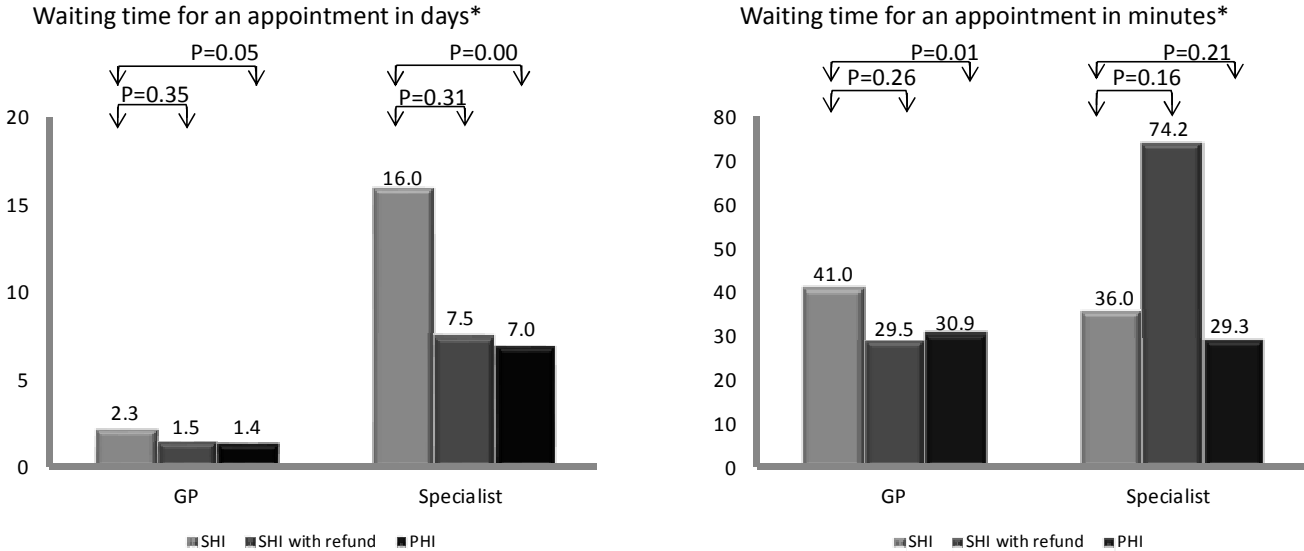
Variables	Weighted N (GP-Model)	Unweighted N (GP-Model)	Weighted % or Mean (SD) (GP-Model)	Unweighted % or Mean (SD) (GP-Model)	Weighted N (Specialist- Model)	Unweighted N (Specialist- Model)	Weighted % or Mean (SD) (Specialist- Model)	Unweighted % or Mean (SD) (Specialist- Model)
Handicap								
No	3181.56	3011	61.6%	58.8%	2891.79	2721	58.8%	61.7%
Yes	1981.31	2111	38.4%	42.2%	1797.39	1905	41.2%	38.3%
Residence								
Urban	3808.07	3863	73.8%	75.4%	3489.07	3531	74.4%	76.3%
Rural	1354.8	1259	26.2%	24.6%	1200.11	1095	25.6%	23.7%
Type of Organization								
Single Practice	3137.35	3142	60.8%	61.3%				
Group Practice. different specialisation	1480.08	1447	28.7%	28.3%				
Group Practice. same specialisation	474.19	477	9.2%	9.3%				
Outpatient Departement of Hospital	44.73	29	0.9%	0.6%				
Unknown	26.51	27	0.5%	0.5%				
Specialty of GP								
Internist	708.74	762	13.7%	14.9%				
Gynecologist	45108.00	9	0.1%	0.2%				
GP	4402.52	4310	85.3%	84.2%				
Other	44.38	41	0.9%	0.8%				
Number of GP visits	5122.00	5122	4.19 (4.80)	4.36 (4.89)				
Number of Specialist Visits					4626.00	4626	6.04 (7.00)	6.19 (6.86)
Duration of GP-Patient Relationship								
< 1 Year	203.52	202	3.9%	3.9%				
< 5 Years	1236.74	1168	24.0%	22.8%				
≥ 5 Years	3722.6	3752	72.1%	73.3%				
Referral to Specialist								
Without Referral					1477.42	1399	31.5%	30.2%
With Referral					3211.76	3227	68.5%	69.8%
Specialty								
Internal medicine					310.7	315	6.6%	6.8%
Naturopathy					13394.00	11	0.2%	0.2%
Homeopathy					27150.00	6	0.1%	0.1%
Radiology					142.82	153	3.1%	3.3%
Surgery					289.11	248	6.2%	5.4%
Occupational Physician					75.06	63	1.6%	1.4%
Public Health Officer					28.96	19	0.6%	0.4%
Gynecology					824.39	879	17.6%	19.0%
Orthopedy					720.75	707	15.4%	15.3%
Ear, Nose and Throat					326.68	293	7.0%	6.3%
Dermatology					379.91	330	8.1%	7.1%
Urology					206.12	214	4.4%	4.6%
Psychology					91.76	102	2.0%	2.2%
Other					1277.82	1286	27.3%	27.8%
Waiting time for an appointment with the specialist (in days)					4626.00	4626	15.64 (22.47)	16.61 (24.00)
Waiting time in specialist practices (in minutes)					4626.00	4626	37.54 (34.70)	37.25 (34.70)
Waiting time for an appointment with the GP (in days)	5122.00	5122	2.82 (6.32)	3.01 (6.77)				
Waiting time in GP practices (in minutes)	5122.00	5122	31.49 (28.00)	31.21 (27.51)				

Source: Bertelsmann Health Monitor (2007-2009)

Waiting time and type of insurance

The type of insurance was a significant predictor for access to specialist care and there was a strong trend for type of insurance to predict access to care to the GP ($p=0.0538$) (Table 2). We found reverse results for waiting time in practice, as type of insurance had no effect on waiting time in the specialist practice but significantly affected waiting time in the GP practice. Marginal effects from our regression models revealed that respondents insured under PHI waited 56% less (9 fewer days) for an appointment at the specialist than individuals with SHI ($P < 0.001$) and 33% less (1 fewer day) for an appointment with the GP ($P = 0.0538$) (Figure 1). Compared to PHI, SHI with refund had no effect on access to care on waiting time for an appointment. Waiting time in the GP practice was also heavily determined by type of insurance. Respondents with PHI waited, on average, 25% less or 10 fewer minutes ($P < 0.001$) than respondents with SHI. For the SHI with refund option the influence on waiting time in GP practice was not significant.

Figure 1: Predicted waiting time for the average respondent by insurance type



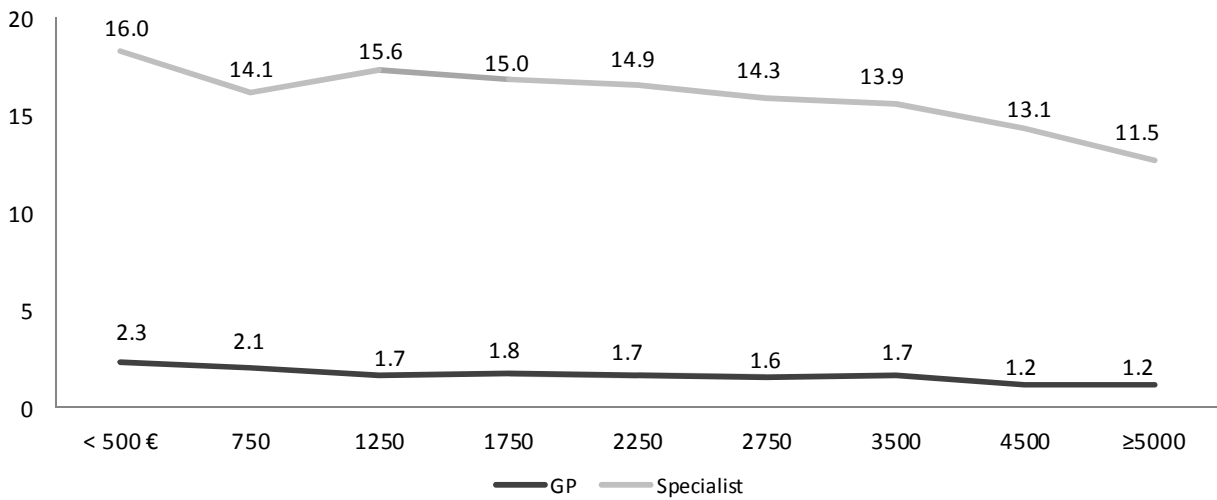
*Predictions were made for marginal effects for the variables of interest, all other variables set to their mean.

Waiting times for different income levels

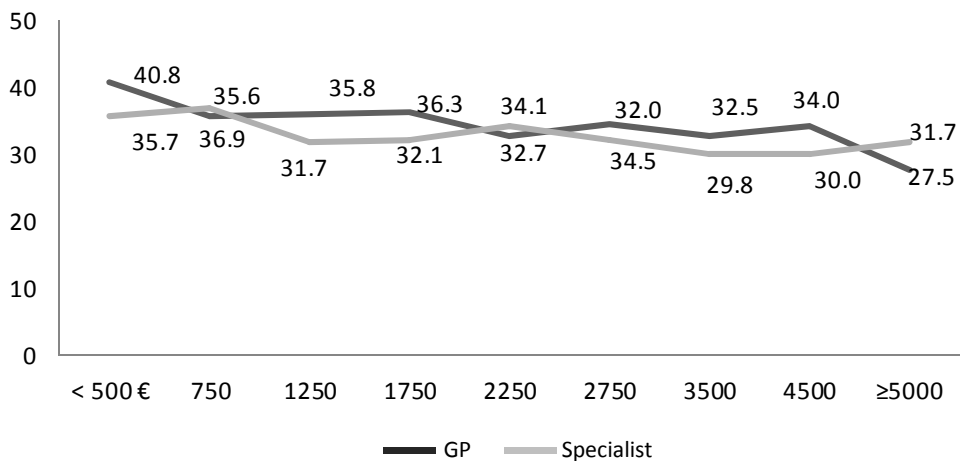
Also, income had a major impact on waiting time for an appointment with the GP, whereas it had a modest influence on waiting time for an appointment with the specialist. A household income of more than 2000€/month on average was associated with a significant reduction in waiting time for a GP appointment compared to respondents with an income of less than 500€ (28% or 1 day less; $P < 0.001$). For the waiting time for an appointment with the specialist only a household income of more than 5000€/month was associated with significantly less waiting time (28% or 5 days less; $P < 0.001$). Increased income also reduced waiting time in practices of GPs and specialists significantly for a monthly household income of more than 1500€ and more than 3000€, respectively (Figure 2).

Figure 2: Predicted waiting time in practices for the average patient by income

Waiting time for an appointment in days*



Waiting time in the practice in minutes*



*Predictions were made for marginal effects for the variables of interest, all other variables set to their mean.

Waiting time and reason for an appointment at the GP

The reason related to the consultation of a GP was also a significant predictor of access to care. Respondents with acute severe disease had to wait shorter times for

an appointment than respondents who consulted their GP because of an acute mild disease ($P < 0.001$), a chronic condition ($P < 0.001$), or other reasons ($P < 0.001$). However, the effect of the reason for appointment was much smaller compared to the effect of type of insurance. Respondents with acute mild disease waited on average 29% more or 1 day longer for an appointment than those with acute severe disease.

Regarding the waiting time in the GP practices, we found reverse results. Respondents with acute severe disease waited longer than respondents with acute mild disease ($P = 0.0484$), a chronic condition ($P = 0.001$), or those who visited the GP for other reasons ($P < 0.001$). This means that respondents with acute mild disease had fewer waiting time in practices compared to those with acute severe disease by waiting 8% or 4 minutes less. Respondents with chronic conditions and respondents who consulted physicians for other reasons waited 14% or 5 minutes less compared to those with acute severe disease.

Interactions

Although we controlled for interactions between type of insurance and all other independent variables, the strong effect of type of insurance remained. Few interaction effects were significant. The subgroup of insured under SHI with refund having mild acute disease experienced fewer waiting time in the GP practice ($P = 0.0268$) compared to SHI insured with acute severe disease. For the waiting time in the specialist practice for surgery ($P = 0.0325$) or urology ($P = 0.0042$) respondents insured under PHI waited significantly less than SHI insured in the specialist practice for internal medicine (reference group).

Sensitivity analysis

We tested the robustness of our findings by performing multiple sensitivity analyses for the four models. At first, we re-estimated the models by varying truncation of the dependent variables. We also re-estimated the models without truncations. The results for the variables of interest became gradually less significant, but point estimates remained robust. Second, we included controls for the patient's self-reported chronic comorbidities. We observed no effect on the results for our variables for type of insurance, income, and reason for an appointment. Thirdly, we controlled for the interaction between income levels and type of insurance, which, however, showed no significant effect. We further re-estimated the two models excluding either the variables for type of insurance or for household income. Household income became gradually more significant, but again, point estimates remained robust. We also checked for multicollinearity. In sum, our variables of interest seem to be robust to model changes.

Table 2: Results from regression models

Variables	Model Ia: Waiting time for an appointment with the GP n=5122				Model Ib: Waiting time in the practice of the GP n=5122				Model IIa: Waiting time for an appointment with the specialist n=4626				Model IIb: Waiting time in the practice of the specialist n=4626			
	Marginal Effects (days)	Estimate	Std.-Error	P-Value	Marginal Effects (min)	Estimate	Std.-Error	P-Value	Marginal Effects (days)	Estimate	Std.-Error	P-Value	Marginal Effects (min)	Estimate	Std.-Error	P-Value
Intercept		0.4199	0.0319	0.0319 **		3.7488	0.0952	<0.0001 ***		2.555	0.1450	<0.0001 ***		3.6095	0.1020	<0.0001 ***
Survey wave		Reference				Reference				Reference				Reference		
Spring, 2007																
Autumn, 2007	-0.4	-0.2096	0.0508	0.0003 ***	-0.5	-0.0143	0.0280	0.6488	3.1	0.1766	0.0406	0.0003 ***	-3.5	-0.1029	0.0287	0.0028 **
Spring, 2008	-0.4	-0.1761	0.0510	0.0022 **	1.6	0.0383	0.0277	0.2153	-0.8	-0.0532	0.0401	0.2661	1.4	0.0385	0.0283	0.2515
Autumn, 2008	-0.4	-0.1927	0.0528	0.0013 **	-1.8	-0.0462	0.0286	0.1483	-0.5	-0.0301	0.0413	0.5378	1.9	0.0524	0.0292	0.1276
Spring, 2009	-0.3	-0.1571	0.0520	0.0087 **	-1.0	-0.0260	0.0284	0.4148	1.0	0.0585	0.0408	0.2242	1.8	0.0480	0.0286	0.1530
Type of Insurance		Reference				Reference				Reference				Reference		
SHI																
PHI	-0.8	-0.4457	0.2135	0.0538 *	-10.1	-0.2837	0.0986	0.0088 **	-9.0	-0.8188	0.2069	0.0005 ***	-6.7	-0.2074	0.1435	0.2108
SHI with refund	-0.9	-0.5087	0.5383	0.3473	-11.5	-0.3305	0.2606	0.2623	-8.5	-0.7492	0.6791	0.3129	38.2	0.7285	0.4700	0.1568
Other Insurance Schemes	2.4	0.7148	0.3427	0.0658 *	7.0	0.1576	0.1887	0.4554	-12.9	-1.6245	0.3872	0.0004 ***	-11.8	-0.4029	0.2615	0.1975
Reason for an appointment with the GP		Reference				Reference				Reference				Reference		
Acute severe disease																
Acute mild disease	1.0	0.3544	0.0769	<0.0001 ***	-3.7	-0.0964	0.0430	0.0484 **								
Chronic condition	1.4	0.4594	0.0539	<0.0001 ***	-5.2	-0.1369	0.0307	0.0001 ***								
Other	1.2	0.4169	0.0431	<0.0001 ***	-5.4	-0.1430	0.0234	<0.0001 ***								
Houshold income €		Reference				Reference				Reference				Reference		
<500																
500-999	-0.2	-0.0937	0.1578	0.5836	-5.2	-0.1378	0.1470	0.1470	-1.9	-0.1294	0.3688	0.3688	1.2	0.0323	0.0842	0.7496
1000-1499	-0.6	-0.3086	0.1515	0.0610 *	-5.0	-0.1302	0.0831	0.1526	-0.4	-0.0231	0.8670	0.8670	-4.0	-0.1201	0.0807	0.2155
1500-1999	-0.5	-0.2478	0.1515	0.1323	-4.5	-0.1173	0.0827	0.1949	-1.0	-0.0626	0.6505	0.6505	-3.6	-0.1067	0.0804	0.2703
2000-2499	-0.6	-0.3262	0.1509	0.0463 **	-8.1	-0.2203	0.0825	0.0147 **	-1.1	-0.0738	0.5916	0.5916	-1.6	-0.0456	0.0802	0.6362
2500-2999	-0.7	-0.3559	0.1528	0.0317 **	-6.3	-0.1664	0.0833	0.0673	-1.7	-0.1150	0.4074	0.4074	-3.7	-0.1087	0.0812	0.2646
3000-3999	-0.6	-0.3249	0.1534	0.0508 *	-8.3	-0.2276	0.0835	0.0125 **	-2.1	-0.1434	0.3011	0.3011	-5.9	-0.1811	0.0814	0.0629 *
4000-4999	-1.1	-0.6179	0.1650	0.0006 ***	-6.8	-0.1824	0.0887	0.0588 *	-2.9	-0.2020	0.1715	0.1715	-5.7	-0.1748	0.0871	0.0905 *
≥5000	-1.1	-0.6562	0.1722	0.0004 ***	-13.3	-0.3936	0.0924	<0.0001 ***	-4.5	-0.3314	0.0315	0.0315 **	-4.0	-0.1188	0.0908	0.2677
Level of Education		Reference				Reference				Reference				Reference		
High																
Middle	-0.2	-0.1032	0.0558	0.1073	-0.1	-0.0015	0.0308	0.9658	-0.7	-0.0478	0.0445	0.3735	0.9	0.0244	0.0316	0.5185
Low	-0.4	-0.2054	0.0461	0.0001 ***	0.6	0.0138	0.0255	0.6315	-2.3	-0.1584	0.0366	0.0003 ***	0.2	0.0051	0.0260	0.8701
In School	-0.6	-0.3076	0.1096	0.0149 **	3.2	0.0745	0.0517	0.1971	-4.8	-0.3597	0.0787	0.0002 ***	0.7	0.0181	0.0530	0.7751
No Education	-0.7	-0.3365	0.0877	0.0009 ***	2.9	0.0685	0.0473	0.1969	-3.2	-0.2197	0.0682	0.0085 **	-1.6	-0.0472	0.0476	0.4129
Other	-0.5	-0.2158	0.0672	0.0057 **	4.3	0.1002	0.0370	0.0171 **	-3.3	-0.2298	0.0540	0.0005 ***	-1.8	-0.0507	0.0383	0.2769
Nationality		Reference				Reference				Reference				Reference		
German																
Other	1.3	0.4498	0.0065	0.0065 **	4.9	0.1140	0.0855	0.2098	-0.9	-0.0584	0.1264	0.6779	5.2	0.1362	0.0889	0.1654
Age	0.0	0.0108	0.0016	<0.0001 ***	-0.1	-0.0022	0.0009	0.0261 **	0.1	0.0049	0.0013	0.0014 **	-0.1	-0.0032	0.0009	0.0026 **
Gender		Reference				Reference				Reference				Reference		
Female																
Male	-0.3	-0.1146	0.0367	0.0075 **	-0.6	-0.0143	0.0198	0.5254	-3.5	-0.2491	0.0303	<0.0001 ***	1.2	0.0324	0.0222	0.2346
Employment Status		Reference				Reference				Reference				Reference		
Full-time employed																
Part-time employed	-0.2	-0.0739	0.0504	0.1867	-1.2	-0.0305	0.0273	0.3076	-1.0	-0.0632	0.0390	0.1618	0.3	0.0096	0.0280	0.7669
Training on-the-job	1.5	0.5103	0.1418	0.0019 **	-5.3	-0.1392	0.0697	0.0744 *	0.7	0.0418	0.1096	0.7444	-0.4	-0.0120	0.0739	0.8868
Unemployed	-0.1	-0.0493	0.0494	0.3734	-0.9	-0.0211	0.0268	0.4773	-1.8	-0.1224	0.0398	0.0089 **	-0.4	-0.0099	0.0276	0.7587
Handicap		Reference				Reference				Reference				Reference		
No																
Yes	0.3	0.1382	0.0385	0.0014 **	4.5	0.1039	0.0210	<0.0001 ***	2.3	0.1361	0.0305	0.0002 ***	2.3	0.0636	0.0215	0.0118 **

* ** *** Marginal effects were calculated for the variables of interest, all other variables set to their mean
p<0.1; p<0.05; p<0.001

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Table 2 continued

Variables	Model Ia: Waiting time for an appointment with the GP n=5122				Model Ib: Waiting time in the office of the GP n=5122				Model IIa: Waiting time for an appointment with the specialist n=4626				Model IIb: Waiting time in the office of the specialist n=4626			
	Marginal Effects (days)	Estimate	Std.-Error	P-Value	Marginal Effects (min)	Estimate	Std.-Error	P-Value	Marginal Effects (days)	Estimate	Std.-Error	P-Value	Marginal Effects (min)	Estimate	Std.-Error	P-Value
Residence																
Urban		Reference					Reference					Reference				
Rural	-0.3	-0.1543	0.0013	0.0013 **	7.2	0.1625	0.0229	<.0001 ***	1.6	0.0974	0.0329	0.0132 **	2.3	0.0632	0.0235	0.0241 **
Type of Organization																
Single Practice		Reference					Reference					Reference				
Group Practice, different specialisation	0.7	0.2697	0.0626	<.0001 ***	3.8	-0.0222	0.0353	0.3852								
Group Practice, same specialisation	0.7	0.2573	0.0411	0.0003 ***	-0.9	0.0895	0.0227	0.0232 **								
Outpatient Department of Hospital	0.5	0.1947	0.2106	0.4176	20.6	0.4096	0.1201	0.0015 **								
Unknown	2.0	0.6304	0.2182	0.0390 **	8.3	0.1862	0.1259	0.2913								
Specialty of GP																
GP		Reference					Reference					Reference				
Gynecologist	8.2	1.5092	0.3440	0.0008 ***	-5.8	-0.1534	0.2153	0.5805								
Internist	1.2	0.4209	0.0515	<.0001 ***	-4.8	-0.1256	0.0300	0.0002 ***								
Other	0.8	0.3069	0.2297	0.2131	8.4	0.1875	0.1275	0.1628								
Number of GP visits	0.0	-0.0066	0.0039	0.1538	-0.2	-0.0080	0.0021	0.0012 **								
Number of Specialist Visits									0.0	-0.0003	0.0022	0.8984	0.0	-0.0008	0.0016	0.6733
Duration of GP-Patient Relationship																
< 1 Year		Reference					Reference					Reference				
1-5 Years	0.2	0.0303	0.0405	0.7678	0.2	0.0448	0.0221	0.0704 *								
≥ 5 Years	0.0	-0.0442	0.0865	0.6530	0.0	0.0391	0.0480	0.0998 *								
Referral to Specialist																
With Referral										Reference						
Without Referral									-0.8	-0.0525	0.0331	0.1770	-1.5	-0.0444	0.0232	0.0975 *
Specialty																
Internal medicine									0.0	Reference						
Naturopathy									22.5	-0.4108	0.3847	0.3048	-9.5	-0.3100	0.2784	0.2842
Homeopathy									-2.3	0.8769	0.3809	0.0489 **	2.5	0.0673	0.2749	0.8355
Radiology									-6.1	-0.1531	0.1066	0.2000	3.3	0.0873	0.0756	0.3047
Surgery									-3.2	-0.4768	0.0909	<.0001 ***	18.2	0.4116	0.0635	<.0001 ***
Occupational Physician									-5.9	-0.2234	0.1527	0.1674	-2.5	-0.0727	0.1088	0.5261
Public Health Officer									3.3	-0.4622	0.2735	0.0986 *	12.0	0.2899	0.1876	0.1290
Gynecology									-2.3	0.1873	0.0745	0.0233 **	-2.9	-0.0849	0.0525	0.1450
Orthopedy									-6.2	-0.1556	0.0748	0.0576 *	12.5	0.3001	0.0530	<.0001 ***
Ear, Nose and Throat									1.8	-0.4888	0.0891	<.0001 ***	-0.6	-0.0162	0.0626	0.8138
Dermatology									0.6	0.1081	0.0841	0.2410	3.3	0.0878	0.0596	0.1801
Urology									8.0	0.0356	0.1002	0.7455	2.5	0.0682	0.0715	0.3827
Psychology									0.0	0.4055	0.1197	0.0032 **	5.5	0.1445	0.0850	0.1401
Other									-4.2	0.1032	0.0683	0.1734	4.8	0.1259	0.0485	0.0199 **
Waiting time for an appointment with the specialist (in days)													0.3	0.0073	0.0004	<.0001 ***
Waiting time for an appointment with the GP (in days)					0.8	0.0199	0.0016	<.0001 ***								
Interactions																
Insurance Type * Age		Included			Included				Included				Included			
Insurance Type * Residence		Included			Included				Included				Included			
Insurance Type * Type of Organization		Included			Included											
Insurance Type * Reason for an Appointment		Included			Included											
Insurance Type * Type of GP		Included			Included											
Insurance Type * Number of GP Visits		Included			Included											
Insurance Type * Duration of GP-Patient Relationship		Included			Included											
Insurance Type * Number of Specialist Visits										Included			Included			
Insurance Type * Referral to Specialist										Included			Included			
Insurance Type * Type of Specialist										Included			Included			

* ** *** Marginal effects were calculated for the variables of interest, all other variables set to their mean
p< 0.1; p< 0.05; p< 0.001

Discussion

This study is among the first to examine the impact of type of insurance and income on waiting time in the German outpatient sector, using such a comprehensive set of explanatory variables. The rich data sample enabled us to include the insurance status and various socioeconomic and structural variables and characteristics of the GP and specialist practices in the four models of waiting time. This allowed us to obtain more consistent estimates for determinants of waiting time in the outpatient sector. Furthermore, our study adds value to existing research by introducing “waiting time in the GP or specialist practice” as an additional dimension of waiting time.

Our findings show evidence of inequality of access for those insured under PHI and SHI with refund compared to SHI. This is the case for waiting time in practices provided by the GP as well as for waiting time for an appointment with the specialist. Overall, the results suggest that membership in PHI plays a significant role for access to care. This might be due to three reasons. First, PHI allows higher reimbursement rates by the factor 2.28 for the same service compared to SHI.¹⁹ Second, PHI usually provides a more generous benefit package, that is, additional health care services, which are not covered under SHI. Thus, the physician is able to perform and bill a higher volume of service items per consultation. Finally, as partly shown by the negative correlation between household income and waiting time in practices,

¹⁹ Walendzik *et al.* (2008).

physicians seem to prefer patients with an increased willingness to pay because these patients are more likely to purchase (additional) health services out of pocket.

While the differences regarding type of insurance influenced waiting time in the practice at the GP, it did not influence waiting time in the practice at the specialist. One possible explanation for this discrepancy may be that the overall service provision, i.e. the type of services to be provided at a scheduled appointment, is more foreseeable at the specialist compared to the GP. Patients that consult a specialist usually will have a referral from another physician or at least some information on the disease that is to be treated when making the appointment, whereas at the GP most patients will make an appointment because they simply feel “sick” without being able to reveal information on the type of services to be provided at the appointment. In addition, GPs have a higher percentage of walk-ins in Germany (49%) compared to specialists (29%).²⁰ So, GPs will get behind their schedule more often compared to the specialist. Thus, the decision between a) making all patients wait a little longer and b) treating the most profitable patient as scheduled (PHI patients) and making SHI patients wait much longer occurs much more frequently in GP practices compared to specialist. Taking into consideration the fact that the coefficients in both models have the expected signs for PHI compared to SHI patients, it might be that overcrowding in specialist practices ($P = 0.2108$) still happens too infrequently for the effect to be significant.

²⁰ German Federal Association of the Company Health Insurance Funds (2008).

While type of insurance influenced the waiting time for an appointment with the specialist, a strong trend was found ($P = 0.0538$) for waiting time for an appointment with the GP for PHI insured. This might also be attributed to the higher percentage of walk-ins for GP practices compared to specialists.

Furthermore it is possible that the observed differences in waiting times are the results of a general tendency for waiting times to increase in the outpatient sector. Sommer (1999) reported that some physicians in the UK balloon their waiting lists. Thereby they aim at demonstrating that their department is under-equipped. While this may be true for the NHS-financed UK system, the argument does not hold for Germany, as physicians work on a self-employed basis. Also, reimbursement through fee-for-service incentivizes physicians to treat as many patients as possible. Still, the increase in the number of the elderly and in patients with chronic diseases has led to a higher demand for outpatient services. Additionally there is the tendency towards generally more day cases and shorter length of stay in the hospital due to the introduction of DRG reimbursement. The after-care of those cases is now often provided by physicians in the outpatient sector.²¹

National and international empirical results also revealed that disparities in access to innovative treatments and shorter waiting times persist across different types of

²¹ Schreyögg et al. (2006)

insurance.²² The study of Schellhorn (2007) also uses data of the Bertelsmann Healthcare Monitor, but is confined to the first wave. It supports our results for SHI to increase waiting time with the specialist and in the specialist office compared to PHI. In contrast to our results, however, waiting time for an appointment with the GP was not significantly different between SHI and PHI in Schellhorn's study and there were significant differences for waiting time in the GP office.²³ Differences might be due to the different time periods of the two datasets and the difference in the measurement of waiting time. He measured waiting times in categories while we had access to waiting time measured as a continuous variable which enabled us to use count data models.

International published studies mainly focused on waiting times for inpatient care, that is, for elective surgeries in general, organ transplantation, or specific subgroups.²⁴ Several studies compared waiting time for those under US Medicaid and Medicare with private insurance plans.²⁵ These findings were in line with our results. Calvin *et al.* (2006) analyzed the impact of insurance coverage for patients admitted for non-ST-segment elevation acute coronary syndromes.²⁶ Patients with

²² Krobot *et al.* (2004).

²³ Schellhorn (2007)

²⁴ Howard (2000).

²⁵ Calvin *et al.* (2006); Resneck, Pletcher, and Lozano (2004); Rosanio *et al.* (1999).

²⁶ Calvin *et al.* (2006).

Medicaid as the primary payer waited 21 hours longer for a coronary artery bypass grafting compared to patients with HMO or private insurance coverage.²⁷ Resneck *et al.* (2004) studied waiting times for an outpatient appointment with a dermatologist. The mean waiting time for Medicare patients and patients with HMO or private insurance coverage was 37 days, whereas patients with Medicaid experienced significant queuing and waited at an average of 50 days.²⁸ Studies conducted with data from the United Kingdom reported that patients with PHI waited on average 99 fewer days for elective surgery compared to patients with National Health Service (NHS) coverage.²⁹

We found that income has a modest effect on waiting time for an appointment and on waiting time in practices. Patients with higher income levels might have an increased willingness to pay for additional services that would be paid out of pocket and experience, thus, less waiting time for an appointment or in the practices. Therefore, physicians might try to motivate their patients to consult them on a private basis, which is associated with an additional income for the physicians.³⁰ Our finding that income does not have a major impact on waiting time is at odds with the results

²⁷ Calvin *et al.* (2006).

²⁸ Resneck *et al.* (2004).

²⁹ Dimakou *et al.* (2009).

³⁰ Sommer (1999)

obtained in other studies.³¹ A study by Schoen and Doty (2004) analyzed inequalities in access to medical care in Australia, Canada, New Zealand, the United Kingdom, and the United States using the Commonwealth Fund International Health Policy Survey. In Australia, Canada, and the United States, individuals with an income below the average waited significantly longer for an appointment.³² Siciliani and Verzulli (2009) used data of the Survey of Health, Ageing, and Retirement in Europe (SHARE). They analyzed waiting time for specialist consultation and elective surgery.³³ They found an increase in income of 10.000€ reduced waiting time for specialist consultation by 8% in Germany. However, because Siciliani and Verzulli (2009) did not control for type of insurance, their results do not seem comparable to ours. Having included both variables, type of insurance and income, the former rather than the latter seems to determine waiting time.

Whereas income only has a modest effect for waiting time, the reason for an appointment has a strong impact on waiting times at GP practices. It is striking that patients with acute severe disease have shorter waiting times for an appointment but have longer waits in practices compared to patients with other reasons for visiting a physician. This might be because of GPs' intentions not to turn away those with acute severe diseases who may need urgent care. However, once these individuals were

³¹ Newacheck *et al.* (1996); Siciliani and Verzulli (2009).

³² Schoen and Doty (2004).

³³ Siciliani and Verzulli (2009).

able to skip the usual waiting list of several days, GPs may try to comply with their scheduled appointments within a given day. Thus, patients with acute severe disease may have been walk-ins who must wait longer than patients with scheduled appointments. As the interactions show, this is also true for patients with PHI coverage. Although patients with PHI generally wait shorter times, the “mark-up” for having an acute severe condition did not differ between those with PHI and SHI.

Most of the existing literature on access to care focuses on the general effects of socioeconomic factors on waiting time.³⁴

This study also has important limitations. First, due to its design using a patient survey, information on GPs, specialists, and their practices is limited. Hence, it is not possible to control for the experience of the physicians or their receptionists in assessing the need of patients seeking access to care. Second, the data do not permit controlling for the exact time of day for the appointment. This could be important because people with higher incomes generally will be more restricted to practice hours than people with lower income who have a larger percentage of part-time workers.³⁵ Controlling for time of appointment may thus even increase the difference in waiting times between patients with PHI and SHI as well as the effect of household income on waiting times. Third, as in many studies relying on survey data,

³⁴ Bishai and Lang (2000); Dimakou *et al.* (2009); Ding *et al.* (2010); Gravelle and Siciliani (2008); Lofvendahl *et al.* (2005); Newacheck *et al.* (1996); Park, Lee, and Epstein (2009); Rosanio *et al.* (1999).

³⁵ Kennedy *et al.* (2004).

the variables are self-reported. Other studies argued that self-reported waiting times by patients tend to be overestimated compared to actual waiting times.³⁶ The same reason may also introduce bias to our variable of interest “reason for an appointment”, because the perception of what is acute or severe might vary. Fourth, socioeconomic characteristics are, at least partly, related to type of insurance, although we could not identify a correlation in our model. Interactions between type of insurance and income did not affect results, but p-values might still be biased downward due to overlapping variance of both variables. A final consideration is that 53% of the patients with SHI received a referral from their GP before they visited a specialist, whereas only 3.5% with PHI obtained a referral. This means that for patients with SHI waiting time for an appointment in specialist practices is likely to be underestimated as every second SHI insured has waited an unobserved additional time period for an appointment at the GP practice before the specialist consultation.

Conclusion

Our study has shown that inequalities in waiting time in the outpatient sector exist. Although results for reason for appointment were as expected, i.e. the more severe a condition the faster a patient could get access to health care, our results also show that there are inequalities in access to health care regarding type of insurance and

³⁶ Lantz *et al.* (1998); Siciliani and Verzulli (2009).

income. If disparities in access to health care exist, one could assume that disparities for different types of insurance also persist regarding the quality of care. However, it is not clear whether the overall quality of treatment is influenced by type of insurance. We recommend analyzing if SHI might provide better health care services or health care quality because of the existence of Disease Management Programs (DMP), which are not available for PHI insured. This has to be considered in future research. Different policy instruments could be considered to prevent inequalities in access to care. Currently the treating physician receives different reimbursement for the same medical service for PHI and SHI patients. On average, the remuneration rate for PHI patients is 2.28 times more than for SHI patients.³⁷ This seems to have an immense influence on access to outpatient care regarding waiting times. Therefore, a harmonization in the reimbursement rates between SHI and PHI may reduce differences.

Above harmonization of reimbursement rates there may be other instruments to improve access to care. Promising examples can also be found in other countries. An innovative online booking platform has recently been launched in Philadelphia (DocAsap.com). This platform intends to match patient's demand for more timely treatment with available doctor appointments, taking into account patient's preferences without knowing their socioeconomic status. In the UK the NHS provides an online booking system at medical centers. When booking an appointment,

³⁷ Walendzik *et al.* (2008).

patients need to enter the reason for their appointment. Another innovative approach is “same-day scheduling” where an appointment is provided at the same day. This type of practice scheduling has shown promise in reducing patient waiting times and increasing the practice efficiency in the outpatient sector in Canada.³⁸ Overall these approaches might reduce discrepancies of waiting times across individuals with different socioeconomic characteristics and types of insurance. However, it is not clear if the above mentioned policy instruments are able to reduce waiting time in physician’s practices.

³⁸ Cameron, Sadler, and Lawson (2010); Murray and Berwick (2003).

References

Aday, L. and Andersen, R. (1974). 'A framework for the study of access to medical care', *Health Services Research* 9(3): 208-220.

Akaike, H. (1974): 'A new look at the statistical model identification', *IEEE Transactions on Automatic Control* 19(6): 716–72.

Barzel, Y. (1974) 'A theory of rationing by waiting', *Journal of Law and Economics* 17(1): 73-95.

Bishai, D. and Lang, H. (2000) 'The willingness to pay for wait reduction: the disutility of queues for cataract surgery in Canada, Denmark, and Spain' *Journal of health economics* 19(2): 219-30.

Breyer, F. (2004) 'How to finance social health insurance: Issues in the German reform debate', *The Geneva Papers* 29(4): 679-88.

Calvin, J., Roe, M., Chen, A., Mehta, R., Brogan, G., DeLong, G., Fintel, D., Gibler, W., Ohman, E., and Smith, S. (2006) 'Insurance coverage and care of patients with non–ST-segment elevation acute coronary syndromes', *Annals of internal medicine* 145(10): 739.

Cameron, A. and Trivedi, P. (1998) *Regression analysis of count data*, Cambridge Univ Pr.

Cameron, S., Sadler, L., and Lawson, B. (2010) 'Adoption of open-access scheduling in an academic family practice', *Canadian Family Physician* 56(9): 906.

Campbell, S., Roland, M., Quayle, J., Buetow, S., and Shekelle, P. (1998) 'Quality indicators for general practice: which ones can general practitioners and health authority managers agree are important and how useful are they?' *Journal of Public Health* 20(4): 414.

Cheng, P. E. (1994). 'Nonparametric estimation of mean functionals with data missing at random', *Journal of the American Statistical Association* 89(425): 81-87.

Cooper, Z., McGuire, A., Jones, S., and Grand, J. (2009) 'Equity, waiting times, and NHS reforms: retrospective study', *British Medical Journal* 339.

DeCoster, C., Carriere, K., Peterson, S., Walld, R., and MacWilliam, L. (1999) 'Waiting times for surgical procedures', *Medical care* 37(6).

Dimakou, S., Parkin, D., Devlin, N., and Appleby, J. (2009) 'Identifying the impact of government targets on waiting times in the NHS', *Health Care Management Science* 12(1): 1-10.

Ding, R., McCarthy, M., Desmond, J., Lee, J., Aronsky, D., and Zeger, S. (2010) 'Characterizing Waiting Room Time, Treatment Time, and Boarding Time in the Emergency Department Using Quantile Regression', *Academic Emergency Medicine* 17(8): 813-23.

German Federal Association of the Company Health Insurance Funds (2008) *Die BKK*, Berlin.

Gravelle, H. and Siciliani, L. (2008) 'Optimal quality, waits and charges in health insurance', *Journal of health economics* 27(3): 663-74.

Greene, W.H. (2002) 'Econometric Analysis', New Jersey: *Prentice Hall*.

Hargraves, J. and Hadley, J. (2003) 'The contribution of insurance coverage and community resources to reducing racial/ethnic disparities in access to care', *Health Services Research* 38(3): 809-29.

Howard, D. (2000) 'The impact of waiting time on liver transplant outcomes', *Health Services Research* 35(5 Pt 2): 1117.

Jones, M.P. (1996) 'Indicator and stratification methods for missing explanatory variables in multiple linear regression', *Journal of American Statistical Association* 91: 222-230.

Kennedy, J., Rhodes, K., Walls, C., and Asplin, B. (2004) 'Access to emergency care: Restricted by long waiting times and cost and coverage concerns', *Annals of emergency medicine* 43(5): 567-73.

Krobot, K., Miller, W., Kaufman, J., Christensen, D., Preisser, J., and Ibrahim, M. (2004) 'The disparity in access to new medication by type of health insurance: Lessons from Germany', *Medical care* 42(5): 487.

Lantz, P., House, J., Lepkowski, J., Williams, D., Mero, R., and Chen, J. (1998) 'Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults.', *Journal of the American Medical Association* 279(21): 1703.

Lofvendahl, S., Eckerlund, I., Hansagi, H., Malmqvist, B., Resch, S., and Hanning, M. (2005) 'Waiting for orthopaedic surgery: factors associated with waiting times and patients' opinion', *International Journal for Quality in Health Care* 17(2): 133.

Murray, M. and Berwick, D. (2003) 'Advanced access: reducing waiting and delays in primary care', *Journal of the American Medical Association* 289(8): 1035.

Newacheck, P., Hughes, D., and Stoddard, J. (1996) 'Children's access to primary care: differences by race, income, and insurance status', *Pediatrics* 97(1): 26.

Park, C., Lee, M., and Epstein, A. (2009) 'Variation in emergency department wait times for children by race/ethnicity and payment source', *Health Services Research* 44(6): 2022-39.

Pell, J., Pell, A., Norrie, J., Ford, I., Cobbe, S., and Hart, J. (2000) 'Effect of socioeconomic deprivation on waiting time for cardiac surgery: retrospective cohort study Commentary: Three decades of the inverse care law', *British Medical Journal* 320(7226): 15.

Potthoff, P., Heinemann, L., and Güther, B. (2004) 'A household panel as a tool for cost-effective health-related population surveys: validity of the Healthcare Access Panel', *Das Gesundheitswesen*.

Prentice, J. and Pizer, S. (2007) 'Delayed access to health care and mortality', *Health Services Research* 42(2): 644-62.

Resneck, J., Pletcher, M., and Lozano, M. (2004) 'Medicare, medicaid, and access to dermatologists: The effect of patient insurance on appointment access and wait times' *Journal of the American Academy of Dermatology* 50(1): 85-92.

Rosanio, S., Tocchi, M., Cutler, D., Uretsky, B., Stouffer, G., deFilippi, C., MacInerney, E., Runge, S., Aaron, J., and Otero, J. (1999) 'Queuing for coronary angiography during severe supply-demand mismatch in a US public hospital: analysis of a waiting list registry', *Journal of the American Medical Association* 282(2): 145.

Schellhorn, M. (2007) 'Vergleich der Wartezeiten von gesetzlich und privat Versicherten in der ambulanten ärztlichen Versorgung', in: Böcken, J, Braun B, Amhof, R (eds.) *Gesundheitsmonitor 2007. Gesundheitsversorgung und Gestaltungsoptionen aus der Perspektive von Bevölkerung und Ärzten*. Gütersloh: Bertelsmann Foundation: 95–113.

Schoen, C. and Doty, M. (2004) 'Inequities in access to medical care in five countries: findings from the 2001 Commonwealth Fund International Health Policy Survey', *Health Policy* 67(3): 309-22.

Schreyögg, J., Stargardt, T., Tiemann, O., and Busse, R. (2006) ' Methods to determine reimbursement rates for diagnosis related groups (DRG): A comparison of nine European countries', *Health Care Management Science* 9: 215-223.

Siciliani, L. and Hurst, J. (2004) 'Explaining waiting times variations for elective surgery across OECD countries', *OECD Economic Studies* 38(1): 95-123.

Siciliani, L. and Verzulli, R. (2009) 'Waiting times and socioeconomic status among elderly Europeans: evidence from SHARE', *Health Economics* 18(11): 1295-306.

Sommer, J. H. (ed.) (1999) 'Gesundheitssysteme zwischen Plan und Markt', Stuttgart: *Schattauer*.

Sudano, J. and Baker, D. (2006) 'Explaining US racial/ethnic disparities in health declines and mortality in late middle age: the roles of socioeconomic status, health behaviors, and health insurance', *Social Science & Medicine* 62(4): 909-22.

The Federal Ministry of Health (2010) 'Statistiken zur gesetzlichen Krankenversicherung' from http://www.bundesgesundheitsministerium.de/cln_169/nn_1193098/DE/Gesundheit/Statistiken/gesetzliche-krankenversicherung__node.html?__nnn=true#doc1193102bodyText2 accessed 7 October 2010.

Van Doorslaer, E., Masseria, C., and Koolman, X. (2006) 'Inequalities in access to medical care by income in developed countries', *Canadian Medical Association Journal* 174(2): 177.

Walendzik, A., Greß, S., Manouguian, M., and Wasem, J. (2008). 'Vergütungsunterschiede im ärztlichen Bereich zwischen PKV und GKV auf Basis des standardisierten Leistungsniveaus der GKV und Modelle der Vergütungsangleichung', *Discussion Paper*. Fachbereich Wirtschaftswissenschaften, Universität Duisburg-Essen.

White, G.C., and Bennetts, R.E., (1996) 'Analysis of frequency count data using the negative binomial distribution', *Ecology* 77(8): 2549-2557.

Zuvekas, S. and Taliaferro, G. (2003) 'Pathways to access: health insurance, the health care delivery system, and racial/ethnic disparities, 1996-1999', *Health Affairs* 22(2): 139.

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