

Effects of increased drug copayments on the demand for drugs and physician visits in Germany

Schnell, Gerald; Gandjour, Afschin; Lauterbach, Karl W.

Veröffentlichungsversion / Published Version

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

GESIS - Leibniz-Institut für Sozialwissenschaften

Empfohlene Zitierung / Suggested Citation:

Schnell, G., Gandjour, A., & Lauterbach, K. W. (2005). Effects of increased drug copayments on the demand for drugs and physician visits in Germany. *Sozialwissenschaftlicher Fachinformationsdienst soFid, Gesundheitsforschung* 2005/1, 11-23. <https://nbn-resolving.org/urn:nbn:de:0168-ssoar-202156>

Nutzungsbedingungen:

Dieser Text wird unter einer Deposit-Lizenz (Keine Weiterverbreitung - keine Bearbeitung) zur Verfügung gestellt. Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

Terms of use:

This document is made available under Deposit Licence (No Redistribution - no modifications). We grant a non-exclusive, non-transferable, individual and limited right to using this document. This document is solely intended for your personal, non-commercial use. All of the copies of this documents must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.

Effects of Increased Drug Copayments on the Demand for Drugs and Physician Visits in Germany

Gerald Schnell, Afschin Gandjour, Karl W. Lauterbach

Background: On July 1, 1997, the German government raised drug copayment by € 2.60 to € 4.60, € 5.60 or € 6.60 per prescription, depending on package size. The aim of this study was to examine the effects of increased copayments on the demand for drugs and physician visits one year later. Lower income groups and the chronically ill were analysed separately.

Methods: A survey of 695 non-exempted adult pharmacy customers who suffered from acute or chronic health conditions in the previous 12 months was conducted. Logistic regression was performed to analyse the effect of different income levels on the demand for drugs and physician visits.

Results: Of the respondents, 19.9% reported reduced physician visits, 22.6% reported reduced prescription drug purchases, 44.9% reported increased use of over-the-counter products and 46.3% reported increased use of non-drugs such as household remedies. A total of 11.2% waived more than one visit to the physician. Almost all of those respondents who reduced their purchases of prescription packages waived 1 to 5 packages (82.5%). There was distinctly less change in purchasing patterns among persons with chronic diseases. Logistic regression confirmed that lower income households were more likely to change demand patterns than households in other income brackets.

Conclusion: Increased copayments had little effect on drugs and physician visits of adult pharmacy customers, especially among those with chronic conditions. Negative effects on low income households were observed.

Introduction

Germany has faced growing health care expenditures for many years. As a percentage of gross domestic product (GDP), medical spending increased from 8.7 % in 1990 to 10.6 % in 1998 and 10.9 % in 2002 [1]. This is a higher percentage of gross domestic product than in almost all other industrialised countries, surpassed only by the United States and Switzerland. A great part of these costs is covered by Germany's statutory health insurance, which provides health coverage for about 87 % of the German population. One of the important cost drivers is expenditures for prescribed drugs. Prescription drug expenditures covered by statutory health insurance amounted to € 18.3 billion in 1998 [2], which is about 14.3 % of the total spending [3].

To offset rising costs, several cost-containment instruments have been implemented in the pharmaceutical market over the last decade. On July 1st, 1997, after years of much smaller increases, drug copayment was increased by € 2.60 to € 4.60, 5.60 or € 6.60, depending on the package size.

The decision to increase drug copayments was met with great concern among Germans. The government was criticised for discriminating against the poor and the chronically ill. The government argued that they expected copayments to have only financial effects, meaning a shift in costs from the

statutory health insurance fund to drug users. To ensure this, the government introduced maximum copayments for the chronically ill [4]. Exemptions for low income groups and a maximum copayment level had already been in existence. Physician visits remained free of charge.

Several studies in other health care systems show that even small copayment levels have a significant impact on the use of drug prescriptions. Studies in the U.S. for different settings, ages and income groups [5-10] and the RAND Health Insurance Experiment [11-12] found that increasing drug cost sharing decreased prescription drug usage. These findings are supported by studies from the U.K. [13-15] and Canada [16-17]. Altogether, however, drug use is rather inelastic. Price elasticity varies mostly from -0.1 to -0.3 . That means that when the copayment charge is increased by 60%, the number of prescriptions is reduced by 6% to 20%.

Some studies have produced more detailed information about whether copayment has different effects on necessary or discretionary drugs. They considered drugs necessary if they were used for chronic conditions, e.g., antihypertensive agents, diuretics or antidiabetics. Drugs like cold remedies or sedatives were defined as discretionary drugs, used in acute conditions. The results are ambiguous. Johnson et al. [18] could not find a consistent pattern when copayments were increased each year over a three-year period. Harris et al. [6] showed that discretionary drugs were more affected. Reeder and Nelson [19] found decreased use of cardiac agents, diuretics, psychotherapeutics and cholinergics, whereas other classes of drugs, such as analgesics or sedatives, were not affected.

There is also the question of possible substitution effects. Stuart and Grana [20] found that over-the-counter drugs (OTC) and prescription drugs (RX) are economic substitutes; whereas Leibowitz [21] showed that patients with full insurance coverage used both over-the-counter drugs and prescription drugs more than patients with a co-insurance policy.

The impact of drug copayments on physician visits was examined by Johnson et al. [8], who found no effect on an elderly population. There is little evidence that the impact on a low-income population is greater than on a high-income population. Only Foxman et al. [22] were able to show that antibiotic use decreased most in the lowest third of the income distribution when patients had to pay a co-insurance fee of 25% or more.

It is difficult to generalise these results to the situation in Germany. No study has been published yet on different age groups and patients of different working status. Previous studies dealt either with the elderly or the work force. Further, the existence and direction of substitution effects is not clear, and effects on different income groups are rather small.

The present study was conducted to examine the effect of increased copayments in the German health care system. First, our goal was to find out if non-exempted persons changed their demand for drugs and medical services. We wondered if individuals avoided physician visits and/or had fewer prescriptions dispensed. Further, we wanted to know if patients tried to influence the physician's prescribing, e.g. by requesting a larger package size to reduce the amount of copayment per tablet. We also wanted to know if patients substituted over-the-counter drugs products, household remedies or alternative health care services for prescription drugs. Moreover, we wanted to find out if patients with chronic conditions were influenced by the increased copayment in their demand for drugs and medical services. Finally, we wanted to analyse the impact of copayments on households in different income brackets.

METHODS

Study design

The study was conducted in Cologne, a city with 1 million inhabitants, from October to December 1998. Questionnaires were distributed to 68 pharmacies (23% of all pharmacies) in Cologne. Included were non-exempted patients who experienced acute or chronic health problems in the last 12 months.

We chose a convenience sampling method. Postage prepaid questionnaires were displayed on the desk of the pharmacy where visitors could pick them up. The questionnaires were completed at home and mailed back to the institute. A pilot study demonstrated the feasibility of the questionnaire and the sampling method.

Sample

About 87% of the population in Germany was covered by statutory health insurance at that time. Most of the population was charged for drug prescriptions, both for brand and generic drugs. Patients younger than 18 years of age were exempt from copayment charges. They accounted for about 19% of those covered by statutory insurance. Further exempted was the lowest income group. It included mainly social security recipients as well as those among the statutorily insured who had gross earnings of less than € 873 (single), € 1,201 (married) or € 1,427 (married plus 1 child) per month (all figures are for 1997). In 1997, this group accounted for another 14% of the statutorily insured. Therefore, about 67% of the insured were subjected to drug copayments [2]. Further, a ceiling of 2% of the gross family income was imposed. This fee was reduced for the chronically ill in the second year of their disease. It is estimated that 60,000 people or about 0.1% of the statutorily insured made use of this exemption in 1998.

Data

A written questionnaire was developed for patient completion. In the first part of the questionnaire, respondents were asked to provide socio-demographic information. The questions in the second part were about the existence of acute or chronic conditions and health care utilisation within the last 12 months. In the third section, we asked respondents whether or not copayment caused changes in their demand for health care in the last 12 months. The final section asked the chronically ill about any changes in their demand for health care relating to their chronic condition.

Model and Variables

Through the survey, we asked individuals if the increased copayment had caused changes in their demand patterns over the last 12 months. We chose five variables to measure changes in demand pattern: reduced prescription purchases, reduced physician visits, increased non-drug use, increased use of OTC products and increased requests for less expensive prescriptions. We described increased non-drug use as household remedies such as teas and alternative medical care such as homeopathic services and acupuncture. We dealt with the topic of increased requests for more economic prescriptions in five questions, which took the costs of the prescriptions into consideration: this included requests for cheaper or for no prescriptions, for a larger or smaller package size or for alternative medical care. Answer possibilities were “once”, “several times” and “no”.

We used a logistic regression model to analyse the effect of different income levels on the variables, and defined income as the net annual household income per capita. The model adjusted for differences in socio-economic and other characteristics. Explanatory variables were age, gender, education, number of information sources used, existence of additional private insurance, number of physician visits in the last 12 months, OTC drugs consumed in the last 12 months, amount of copayments in the last 12 months, and the existence of acute and chronic conditions. We classified gender as a dummy variable with women equal to 1. Income was adjusted by household size as follows. Seven income classes were given as answer categories. Under the assumption of a normal distribution within each income class, the midpoint of each class was divided by the number of household members. In this way we derived household income per capita in € per month. Education was measured by the number of years of formal schooling. In order to facilitate the response, we used 4 to 5 intervals to estimate the number of physician visits, number of days drugs were consumed and amount of copayments in the last 12 months. Calculations were again done with class midpoints. Patients faced with a chronic condition were asked about their medication used. An individual consuming drugs minimum of 3 times a week was defined as chronically ill. Frequent chronic conditions which are usually treated by medication, such as high blood pressure, heart problems, high cholesterol level, asthma or diabetes mellitus, were given as answer possibilities.

Statistics

We conducted binary logistic regression with each of the five dependent variables. The method we used is described by Hamilton [23]. Therefore, we summarised the answer possibilities “once” and “several times” of the dependent variables to “yes”. In this way we could be sure that both answer categories contained enough cases to get robust results. We tested variables for multicollinearity. Studentized residuals checked for outliers. To identify influential cases, we used Cook’s Distance. We used the likelihood ratio test to confirm the hypothesis that the model showed no overall effect. We calculated the t statistic and the p value for each variable. Significance level was $\alpha = 0.05$.

When we asked about the number of visits to a physician in the last 12 months, we facilitated the estimation for high drug users by giving a 3-month period as an additional answer possibility. The estimation on a 3-month period was then extrapolated to a 12-month period. Of the respondents, 54 did not answer the question concerning the 12-month time period. In order to interpolate 53 of these missing values, we did linear regression using the variables number of visits in the last 3 months and chronic condition. R^2 was 59%. We did the same for the amount of copayments in the last 12 months,

where 100 values were missing. Explanatory variables were the amount of copayment charged in the last 3 months, age, number of physician visits, number of information used and gender. R^2 was 70%.

RESULTS

Table 1. Characteristics of All Respondents and of Respondents Included in the Regression Analysis (Subsample)

Personal Characteristics	All Subjects ^a (n = 695)	Subsample (n = 605)
Mean age (yr.)	54.6	53.8
Female (%)	64.2	64.0
Additional private insurance (%)	22.6	23.0
Average household size (members)	2.0	2.0
Household income (net) (%)		
< € 920	7.9	6.4
€ 920 - € 1,278	19.5	19.0
€ 1,278 - € 1,534	21.0	21.7
€ 1,534 - € 2,045	20.3	20.3
€ 2,045 - € 2,556	13.7	14.5
€ 2,556 - € 3,068	8.4	8.4
> € 3,068	9.3	9.6
Education (%)		
Education less than Baccalaureate	66.8	64.0
Baccalaureate	13.2	14.2
University degree	19.9	21.8
Acute condition in the last twelve months (%)	67.8	68.1
Chronic condition in the last twelve months (%)	58.4	59.8
Physician visits in the last twelve months (%)		
0	1.4	1.3
1 - 5	37.9	38.5
6 - 10	33.4	32.9
11 - 20	13.3	14.5
> 20	14.0	12.7

^a Percentages among respondents were calculated.

In total, 742 questionnaires were sent back. We excluded 22 questionnaires which were not completed correctly, 24 respondents who were covered by private insurance and 1 respondent younger than 18 years of age. We used a sample of 695 questionnaires for our descriptive analysis. We ex-

cluded 90 questionnaires because of missing values. Thus, we did logistic regression with the 605 complete questionnaires. Characteristics of included and excluded patients were very similar (Table 1). The mean age of the respondents was 55 years, and 64% of respondents were women.

Table 2 shows the results regarding the impact of increased drug copayment on the demand for drugs and physician visits. About 22.6% of the respondents reported that they had waived a prescription once or several times. We asked these respondents about the number of prescriptions they had waived. Most of them (82.5%) answered that they had not bought 1 to 5 drugs, and 10.4% had waived 5 to 10 drug prescriptions.

Table 2. Effects of Increased Drug Copayment on the Demand for Drugs and Physician Visits (n = 695)

Effects of Increased Drug Copayment	in %
Reduced physician visits	19.9
Reduced drug purchases ^a	22.6
Increased requests for more economic prescriptions ^a	49.7
Increased non-drug use	46.3
Increased use of OTC products	44.9

^a Only physician visitors (n = 680)

About 19.9% of the respondents reported that they had avoided at least one physician visit in the last year because of increased copayments. Of these respondents, 8.6% reported that they had renounced one visit, the other 11.2% had renounced more than one visit. To get an impression about the range of changes, we made a rough estimation about the impact on physician visits on the basis of the number of physician visits in the last year reported by each respondent. Patients answering "more than one visit" waived at least 2 visits. This results in a reduction of at least 4% of physician visits per year by the non-exempted insured.

During a physician visit, 49.7% of the respondents reported that they had specific requests concerning the prescription. Most of the respondents said that they asked for the prescription of a larger package size (35.4%). The respondents requested another, cheaper prescription (17.1%), a smaller package size (5.6%) or alternative medical care instead of medication (7.9%). Only a small portion of the respondents, 4.9%, told the physician not to prescribe any drugs. Finally, more than 40% reported an increase of OTC products and non-drug use to treat less serious diseases.

Table 3. Distribution of Chronic Diseases among the Chronically Ill (n = 406)

Chronic Diseases	in %
Hypertension	36.7
Heart failure	23.4
High cholesterol level	19.0
Thyroid dysfunction	18.5
Risk of osteoporosis	15.5
Obesity	14.0
Diabetes mellitus	11.6
Asthma	9.4
Other chronic diseases	39.9

In the second section of the questionnaire, we asked similar questions of patients suffering from one or more chronic conditions about the treatment of their chronic disease. Table 3 shows the distribution of the diseases. We found that the impact of increased copayment on the treatment of chronic diseases was less pronounced among the chronically ill than among respondents as a whole. Table 4 shows the results. Only about 6% to 7% of the chronically ill reported reduced physician visits and reduced drug purchases.

Table 4. Effects of Increased Drug Copayment on the Chronically Ill (n = 406)

Effects of Increased Drug Copayment	in %
Reduced physician visits	6.2
Reduced drug purchases	6.7
Increased non-drug use	15.0
Increased use of OTC products	10.1
Reduced drug consumption	8.6
Changed drug consumption	3.9
Request for the prescription of fewer drugs	3.7
Increased copayment had no effect	67.2

Finally, we wanted to know if drug copayment had a stronger effect on lower income households. Table 5 shows the results of the logistic regression. We detected no influential outliers. Odds ratios of the logit-functions and confidence intervals are reported in the table. An odds ratio of less than one indicates that the independent variable, e.g. household income per capita, has a negative effect on the dependent variable, e.g. reduced physician visits. The more the household income per capita increases, the higher the likelihood that the copayment causes the individual to reduce the number of physician visits decreases.

Table 5. Odds Ratios and 95% Confidence Intervals for Effects of Increased Drug Copayment (n = 605)

	Reduced physician visits	Reduced prescribed drug purchases	Increased requests for more economic prescriptions	Increased use of OTC products	Increased non-drug use
Household income per capita	0.5677*** (0.4252; 0.7581)	0.6821** (0.5299; 0.8781)	0.7095*** (0.5851; 0.8604)	0.9077 (0.7580; 1.0870)	0.7313** (0.6034; 0.8862)
Education	0.9664 (0.8995; 1.0384)	0.9557 (0.8954; 1.0201)	1.0103 (0.9566; 1.0671)	0.9219** (0.8728; 0.9738)	0.9296** (0.8805; 0.9814)
Gender ^a	1.4041 (0.8645; 2.2804)	1.2727 (0.7939; 2.0403)	1.3203 (0.8968; 1.9439)	1.6317* (1.1211; 2.3747)	2.0061*** (1.3723; 2.9327)
Age	0.9908 (0.9748; 1.0072)	0.9537*** (0.9382; 0.9695)	1.0033 (0.9902; 1.0167)	0.9926 (0.9798; 1.0055)	1.0096 (0.9966; 1.0227)
Amount of copayment paid	1.0015* (1.0001; 1.0031)	1.0014 (1.0000; 1.0029)	1.0023*** (1.0011; 1.0035)	0.9998 (0.9986; 1.0009)	1.0014* (1.0002; 1.0026)
OTC products consumed	1.0187 (0.9929; 1.0452)	1.0071 (0.9819; 1.0330)	1.0245* (1.0030; 1.0465)	1.0598** (1.0375; 1.0825)	1.0092 (0.9885; 1.0303)
Physician visits	0.9580* (0.9230; 0.9944)	1.0041 (0.9698; 1.0396)	1.0009 (0.9714; 1.0313)	0.9904 (0.9619; 1.0197)	0.9733 (0.9453; 1.0022)
Acute condition	2.9013*** (1.6450; 5.1171)	1.4668 (0.8962; 2.4007)	1.4008 (0.9484; 2.069)	1.2100 (0.8258; 1.7731)	1.4671* (1.0012; 2.1497)
Chronic condition	0.8421 (0.5014; 1.4144)	0.8199 (0.5034; 1.3355)	1.6214* (1.0642; 2.4704)	0.8267 (0.5452; 1.2533)	0.9164 (0.6035; 1.3917)
Additional private insurance	0.5376* (0.2964; 0.9748)	1.0427 (0.6308; 1.7233)	1.1163 (0.7290; 1.7093)	0.9735 (0.6414; 1.4776)	0.7608 (0.5004; 1.1566)
No. of information sources	0.9836 (0.8245; 1.1734)	1.0631 (0.8984; 1.2579)	1.1379 (0.9841; 1.3156)	1.1308 (0.9821; 1.3019)	1.1254 (0.9781; 1.2949)

*** p < 0.001 ** p < 0.01 * p < 0.05 ^a women = 1

We found a strong negative correlation between the likelihood to change drug demand and the per capita household income. Four of the five models show significant effects. Patients with lower income were more likely to reduce drug purchases ($p < 0.01$) than those with a higher income. They were also more likely to reduce physician visits ($p < 0.001$), to discuss the possibility of a more economic prescription with the physician ($p < 0.001$) and to increase non-drug use ($p < 0.01$).

Further, we found that other explanatory variables were associated with an increased likelihood to change drug demand. Women and less educated people were more likely to increase non-drug and OTC-product use. Younger people were more likely to discuss prescriptions alternatives with a physician. Patients with high copayments and OTC products consumed were more likely to change their demand patterns. However, copayment caused patients with a small number of physician visits to reduce them. When there was an acute condition, physician visits were reduced and non-drug use increased. Patients with chronic conditions discussed prescription alternatives with the physician, mainly regarding larger package sizes.

DISCUSSION

The results of the survey show that increased drug copayment had a slight effect on the demand for drugs and physician visits for a great number of pharmacy customers, mainly in the treatment of acute conditions. Lower income households were more likely to change their demand patterns than households in higher income brackets.

Our study sample included non-exempted patients who developed chronic and acute health problems within the last year. This broad study sample included all potential drug users who were faced with prescription fees.

The study is limited by the data collection method. We did not directly ask pharmacy customers to participate, but left it to the discretion of visitors to pick up a questionnaire. Therefore, a response rate cannot be determined. To ensure that the sample was not atypical, we compared the characteristics of the respondents with those of respondents to another survey conducted one year before in Cologne and the greater Cologne area [24] as well as the normal population of Cologne. This survey was also conducted in pharmacies. The sample included all pharmacy visitors, with no exclusion criteria given. 18,693 forms were evaluated. We found a strong congruence between the baseline characteristics of participants of both studies. Our respondents were slightly younger (+3.4% in the group 31-60 years of age and -5.2% in the group older than 60 years of age) and were made up of fewer women (-6%). Our sample had a lower representation in the income class of households with more than 5,000 DM per annum (17.6% vs. 21.6%). When compared to the demographics of the population of Cologne, single-person households were underrepresented in our sample. The income distribution showed that our sample had a smaller percentage of respondents from the lowest income class (< 1,800 DM) than is representative of the German population, a divergence which is congruent with the exemption rule. Our respondents were on average more educated than the German population as a whole, which can be explained by the study location in an urban region and the correlation between the exempted low-income patients and their low education level. Nevertheless, we cannot fully exclude the possibility that there is a systematic correlation between the willingness to fill in the questionnaire and the reaction to drug copayment.

Surveys are limited by the accuracy of the reported data. Response biases such as respondents' tendencies to answer a question with "yes" or to answer in a socially desirable manner cannot be excluded. Further, it is known that individuals underreport health service use when asked to recall a 12-month period [25-26]. However, there is no evidence that underreporting varies systematically by respondents' characteristics, e.g. gender, age or income level. Assuming that the recall bias affects all respondents similarly, descriptive results and results from the regression analysis are not biased by the tendency to underreport health services. To reduce potential biases, answer classes were given, and the exact number was not asked. Regression analysis only distinguished those who changed their demand from those who did not.

We compared our results with total drug sales and total number of drugs consumed by the population covered by statutory health insurance. There are no data available that refer to drug use for those who are charged for their prescriptions. Figure 1 shows the development in the prescription sales market since 1994. Between 1994 and 1996, no additional regulation was conducted by the government to influence drug expenditures. The number of prescriptions sold per year varied by 3% to 6%. In 1997, there was a decrease of 11%, followed by another decrease of 3% in 1998; whereas, the number of patients insured decreased by only 0.5% [3]. Copayment had been increased by 1 DM (0.51 EUR) on

January, 1st 1997, other regulations on the pharmaceutical market were not introduced. Of course there are other factors influencing the number of prescriptions, such as changes in the morbidity of the insured. Therefore, these figures cannot serve as proof for our findings, but they support our interpretation.

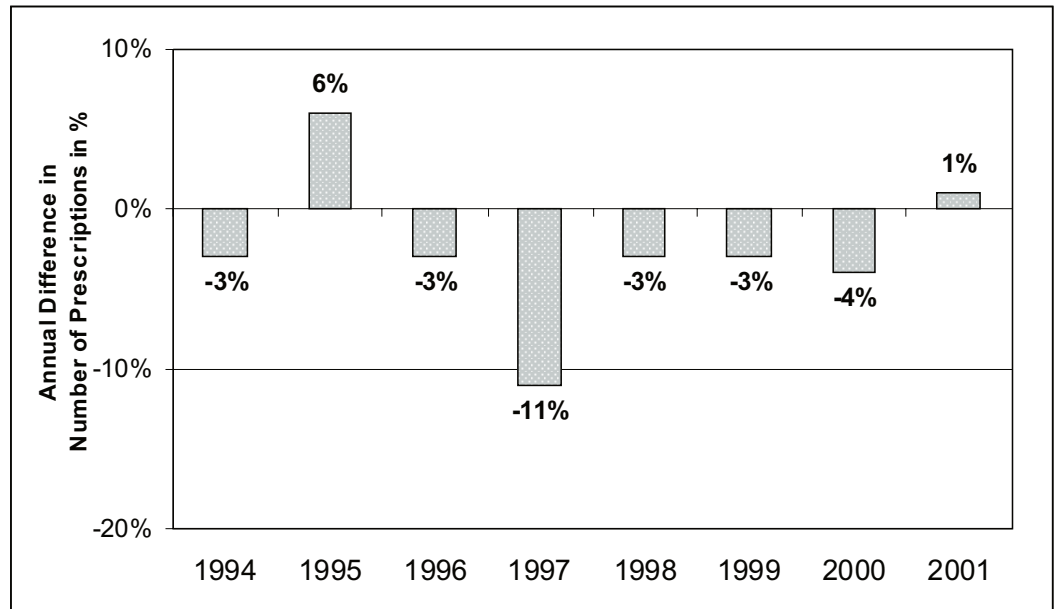


Figure 1: Annual Difference in Number of Prescriptions Covered by the Statutory Health Insurance 1994-2001 in Percent

Source: Own calculation, based on Schwabe U. *Arzneiverordnungen 2002 im Überblick*.
In: Schwabe U, Paffrath D, editors. *Arzneiverordnungs-Report 2003*, p. 1.

It is difficult to compare our findings with previous studies because of differences between the study samples and outcome measures. We chose a more explorative study design and our goal was to determine the number of patients whose demand patterns changed. Previous literature suggests that increased copayments cause reductions in the number of prescriptions, although the extent of the effect is small [5-17]. Our results showed small reductions as well: Almost all of those respondents who reduced their purchases of prescribed packages (22.6%) waived 1 to 5 packages (82.5%). Effects on the demand for physician visits influences the number of prescriptions demanded as well. We also found small reductions in this area. Only 8.6% waived one, and 11.2% waived two or more physician visits. Further, we found that prescriptions were substituted by OTC products, which is a finding confirmed by previous research [20].

Growing effects of copayment on lower income patients were found for the use of antibiotics in the RAND study [22]. Harris et al. [6] found smaller effects within the four essential drug classes

(antihypertensives, cardiac agents, antidiabetics and thyroid hormones), compared to effects on discretionary drug classes such as cold remedies and topical anti-inflammatories. This confirms our findings of smaller effects on the chronically ill.

Our findings have important implications for future health care policy. Results show that increased copayment not only had a financial impact, but also an impact on drug use. If the government aims to avoid effects on prescription demand or drug use inequality, copayments have to be reduced to the previous level or the exemption level has to be raised. From our results, we do not know how a reduction in physician visits and drug use translates into patient outcomes. For instance, this depends on whether necessary or unnecessary drugs and services have been avoided. Therefore, further research needs to be conducted to examine whether copayment levels up to € 6.60 are associated with a reduced use of necessary drugs and other necessary health care services in the German population.

Acknowledgments

The study was sponsored by the Hartmann Bund, the Association of German physicians.

REFERENCES

- [1] Organisation for Economic Co-operation and Development. OECD Health Data 2004. Paris: OECD, 2004.
- [2] Schroeder H, Selke GW. Der Arzneimittelmarkt in der Bundesrepublik Deutschland (The Drug Market in Germany). In: Schwabe U, Paffrath D, editors. *Arzneiverordnungs-Report 1999*. Berlin, Heidelberg: Springer, 2000: 657-683.
- [3] Statistisches Bundesamt (editors). *Statistisches Jahrbuch 1999 für die Bundesrepublik Deutschland* (Statistical yearbook 1999 for Germany); Stuttgart: 1999.
- [4] Deutscher Bundestag. *Beschlußempfehlung und Bericht des Ausschusses für Gesundheit* (Recommendation and Report of the Committee for Health of the German Parliament). BT-Drucksache 1997, 13/7264.
- [5] Nelson AA, Reeder CE, Dickson WM. The effect of a Medicaid drug co-payment program on the utilization and cost of prescription services. *Med Care* 1984; 22: 724-36.
- [6] Harris BL, Stergachis A, Ried LD. The effect of drug co-payments on utilization and cost of pharmaceuticals in a health maintenance organization. *Med Care* 1990; 28: 907-17.
- [7] Smith DG. The effect of co-payments and generic substitution on the use and costs of prescription drugs. *Inquiry* 1993; 30: 189-98.
- [8] Johnson RE, Goodman MJ, Hornbrook MC, Eldredge MB. The effect of increased drug cost-sharing on medical care utilization and expenses of elderly HMO members. *Med Care* 1997; 35: 1119-31.
- [9] Hillman AL, Pauly MV, Escarce JJ, et al. Financial incentives and drug spending in managed care, in: *Health Aff* 1999; 18: 189-200.
- [10] Stuart B, Zacker C. Who bears the burden of medicaid drug copayment policies? *Health Affairs* 1999; 18: 201-12.

- [11] Leibowitz A, Manning WG, Newhouse JP. The demand for prescription drugs as a function of cost-sharing, in: *Soc Sci Med* 1985; 21: 1063-9.
- [12] Lohr KN, Brook RH, Kamberg CJ, Goldberg GA, Leibowitz, A. Keesey J, et al. Use of medical care in the RAND health insurance experiment: Diagnostic- and service-specific analyses in a randomized controlled trial. *Med Care* 1986 (suppl); 24: S1-S87.
- [13] Ryan M, Birch S. Charging for health care: Evidence on the utilization of NHS prescription drugs. *Soc Sci Med* 1991; 33: 681-7.
- [14] O'Brien B. The effect of patient charges on the utilization of prescription medicines. *J Health Econ* 1989; 8: 109-32.
- [15] Hughes D, McGuire A. Patient charges and the utilization of NHS prescription medicines: Some estimates using a cointegration procedure. *Health Econ* 1995; 4: 213-20.
- [16] Grootendorst P. A comparison of alternative models of prescription drug utilization, *Health Econ* 1995; 4: 183-98.
- [17] Tamblyn R, Laprise R, Hanley JA, et al. Adverse events associated with prescription drug cost-sharing among poor and elderly persons, *JAMA* 2001; 285: 421-9.
- [18] Johnson RE, Goodman MJ, Hornbrook MC, Eldredge MB. The impact of increasing patient prescription drug cost sharing on therapeutic classes of drugs received and on the health status of elderly HMO members. *Health Serv Res* 1997; 32: 103-22.
- [19] Reeder CE, Nelson AA. The differential impact of copayment on drug use in a Medicaid population. *Inquiry* 1985; 22: 396-403.
- [20] Stuart B, Grana J. Are prescribed and over-the-counter medicines economic substitutes? *Med Care* 1995, 33: 487-501.
- [21] Leibowitz A. Substitution between prescribed and over-the-counter medications. *Med Care* 1989; 27: 85-94.
- [22] Foxman B, Valdez RB, Lohr KN, Goldberg GA, Newhouse JP, Brook RH. The effect of cost sharing on the use of antibiotics in ambulatory care: Results from a population-based randomized controlled trial. *J Chron Dis* 1987; 40: 429-37.
- [23] Hamilton LC. *Regression with graphics*, Belmont 1992.
- [24] Kaapke A, Heemann L. Erwartungen und Bedürfnisse von Konsumenten gegenüber Apotheken - Ausgewählte Ergebnisse einer empirischen Untersuchung (Expectations and needs of consumers from pharmacies – selected results of an empirical study). *Mitteilungen des Instituts für Handelsforschung an der Universität zu Köln*, 1998; 50: 69-82.
- [25] Wallihan DB, Stump TE, Callahan CM. Accuracy of self-reported health services use and patterns of care among urban older adults. *Med Care* 1999; 37: 662-670.
- [26] Roberts RO, Bergstralh EJ, Schmidt L, et al. Comparison of self-reported and medical record health care utilization measures. *J of Clin Epidemiol* 1996; 49: 989-995.

Zu den Autoren

Afschin Gandjour, PD Dr. med. Dr. rer. pol., M.B.A., Institut für Gesundheitsökonomie und Klinische Epidemiologie der Universität zu Köln, Vorstand der Gesellschaft zur Förderung von Nachwuchs und Wissenschaft in der Gesundheitsökonomie

Karl W. Lauterbach, Univ.-Prof. Dr. med. Dr. sc. (Harvard), Direktor des Instituts für Gesundheitsökonomie und Klinische Epidemiologie der Universität zu Köln, Mitglied im Sachverständigenrat für die Konzertierte Aktion im Gesundheitswesen

Gerald Schnell, Dr. rer. pol., Unternehmensberatung Simon, Kucher & Partners, Division Life Sciences