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Original Article

Preliminary analysis of short term financial implications of a prevention bonus program: First results from the German statutory health insurance

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Summary

Objectives: With the implementation of the Health Care Modernization Act in 2004 sickness funds in Germany were given the opportunity to award bonuses to their insured for health-promoting behavior. The aim of this study was to investigate the financial implications of a prevention bonus program from a sickness fund perspective.

Method: The investigation was designed as a controlled cohort study (matched pair study) comprising 70,429 members in each group. Matching criteria were sex, postal code, insurance status, and cost categories for health care utilization. Insured opted into the program on a voluntary basis. The program consisted of interventions featuring primary prevention, modest exercise and immunization. Differences in cost trends between the two groups were examined using the paired t-test.

Results: A reduction in mean costs of 241.11 € per active member for the year 2005 (90 % CI = 348.70, 133.52; p-value < 0.001) could be achieved in the intervention group compared to the control group. When costs for the implementation of the program and the bonus payments were taken into account, there was a saving of 97.14 € per active member for the year 2005.

Conclusions: Preliminary results of a prevention bonus program in the German Statutory Health Insurance suggest a decrease in mean health care spending per enrollee. These effects may increase with time as long term effects of prevention become effective. However, further research is needed to understand how much of these short term cost reductions can be attributed to the program itself rather than to possible confounders or volunteer bias and how the short term savings may be accrued.

Keywords: Prevention – Incentives – Statutory health insurance – Bonus payment – Cost.

The German Statutory Health Insurance (SHI) has a long tradition in awarding bonuses to encourage prevention and health promoting behaviour [1; 2]. The most prominent example is dental care where the percentage of benefit payment depends on the documentation of regular check-ups [2]. In the international literature, bonus payments are perceived as adequate incentives to encourage participation in prevention programs [3]. With Germany's implementation of the Health Care Modernization Act in 2004, the options for sickness funds to award bonuses to their insured have been augmented [4]. Sickness funds may award financial bonuses for active participation in prevention programs.

The rationale behind prevention bonus programs supported by sickness funds is threefold. First, by awarding bonuses to encourage health promoting behaviour, the individual's responsibility is stressed with regard to preventable chronic diseases [5]. This takes into account that the course of most chronic diseases with a high socioeconomic impact can be delayed or altered through effective prevention; yet, too few people engage in it [6; 7; 8; 9; 10; 11]. Second, bonus programs allow sickness funds to differentiate their service

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package as a competitive asset [12]. Third, prevention is increasingly regarded as an investment to stabilize the strained social security systems which face the challenges of a growing aging population and a subsequent rising prevalence of chronic diseases. This approach is advocated for by the World Health Organization (WHO) who suggests implementing efforts toward achieving positive effects of prevention to curb the rising burden of chronic disease in aging populations [13].

In Germany, the expert Council for Concerted Action in Health Care also postulated a more prevention oriented health care system in several expertises to improve population health and reduce health care costs caused by medical complications and recurrent hospitalizations [14; 15]. Critics, however, admonish that the association of net costs and life years gained is unclear for most prevention interventions [16]. This uncertainty could be a keyfactor why only a small amount (about 4.5 %) of public and private health care expenditure in Germany is spent on prevention [17]. Furthermore, from a societal point of view, prevention programs are often measured against the requirement of cost-savings while other gains of prevention such as better quality of life or years of life gained in better health are not rated accordingly. From a sickness fund's point of view investment into prevention programs are uncertain as the effects may not be manifest until 5 to 10 years later. By that time the insured may have switched to another fund [18].

The following study investigates short term financial implications of a prevention bonus program from a third party payer perspective. The study was designed to meet the legal evaluation requirements of sickness fund offered bonus programs with respect to § 65a of the Social Code Book V (The Social Code Books I to XII contain all regulations for the social security system. Social Code Book V spells out the regulations regarding the Statutory Health Insurance). Beyond legal evaluation requirements, the study further explored which of the interventions offered were used most often by the insured, which service types experienced changes in utilization, and how these relate to different age groups.

Method

Prevention bonus program

The prevention bonus program studied was one of the first of its kind to be introduced in the SHI. The program is designed to meet the legal requirements stated in § 65a of the Social Code Book V. The program offers interventions in the three categories immunization (1 intervention), check-ups and screenings (8 interventions) and exercise (8 interventions) (Tab. 1). The immunization intervention consists of an influenza vaccination. The check-ups and screenings interventions are comprised of check-ups for children, prenatal care, male and female adult screenings for risk factors and onset of chronic diseases including cancer screenings for both men and women, and smoking cessation classes. Exercise interventions consist of participation in licensed exercise classes, membership in sports clubs and fitness studios, and earning the German sports batch. For each intervention a certain amount of credit points is awarded (see Tab. 1). Any member who earns 500 credit points in one year or two successive years is eligible for the bonus payment. For a bonus each insured could choose between in-kind benefits such as a sports bag, drinking bottle, backpack, watch, or partial payment of a short trip, or 30 € in cash. The prevention bonus program was advertised by the sickness fund with flyers and information in the regular newsletters sent to all members, on the internet, and via the general press. Insured members could opt into the program on a voluntary basis.

Subjects

The study sample consisted of insured members of the single largest nationally operating sickness fund of the SHI in Germany. Of the members in this sickness fund, 77,947 opted into the program. 70,437 members took part in at least one intervention. Due to missing data for eight members, a total of 70,429 are represented in the intervention group. To form a control group, the 70,429 members of the intervention group were matched with 70,429 members of the sickness fund who had never opted into the program. Matching criteria were selected before matching. They included age, gender, postal code, insurance status (insured, voluntary and compulsory members) and cost categories per year (Tab. 2). Due to the size of the sample the groups could be well matched and there was no statistically significant difference in mean costs between the two groups at baseline (Tab. 3). Exclusion criteria were new or discontinued enrolment one year prior to and during the study period.

Mean age in both the intervention and control group was 41.2 years with a standard deviation of 22.7 years. In both groups around 26 % of enrolled persons were male and 74 % were female, 37 % were over 55 and 1.6 % over 75 years old, and 24 % were children up to the age of 19 years. Table 4 shows the demographic characteristics of the study population.

Study design

The study was designed as a two-year prospective controlled cohort study during the period of January 1st 2004 until December 31st 2005. Recruitment and evaluation also occurred during this period.

Hypotheses

Two hypotheses were tested. Hypothesis one stated that through the bonus program a decrease in health care spending for those who achieve the bonus is realized. Hypothesis two postulated that the decline in health care spending for those achieving the bonus will be sufficient to compensate for the payments of bonuses and the affiliated administrative costs.

Data analysis

Statistical analysis was performed with the program R version 2.4.1 [19]. Measurements at sickness fund level were health care utilization per insured per year measured in cost per insured per year in three categories: hospital, medication, and additional treatment comprising all other treatment costs such as physical therapy and massage, but not outpatient physician

Table 1 Components and Credit Points of the Prevention Bonus Program offered to all insured

Category	Intervention	Credit points
Prevention	Screening for early detection of chronic disease and measures of primary prevention (Check –up 35*) for adults. Include are screening for Diabetes mellitus, Diseases of the Cardiovascular and/or Renal system.	150 per check-up/screening
	Prenatal care	150 per pregnancy
	Children check up§	150 per child
	Smoking cessation	100
	Nutrition classes	100
	Cancer check up >45 years** (male)	150
	Cancer check up >25 years*** (female)	150
	Screening for colon cancer	150
Immunization	Influenza vaccination	50 per annum
Exercise	Licensed exercise classes I–III	100 per program
	Active membership in a licensed sports club	100 per annum
	Active membership in a licensed fitness studio	100 per annum
	Acquisition of the German Sports Badge	100 per annum
	"Germany Moves" Part I****	150
	"Germany Moves" Part II*****	150

* **Check-up 35** All men and women who are 35 or older are eligible for the biennial check-up 35 which essentially is a screening for risk factors or active chronic disease. The main focus is on diabetes, cardiovascular and renal disease. Insured enrolled in the bonus prevention program are annually eligible for this check-up.

** **Cancer check-up >25 years (female)** Women who are 20 years and older are eligible for annual screening for genital cancer including pap smear. Women aged 30 years and older are eligible for annual screening for cancer of the skin and breast. Women aged 50 until 69 years receive a written reminder every two years for mammography screening.

*** **Cancer check up >45 years (male)** Men aged 45 and older are eligible for annual screening for cancer of the skin, prostate and genital.

Germany moves I To earn this award 7 different tests relating to stamina, fitness, coordination and strength have to be passed. The results will be used to draw up an individual exercise program.

Germany moves II To earn this award 7 different tests relating to coordination, strength, stamina and ability to move have to be passed. The tests in Germany moves II are more advanced compared to Germany moves I.

§ Children check-up The children check-up comprises a series of check-ups which screen for any abnormalities in physical and mental development of children starting at birth until adolescence.

Table 2 Cost categories for matching

Cost Categories (costs per year)		
Hospital costs	**Medication costs**	**Costs for additional treatment (e.g. physiotherapy)**
0€	0€	0€
>0€ up to 500€	>0€ up to 200€	>0€ up to 200€
>500€ up to 5,000€	>200€ up to 500€	>200€ up to 500€
>5,000€ up to 10,000€	>500€ up to 1,000€	>500€ up to 1,000€
>10,000€ up to 20,000€	>1,000€ up to 2,000€	>1,000€ up to 2,000€
>20,000€	>2,000€ up to 3,000€	>2,000€ up to 3,000€
	>3,000€	>3,000€

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Table 3 Mean costs (median) for intervention and control group at time of enrolment

Group	Mean hospital costs (Median)	Mean pharmaceutical costs (Median)	Mean costs for additional treatment (physical therapy, etc.) (Median)
Intervention group (n = 70,429)	429.4 € (0 €)	349.8 € (100.30 €)	102.6 € (0 €)
Control group (n = 70,429)	435.2 € (0 €)	350.1 € (88.62 €)	103.3 € (0 €)

Source: own depiction

services. Measuring points were the years 2003 and 2005. Differences in costs between the intervention and the control group were analysed as follows: For each individual of the intervention and the control group the difference (change) in costs between the years 2003 and 2005 was calculated; this change in costs was compared between individuals in the intervention group and matched controls using the paired t-test with an alpha = 0.1 level of significance. The degrees of freedom were approximated with the Welch modification.

To judge if the program was cost neutral the cost difference (possible "savings") between the intervention and the control group was adjusted for program costs. Program costs incurred by the members who enrolled but did not participate in any interventions were considered when possible savings were adjusted for program costs.

Table 4 Demographic characteristics of the study population (in 5-year clusters)

Age	Number of enrolled in intervention group	Number of enrolled in control group
0– 4	4,082	4,082
5– 9	9,738	9,738
10–14	2,833	2,833
15–19	193	193
20–24	567	567
25–29	2,111	2,111
30–34	4,118	4,118
35–39	5,911	5,911
40–44	4,888	4,888
45–49	4,698	4,698
50–54	5,129	5,129
55–59	5,186	5,186
60–64	10,394	10,394
65–69	7,119	7,119
70–74	2,305	2,305
75–79	908	908
80–84	222	222
85–89	21	21
90+	6	6
N	70,429	70,429

Results

In 2004, almost half (46.53 %) of all enrolled participated in at least one exercise program. More women compared to men accepted the sex-based cancer screening intervention (41.7 % vs. 8.3 %) and around one third (36.2 %) of all enrolled received an influenza vaccination (Fig. 1 and Fig. 2). In 2005, the participation trends for exercise classes, cancer screening for women and influenza vaccination continued as these three interventions show the highest percentages of participation.

Regarding mean costs there were significant differences between the intervention group and the control group. The mean difference in costs for the year 2005 compared to the year 2003 amounted to -241.11 € (90 % CI = [–348.70; –133.52], p-value < 0.001) per active insured for the intervention group compared to the control group. This amounts to an overall cost reduction of 4,874.120 €.

Table 5 shows the cost differences between the control and intervention groups in the three cost categories 'hospital', 'medication' , and 'additional treatment'. At baseline there were no cost differences between the intervention and the control group in all three cost categories.

Mean hospital costs rose for both the intervention and the control groups but were significantly lower in the intervention group (16.46 € vs. 210.53 €; difference of 194.07 € (90 % CI = –300.5; –87.7; p = 0.003)). Comparing the distribution of hospital cases according to cost categories, there are fewer cases in the intervention group in the three highest cost categories compared to the control group (Tab. 6).

Evaluation of the medication cost category showed a mean savings of 18.65 € in the intervention group while in the control group mean cost rose by 37.38 €. The mean difference of -56.03 € (90 % CI= [–66.2; –45.9]) was highly significant with p < 0.001. Differences in the number of insured per cost category between the groups could be found mainly in the higher cost categories (Tab. 7).

No cost difference could be detected for additional treatment between the two groups at the time of enrolment (Tab. 8).

At evaluation, the mean difference between both groups amounted to approximately 8.99 € (90 % CI = [6.77; 11.21]; p < 0.001) with a mean savings of 4.42 € in the intervention

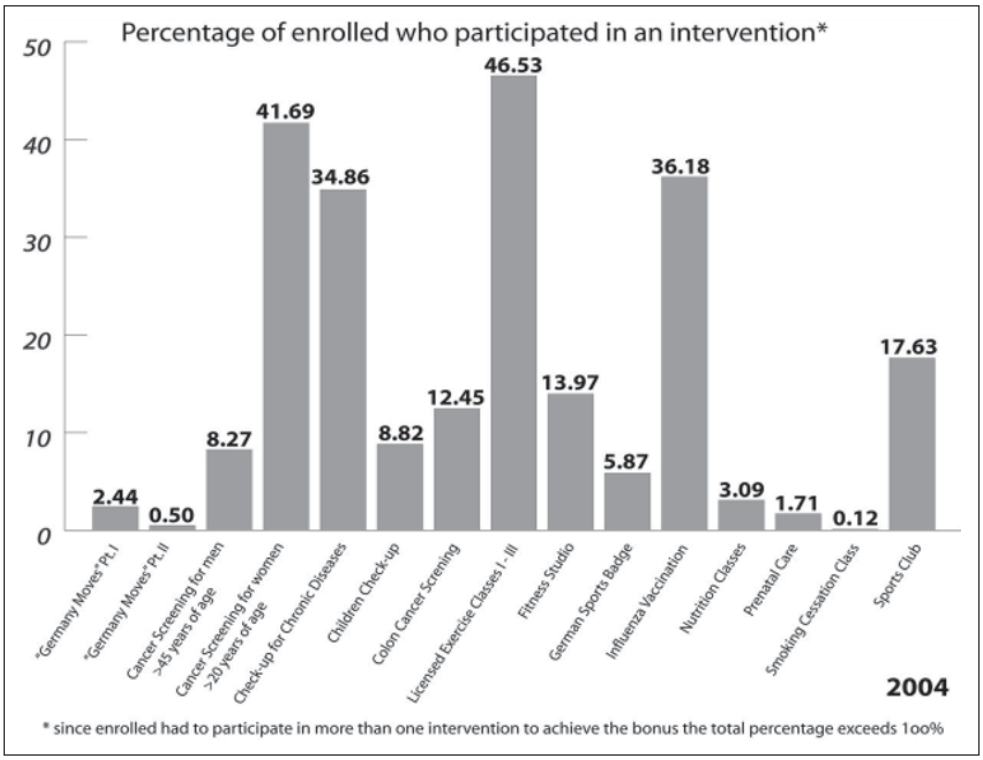

Figure 1

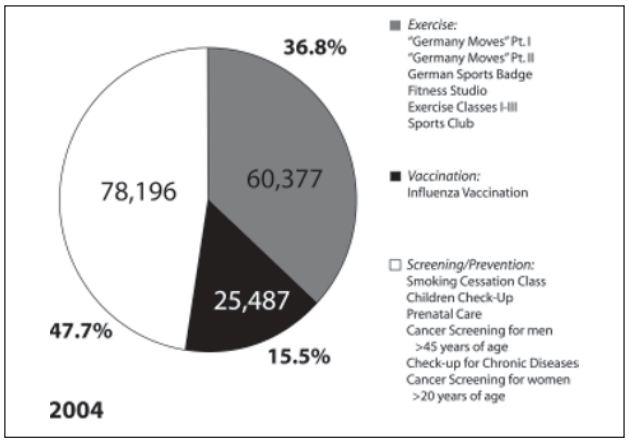

Figure 2

group and mean savings of 13.41 € in the control group (Tab. 8). Thus savings were higher in the control group compared to the intervention group in all age classes except for the age group of 75 years and older despite the higher number of insured in the three highest cost categories in the control group compared to the intervention group (Tab. 7).

Analysis of the mean difference in hospital costs by different age categories showed that significant savings could be achieved between groups for all ages except those from 0 to 24 years. If effects on hospital costs were split up in 4 different age categories no significant savings in the mean difference between the groups could be achieved in the age group 0 years until 24 years. Whereas in all other age groups cost differences were significant or highly significant (Tab. 5). Medication savings could be realized in the intervention group for adults aged 25 to 49 years, but mean cost differences were not significant in the age groups <50 years old although, in the intervention group savings could be realized in the age group 25 to 49 years old. Additional treatment savings were significantly greater in the control group compared to the intervention group in all age groups except 75 years and older (Tab. 5).

Analyzing costs by gender found both sexes had significant hospital and medication cost savings in the intervention group compared to the control group (data not shown). For both sexes the savings were higher in the control group in the additional treatment category. The mean of the cost differences between control and intervention group was significant for both sexes.

Since legislation ruled that the bonus payment may not exceed the savings generated through the program the savings must be related to program costs. Overall costs of the bonus program in the evaluation period amount to over 10 million €. Costs per active member for the two year evaluation period amounted to 143.97 € or to 71.99 € per active member per year respectively. Program costs were offset with savings generated through the program in 2005, resulting in a saving of 97.14 € 90 % CI [–10.45 €; 104.73 €] per active member

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for the evaluation period. However, if one assumes a stable progression of both program costs and savings throughout the next couple years and does not expect any long term effects to be manifest within this period yearly savings of 169.11€ 90 % CI [61.54€; 276.70€] per active member could be realized through the prevention program by the sickness fund.

Discussion

The goal of this study was to investigate whether monetary incentives for prevention lead to a decrease in healthcare costs for insured in the SHI in Germany. To investigate this question costs of insured who actively participated in a bonus prevention program were compared with costs of insured not enrolled in the program. Costs were analyzed in the three categories of hospital, medication and additional treatment. In the hospital and medication categories, costs were significantly lower in the intervention group compared to the matched control group. In the additional treatment category, savings were realized in both groups but only lower in the intervention group for those 75 years and older. These findings indicate that a sickness fund prevention-based bonus program could result in a decrease in health care costs.

Table 5 Cost savings in three categories: hospital, medication and additional medical treatment split up in age groups

	Mean of the differences between control and intervention group (p-value of the t-test, SD)		
Age group in years	**Hospital**	**Medication**	**Additional medical treatment**
1–24 (n = 17,359)	–27.60 (p = 0.37, 4063.32)	–7.00 (p = 0.14, 628.83)	10.80 (p < 0.001, 420.28)
25–49 (n = 21,726)	–50.81 (p < 0.02, 3177.86)	–21.43 (p = 0.07, 1754.16)	10.30 (p < 0.001, 266.79)
50–74 (n = 30,142)	–377.67 (p = 0.01, 25893.37)	–107.82 (p < 0.001, 1941.84)	7.95 (p < 0.001, 376.19)
>75 (n = 1,157)	–607.78 (p < 0.01, 6371.27)	–94.56 (p < 0.03, 1468.76)	–15.56 (p = 0.15, 371.84)

Table 6 Number of insured in intervention and control group in hospital cost categories

Hospital cost	**At enrolment**	**At evaluation**	
	Intervention group/control group	**Intervention group**	**Control group**
Category 1	59,591	60,901	60,957
Category 2	1,574	1,114	959
Category 3	7,912	7,080	6,463
Category 4	924	986	1,337
Category 5	363	271	525
Category 6	65	77	188
N	70,429	70,429	70,429

Table 7 Number of insured of control and intervention group in cost categories for medication

Medication cost category	**At enrolment**	**At evaluation**	
	Intervention and control group	**Intervention group**	**Control group**
Category 1	5,967	7,920	10,215
Category 2	40,017	38,457	35,301
Category 3	11,672	12,190	12,029
Category 4	7,324	7,185	7,249
Category 5	3,746	3,318	3,722
Category 6	915	754	963
Category 7	788	605	950
N	70,429	70,429	70,429

Cost category	At enrolment	At evaluation	
	Intervention and control group	Intervention group	Control group
Category 1	46,102	45,675	50,943
Category 2	13,471	14,993	11,561
Category 3	7,115	6,239	4,663
Category 4	2,613	2,399	1,985
Category 5	918	889	931
Category 6	148	148	215
Category 7	62	65	121
n (missing values)	70,429	70,408 (21)	70,419 (10)

Table 8 Number of members of control and intervention group in cost categories for additional treatment

However, it remains unclear to what extent these effects may be attributed to the program itself as we could not adjust for potential confounders as e. g. prior participation in prevention measures, level of education or income. This bias may be especially pronounced as enrolment and evaluation periods overlapped. Surveys from Allensbach, FTD and the WIdO (Wissenschaftliches Institut der Ortskrankenkassen) from 2003 suggest that all of these factors may play an important role in motivating insured to enrol in a bonus program while international research points to sex and gender as the two single factors with a significant influence in an epidemiological study [20; 21; 22; 23; 24]. On the other hand 87 % of the interviewed in the FTD-Survey and 59 % in the GKV-Monitor rated bonuses for participation in preventive measures as a high incentive [23; 24]. Higher rates of approval are found in both surveys from insured with good health, higher incomes, who intend to switch funds and have no children. A recent WIdO survey from 2005, however, finds a negative correlation between education level and interest in the bonus programs [25]. In contrast the University of Bremen and the Bertelsmann Stiftung report that 19 % insured from higher socioeconomic strata participate in prevention bonus programs compared to 11 % from lower socioeconomic strata [12]. While we could not adjust for possible confounders due to socioeconomic status, prior participation in prevention interventions or education level, sex differences did not have a significant influence in our study and prior morbidity was approximated through cost categories reflecting utilization due to morbidity. The fact that health promoting behaviour and risk behaviour differ between social strata and education levels give rise to the critique that bonus prevention programs may only pick up people from higher education and income levels who already participate in health promoting behaviour which leads to volunteer bias [5; 26]. This fact has been addressed in a few studies with mixed results. While most studies find volunteers to be healthier, younger, and better educated one study found that refusers to participate in a trial for preventive health services were the healthiest, followed by participants, followed by unreachables (22; 27; 28; 29; 30]. To support or discard the hypothesis that volunteer bias contributes a substantial share of the effect of the program is beyond the scope of this paper. Also from a pragmatic point of view it would be impossible to randomize insured to a prevention bonus program since the lawgiver stated that enrolment is voluntary.

Besides the possible confounders mentioned above an overestimation of the effect of the bonus program may arise from another source. Due to political and legal factors members who opted into the program but did not participate could not be considered regarding individual cost differences in the calculation of the mean costs of the intervention group. The exclusion of patients who did not start the allocated intervention from the intention to treat analysis is fairly common in the literature (about 10 %) even in trials labelled intention to treat [31]. However, it may lead to an overestimation of the effect of the intervention [32]. Especially, if for example, these insured did not participate in any intervention of the program on account of acute sickness. Critics of the intention to treat analysis on the other hand argue, that this approach is too cautious and more susceptible to type II error [33; 34; 35]. Regarding administration costs, however, all costs generated through members of group three (who opted into the program but did not participate in an intervention) were considered in the analysis. Hence any overestimation of the effect is limited to individual acute costs. If possible savings and program costs are compared a decrease in cost per active member is even achieved if program costs for both years are compared to the savings achieved in the year 2005.

Additionally, this study has been carried out from a sickness fund perspective. This means that outpatient physician costs are not broken down into actual costs because sickness funds in Germany pay a flat rate per member per month for physician reimbursement. Any increase in outpatient physician cost which is likely to occur through utilization of prevention services in the bonus programs will not be reflected in the net balance.

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Regarding implications for an aging society prior surveys show that higher age groups show greater interest in participation in a bonus program compared to younger age groups (63,2 % for 60 years and older vs. 59 % in younger age groups) [24]. The higher interest in older age groups may explain the highly significant differences for hospital and medication costs between the groups in higher age while in younger age groups no significant difference can be found. If this effect will persist over time it might be well worth for funds to try and attract more elderly people into the programs. Further research, however, is needed to address how morbidity in general and in older age in particular is influenced by prevention bonus programs. One possible explanation for a decrease in hospital costs in the elderly might be the number of influenza vaccinations. Over 54.6 %/59.7 % (2004/2005) of insured in the bonus program who received the vaccination were >60 years of age. There is evidence in the literature that especially in the elderly population influenza vaccinations are cost-effective regarding short term decreases in costs with a mean efficacy of influenza vaccinations in reducing the incidence of influenza-like illness by around 18.9 % and in reducing hospitalizations in people aged >65 by around 36.6 % [36]. Another possible source of short term decreases in utilization might be the high number of members participating in exercise programs. About 36.8 %/15.8 % (2004/2005) of all enrolled participated in some kind of exercise intervention. Although evidence is not yet completely clear human models suggest that modest exercise may increase the number, percentage and activity of natural killer cells and neutrophil counts and improves health especially by preventing the immunological deleterious consequences of stress [37; 38]. Especially for the prevention of upper respiratory tract infections the relationship seems to be positive [39]. Further research is needed to investigate how the morbidity patterns change between enrolled and not enrolled insured. Additionally further research should investigate, for example, if the number of referrals to orthopaedists or to physical therapy for low back pain was lower in the intervention group compared to the control group. This kind of information could help tailor bonus programs to the needs of epidemiologically relevant diseases. This question could also be investigated regarding occupation and sex of the insured. So far, although there are more women enrolled than men no sex differences in the differences of mean costs between the groups could be observed.

From a microeconomic viewpoint the evaluation period was too short as the most pronounced effects in prevention are long term effects. In the long run, therefore, cost savings might even exceed the now achieved results. However, long term effects will only be realized if the behaviour change is sustained over an adequate period of time [40; 41; 42; 43]. At the moment it must be considered unclear which effect prevention bonus programs have on the long time sustainability of preventive behaviour. The study could show, however, that short term financial effects will not increase costs for the sickness funds and that a high number of insured enrolled in the programs and participated in interventions. Thus the program succeeded in fulfilling the two intentions of the lawgiver to stipulate competition between funds and to strengthen individual responsibility through health promoting behaviour. This cannot be generalized to all insured, however, as in relation to different epidemiological conceivability about human behaviour in general and risk behaviour in particular different kinds of prevention are preferred [44]. The bonus program appeals to the individual responsibility and assumes rationality in individuals. Interactions between the context and the individual behaviour are neglected. It seems feasible, to face risk-behaviour of different person groups in different ways. To adapt the bonus programs to this dictum might be the greatest challenge yet.

Conflict of interest

All authors disclose any financial or personal relations to people or organisations that could influence this work.

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