Reversal of the profitability rates of health plans according to age

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OBJECTIVE: In this study, we will analyze assistance costs and profitability rates of a private health insurance company.

METHODS: A private health insurance company of an inland city of São Paulo was analyzed. Assistance costs and profitability rates were analyzed in a time interval of seven years according to age and gender. The assistance cost (sum of medical appointments, exams, surgical intervention) was calculated by the absorption counting method, which consists of the analysis of direct and indirect, fixed and variable costs caused by the use of medical and hospital resources. The profitability rate was calculated based on the difference between the premium (monthly fee and co-insurance [20%]) and the cost assistance.

RESULTS: Although the number of users decreases as age increases, costs increase disproportionally. The growth of unitary premiums from the age group of 50 to 59 years contrasts with the unitary results. There is a surplus until the age of 59 years and subsequent deficit from this age on. This deficit progresses according to the age group. In this case, while the first age groups present a balanced unitary profit, there is a growing progression of the unitary cost that causes costs to increase above the premium, especially in individuals over 60 years of age.

CONCLUSION: Our results consistently support the hypothesis of inversion of profitability rates according to age, regardless of the decrease of the number of individuals at the age group of 60 years.

KEYWORDS: Aging; costs; health insurance; profitability.

■ INTRODUCTION

Brazil represents one of the most fast-growing and solid economies in the world. It is the largest country in the southern hemisphere, with a population of 190.732.694 habitants with about 19.4% (or 37.032.403 habitants) living in the State of Sao Paulo.

In 2050, Brazil will be constituted by 20% of young people and 17% of elderly people; in 2000, these proportions were 29% and 5%, respectively.[1] For 2050, the life expectancy projection will be 81 years at birth.[2] The ageing of population, associated with the growing number and severity of diseases, comorbidities and coinfections,[3,4] suggests an increase of health services use, which in turn influences the management of health plans.[5]

Health plans offer several distinct services available for the population; these represent products of health insurance companies that are standardized by resolutions and laws regulated by the National Agency for Supplementary Health Services[6] (e.g., law 9656/98, provisional measure 2177-44, law 9961/00). These guidelines direct supplementary health service delivery: logistics, operational functioning, tax base for service charge, individual and corporative contracts. For instance, law 9656/98 defines the age classification, as well as the method for establishing prices according to the age, establishing a directly proportional relation between the individual's age and the price of the plan.[7]

On the other hand, health insurance companies have the complex challenge of minimizing treatment costs and matching economic and assistance aspects.[7,8] The organizational structure of these companies is related to important factors (e.g., financial strategies, service providers, financial income, regionalization) which are mostly dependent on the clients' characteristics.[9] Therefore, the successful management of this commercial segment is directly associated, not only with management characteristics and strategies, but, mainly, with the profiles of subjects.[7] Those characteristics are very important in small geographic regions where the health of the company is related to client flow in distinct age cohorts. Therefore, the survival of health insurance companies depends on models that will harmonize the need for treatment (namely the permanent management of beneficiaries and their families with multi-professional assistance) with monthly premiums, especially of elderly individuals, without compromising the quality of the

assistance. In this sense, this study aimed to analyze assistance costs and profitability rates of a private health insurance company.

■ METHODS

Sampling

A private health insurance company from an inland city of the state of Sao Paulo, with micro-regional coverage, was selected in order to allow data collection.

Only two health plans have commercial activities in the region. The selected company has operated since 1997 and its portfolio is composed of individual and corporative plans, totaling about 12.000 beneficiaries (the population of this micro-region comprises 700,000 inhabitants, and over 80 thousand have health plans[10]) of a lower socioeconomic level, i.e., people who do not have access to all consumer goods required for the attainment of a certain level of social welfare (e.g., education, housing); this group represents the largest segment in that region. Because it is relatively small, both the rules imposed by the National Agency for Supplementary Health Service and the characteristics of the market demand efficient administrative management; the main preoccupation is related to the ageing of the associates, which may inevitably increase operational costs.

The company authorized this data collection of socio-demographics, assistance costs and profitability rates of associates over a time span of seven years (2004 to 2010). It was possible to gather this information through the data management system of the health plan. The data management system was prepared to individually identify the associates through codes, and all events were attributed to the codes. Therefore, confidentiality of information was maintained and there was no access to any other information.

Costs and premiums

The database of the company allowed us to analyze information by means of a statistical system, *Data Mining,* using financial analysis techniques. All assistance costs of each beneficiary were tabulated according to the age group and year. This analysis allowed us to calculate the mean unitary cost in each one of the age groups.

Accordingly, it was possible to calculate the mean premium by age group and year. The premium is composed by the sum of the monthly payment plus the co-insurance, which represents an index of 20% paid by the user over the cost of health-related ambulatory services. In this case, the company adopts the medical fee table of the Brazilian Medical Association.[11] The table includes medical procedures covered by the health plan contracts. Assistance costs were considered, namely, the values disbursed by the health insurance company with medical appointments, diagnostic exams, as well as therapies and hospitalizations. The absorption counting method was adopted, consisting of the analysis of all costs (direct and indirect, fixed and variable) caused by the use of medical and hospital services delivered by the company. Costs, as well as the premiums according to age, sex and year are presented in the period of 2004 to 2010. The total cost and premium by age group represents the sum of male and female population. The unitary cost and premium were obtained by dividing the total cost in each age group by the number of beneficiaries in these groups.

Statistical Analysis

Data are presented as frequency, percentage and arithmetical mean. The *Predictive Analytics Software* (version 18.0, PASW, Inc., Chicago, IL) was used to analyze the results.

■ RESULTS

Table 1 presents the results concerning the total number of individuals by age group in the period of 2004 to 2010. It is possible to observe a higher concentration of individuals in the age group of 0 to 19 years. From this age group on, there is a proportional inversion between the number of individuals and the age group, which occurs in all the studied periods.

Mean costs and premiums in the period from 2004 to 2010 according to the age group are presented in Table 2. Although the number of users decreases as the age group gets older, costs increase in a disproportionate manner. For instance, the unitary cost of age group 0 to 19 years is lower when compared to any other age group, especially to the group above 70 to 79 years.

The unitary premium increases from the age group of 50 to 59 years. There is a monotonous increase in unitary premium up to the range of 40 to 49 years. From this, the increase in subsequent age groups is linear (up to 60 to 69 years), and exponential for 70 to 79 years. The subsequent decrease can be explained simply by a decrease in the number of people in the respective age groups (Table 1). A methodology of results calculation was used in order to attenuate the false impression of positive results. The analysis of costs,

Table 1 - Number of individuals according to age group and period

Age group (years)	Period (year)														Total
	2004		2005		2006		2007		2008		2009		2010		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
0 to 19	3,921	31.6	4,231	32.7	4,195	30.8	4,302	31.9	4,323	31.6	3,962	31.9	3,795	31.5	28,729
20 to 29	2,238	18.0	2,406	18.6	2,410	17.7	2,390	17.7	2,415	17.6	2,203	17.8	2,188	18.2	16,250
30 to 39	2,166	17.4	2,273	17.6	2,398	17.6	2,339	17.3	2,397	17.5	2,198	17.7	2,060	17.1	15,831
40 to 49	1,965	15.8	2,012	15.6	2,135	15.7	2,143	15.9	2,122	15.5	1,914	15.4	1,924	16.0	14,215
50 to 59	1,136	9.2	1,212	9.4	1,282	9.4	1,305	9.7	1,322	9.7	1,201	9.7	1,243	10.3	8,701
60 to 69	518	4.2	599	4.6	634	4.7	632	4.7	649	4.7	558	4.5	597	5.0	4,187
70 to 79	265	2.1	261	2.1	299	2.2	305	2.3	281	2.1	250	2.0	292	2.4	1,953
80 to 89	111	0.9	114	0.9	121	0.9	123	0.9	124	0.9	115	0.9	119	1.0	827
90 to 99	16	0.1	17	0.1	18	0.1	18	0.1	17	0.1	16	0.1	16	0.1	118
Over 100	3	0.1	4	0.1	4	0.1	4	0.1	2	0.1	1	0.1	—	—	18
Total	12,339		13,129		13,496		13,561		13,652		12,418		12,234		90,829

Table 2 - Costs and premiums during the period from 2004 to 2010 according to age group

Age group (years)	Cost (US$)			Premium (US$)		
	Male	Female	Unitary	Male	Female	Unitary
0 to 19	1,874,012.29	1,658,658.44	860.76	2,956,196.97	2,292,800,00	1,434.16
20 to 29	751,016.59	2,180,607.68	1,262.86	1,837,448,28	3,006,531,81	2,086.64
30 to 39	1,178,090.66	3,212,665.88	1,941.46	2,845,300.17	2,851,484.69	2,518.95
40 to 49	1,148,400.68	2,868,501.49	1,978.07	2,494,347.73	2,754,781.32	2,584.87
50 to 59	1,134,793.16	2,811,589.85	3,174.88	1,966,249.12	2,074,686.72	3,250.95
60 to 69	843,245.16	1,513,440.07	3,940.00	1,093,375.21	1,162,171.77	3,770.92
70 to 79	748,494.17	1,069,136.89	6,514.80	797,985.55	910,459.49	6,123.46
80 to 89	384,069.31	493,428.23	7,427.43	285,224.59	414,874.60	5,925.87
90 to 99	181,679.70	1,040,076.71	16,951.65	17,534.72	63,433.93	4,803.22
Over 100	1,333.58	18,966.49	7,894.47	740.37	3,313.10	1,576.35
Total	8,245135.30	15,931071.79	– – –	14,294,402.71	16,171,537.41	– – –

Table 3 - Invoicing during the period from 2004 to 2010

Age group (years)	Sample	Total premium (US$)	Total cost (US$)	Invoicing (US$)	
				Total	Unitary
0 to 19	28,729	5,885,996.97	3,532,670.74	2,353,326.23	573.40
20 to 29	16,250	4,843,980.09	2,931,624.27	1,912,355.81	823.79
30 to 39	15,831	5,696,784.86	4,390,756.54	1,306,028.31	577.49
40 to 49	14,215	5,249,129.04	4,016,902.17	1,232,226.87	606.80
50 to 59	8,701	4,040,935.84	3,946,383.00	94,552.83	76.07
60 to 69	4,187	2,255,546.98	2,356,685.23	− 101,138.26	− 169.09
70 to 79	1,953	1,708,445.04	1,817,631.07	− 109,186.03	− 391.35
80 to 89	827	700,099.19	877,497.54	− 177,398.35	− 1,501.56
90 to 99	118	80,968.65	285,756.41	− 204,787.77	− 12,148.43
Over 100	18	4,053.47	20,300.07	− 16,246.60	− 6,318.13
Total	90,829	30,465,940.12	24,176,207.09	6,289,733.03	484.73

premiums, number of beneficiaries and results by age group evidences problems of the company's solvency.

There is a surplus of income until the age of 59 years-old, and a subsequent deficit from this age on (Table 3). This deficit grows progressively according to the age group. In this case, while the first age groups present balanced unitary profitability, there is, on the other hand, a growing progression of the unitary cost that overcomes the premium costs, especially in those individuals over 60 years.

■ DISCUSSION

Our results support the hypothesis of inversion of profitability rates according to age regardless of the decreasing number of individuals in the age groups over 60 years.[7-9,12-14] Furthermore, the maintenance of the proportion of individuals over 60 years old during the period of seven years analyzed, as well as the low rate of geographic and commercial migration (e.g., changes of health plan companies), represent important stability predictors, allowing us to suggest that, probably, the age *per se* may represent the primary determining factor of assistance costs and premiums.[3,4] There were small variations in the mean age of individuals, regardless of the period (data not presented), suggesting maintenance of age characteristics through the period of seven years.

We also observed that the relative distribution of elderly individuals coming from old plans is higher than those from new plans. This phenomenon could increase both absolute and relative costs of health plans in advanced ages due to the fact that the health insurance companies did not predict the burden of chronic diseases for a long-time for elderly individuals in old plans. In this case, and because the health plan supports a relatively young population, the most homogeneous contingent (20 to 49 years-old) represents an extensive parcel that coincides with the economically active population, with a subsidiary participation of the population of 50 to 59 years old. On the other hand, the inversion of profitability rates according to age suggests a re-dimensioning of business strategy as a function of the potential negative profitability associated with the ageing of the portfolio.[15-17] Another important strategy recently used by several companies is to provide health promotion programs for their associates directed, mainly, to behavioral changes such as eating habits or physical activity.

Women represent about 60% of beneficiaries. This characteristic is observed in all age groups and it is more evident in the age groups of 20 to 39 years and over 70 years (data not presented). These age groups correspond, respectively, to the most fertile age and to the higher proportion of women in the elderly population.[18] In the first case, one can suppose that women in a fertile age seek individual health plans in order to ensure obstetric coverage, particularly when they don't have access to group plans.[18] Most likely, due to these reasons, total costs of female portfolios represent about 66% of the total population.

Premiums represent information about assistance expenses generated by health plan users, and are composed by monthly payments associated with co-insurance (20% charge over ambulatory procedures values, except hospitalizations). The co-insurance works as a plan use restrainer having an inhibitory function, since the beneficiary will pay,

in addition to the monthly fee, certain values for the procedures performed. The unitary value of payment for the health care plan in the younger age groups is lower when compared to the older ones. The existence of a higher payment in the older age groups does not represent a premium (Table 3) because the individual costs on the older age groups have been exponentially higher than those of younger ones. In this way, there is a false impression that the increase in the absolute premium represents a positive aspect (Table 2); when, in fact, the relative increase (Table 3) which defines the survival of the heatlh insurance plan.

The users that provide a positive contribution margin are between zero and 49 years old; the 50 to 59 year-old users are at the equilibrium point between premium vs. assistance costs. However, this age group has great potential to become negative, because its contribution margin, despite being positive, is too small to support potential cost alterations, especially because of the age characteristics.

The ageing of the population as well as of the health insurance company portfolio is an important concerning factor due to the direct repercussion in the increase of the participation in assistance costs and in the plan's monthly fees.[7,8,9,13,14] This provokes potential desistence of beneficiaries, who migrate to the public health system, making this return even more difficult due to higher premiums with no possibility of returning to the previously contracted plan. The negative fluctuation of the number of young adults aggravates the phenomenon, because it decreases the plan's profitability margin. Beneficiary fidelity represents another important factor in cost control. The beneficiary that enters the plan at a young age (0 to 19 years) will have annual fee adjustments according to the rules of the National Agency for Supplementary Health Services.[6] On the other hand, those that enter late are likely to be submitted to a price table calculated by the insurance company based on utilization costs of the portfolio, which are not monitored by the regulator organ. Furthermore, exogenous costs, such as technological changes, exam repetitions, professional training and others, also contribute to the increase of expenses. Therefore, the financial balance at the age groups over 50 years demands a well-defined planning scheme that contemplates not only the development of strategies for prevention and control of chronic communicable and non-communicable diseases, but also requires a rigorous control of ambulatory needs and hospitalizations that may help avoid unnecessary procedures and allow an adequate cost management.[9]

Thus, the normative resolutions 264 and 265 of the National Agency for Supplementary Health Services[6] describe subsidy concessions to beneficiaries of private health plans for their participation in programs of active ageing promotion and programs of management of individuals with chronic diseases. The creation of such mechanisms allowed the companies to emphasize preventive programs.[9] The investment in preventive measures, risk factor vigilance, actions in partnership with families, reformulation of the assistance model, as well as the provision of integral information to health professionals so that they can act in a prophylactic way with the beneficiary or so that doctors have precise clinical reports, represent some of the strategies that may be employed to optimize plan expenses.[7]

The company analyzed in this study operates in an economically deprived region in which the main economic power is related to commercial activities. The low salary patterns makes people seek public health services. This economic characteristic of the region makes the operation, survival and expansion of health plans difficult, especially if the maintenance of the health plan is not prioritized in the family budget.[19] Another important aspect is related to the cultural habit of people only seeking medical assistance when actually afflicted by a disease. Furthermore, the studied health company provides their services for a community constituted mainly of individuals of a low socioeconomic level, i.e., people who do not have access to all consumer goods required for the attainment of a certain level of social welfare (e.g., education, housing). These clients contract health plans suitable to their socioeconomic conditions, but, not necessarily, plans that adequately meet their individual and family demands. This situation may differ from that of other health plans available in private or public companies, which offer medical assistance at a level that is suitable to the demands of the client.

For all those reasons, there is a great operational challenge in the evolution of the beneficiaries' portfolios of a local and regional small-sized health insurance company. The future of such a company is very likely associated with the capacity of developing products and actions that foresee the population's demand. Concerning individual or family plans, the alternative would be to develop more specific activities directed to sales, that is, to promote the adhesion of new users, preferably young ones, and yet to work towards the fidelity of beneficiaries. Finally, the establishment of preventive strategies allied to centralized clinical information (such as electronic files) may facilitate the rationalization of costs.[7,9]

Nevertheless, the absence of relevant information, such as clinical and socio-demographic characteristics of individuals or indicators of number of appointments, is an important limiting factor. It would be interesting to carry out a detailed discriminatory analysis concerning the costs related to certain healthcare aspects (e.g., hospitalization, medical appointments), which could permit a better comprehension of costs and an efficient organization of services, especially of organizational projections.[9] Future studies should consider each subject *per se* together with a wide spectrum of clinical, demographic, economical and social variables in order to allow multivariate analyses.[15-17,20] This strategy could permit a better estimate of future costs for an optimum organizational management of health plans according to age, gender and others.

■ RESUMO

OBJETIVO: Analisar os custos de assistência e as taxas de rentabilidade de uma empresa privada de seguro de saúde.

MÉTODOS: Uma companhia provada de seguros de saúde de uma cidade do interior de São Paulo foi analisada. Os custos da assistência e as taxas de rentabilidade foram levantados em um intervalo de tempo de sete anos e estratificados de acordo com idade e sexo. O custo de assistência (soma de consultas médicas, exames, a intervenção cirúrgica) foi calculado pelo método de contagem de absorção, que consiste na análise de custos diretos e indiretos, fixos e variáveis causadas pelo uso de recursos médicos e hospitalares. A taxa de rentabilidade foi calculada baseada na diferença entre a receita (mensalidade e co-participação [20%]) e o custo da assistência.

RESULTADOS: Existe aumento desproporcional nos custos embora seja observado decréscimo do número de usuários com o aumento da idade. O incremento da receita unitária na faixa etária de 50 a 59 anos de idade contrasta com os resultados unitários. Existe superávit até a idade de 59 anos e déficit a partir desta idade. Esse déficit progride de acordo com a faixa etária.

Neste caso, enquanto os primeiros grupos etários apresentam lucro unitário equilibrado, existe progressão crescente do custo unitário contribuindo para o aumento dos custos acima da receita, especialmente nos indivíduos com mais de 60 anos de idade.

CONCLUSÃO: Nossos resultados consistentemente apoiam a hipótese de inversão das taxas de rentabilidade em função da idade, independentemente da diminuição do número de indivíduos na faixa etária de 60 anos de idade.

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