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Equity and Health

This article raises the problem of equity in the health system in Switzerland. Three dimensions of the concept of equity are taken into consideration: the inequality in the financing of the health system, the inequality in the distribution of the state of good health, and, finally, the iniquity in the access to health care. Some methodological developments are presented as well as the results. In conclusion we observe that the state of good health does not depend strongly on income but that it exists some iniquity in the access to health services from specialists and that the income inequality is increasing due to the financing of the health system.

1. Introduction

The specific theme of «Equity and Health» was examined by the Laboratory of Applied Economics and the Department of Econometrics of the Geneva University as part of a research program called «Sciences, Life, and Society»[1], launched in collaboration with the universities of Geneva and Lausanne and the Swiss Polytechnic School. The paper presents a summary of this research and some of the results with respect to Switzerland. The notion of equity in the context of health has to be defined more precisely if we want to evaluate if a health system is equitable. Three dimensions of equity have to be taken into consideration. The first one concerns the financing of the health system. For a country like Switzerland where this financing relies, either directly or indirectly through other economic agents, primarily on households, it is important to know if these expenditures are supported by the households proportionally to their financial capacities or not. The first section of the paper discusses this problem. In Switzerland the expenditures on health per head are very high, but the health situation of the population is yet very satisfactory. Thus, the question is whether there is inequality between the distribution of the state of health of the population and the income of the households. This second dimension of equity in health raises the problem of the measurement of the state of health, as the results of this measurement are necessary to build a concentration curve to evaluate if the good health is more concentrated in the upper classes of the population. In the second section of the paper we will present this dimension of equity of the health system. Finally, the third dimension of equity concerns the access to health care. The question in this case is the following: is there a difference between poor and wealthy households access to health? The third and final section of this paper examines the state of research on this question as it concerns Switzerland.

2. Inequality in the Financing of the Health System

2.1. Health Expenditures in Switzerland and its Financing from a Macro-Economic Point of View

In 2005, the total cost of the Swiss health system was 53 billion of Swiss francs; this amount corresponds to 7,059 Swiss francs per head. The cost of health represented 11.6% of Gross

[1] This research is part of the IRIS (Integration, Régulation et Innovation Sociales) program which joins together the Universities of Geneva and Lausanne and the Polytechnic School of Lausanne. The program is funded by the «Conférence Universitaire Suisse» and by the already quoted institutions.

Domestic Product, which places Switzerland second in the ranking of countries by the Organization for Economic Cooperation and Development (OECD) [Swiss Federal Statistical Office (2007)]. In 1990, this ratio was 9.7%; consequently, Switzerland dedicates continuously a greater part of its resources to the health system.

The purpose of this section is to present the economic agents who pay for the health goods and services and those who finally support these costs. For the year 2005 we have the following results.

Table 1

Financing of the health system — Economic agents who paid in the year 2005

	Millions of Swiss francs	%
Government	8,885.2	16.9
Social Insurances	22,514.6	42.7
Private Insurances	4,674.8	8.9
Households	16,122.7	30.6
Other private agents	500.1	0.9
Total	52,697.3	100

The Government contributes to these expenditures through subsidies; it also supports the cost of prevention and public health. Both social and private insurances are intermediary agents that pay the costs for the households. Households financing corresponds to the portion of health goods and services that are not paid by the insurance, as it comes out of pocket money. «Other private agents» include non-profit organisation.

Table 2

Financing of the health system — Economic agents who supported the cost in the year 2005

	Millions of Swiss francs	%
Government	14,383.9	27.3
Enterprises	3,525.6	6.7
Private Households	34,787.8	66.0
Total	52,697.3	100

The increasing participation of the government is due to its financing of social security by paying directly or indirectly for health services. The enterprises pay for the social security contributions of their employees as far as these contributions concern health insurance. Finally, the households, in addition to their out of pocket expenditures, pay social and/or private insurance health premiums.

The previously presented macro-economic data do not allow evaluating if the financing of the health system is equitable. In order to do so, we had to work with micro-economic data.

2.2. Health Expenditures in Switzerland and its Financing from a Micro-Economic Point of View[2]

In order to evaluate if the financing of the health system is equitable we have, first, to define a theoretical criterion for equity. We define it as follows: the households have to finance the health system according to their financial capacity. To verify if this criterion is satisfied we compare the income inequality before and after the financing of health care. This comparison relies on micro-economic data taken from the Swiss Survey of Income and Expenditure (SIE) which, unfortunately, is not specialised in the field of health. The SIE is a survey that measures the incomes and expenditures of a sample of Swiss households. The incomes and expenditures are observed in equal periods of time. This survey provides the data for income before the financing of health care, but some financial components of health system financing are not always available or otherwise are of poor quality. A simple method of estimation for these financial components that relate the Cost of Health System (CHS) and National Account (NA) macro-economic data to the SIE micro-economic data was developed by [Bilger (2005)] and is briefly summarised here.

First of all, it is important to notice that if the financing components of interest were observed at the micro-level, it would be possible to compute the financing at the same level by using the sample weights provided by Swiss Federal Statistical Office (SFSO). The idea is then to go backward from the reliable macro-financing data available in CHS and NA to the computation of the unobserved micro-financing. However, this is not sufficient, and household-level data is needed as well. A proxy has, thus, to be chosen among variables available in SIE. Moreover, the method requires the proxy variable to be assumed being proportional to the unobserved financing of interest. Finally, some basic algebra leads to compute the unobserved financing x_i by multiplying the proxy variable p_i by the macro-financing X and dividing the product by the weighted sum of the proxy variables:

$$x_i = \frac{p_i \cdot X}{\sum_{i=1}^{m} n_i \cdot p_i},$$

where the weight n_i represents the number of households in the population corresponding to household i in the sample and m is the sample size.

This computation method has been used for the 10 health system financing components under study, presented in the second column of Table 3. Column 1 in the table presents an aggregation of these components which is helpful for international comparisons; columns 3 and 4 present respectively the formulated economic assumptions and the chosen proxy variables.

Table 3

Economic assumptions and variable choices for estimation of the health system financing

Aggregated health system financing	Health system financing component	Economic agent who is supposed to support the financing	SIE proxy variable
State	Direct taxes	Taxpayers	Total amount of direct taxes paid
	Consumption taxes	Taxpayers	Estimated amount of value added tax
	Corporate income taxes	Taxpayers	Total income from interest and dividends

[2] This and the next section are built upon [Bilger (2004) and (2005)].

End of Table 3

Aggregated health system financing	Health system financing component	Economic agent who is supposed to support the financing	SIE proxy variable
Social insurances	Social health insurance	Taxpayers	Amount of social health insurance premiums
	Accident insurance	Employees	Amount of accident contributions
	Old age and disability insurance	Employees	Sum of old age and disability contributions
	Military insurance	Military servicemen	Number of men of military service age in the household
Private insurance		Taxpayers	Total amount of private insurance premiums
Direct payments		Households	Total amount of expenditure on health[3]
NPIs[4]		Households	Total amount of donations to NPIs

2.3. Evaluation of Equity in the Financing of Health Expenditures in Switzerland

2.3.1. Methodology

In the previous section we said that to be equitable the financing has to be proportional to the financial capacity of the household. The total redistributive effect is a measure of the difference between this norm and the real situation. It can be evaluated through the difference between the income inequality indices before and after the financing of health care. As the relative inequality index does not change when all the incomes are modified proportionally, proportional financing of the health system will result in the redistributive effect being equal to zero. In the case of reduction of the inequality this total redistributive effect is positive; it is less than zero when the inequality is growing. As this measure is greatly aggregated, it does not allow a deep understanding of the impact of the health system's financing on the income distribution. [Aronson and Lambert (1994)], in the context of taxation, proposed a way to decompose the total redistributive effect into three components: a vertical, a horizontal and a third effect due to the rearrangement.

The *vertical effect* is a measure of difference of handling persons with different gross incomes. We want here to compare the contribution of a rich person with that of a poor. If the rich person needs a larger part of his income to finance the health system than the poor, the vertical effect is positive, and the inequality in the income distribution diminishes. The financing is a progressive one. On the contrary, when the vertical effect is negative, the inequality is increasing, and the financing is regressive.

The *horizontal effect* is a measure of difference of handling persons with the same gross income. In this case if two persons have the same income, and if one of them contributes more to the financing of the health system, the available income of this person for the consumption of non-health goods and services will be less than the one of the other individual. The horizontal effect

[3] More precisely, the sum of expenditures on health care and services, as well as the participation in the insurance costs.

[4] Non-profit institutions serving households.

measures this kind of iniquity. This measurement raises some problem as it is impossible to observe households which are «equal», that is with exactly the same gross income. Aronson and Lambert pass around this difficulty by replacing the notion of « equal treatment of equal persons» with the notion of «equal treatment of similar persons». This means, that they define intervals of income in which the households are considered as being equal. This solution is more a compromise than a satisfactory one. [Duclos and Lambert (2000)] proposed a fully satisfactory solution with the introduction of a continuous measure of the horizontal inequality. This solution is being implemented for Switzerland but is not yet finished. We will, thus, present the results of the Aronson and Lambert decomposition.

The *rearrangement effect* shows the importance of reranking in the distribution of individuals as they are classified with respect to their increasing income, the change being due to the financing. Thus, if Mr. X. is richer than Mr. Z before the financing of the health system but is poorer after the financing, we face an equity problem that can be measured through the rearrangement effect.

The discussion until now has concerned more the definition of the concepts than their measurement. The next section presents the measurement of the redistributive effect as well as the Aronson and Lambert decomposition.

2.3.2. Aronson and Lambert Decomposition

As already mentioned, the Aronson and Lambert decomposition needs creating groups of households, whose pre-financing incomes are considered to be close. We, thus, have to choose a range for the income intervals in which we assume the households are equal with respect to their incomes. The choice of this range for the income intervals is not discussed here, we suppose, thus, that it has already been done. The Aronson and Lambert decomposition is based on the Gini and the concentration indices.

Let us recall that the Gini index is defined by using the Lorenz curve that relates the cumulated proportions of the population ranked by increasing range of the income to the cumulated proportions of the income they dispose. This index will be used to measure the inequality before and after the financing of the health system. If the incomes of all the households are the same, the Lorenz curve is a straight line; otherwise it is a convex curve that lies under the line of perfect equality. The interpretation of any point of this curve is the following: x per cent of the households own y percent of total income. The Gini index is defined as the double of the surface area between the Lorenz curve and the line of perfect equality.

A concentration index is defined by using a concentration curve that has the same meaning as the Lorenz curve. In such a curve the cumulated proportions on the y axis do not concern the variable that is used to range the households on the x axis. In this study, the variable with cumulated frequencies presented on the y axis is the post-financing household income while on the x axis we use the pre-financing income. The concentration index is the double of the surface area between the concentration curve and the line of perfect equality.

2.3.3. Graphical Explanation of the Decomposition

The total redistributive effect due to the financing of the health system is measured by the surface area between two Lorenz curves; the first concerns the pre-financing and the second — the post-financing incomes. The decomposition is achieved through the construction of two in-

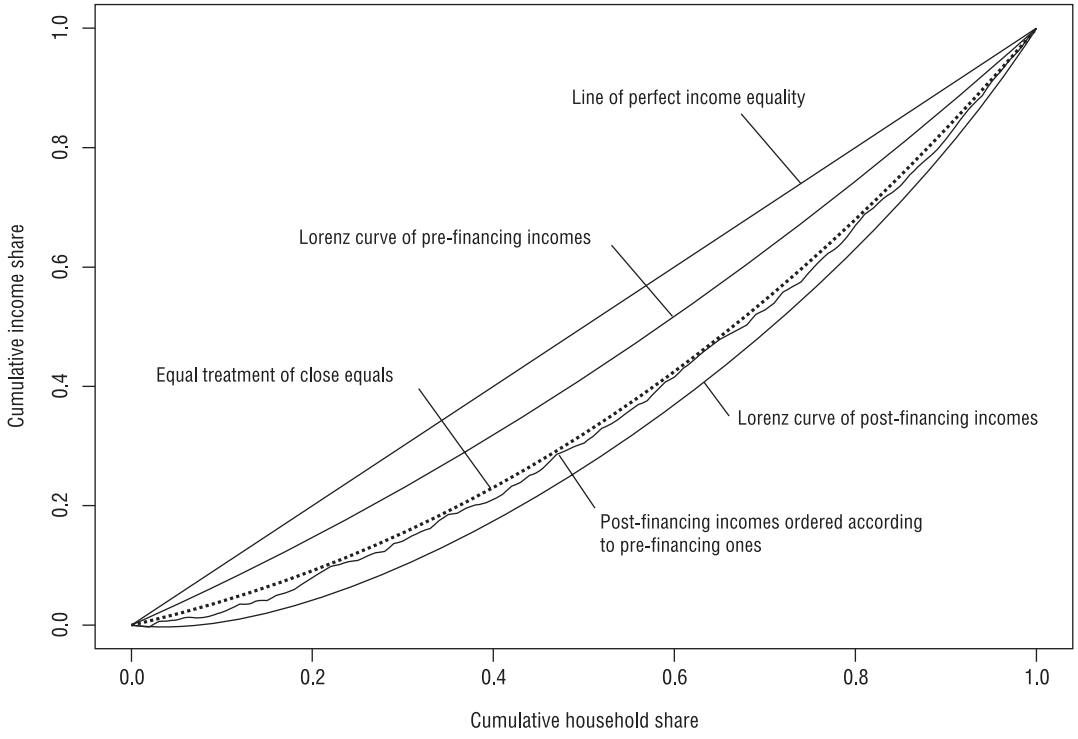

Figure 1. Decomposition of the total redistributive effect induced by the financing of the health system into its vertical, horizontal, and rearrangement effects

termediary curves that neutralize respectively the horizontal and the rearrangement effect. Figure 1 shows this decomposition. To evaluate the vertical effect, a Lorenz curve of the post-financing incomes has to be built that simultaneously neutralizes both the horizontal and the rearrangement effects. This curve is called «curve of equal treatment of close equals». It is obtained by imputing to each household belonging to a group the same health expenditures amount. The transition from the Lorenz curve of pre-financing incomes to the curve of equal treatment of close equals is, thus, only explained by the vertical effect. To evaluate the horizontal effect we have to neutralize only the rearrangement effect. This is done with the concentration curve of the post-financing incomes ordered according to the pre-financing ones. We notice that this curve is not always monotonously increasing. The horizontal effect is then measured by the surface area between the concentration curve and the one of «equal treatment of close equals». The rearrangement effect is finally evaluated through the surface between the Lorenz curve of post-financing income and the concentration one.

2.3.4. Results

Table 4 shows, first, the share of the components of the financing of the health system in Switzerland. Comparing to Table 2 we notice that in addition to out of pocket payments and contributions to social and/or private health insurance the households participate in the financing through other contributions, as, for example, through the direct taxes, which finance the government expenditures on health.

Concerning the inequality in the financing we notice that global redistributive effect is negative, the inequality in the distribution of income is increasing. We also see from Table 5 that this result is mostly explained by the vertical effect that counts for 80.4% of the total. The rearrangement effect is stronger than the horizontal inequality; they are responsible, respectively, for 16.4% and 3.2% of the total redistributive effect. The component of financing that contributes the most to the increase of the inequality is the contribution to social health insurance. The total redistributive effect of this financing is almost entirely generated through the regressive vertical effect. This result reflects the policy used in Switzerland with respect to the social insurance premiums, which are defined per head without any consideration of the households' income. The second most negative redistributive effect results from the direct payments. The vertical, horizontal, and rearrangement effects account respectively for 64.2%, 5.9%, and 29.9%. The vertical inequality is again relatively the most important, but the rearrangement is far from being negligible. This can be explained by the fact that this contribution is connected with the health state and not with income. Finally, the financing passing through private health insurance and consumption taxes has also a negative redistributive effect, whereas direct taxes and corporate income taxes have a propensity to reduce the income inequality.

Table 4

Total redistributive effect caused by health system financing components

Health system financing component	Financing share	Total redistributive effect[5]
Direct taxes	8.96	0.0749
Consumption taxes	5.67	–0.0545
Corporate income taxes	2.32	0.0416
Social health insurance	36.65	–1.1290
Accident insurance	3.71	–0.0017
Old age and disability insurance	5.20	0.0169
Military insurance	0.11	–0.0025
Private health insurance	11.85	–0.1806
Direct payments	24.36	–0.8756
NPIs	1.16	–0.0160
Total health system financing	100.00	–2.3790

Table 5

Vertical, horizontal, and rearrangement effects expressed as a share of total redistributive effect for the main health system financing components, %

Health system financing component	Vertical effect	Horizontal effect	Rearrangement effect	Total redistributive effect
Social health insurance	97.1	2.2	0.7	100
Direct payments	64.2	5.9	29.9	100
Total health system financing	80.4	3.2	16.4	100

[5] The results have been multiplied by 100 for readability.

3. Inequality in Health Status[6]

3.1. Continuous Indicators of the State of Health

Swiss Federal Statistical Office carried out in 1992, 1997, and 2002 three «Inquiries on Health». In these inquiries the state of health is measured by a significant number of ordinal and even binary variables, but our goal would be to find one or several *continuous indicators* summarizing the health potential of an individual on continuous scale. We see that behind the answers to different health questions from the inquiry, there is a latent but very present variable of the health itself. Unfortunately, this variable can not be observed, but, fortunately, it can be estimated.

To determine the continuous indicator or indicators of the state of health we propose to use the Latent Variables Model, a good reference would be a book of [Bartholomew and Knott (1999)]. Speaking very generally, this model tries to find a relation between the observed variables, usually called in statistics *manifest variables*, corresponding here to the variables from the inquiries; and non-observed variables, called latent variables, which are represented in our study by continuous indicators of the state of health. Using such a model allows us to estimate one or several continuous health indicators. For more methodological and theoretical detail see [Huber et al. (2004)]; for numerical applications see [Conne and Victoria-Feser (2004)], [Scheuer (2004)], [Conne and Antille Gaillard (2004)].

In the model used for our analysis we suppose that behind manifest variables, measuring indirectly the state of health of one individual, there are one or two latent, non-observed variables explaining the answers got for manifest variables. From a practical point of view, we select a set of manifest variables among those we have from the inquiry. This set should take into account the subjective, physical as well as the psychological health. The interpretation of the latent variables should be done, in the end, on the basis of the estimation results. Once the continuous indicator or indicators are calculated using the Latent Variables Model, we can evaluate the equity in the distribution of the state of health.

3.2. The Concentration Curve and the Inequality Index for the State of Good Health

To quantify the inequality in the health mentioned before, we propose to use the concentration index derived from the concentration curve.

The derivation of this curve should be based

1. on the continuous measure of the State of Good Health (for which the good health is increasing in the score) calculated with Latent Variables Model

and

2. on a variable allowing to observe the socio-economic condition (for example, income, maximum achieved educational level, consumption expenditures, etc.).

The concentration curve represents on the *x* axis a cumulated proportion of individuals (once they are arranged by the «increasing» order of their socio-economical status) and on the *y* axis — the cumulated proportion of their state of good health.

[6] This section is a summary of [Bilger, Flores et al. (2005)]

Then we have three cases to consider[7]. First, if everybody has the same share of the good health independently of his socio-economical status, then the curve coincides with the 45° diagonal (called the perfect equality line). Second, in the presence of the inequality called «pro-disadvantaged», the concentration curve remains over the perfect equality line: the first *x* per cent of the most disadvantaged individuals own more than *x* per cent of the state of good health. Third, the concentration curve falls under the diagonal if the inequality in the state of good health is «pro-reach», it means in the favor of more wealthy individuals.

The *concentration index* is a very useful tool to represent in one figure the inequality related to the socio-economical status of the individuals. Thus, it resembles a bivariate measure of inequality: it quantifies the inequality of the variable of interest (the good health) in respect to the ordering of individuals according to another variable (the income).

The concentration index is evaluated on the basis of the surface area between the concentration curve and the perfect equality line. It varies between the minimum value equal to –1 and the maximum value 1 indicating that, in the first case, all the good health is in the hands of the most disadvantaged and, in the second, it is fully seized by the individual with the highest socio-economical status. In the absence of inequality due to the socio-economical status, the index takes on the value of 0, which means that everybody gets the equivalent part of the whole stock of the state of good health.

Note. There exists, additionally, a standardized version of the concentration index adjusted to a small number of demographic variables such as age and sex, this version gives a result closer to the «real» latent inequality.

3.3. Application: the Inequality in the State of Good Health in Switzerland, 2002

For the Swiss Inquiry on Health in 2002 we have selected 18 manifest variables concerning the state of health of each person who participated in the inquiry. In particular, without being exhaustive, let us cite subjective health of the individual, the presence of chronic illness, seeing handicap, hearing handicap, walking problem, allergic cold, psychiatric treatment, headache, and fever. After model estimation, we proceed with two continuous indicators of the state of good health; one basically represented by the variable *mobility* (indicator 1) and another by *nearly all manifest variables*, except the variable of mobility (indicator 2). Concerning the inequality relative to the socio-economical status, here expressed by the net personal income of an individual, Table 6 shows that this inequality is very slightly pro-reach for both dimensions (indicators).

Table 6

Concentration index for the Swiss Inquiry on Health, 2002

Swiss Inquiry on Health, 2002	Indicator 1	Indicator 2
Concentration index (non standardized)	0.0233 (significantly different from 0)	0.0231 (significantly different from 0)

[7] In the following analysis we exclude the case where the concentration curve $L(r)$ cuts the diagonal. The expected results should be «opposite» if we measure the state of bad health.

Figure 2 reproduces, only for the first indicator, the score of good health for each individual as well as the concentration curve. We note that the concentration curve nearly coincides with the 45° line, confirming that the relative inequality is extremely weak even if significantly different from 0.

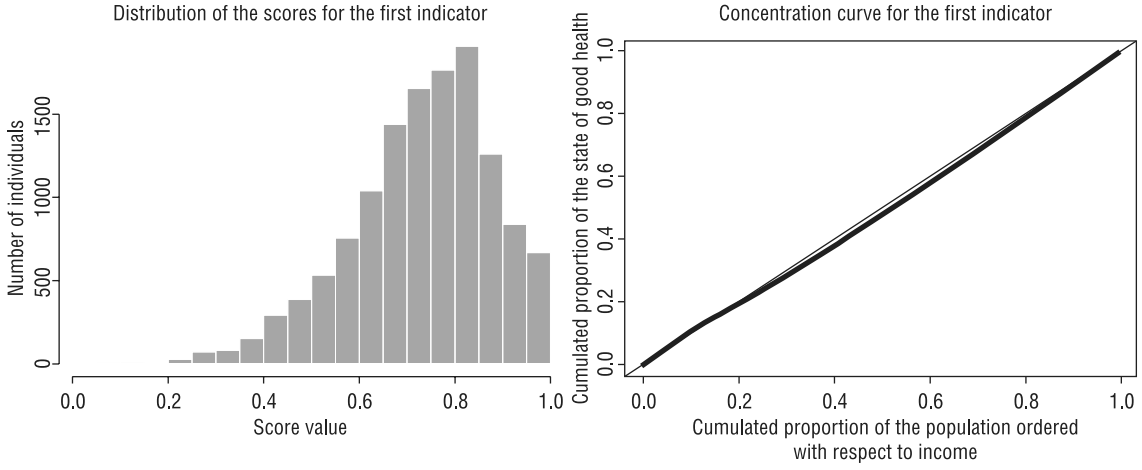

Figure 2. Scores and concentration curve for the first indicator

To conclude, we have seen that, henceforth, on the basis of the ordinal as well as binary variables from categorical inquiries it is possible to establish one or several continuous indicators of the state of health of an individual. Those indicators are simultaneously characterized by good statistical properties and clear interpretation. Using Swiss Inquiry on Health in 2002, we arrived to make evident two continuous indicators of the state of health, which distribution is slightly unequal and in favor of well-off population.

4. Equity in the Access to Health Care

In Switzerland the questions concerning the iniquity relatively to the access of health care have been studied by [Leu and Schellhorn (2004)]. [Flores(2004)] showed that these studies concern the utilisation of health care by elderly persons and the impact of «franchise»[8] on the demand for medical visit [Schellhorn et al. (2000)] and [Schellhorn (2001)]. To analyse this iniquity, the authors used data for the years 1981, 1992, 1997, and 2002. These data measure the access to health care through the total number of medical visits for all types of reasons as well as the number of nights in the hospital. The most important results obtained are the following: there is no significant inequality in the access to health care with regard to income, except in the demand for specialists. In this case one can presume that the treatment is not the same. The reasons for iniquity are related to the education level as well as to the status of being a retired person. The authors did not find any differences in the indicator of iniquity over the time; this could be interpreted as little influence of the 1996 reform of the health system on the iniquity evolution.

[8] The «franchise» is the amount of health expenditures paid by health insurance that the households have to pay by their own.

5. Conclusion

While the state of health does not depend strongly on income, we, nevertheless, have noticed that there exists some iniquity in the use of health services from specialists and that the income inequality is increasing due to the financing of the health system. The situation of the health system in Switzerland is, thus, mitigated if we look at it from the point of view of equity. Some reforms are in preparation in order to reduce the costs of health, they concern the increase of the «franchise» as well as the reduction of the cares paid by the social health insurance. These changes are justified with regards to efficiency but they could be inappropriate if we consider them in terms of equity.

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