Institute of Health Economics
and Management, Unil

Zürcher
Hochschule
Winterthur

Winterthurer Institut für
Gesundheitsökonomie WIG

ASSESSING THE RETURN OF INVESTMENT (COST-BENEFITS) OF PREVENTION IN SWITZERLAND: A FEASIBILITY STUDY

Executive summary

Hélène Chevrou-Séverac, Dr. in Economics, IEMS and DEEP, University of Lausanne.
Simon Wieser, Dr. oec. publ., WIG, Zürcher Hochschule Winterthur
Prof. Alberto Holly, IEMS and DEEP, University of Lausanne.
Urs Brügger, Dr. oec. HSG, WIG, Zürcher Hochschule Winterthur
Prof. Reto Schleiniger, ZWP, Zürcher Hochschule Winterthur

With the collaboration of
Martine Heiniger, doctor-assistant in Public Health, IUMSP Lausanne.
Roger Ngassa, PhD-assistant in research; Adona Oviedo, PhD, research assistant; Nino Catalanotto, research assistant and Michaël Benjamin, research assistant, University of Lausanne.

Commissioned by the Swiss Federal Office of Public Health (FOPH)

May 2007

Publisher's Imprint

Contract number :	06.003951
Contract period :	November 2006 – February 2007
Data collection period :	November 2006 – February 2007
FOPH study project manager	Marlène Läubli Loud, head of Research Policy, Evaluation and Reporting Section (RER)

ASSESSING COST-BENEFITS OF PREVENTION PROGRAMMES IN SWITZERLAND: A Feasibility Study[1]

EXECUTIVE SUMMARY

Authors:
Hélène Chevrou-Séverac, Dr. in Economics; Simon Wieser, Dr. oec. publ.; Prof. Alberto Holly, IEMS and DEEP; Prof. Urs Brügger, Dr. oec. HSG; Prof. Reto Schleiniger.
Institutes: IEMS, University of Lausanne and WIG, Zürcher Hochschule Winterthur.
Contract period: 15th of November 2006 to 28th of February 2007
Key words: Economic evaluation; cost-benefit analysis; risk factors prevention.

1. INTRODUCTION

The Swiss Federal Office of Public Health (FOPH) is organized along the lines of results based management. Since 1987, therefore, evaluation is considered an important tool for helping the Office to improve the effectiveness of its measures. In September 2005, the Department of Home Affairs appointed the Special Commission of Prevention and Health Promotion (SC-PHP 2010) to debate the future of health promotion and disease prevention in Switzerland, particularly with respect to the structures and legal framework. The SC-PHP 2010 presented its report and recommendations for enhancing promotion and prevention procedures in September 2006. One of its recommendations was that the effectiveness and efficiency of prevention measures should be enhanced[2]. As a consequence, Ms. Marlène Laübli, head of the Research Policy, Evaluation and Reporting Section at the Swiss Federal Office of Public Health (FOPH) commissioned us, the Institute of Health Economics and Management (IEMS) from Lausanne University, in collaboration with the Winterthur Institute of Health (WIG), to prepare a feasibility study on a cost-benefit analysis of Swiss prevention efforts.

The aim of this report is threefold:

(1) To present the best economic evaluation approach for assessing prevention, with a debate on methodological issues, and
(2) To present three risk factors for which a cost-benefit analysis would be appropriate and why: tobacco consumption, alcohol abuse and high-risk drinking, and road accidents,
(3) To consider whether or not a cost-benefit analysis of the prevention measures related to these risk factors is feasible in Switzerland, and the likely costs.

Firstly, we present the characteristics of prevention measures in Switzerland. Secondly, we briefly expose economic evaluation and its application to prevention. Then, we present the three risk factors considered for the feasibility analysis, why they are appropriate for economic evaluation, and how *well they could be assessed* from existing Swiss information. The last section presents our conclusions.

[1] This study was commissioned by the Federal Office of Public Health, contract no.06.003951
[2] "Vision et thèses sur la nouvelle réglementation de la prévention et de la promotion de la santé en Suisse" – Document de la Commission spécialisée "Prévention + Promotion de la santé" du 13 mars 2006. Thèse n° 7. OFSP – p. 25.

2. METHODS AND APPROACH

2.1. Characteristics of prevention measures

Diseases prevention concerns three levels of the development of the illness: primary prevention works on the causality channel to prevent the onset of the disease; secondary prevention begins once the causality chain has started in order to stop subsequent health damages; and tertiary prevention is aimed at curing and preventing further subsequent damages to health. Therefore, for each level of prevention, we need to know the number of cases of the main disease for primary prevention; of the related diseases for secondary prevention; and of the recovery or status quo of the main disease and it consequences on health for tertiary prevention. Thus, the impact of disease prevention is usually analysed in terms of changes in the number of cases of ill people in the population, i.e. the prevalence of the disease and its related damages (other diseases or injuries).

Having determined the main goal of prevention, we can now consider the characteristics of the population targeted by prevention efforts, as the outcome of prevention depends highly on this element. The prevention paradox is that people facing a small health risk are more numerous than those facing a high risk. Therefore, society bears a higher human and monetary burden for those at low risk than those at high risk. So, the larger the number of the public targeted by prevention, the better the results should be.

But the effects of prevention efforts are also quite sensitive to the nature of the prevention measures themselves and the time lapse between intervention and impact on disease prevalence. Some of these issues are briefly discussed below:

- Usually, *structural prevention measures*, such as regulation, have been shown to be very effective in primary prevention. Regulation can take different forms such as making vaccination compulsory, repressing drivers exceeding the speed limit, putting taxes on alcohol prices, banning advertisement on smoking, etc. It could target the whole population or more sensitive subgroups, such as the young in smoking prevention, for instance. *Other primary prevention measures* such as mass media counter-information or educational programs are more difficult to assess. Often they are conceived and put to work as a whole, an integral 'basket of prevention measures'. This makes it difficult to assess the effectiveness of one individual measure in isolation. Moreover, often some measures, such as media information campaigns, have specific intermediate objectives such as raising public or target group awareness about a particular health problem; their 'effectiveness' is therefore analysed in terms of how well they achieve this intermediate objective. *Secondary and tertiary prevention*, which target patients and concern more curative care than public health, are expected to have a smaller outcome, even though, taken as a whole, health care is more costly than prevention.
- In addition to these elements are *the environmental factors,* which also impact on the population's health. First of all, *other prevention measures targeting other diseases can interact with the one under study*, for instance prevention of obesity and smoking interact strongly with prevention of cardio-vascular diseases. Secondly, *regulation of other social and economic domains can impact health prevention* as well, such as road accident regulation and its effect on driving under the influence of alcohol. Thirdly, as Switzerland is a confederation, there is also a strong interrelationship between the Federal and Cantonal health policies, at the executive level. However, as prevention efforts are mostly conducted by non-governmental organizations, the effects can be quite different between Cantons or even cities. Fourthly, prevention measures are known to have a different effect on subgroups according to their socio-demographic and economic features: the worse-off are at higher risk of having damaging health behaviour as they are less well informed than the better-off. Finally, it has also been noticed by public health researchers, that nowadays there is a trend

in people's life styles showing that they are becoming more concerned with their health.

- The time lapse between detrimental health behaviour and its subsequent damage on health is also an important issue in prevention. It has taken a very long time for people to perceive tobacco consumption as a danger to health. In the 1970s there was little scientific evidence showing, for example, the link between the problem of foetal development and smoking. Thus, If for some behaviour the causal link to the injury is obvious, such as in road accidents, for others, generally speaking, people are not fully aware of the causal paths.

Given the definition of prevention and the interactions between the prevention measures themselves, their interaction with the characteristics of the population and different geographical regions, we propose to focus on (1) a ***specific health problem*** rather than on a specific bundle of measures; (2) ***structural prevention and primary prevention measures***, by virtue of the prevention paradox; (3) ***Federal prevention measures***, in terms of costs, it is often virtually impossible to distinguish federal from cantonal costs, or to even identify all the different cantonal prevention measures. In terms of health impact, whilst morbidity and mortality data is available at a national level, such data is not systematically available at cantonal level. The differentiation between what can be attributable to Federal or Cantonal prevention measures is therefore virtually impossible. We therefore propose focusing on federal prevention measures since we can measure both costs and the national health impacts.
We now present a method to evaluate the costs and health effects of prevention that takes into account some of these issues as well as three risk areas, which would be appropriate for the analysis.

2.2. Evaluating prevention with cost-benefit method

To evaluate prevention along two dimensions, health impact and costs, economic evaluation proposes three methods that link together these two dimensions in one: *cost-effectiveness, cost-utility and cost-benefit analyses*. These three methods relate costs to effects (in terms of impact on the population's health) of the project assessed. But they measure the impact on health in different units.

- The *cost-effectiveness analysis* (CEA) measures them in physical units, such as years of life gained, number of recoveries, or number of well diagnosed patients. Thus it is a purely quantitative method.
- The *cost-utility analysis* (CUA) measures them in a utility index, which states for the level of preference of an individual for a particular health state. Utility measures such as DALYs[3] or QALYs[4] mix together quantity and quality of life.
- The *cost-benefit analysis* (CBA) can take into account the quantity and quality of years of life (similar to cost-utility) but can go one step further by transforming them into a monetary value. Once the benefits and costs are transformed into the same unit, the comparison of different projects becomes feasible, and the "return on investments" can also be calculated.

Therefore, given these features of economic evaluation methods, the CBA is the most appropriate: it enables a comparison of different kinds of federal projects and it can be used to calculate the level of "return on investment".

[3] DALY = Disability Adjusted Life Years
[4] QALY = Quality Adjusted Life Years

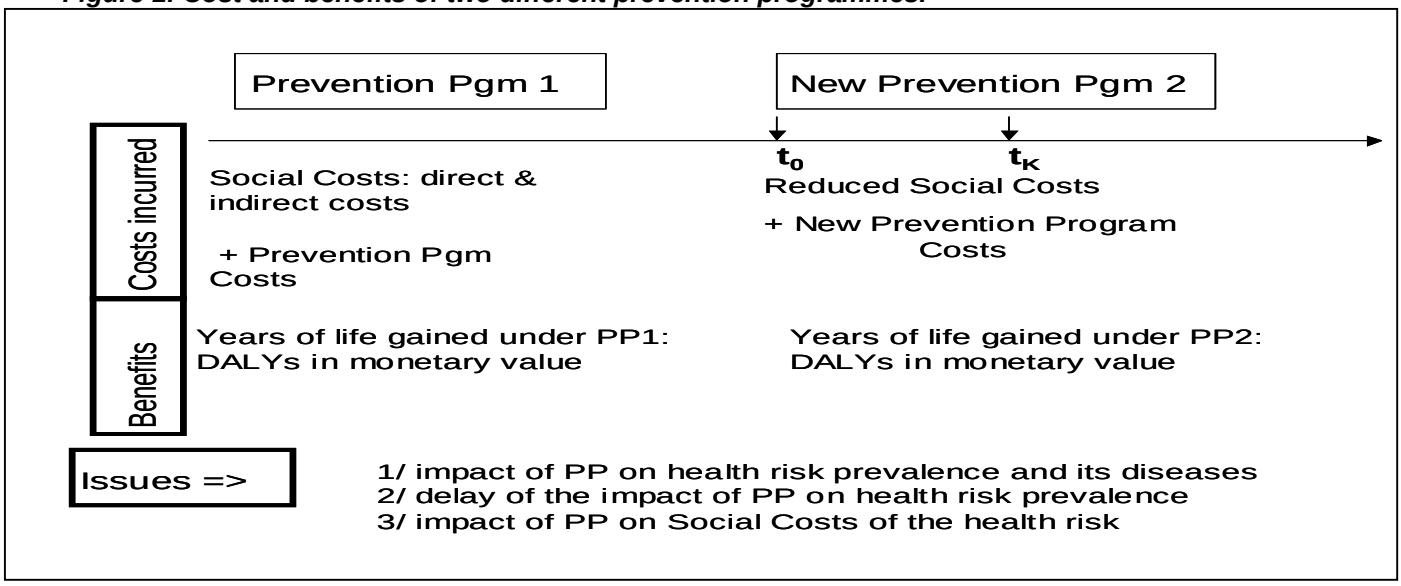
Causal pathway of risk factor on health

A risk factor is defined as the probability of an adverse outcome, or a factor that raises this probability. Risk factors can be of different nature, such as environmental, socio-economic or sanitary risks. Detrimental health behaviour follows different causal paths on health. The "patient" can cause himself or someone else an injury (such as a car crash when drunk) or a disease (such as hypertension for smokers). In both cases, we have to list all the effects of a risk factor on health as well as the attributable fraction of the disease or injury it may cause.
The health burden of a risk factor on an individual health is the attributable fractions (AFs) of diseases caused by the risk factor. The alcohol attributable fraction of road traffic injuries, for instance, is the proportion of road traffic injuries in the specific population that would be eliminated in the absence of alcohol consumption. In addition, the causal path of risk factor on health is also time related, given that a change in a risk factor can have immediate or delayed repercussions on its attributable diseases, as illustrated below.

CBA method for health risk factors

Usually, CBA compares two or more projects to give decision-makers sufficient information in order to make an enlightened choice between them. The best approach in doing a CBA of prevention programmes (PP) in relation to a specific health problem would be to compare the PP with the "doing-nothing alternative", i.e. without prevention. However, although this approach would allow assessing the full effect of prevention measure on the population's health, it is quite difficult to implement as very often no data are available under the alternative programme (no prevention at all). Therefore it would be better to compare existing prevention programmes (PP1) versus new prevention programmes (PP2) (see figure below, with PP1, for example, being the legal ban on TV advertisements coming from the Federal Swiss law RS 748.40 LRTV, for instance, and PP2 being the two consecutive National Tobacco Prevention Programmes,1996-1999 and 2002-2007. In both cases, society faces social costs due to the health problem (tobacco consumption) and its consequences on the population's health (lung cancer, for instance). With PP2, the expected benefits are twofold: a reduction in social costs and positive benefits in terms of years of life gained (DALYs) thanks to a reduction in the prevalence of the health problem and its related diseases. However, the costs could increase due to the costs of launching prevention measures. However, these costs are expected to be offset by the decrease in social costs due to prevention. If under the new prevention programme, PP2, both of the 'two fold benefits mentioned above can compensate for the cost increase due to the cost of implementing the new PP, then the cost-benefit ratio should be in favour of the new PP. In this case, it is relevant for the society to continue with the new national prevention programme.

Figure 1: Cost and benefits of two different prevention programmes.



For doing a CBA, we have to define costs and main effects (benefits) for each project. Under the PP1 alternative, there are social costs and no benefits are estimated, as it is the base case; whereas under the PP2 alternative, there are still some costs, the ones of the new PP and the social costs (assumed to be smaller than under PP1), but then benefits are computed as life saved or better health thanks to PP2. The social costs are (1) direct medical costs linked to the "patient", his/her family and also any third parties injured by "patients", and (2) indirect costs, that are the productivity lost by the "patients" and their relatives in market and non-market activities. For instance, for road accidents, "third parties" are those people injured by the driver that caused the accident, for alcohol abuse, the family/friends of the abuser, and for smoking, passive-smokers. Concerning health effects, the benefits under the old programme PP1 are not computed. Under the new programme PP2, the expected health impacts are less people incurring the disease and fewer deaths. This decrease in deaths and the number of cases of the disease is a gain in quantity and quality of life for the whole population.

Assessing health effects

To assess this double gain we will use the DALY measure. This health gap measure was developed by the World Health Organization for the Global Burden of Disease Project. Disability adjusted life years measure the difference between a specific health state due to a disease and a state of perfect health. It is a measure of utility or preference for a specific health state, such as QALY. The DALY measure fits quite well with prevention impact assessment. First of all, its computation is based on experts' judgements that represent social preferences, whereas QALY are based on individual preferences. Moreover, DALYs are disease-specific measures, whereas QALY are generic health description. So DALYs are more precise and can be summed up in the case of co-morbidities. DALY *also allows comparing different health states and the same health state but between different countries*. In CBA, the health effects are expressed in money. Thus once DALYs are known, they then have to be transformed into money values: the value of one year of life has been assessed at between US$70'000 and US$175'000. Having health benefits calculated in money terms will help decision-makers be able to compare the costs and benefits of all federal government prevention projects. In addition to computing CB ratios, we will also be able to compute the return on investment of prevention measures, as benefits will be available in Swiss francs.

Cost-benefit ratios

If the difference in costs between both PP is negative (i.e. smaller costs for the new PP), and if the difference in benefits between both PP is positive (i.e. the new PP is more effective on health than the previous one), then the new PP is preferred to the previous one.

Return On Investments of Prevention programmes

Finally, if the Federal government is concerned with the return on investment of its prevention programmes, the net present value (NPV) of these programmes over their lifetime has to be computed. It gives the actual reward of investing a Franc in such a program today. This NPV of PP can be compared with the NPV of other Federal programmes to assess the opportunity of this investment.

$$NPV = \frac{(B-C)_1}{(1+r)} + \frac{(B-C)_2}{(1+r)^2} + \frac{(B-C)_3}{(1+r)^3} + \cdots + \frac{(B-C)_T}{(1+r)^T}$$

With *B* the benefits of the PP and *C* its costs; *r* is a discount rate that stands for the preference for the present; and *T* is the time duration of the investment. When NPV is positive, the benefits exceed the costs.

Projection and sensitivity analysis.

To forecast the effect of prevention program in the future, we have to project some of our results. To do so, we should make assumptions concerning the exogenous factors that impact on health behaviour/condition as well as the endogenous ones. Usually, a conservative approach is adopted. Under this approach, almost all exogenous and endogenous factors are assumed to stay identical in the future. Finally to cope with uncertainty in our results, a sensitivity analysis should be done for the estimated and forecast cost-benefits ratios. The aim of such analysis is to relax the assumptions of the conservative approach and to set more extreme assumptions in order to assess the range of the variability of the results.

2.3. Recommendations for assessing the cost-benefit of prevention in Switzerland.

On the basis of existing data on social costs of risk factors in Switzerland, we propose a general framework for cost-benefit analysis in Switzerland that can be used to compare the effects of prevention programs that deal with different public health issues. In turn, this could play an important role in allocating scarce resources to public health programs more efficiently. For this study, we considered the feasibility of conducting a ***CBA of prevention in the fields of tobacco consumption, alcohol abuse and road accidents***, as: (1) there is available data for Switzerland from studies conducted on the social costs in each of these three fields (road accident (1994), tobacco consumption (1998), alcohol abuse (2003)); (2) road accidents and tobacco consumption have the higher social costs (direct and indirect costs) of all risk factors in Switzerland: CHF 6 billion and 5 billion, respectively (see table below); (3) social costs of tobacco consumption and alcohol abuse were assessed by the same research team (University of Neuchâtel, IRER), which allows a direct comparison; (4) prevention is not new in these domains in Switzerland.

However, a closer look at the results of the studies on social costs currently available vary considerably not only due to differences in the characteristics of these three public health issues, but also because of the substantial differences in the methodology used for road accidents compared with alcohol and tobacco consumption.

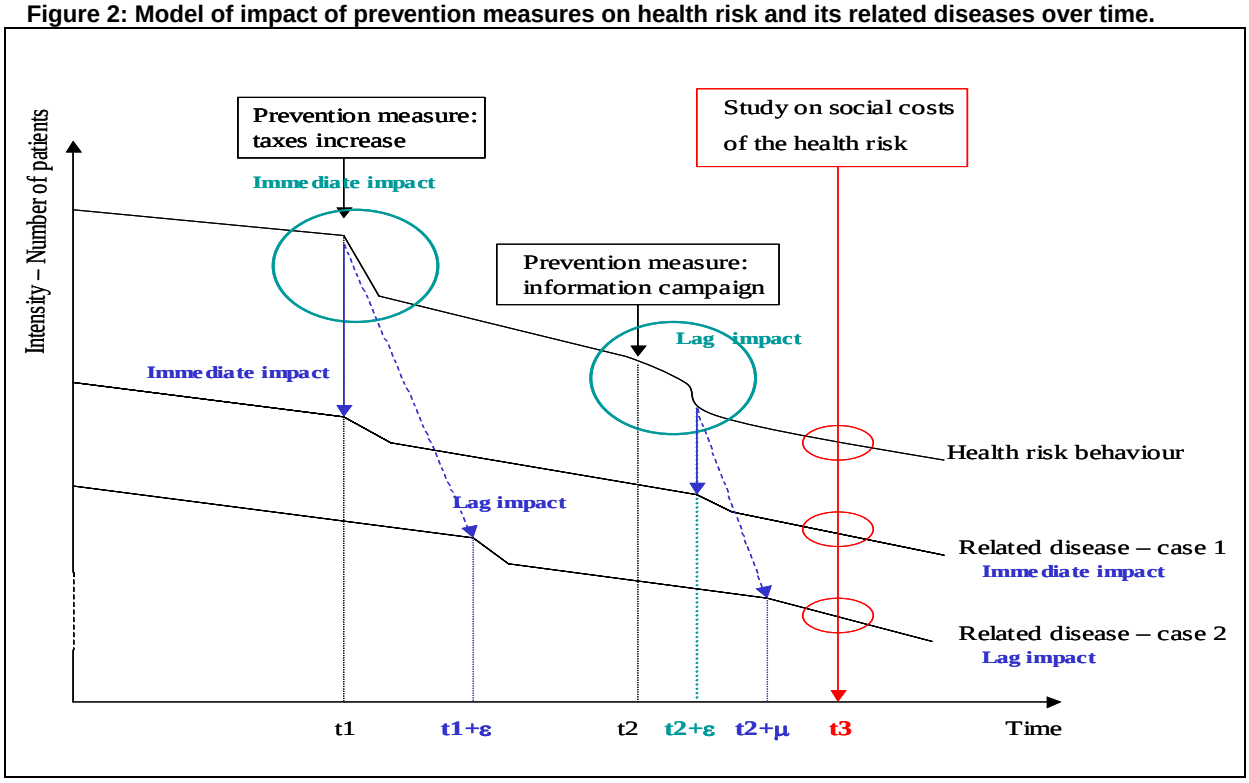
For CBA of each of these three public health issues we could proceed in the following way:

a. Update the direct and indirect costs of Swiss social costs studies.
b. Update the information on mortality and morbidity (number lives lost, number and degree of disabilities) and transform them into DALYs using the weights we obtain from the literature.

c. Transform the DALYs into a monetary measure by multiplying them with "value of life" in Switzerland (as we use the same value for the three different health issues, this is an important advantage of our study). The value of DALYs will be used as the monetary gain in years of life: it is a monetary benefit of prevention measures.
d. Quantify the impact of the prevention programmes in terms of DALYs.
e. Quantify the costs of the prevention programmes.
f. Conduct the cost-benefit analysis by comparing the social costs incurred under the old prevention programmes with those under the new prevention programmes that are monetary gain in DALYs minus new smaller social costs of the risk factor minus costs of prevention programmes.

Another issue concerns the time elapsed between the prevention measure, its impact on the health risk prevalence and on its related morbidity and mortality, and the date of the evaluation of social costs of the health risk. Assessing the impact of prevention measure on health should be done over time whereas the social costs studies have been done in cross-section, i.e. at a fixed date. The figure below illustrates this problem.

Figure 2: Model of impact of prevention measures on health risk and its related diseases over time.



The issues are that (1) we don't know how long the impact of a prevention measure will last; (2) at time t3, we don't know if the magnitude change in health risk behaviour is due to the additional impact of both measures or to only the last one or the more durable one (e.g.: taxes); (3) at time t3, we don't know if the change in attributable diseases is due to the change in the health risk behaviour at t1, or at t1 and t2; (4) and we don't know the magnitude share of the change in health risk behaviour due to long-term changes in people's habits. But social costs, when computed at a fixed date (as in t3), take into account the prevalence rates of the health risk behaviour and its related diseases/injuries/deaths registered in t3, independently of the causes of changes in attributable diseases.

Moreover, since the social costs study for one of the three proposed health risk factors (road accidents) was not made by the same research team, the approach in computing social

costs is neither fully comparable nor replicable, as it was simply not completely explained. We therefore considered adopting a common approach for doing CBA on tobacco consumption and alcohol abuse, with a slightly different one for road accidents. We summarize the approach adopted for each health problem in the section below.

3. PROPOSED FIELDS OF PREVENTION AND FEASIBILITY OF CBA: TOBACCO AND ALCOHOL CONSUMPTION, AND ROAD ACCIDENTS

To conduct a comparable analysis for all three of the proposed health risk factors, firstly, we would need to have social costs before the onset of prevention, and secondly comparable baseline information on Swiss social costs for each of the relevant risk factors and data on the health impact of the relevant prevention programs.

As social costs of the risk factors are available in Switzerland in 1994 for road accidents, 1998 for tobacco consumption and 2003 for alcohol abuse, we could only realistically take the year used for each of the relevant social costs reports as a baseline to compare with the *new prevention measures* that have been launched since this date.

Moreover, since the social costs study for one of the three proposed health risk factors (road accidents) was not made by the same research team, the approach in computing social costs is neither fully comparable nor replicable, as it was simply not completely explained. We therefore considered adopting a common approach for doing CBA on tobacco consumption and alcohol abuse, with a slightly different one for road accidents. .

3.1. Tobacco Consumption

Tobacco consumption per habitant in Switzerland grew steadily between the 1950s and the 1970s. Since then, it has been continuously decreasing, but is still at a high level compared with European countries. In 2002, 30.5% of the Swiss population aged 15 and above were smoking: 36% of men and 26% of women of the population aged 15+. If between 1970 and 1995 the proportion of smokers in the population decreased, it is not the case for the number of cigarettes smoked: less people smoked a higher quantity of tobacco. *Smoking is the number one risk factor in Switzerland, as it causes many related-diseases and premature deaths among smokers and non-smokers* also, because of passive smoking. So it is a full population health risk factor.

According to the information and literature collected and the limitations described in the previous paragraphs, doing a cost-benefit analysis of tobacco consumption for Switzerland is feasible. We present below the steps of the CBA study.

- **Updating social costs of tobacco consumption:**
  - **Direct medical costs**:
    - Swiss data on the number of hospitalisations by disease can be recovered from the Swiss Federal Office of Public Health (“Swiss data of hospital stays”). However this statistical report is only complete from 1999;
    - **Ambulatory care and pharmaceuticals number of cases:** available by year from IMS;
    - **Prices or costs of health care**: from Interpharma or Swiss Federal Office of Statistics (by year).
  - **Indirect costs**: Swiss data from different sources. Mainly ESPA survey (Swiss survey on Working Population); Disability insurance (AI) for disability; And the Federal population census
- ***Smoking prevalence from the Swiss Health Survey*** (SHS) for the years 1992, 1997, 2002, and 2007. For tobacco consumption, since 2001 a data from the “Tobacco Monitoring” survey, recording smoking behaviour on a yearly basis.
- ***Morbidity and mortality caused by smoking***
    - Assumption: changes in attributable diseases or deaths are due to changes in smoking behaviour, up to the attributable fraction of smoking.

- ✓ Diseases partially or fully attributed to smoking/drinking, with their attributable fractions
  - Attributable fraction: *Assumption: no changes in attributable fraction over the period;* Remark: attributable fractions are not Swiss specific
  - Number of cases by disease: Swiss Medical Statistics (FOS)
- ✓ Deaths by disease, available at the Swiss Federal Office of Statistics by year.

▪ When Swiss data are available on a specific disease mainly due to smoking, assessing the Swiss impact of changes in tobacco consumption on the prevalence of the disease (for lung cancer).

➢ ***Assessing the impact of smoking prevention measures***:

▪ Make a link between the Swiss prevention measures and those that have been assessed in the international literature, whenever possible.

Table 1: Proposed cost benefit analysis of prevention measures of tobacco consumption

Tobacco	**Baseline social costs: 1998**	**New prevention measures**
Prevention	Since 1970s	See table in annex 3
Prevalence of smoking	Measured in Swiss Health Survey (SHS) in 1992 and 1997	SHS **2002 and 2007**. Tobacco monitoring, **from 2001**.
Effects on related-diseases	Attributable fraction for diseases due to smoking from international literature	Conservative assumption.
Computing social costs	Done in the report	Update from Fed. Office of Statistics, after 1999 (statistics more complete).
Effects of prevention on prevalence	-	From international literature. For CH, not enough data.
Cantonal versus national prevention	-	Difficult to assess: -no full access to cantonal measures
Environmental or contextual effects	-	Impossible to assess (not enough data, except since 2001)
Mixed impact from other prevention field	-	Assumption – Only if at Federal level.

- ***Thus for tobacco, we concluded that CBA analysis would be possible as we have:***
  - ***Baseline social costs for Switzerland in 1998 under older prevention measures (PP1), and***
  - ***Data on tobacco consumption prevalence on a yearly basis from 2001 onwards, and on federal prevention measures covering a broader spectrum than strictly tobacco control measures (orchestrated since 1996),***

And as difficulties arising from assessment of prevention measures on tobacco consumption can be circumvent.

3.2. Alcohol consumption

Alcohol consumption is *a more complex health risk factor* than tobacco consumption. Whilst smoking per se is detrimental to health, for alcohol, it depends on the frequency and quantity of consumption. Moderate drinkers improve their health as alcohol has a protective impact on cardio-vascular disease, compare to abstainers and heavy drinkers. But even the consumption of a small quantity of alcohol increases the risk of road accident or injury by comparison with abstainers. Between 1992 and 2002, the percentage of non-drinkers increased from 16% to 23%, and, over the same time, the percentage of daily drinkers has

decreased from 20% to 16%. Thus in the 1990s the rate of decline in the level of risky alcohol consumption had slowed down. In 2002, the Swiss Health Survey measured 1.1% of women and 3.0% of men with alcohol consumption "at risk". However there have been changes in consumption patterns. During the last ten years, a new drinking behaviour has appeared: binge drinking. It is an occasional practice that results in extreme drunkenness from consumption during one drinking-session. This behaviour has expanded the problem to a new population: the young. Heavy alcohol consumption has huge consequences on the people's health causing cancer, neuro-psychiatric diseases, diabetes, cardio vascular disease (CVD), injuries because of accidents and violence. Given the great concern of the governments and local actors, and given the high responsiveness of the young to the price of related-binge drinking alcohols, the Federal Alcohol Commission introduced higher taxes on these beverages to diffuse the problem. In 2003, the University of Neuchâtel computed the social costs[5] of alcohol abuse and high-risk drinking: they amounted to CHF 2,200 million. Since the introduction of the Food Law in 1930, the Federal Government has, in the main, continuously depended on 'regulation' to control alcohol production, sales and demand. Additional prevention measures were introduced with the launch of the National Alcohol Prevention Programme (first period). The programme's evaluation showed. a decrease in the prevalence of some 'risky' drinking patterns. However, so far there has been no CBE of prevention measures on alcohol consumption: such analysis is only available in the international literature, and more often, only in relation to regulation measures. Moreover, the impact of regulation measures only focuses on alcohol consumption as a whole, not on alcohol abuse or excessive drinking. Henceforth, for alcohol abuse, it is quite hard to make any causal link between prevention measures and the prevalence of the health behaviour.
The special issues still at stake in doing a CBA of alcohol consumption are the following:

- The report of Alcohol Abuse in Switzerland" (Jeanrenaud, 2003) refers to alcohol abuse in general, and not to all patterns of alcohol consumption in particular. Hence, binge drinking, which is an important public health issue nowadays, was not assessed in the social costs study.
- So far, the impact of prevention measures on all the various drinking-pattern groups has not been assessed, but rather on alcohol consumption in general, independently of drinking behaviours or on specific subgroups of the population. The drinking patterns can have a preventative or a detrimental effect on people's health. A moderate consumption decreases the risk of having alcohol-attributable diseases, whereas a low or a high consumption increases their risks. Henceforth, it is necessary to disentangle the impact of prevention measures by drinking patterns.
- Whereas Swiss data concerning alcohol consumption per habitant are available over a long time period, Swiss data about drinking patterns are only available for four years: 1992, 1997, 2002 and 2007 in the Swiss Health Survey (FOS). Henceforth it is not possible to analyse the changes in drinking patterns and their related diseases over the longer term.

Given these limitations, a possible approach to do a CBA of alcohol consumption from the existing data and literature should be:

- **Update of social costs of alcohol abuse:**
  - ✓ **Direct medical costs**:
    - Swiss data on the number of hospitalisations by disease can be recovered from the Swiss Federal Office of Public Health ("Swiss data of hospital stays"). However this statistical report is only complete from 1999;
    - **Ambulatory care and pharmaceuticals number of cases:** available by year from IMS;

[5] "Coût Social de l'Abus d'Alcool en Suisse", Jeanrenaud et al. (2003), University of Neuchâtel, commissioned by the BAG-OFSP.

- **Prices or costs of health care**: from Interpharma or Swiss Federal Office of Statistics (by year).

✓ **Indirect costs**: Swiss data from different sources. Mainly ESPA survey (Swiss survey on Working Population); Disability insurance (AI) for disability; And the Federal population census

➢ ***Alcohol drinking patterns prevalence from the Swiss Health Survey*** (SHS) for the years 1992, 1997, 2002, and 2007.

➢ ***Morbidity and mortality caused by drinking (by patterns)***

✓ Diseases partially or fully attributed to drinking, with their attributable fractions

- Attributable fraction: *Assumption: no changes in attributable fraction over the period;* Remark: attributable fractions are not Swiss specific
- Number of cases by disease: Swiss Medical Statistics (FOS)

✓ Deaths by disease, available at the Swiss Federal Office of Statistics by year.

➢ ***Assessing the impact of drinking prevention measures***:

✓ Make a link between the Swiss prevention measures and those that have been assessed in the international literature, whenever possible.

✓ Issue: how to link surely prevention measures to drinking patterns.

However according to the limitations previously described, we do not recommend conducting a CBA of alcohol consumption.

Table 2: Elements considered for a CBA of alcohol abuse and excessive drinking

Alcohol	Baseline social costs: 2003	New prevention measures
Prevention	Since 1970s	See table in annex
Prevalence of smoking	Measured from SHS in 1997	SHS **2002 and 2007**.
Effects on related-diseases	Attributed diseases from international literature	Conservative assumption.
Computing social costs	Done in the report.	Update from FOS, after 1999 (statistics more complete).
Effects of prevention on prevalence	-	-For CH, not enough data. -***Not clearly identified in international literature*** (magnitude of taxes impact)
Cantonal versus national prevention	-	Difficult to assess: -no full access to cantonal measures
Environmental or contextual effects	-	Impossible to assess (not enough data)
Mixed impact from other prevention field	-	Assumption – Only if at Federal level.

3.3. Road Accidents

Road accidents are one of the major public health problems in Switzerland, and by comparison with other public health issues, there is a clear-cut link between hazardous behaviour and mortality and morbidity. In 2005 road accidents caused 409 fatalities, 5'059 seriously injured and 21'685 slightly injured casualties. Most of the victims of mortal accidents were car passengers (55%), followed by motorcyclists (18%), cyclists (11%), pedestrians (8%) and moped riders (3%). Compared to other kinds of accidents and causes of mortality, the cost of road accidents is particularly high because the low average age of the victims leads to a high number of years of active life lost. In the last 35 years road accidents in Switzerland have evolved similarly to most other European countries. The number of fatalities and seriously injured individuals has continuously declined since a peak

in 1971 (1'773 fatalities and 18'785 seriously injured victims) while the number of slightly injured individuals has increased. Social costs of road accidents have been assessed in 1998 at CHF 8,362 million split into direct and indirect costs. In addition, the study on the social costs of alcohol abuse has estimated alcohol-related traffic damages at CHF 1,182 million in 2003. Since 1971, with the increase in road traffic, the Federal Government has introduced measures to reduce road accidents. To analyse the effectiveness of these strategies, different Swiss studies have been conducted at different executive levels. However, none of them give a straight conclusion on the quantitative impact of these prevention measures on the number of road accidents.

Table 3: Proposed cost benefit analysis of prevention measures of road accidents

Road accidents	Baseline social costs: 1998	New prevention measures
Prevention	Since 1970s	See table in annex
Number or fatalities and seriously injured	Measured yearly by FOS	Years 1999 - 2006
Computing social costs	Done in the report	Update with the same methodology as in tobacco and alcohol evaluations.
Environmental or contextual effects (improved road and vehicle security)	-	From international literature
Cantonal versus national prevention	-	When there is a variation in prevention between cantons
Mixed impact from other prevention field	-	Alcohol prevention at Federal level.
Impact of single prevention measures		Whenever data are suited to show clear link with casualties (multivariate estimation)

To conclude, we propose several strategies for data collection and analyses:

- ***Crude update of social costs of road accident***
- ***Data on road accidents and consequent morbidity and mortality***
  - Data of the Swiss Federal Statistical Office, published since 1927, with details only **since 1992**. Available by cantons.
  - Data on the medical costs of injuries and disability from the Invalidity insurance (AI).
- ***Data on prevention measures and other factors potentially influencing road accidents***:
  - Changes in traffic laws and regulations and prevention programs (see table 1 above for major programs). (yearly)
  - Number of fines and other administrative measures (ASTRA) (yearly, cantonal) (might be used as a proxy for control intensity)
  - Number and types of vehicles registered (ASTRA) (yearly, cantonal)
  - Average distances travelled (ARE) (yearly)
  - Travel speed measurements (ETH) (yearly)
  - Attitudes of drivers concerning road safety measures (BFU)
  - Safety-belt and helmet wearing quota (BFU) (yearly, language regions)
  - Black accident spot program (BFU) (yearly)
  - The costs of prevention programmes can be valued extrapolating the numbers proposed in Basler & Hofmann (2002) or updated by consulting the annual reports of the main prevention agencies.

- There is no statistical information quantifying the changes in road and vehicle security. It should be possible to use the results of studies in other developed countries to construct a time trend capturing the combined effect of these factors.

Special Issues

- Assessing the impact of cantonal measures. Using yearly data on road accidents from 1970 to 2005 disaggregated at a cantonal level. Thus, it is possible to identify the impact of cantonal regulation in contrast with other cantons with less intensive regulation.
- A particularly interesting aspect of the evolution of road accidents is the strong decrease of fatalities (-20%) and seriously injured (-8%) in the year 2005. This trend has continued in the first half of the year 2006. The factors responsible for this strong decrease have not yet been fully understood (BFU). It could be due to the stricter blood alcohol limits introduced in 2005. However, accidents caused by other factors have also decreased. According to the BFU the intensification of police controls and the increased public attention towards road safety might also be responsible for this drastic decline. A detailed study of the reasons for this decrease of severe accidents might be an important illustration of how combined prevention efforts at all levels can lead to a reduction in public health problems.
- Even with the statistical problems and data limitations, the study of the effects of some prevention campaigns might still be possible. If there is an apparent connection between the kind of injuries caused by an accident and change in behaviour, a causal connection between campaign and reduction of fatalities and severe injuries can be demonstrated. This could be the case for severe head injuries due to bicycle helmet campaigns or for the proportion of fatal accidents of drivers without safety belts. Different intensity in prevention strategies in different cantons or language regions could facilitate the exposure of a causal link between the prevention measure(s) and the reduction of severe road accidents.

4. CONCLUSIONS AND RECOMMENDATIONS

This feasibility study presents an overview of how an economic evaluation of Swiss prevention measures could be done. The method of cost-benefit analysis is doubly well fitted for evaluating prevention as it links the benefit and costs effects of prevention projects in a single measure. It enables us to assess the impact of prevention measures on the quantity and quality of life in a monetary value. This value could then be used to compute the “return on investments” of prevention strategies.

Having considered the three prevention areas posing the highest social costs as feasible for CBA analysis, we conclude the following:

- For **alcohol,** it is not appropriate at this stage to conduct a CBA on Swiss data. The impact of prevention on consumption behaviour is not fully documented at national and international levels; and in Switzerland, for the purposes of econometric analysis, the existing data on alcohol consumption patterns are inadequate since the time period covered is not yet long enough.
- For **tobacco,** a CBA is possible. However, due to availability of the dataset and beginning of prevention in Switzerland, the analysis would be limited to observations of tobacco consumption behaviour over a very short time period (since 1998). This could, however be supported by international studies.
- For **road accidents,** the causal chain between the detrimental health behaviour and the injuries is clearer, and Swiss data are available over a longer time span as well as prevention measures. Henceforth CBA is feasible and less controversial.

To assess the cost/benefits of each of these two risk factors (tobacco and road-accidents), we propose evaluating the "basket of prevention measures" as a whole with respect to each. This strategy allows us to circumvent some issues in evaluating prevention, such as mixed impact of prevention measures. For both risk factors, we will compare a baseline year, the one of the first study on social costs (respectively: 1994 for road accidents and 1998 for smoking) with the following years. Thus for the subsequent year, we will update the social costs according to the variation in prevalence of the risk factor. The new social costs are expected to be the decreased social costs (thanks to prevention) plus the costs of prevention measures. The benefits expected are the decrease in prevalence of the risk factor and its related diseases, under a conservative assumption of same attributed fraction. These benefits are then transformed into DALYs and monetary value. However, given that we don't have data on the social costs *before any prevention strategies were introduced* in Switzerland, it may well be that the cost-benefit ratio between PP1 and PP2 will be less significant than would otherwise have been the case. The other limits of our approach are the following. For tobacco, it is unlikely that we could disentangle the impact of cantonal from Federal prevention measures. For road accidents, we can only crudely update social costs, and not finely as in the case of smoking. We would largely depend on the international literature for discerning the contextual effects on prevalence. And finally, given that morbidity statistics come from the Swiss hospitals statistics and from the SHS, any study using morbidity as a health outcome will be surrounded to available data. However, as the FOPH now wish to launch a project called "Indicateurs de la Prévention: poids corporel sain, santé psychique et stress"[6] in collaboration with the IEMS, more reliable morbidity and related treatments data would be available for conducting CBA of prevention of overweight, mental health and stress, in the near future (3 to 4 years).

Our proposal offers two important additional advantages:

1. To our knowledge, this would be the first time that the prevention of two health risk factors would be assessed in the same way: cost-benefit analysis.
2. We also propose to extend our analysis in order to make a general framework for the future CBA of the prevention of new public health issue such as obesity.

Nowadays, curbing health expenditures of National Health Systems is a challenge for all developed countries. Cost-benefit analysis is then the most relevant method to compare health services or policies targeting different diseases at different levels, i.e. curative or preventive care. Henceforth, assessing cost-benefit of all health services whereas for curative or preventive care should be one of the major aims of policy-makers in order to invest efficiently state revenues.

Contact Address:
Hélène Chevrou-Séverac, Dr. PhD
IEMS
University of Lausanne
Extranef
Ch-1015 Lausanne

Helene.Chevrou-Severac@unil.ch
Tel: +41 (0)21 692 36 62

[6] A collaboration of the IEMS (Dr. Yves Eggli) with the FOPH (Till Bandi).