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Summary:

Effects of information campaigns on behaviour and road accidents - conditions, evaluation and cost-effectiveness

The present report consists of four studies:

1) Effects of campaigns on road traffic accidents,
2) Effects of campaigns on other areas of behaviour than road traffic,
3) Evaluation of campaigns of the Swedish Road Administration
4) Swedish campaigns: Appraisal of cost effectiveness and benefit-cost aspects

1) Effects of campaigns on road traffic accidents,

Study 1 considers estimation of effects of campaigns on road traffic accidents. The basis for estimating the effects has been the construction of a database, which comprises 86 results from a total of 30 evaluation studies. Of these, 72 results are used for estimating the effects of campaigns during the campaign period and 14 results are used for estimating the effect in the after-period.

Two types of analysis are presented. The first is from meta-analysis and concerns the general, overall effect of campaigns. The second comprises results from meta-regression and concerns factors that contribute to explaining effects of campaigns.

The data are tested for publication bias, i.e. the tendency not to publish results from campaigns where the effect seems to have been zero or gone in the opposite direction of what would have been expected. Considering all results in the database there seem to be a certain publication bias and a "trim-and-fill"-procedure indicates that 13 "campaigns" should be added to the data in order to compensate for publication bias.

Considering the studies that evaluate effects in the campaign period the number of campaigns against drink driving is 33. A trim-and-fill procedure indicates publication bias for this subset of campaigns and 6 "campaigns" should be added for compensating this bias. The number of campaigns against speeding is 18 and a trim-and-fill procedure indicates publication bias also for this subset of campaigns and 4 "campaigns" should be added for compensating this publication bias. For other single-theme campaigns one result is added after trim-and-fill and for multi-theme campaigns the number of added results is 4. There is no publication bias among the studies that are used to estimate effects in the after-periods.

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The overall, general question, which is addressed, is whether campaigns can be said to have effects (at all) on road traffic accidents. The premises for answering this question are the following:

1. Only evaluation designs, which use a control group or comparison group are included in the database
2. The data are put through meta-analysis in order to calculate a best estimate of a potential effect
3. The data are tested for homogeneity and corrected for publication bias

Under these premises the best estimates have been calculated. The results are presented in the table S.1:

Table S.1 General effect of road safety campaigns on road accident in the campaign period and in the after-period. Percentage and confidence interval.

Group:	***Effect***	***95% -confidence interval***	***P < 0.05 ?***
Effect in the campaign period (n = 72)	- 8.9	(- 12.7; - 4.6)	yes
Effect in after-period (n =14)	- 14.8	(- 23.0; - 0.5)	yes

Source: TØI report 727/2004

The table shows that the weighted average of road safety campaigns in the campaign period is a 8.9 % reduction on the number of road accidents. In the after-period the effect of campaigns is estimated to a reduction of 14.8%. Both estimates are statistically significant ($p < 0.05$).

Most campaigns are directed towards one single theme. The two largest subgroups in the database are campaigns against drink driving and against speeding. Table S.2 presents results of campaigns according to the theme of the campaigns:

Table S.2. Effects (%) of road safety campaigns on road accidents. Based on random-effect models with generated data from "trim-and-fill". Percentages and confidence intervals.

Theme of campaigns	***Effect***	***95% CI***	***p < 0.05?***
All campaigns (n=72)	- 8.9	(-12.7; - 4.6)	Ja
Campaigns against drink driving (n=33)	-14.4	(- 21.1; - 8.3)	Ja
Australian RBT-campaigns *) (N=9)	-13.5	(- 22.2; - 3.8)	Ja
Campaigns against speeding (n=18)	-8.5	(- 19.9; + 3.4)	Nei
Other single-theme campaigns (n=6)	-10.4	(- 18.9; - 1.1)	Ja
Multi-theme campaigns (n=15)	1.0	(- 6.7; + 9.3)	Nei

*) RBT = Random Breath Testing

Source: TØI report 727/2004

The table shows that single-theme campaigns do better than multi-theme campaigns. Campaigns against drink driving and other single-theme campaigns show statistically significant reductions on the number of accidents of 14,4% and 10,4% respectively. Multi-theme campaigns have not had any effect at all, while campaigns against speeding show a tendency of reducing the number of accidents by 8,5%, but this estimate is not statistically significant at a 5%-level.

In table S.3 the effects of campaigns are specified for four types of campaigns:

Table S.3: Effect (%) of road safety campaigns on road accident distributed according to type of campaigns. Based on random-effect models with generated data from "trim-and-fill". Percentages and confidence intervals.

Campaigns according to type	Effect	95% - CI|	p < 0.05?
Campaign alone	0.9	(- 8.6; + 11.7)	Nei
Campaigns with police enforcement	-12.7	(- 18.9; - 6.2)	Ja
Campaigns + enforcement + education	-14.2	(- 22.0; - 4.9)	Ja
Local, personally directed campaigns	-39.3	(- 56.0; - 17.4)	Ja

Source: TØI report 727/2004

TableS.3 shows that mass media campaigns alone, i.e. without any accompanying measure, have not had any effect at all, the effect is practically zero. The remaining three groups have, however, all had statistically significant effects on the number of accidents. This concerns campaigns with police enforcement as accompanying measure, a type of campaign, which may be labelled "publicized enforcement", and campaigns, which use education as an element in addition to police enforcement. There is, however, no significant difference between the effects of these two types of campaigns, they are both in the range of 13-14 %. The fourth and last type of campaigns, i.e. local, personally directed campaigns is the one with the largest effect of all campaigns types, with an effect of nearly 40%. It should, however, be noted that this campaign type is based on rather few results and the confidence interval is also quite large.

The report discusses several theories, which have a potential in explaining why some campaigns might reduce the number of road accidents. Further, an elaboration of multivariate models is discussed. The main purpose of applying multivariate models would be, by meta-regression, to describe factors, which may contribute to explaining why campaigns might have an accident-reducing effect. Two multivariate models are described, one is called ***full*** model, the other ***reduced*** model.

The following predictors are comprised by full model: Country, theme, year, type of campaign, size of target group, length of campaign (4 groups), communication channels used (TV, radio, newspapers, posters/billboards, leaflets/brochures), personal influence, other communication channels. The main results from meta-regression by applying full model were the following:

- Australian and Dutch campaigns both gave statistically significant contributions to an explanation of the overall accident-reducing effect of campaigns. The Australian campaigns were mainly directed towards drink driving and most of the campaigns utilized Random Breath Testing (RBT)

as a part of the police enforcement. The Dutch campaigns were all directed towards speeding and speed enforcement was an accompanying measure in all of the campaigns. Warning signs displaying "you are speeding" were posted at the roadside and drivers were informed that speed enforcement might take place in 6 of the 7 Dutch campaigns. Then, both the Australian and the Dutch campaigns relied heavily on police enforcement.

- Posters/billboards seem to reduce the effect of campaigns. It is difficult to find a reasonable explanation to this result, but one hypothesis could be that campaigns using posters/billboards might have other, common characteristics that are not comprised by full model.
- *Personal influence* is the only kind of communication, which contributes significantly in explaining why campaigns reduce the number of accidents ($p = 0.0032$). Personal influence is partly defined as two-way communication face-to-face, but two-way communication is not a precondition that personal influence might have taken place. If, for example, letters are addressed personally to members of a given target group, it could be coded as a source of personal influence. At the basis of a categorisation as personal influence, is the assumption that information processing, i.e. of a given campaign and its features, has followed the central route according to the Elaboration Likelihood Model developed by Petty and Cacioppo. In simpler words: Information processing has been (highly) conscious, people have been reasoning substantially about information provided to them by the campaign.
- For the rest of predictors, there are no statistical significant effects or effect tendencies. Considering all communication channels, none of them seem to have special advantages in explaining the accident-reducing effects of campaigns, except personal influence.

The following predictors were comprised by reduced model: Country, theme, type of campaign, length of campaign (2 groups: ≤ 200 days and > 201 days), mass media communication channels used (TV, radio, newspapers), "two-step/multi-step strategy, feedback of information (at the roadside), and personal influence. The main results from meta-regression by applying reduced model were the following:

- Again, both Australian and Dutch campaigns contribute statistically significant in explaining the accident-reducing effect of campaigns ($p = 0.0257$ and $p = 0.0105$ respectively). The Australian campaigns were mainly directed towards drink driving and the Dutch campaigns were all directed towards speeding. A warning sign displaying "you are speeding" were posted at the roadside. Roadside posts informed drivers that speed enforcement might take place in 6 of the 7 Dutch campaigns.
- A categorisation of accompanying measures into three groups did not give any substantial difference between the three groups. This is surprising, but an explanation could be that the effect would already be explained by the variable *country*, i.e. by Australian and Dutch campaigns, which both relied heavily on police enforcement.

- The effect of length of campaigns appears more clearly when only two groups are considered, i.e. ≤ 200 days and > 201 days (full model used 4 groups). A duration of ≤ 200 days is significantly more efficient ($p = 0.0002$) than a duration of > 201 days. It seems reasonable that there may exist an optimal campaign length and, further, that the reason behind an optimum could have something to do with how long it is possible, or optimal, to focus on one single theme.
- Again, as was the case in full model, personal influence is the only communication channel that result in a statistically significant contribution to explain why campaigns may reduce the number of accidents. A categorisation of personal influence is used when there are good reasons to believe that a campaign has resulted in a high degree of conscious involvement in the target group.

2) Effects of campaigns on other areas of behaviour than road traffic

The objective of study 2 was to investigate possible effects of campaigns aimed at influencing behaviour on other areas than road user behaviour. The meta-analyses are based on results from 99 studies, which have evaluated effects of information campaigns on behaviour. The majority of these studies comprised effects of campaigns directed towards promotion of health protective/preventive behaviours such as exercise, healthy eating habits, sun protection, HIV/AIDS protective behaviours etc. Studies concerning smoking, alcohol, or drug abuse were excluded from the meta-analyses.

The study had two objectives. The first was to investigate whether such campaigns have any effects at all on behaviour, while the second was to examine whether certain characteristics of campaigns might be more important for obtaining behavioural change than others.

The results from the meta-analyses indicate that information campaigns have an effect on behaviour. This is a significant result in itself, especially since a common opinion is that campaigns do not influence behaviour. However, the average effect on behaviour across all studies is not very strong, although there is no doubt that the effect exists. There are some differences between the campaigns regarding how effective the different campaigns are in obtaining behavioural change. Results from meta-regression analyses show that much of these differences in campaign effects can be explained by the following characteristics:

- Large campaigns, which are directed towards a large population, are more effective than campaigns directed towards few people. One possible explanation is that large campaigns possess more and stronger measures and resources than small campaigns. Furthermore, there is reason to believe that large campaigns are more professionally conducted than small campaigns.
- Campaigns directed towards a specified target group seems to be the most effective ones, but the effect is not statistically significant,. At first glance, this finding seems to contradict the above result, i.e. that large campaigns are more effective than smaller campaigns. However, this is not necessarily a contradiction as several of the campaigns that are directed

towards a specified target group also have a considerable size of the target group.

- Campaigns lasting more than one year are less effective than campaigns of shorter duration. This could be a consequence of reaching a saturation point regarding the information efforts, among those who are campaigning as well as those in the target population.
- In particular, campaigns using some form of personal influence seem to be more effective than others. Campaigns using mass communication in combination with personal influence are also more effective than campaigns using mass communication only.
- The results also suggest that the use of video and letters may be beneficial in order to obtain behavioural change.

Several of the results coincide with study 1, especially regarding the use of personal influence, the length of campaigns, and the fact that several of predictors in the regression models does not seem to have any effect on behaviour.

3) Evaluation of campaigns of the Swedish Road Administration

The purpose of study 3 has been to point out potentials of improvement for the information campaigns of the Swedish Road Administration. The issues are:

- What have been the effects of the campaigns?
- In what way were the campaigns evaluated?
- Were the evaluations insufficient in any way, and if so: How could the evaluations be improved?
- Were there possibilities of considering cost effectiveness and/or doing cost-benefit analyses of the Swedish campaigns?
- Which are the potentials of improvement regarding the information activity headed by the Swedish Road Administration?

The Swedish Road Administration selected 6 information campaigns for closer appraisals according to the above issues (their names and objectives do all have an original Swedish wording and a symbolic meaning that might be lost when translated to English):

- "Zkona Zebrafolket" ("Protect the Zebra people") – rule change and change of behaviour
- "Hastighetskameror" ("Speed cameras") – method and effects regarding adaptation to the prevailing speed
- "SPARK" – thrifty driving
- ISA – Intelligent Speed Adaptation
- "Säkereken" ("The Safe Oak")

- "Alkolås i min bil" ("Alcolock in my car")

In study 3, evaluation methods and methods of calculating cost-effectiveness are discussed. These topics are especially addressed when information is included as one part among several other measures.

The appraisal of the above six campaigns showed that none of them are mere information campaigns. They are more like "measure packages" where information is applied together with other measures for improving safety, traffic mobility or the environment. This seems to be an efficient application of information, but, at the same time, it makes it difficult to isolate the effect of the information effort alone on the end goals of the campaigns. An alternative strategy is to identify sub-goals regarding the information effort, and then investigate to which extent the sub-goals have been achieved.

These six campaigns are all well included in the information policy of the of Swedish Road Administration, and it is difficult to see or elaborate alternatives to applying information in these campaigns. Information is not applied as any kind of symbolic measure in any of the campaigns.

Only two of the campaigns, *Zkona Zebra-folket* and *Säkereken*, were supposed to have a full-scale effect on mobility efficiency and on traffic safety, respectively. The campaign *Zkona Zebrafolket* resulted in a knowledge level of 97% who had become aware of the change of rule regarding who should yield at pedestrian crossings (the responsibility of yielding changed from pedestrians to drivers). Further, the waiting times for the pedestrians at the crossings were reduced considerably. The Säkereken-campaign succeeded in reducing the number of killed and injured in traffic in the county of Blekinge, although not quite as much as the goal that initially was set.

The four remaining campaigns were all testing new measures, and the purpose with these must have been to gain experience in order to implement these measures on a wider scale at a later point of time. Regarding *Hastighetskameror* ("Speed cameras"), the awareness among drivers were in Stockholm county, and the average driving speed was reduced by 4-5 km/h on the two road stretches were awareness was at its highest. On one of the road stretches, the traffic accidents we lowered by 50 % and the proportion of drivers who had a positive attitude towards speed cameras is increased.

The potential for reducing the gasoline consumption by the campaign SPARK ("Thrifty driving") was on short term some 10 %. The evaluation studies did, however, not show how one should manage to put a large proportion of Swedish drivers through the educational program.

ISA – Intelligent Speed Adaptation – is estimated to reduce the number of personal injury accidents by some 5-17 %, maybe as much as 20%. The ISA campaign seems to have turned the attitude towards ISA from "*resistance from the car industry and fear towards electronic systems"* to "*ISA is a way of escaping from serious accidents*". Nothing is, however, stated on how ISA would achieve the wide spreading that would be necessary to increase road safety substantially.

Trials with Alcolock have shown that it "could be an effective road safety measure" and surveys confirmed that "the Swedish people will give a powerful

support for a new law that requires alcolock to be installed in new car makes". It is, however, a long way to go before alcolock would be so widespread that it would have a substantial effect on road safety.

The campaigns goals should have been stated and operationalised more clearly, especially the four above-mentioned "pilot" campaigns. The theoretical basis for applying information activities, i.e. how information was expected to influence the target populations together with the other campaign measures, should have been specified.

All the six campaigns that were selected and run by the Swedish Road Administration have been evaluated quite thoroughly. However, the variation of the depth of these evaluations has been so large that it is reason to ask the Swedish Road Administration to what extent they know what they want to accomplish by means of evaluation, what kind of evaluation should be applied, and how thorough the evaluation should be. Generally speaking, there is a need for a more systematic and purposeful evaluation.

As is reasonable, it is primarily the campaigns as a whole that are evaluated. Except for "*Zkona Zebrafolket"*-campaign, the information effort is rarely considered in the evaluation of the campaigns. This could be given a positive interpretation, i.e. that the information activity has not been any problem. On the other hand, however, it could also be a consequence of incomplete documentation, which has been a problem with several of the campaigns.

Data regarding costs are important concerning evaluation, especially when it comes to cost-effectiveness and cost-benefit issues. The present evaluations address these issues only to a little extent. The Swedish Road Administration has provided the data on costs, but their completeness is doubtful. Documentation of costs and measure applications, which in this case is information, should take place contemporarily with the campaigns, in order to secure that such data are taken care of for evaluation purposes.

For two of the campaigns, *Säkereken* and *Hastighetskameror*, cost-effectiveness is calculated. In these two cases, the cost-effectiveness seems more than acceptable. Regarding Hastighetskameror, the benefit-cost ratio is estimated to 3 : 1.

The information activity of the Swedish Road Administration then seems effective and well integrated in rest of the activities of the Road Administration. It seems reasonable to continue a direction where information is included as part of larger measure packages instead of promoting sole information campaigns as independent measures for traffic safety or other objectives. An integration of the information activity in larger packages of measures makes it, however, difficult to document and calculate effects of information efforts. If the Road Administration wants to document effects of information, for example in order to know how much weight should be put upon information efforts as part of larger packages, one has to undertake controlled studies with systematic variation of the amount of information.

While the information activity of the Road Administration, appraised on the basis of the present six campaigns, seems systematic and well integrated in the rest of activities of the Road Administration, the evaluations seem more arbitrary. In that respect, there may be a need for developing an evaluation standard that describes

how data should be collected and analysed (a standard is elaborated in chapter 3 of the report).

Even if evaluations should preferably be done by independent institutions rather than by the Road Administration themselves, there may be a need for clarifying the purpose of evaluation to the Road Administration and also educate selected staff regarding why and how evaluation should be done. Executive officers in the Road Administration who would be responsible for delegating commissions of evaluation, need knowledge about evaluation in order to be able to appraise the qualities of the offers given to them and also the qualities of the reports that would bed delivered.

Finally, there is also a need for systematic studies of different information types and quantities and by this investigate how much information that would be needed in order to make a new law or regulation known or new technology accepted by the public.

4) Summary of cost-effectiveness and benefit-cost analyses

Study 4 attempts to estimate both cost-effectiveness and benefit-cost relationships regarding the six campaigns conducted by the Swedish Road Administration. These economic analyses are primarily based on the information given in the evaluation studies, but also on additional information from the Road Administration and some calculations done by the author.

In order to do benefit-cost and cost-effectiveness analyses, one needs, at the starting point, the same type of information as in the case of meta-analysis (and meta-regression), i.e., primarily scientifically based measurements of the effects of the campaign. In addition, complete cost figures for the campaign, including valuation of the time and the equipment that is used, are required (where values are based on opportunity cost approaches, e.g., applying wage rates or market prices). Valuation of environmental and traffic safety gains, which would be outcomes of the campaigns, must likewise be provided.

For all six campaigns it was estimated benefit-cost ratios. For the traffic safety campaigns it was also estimated cost-effectiveness ratios – a comparing overview based on estimated number of saved lives per million Euro (ca SEK 9,16 mill). Table S.4 presents the results from the economic analyses:

Table S.4. Rate of cost-effectiveness and benefit-cost ratios according to campaign and campaign type. Results from economic analyses.

Campaign type	Campaign	Rate of cost-effectiveness	Benefit-cost ratios
Safety	*Lite lugnare tempo (Speed cameras)*	0.386	3.14
	Alkolås i min bil! (Alcolock in my car)	0.211	6.13
	ISA – Intelligent Speed Adaptation (assumed 20% reduction in accidents)	0.059	0.29
	ISA – Intelligent Speed Adaptation (assumed 5% reduction in accidents)	0.015	0.07
	Säkereken (The safe oak)	-0.224	17.3
Other	*Sparsam körning – SPARK (Thrifty driving)*		0.22
	Zkona Zebrafolket (Protect the zebra people)		(negative)

Source: TØI report 727/2004

Comment: Regarding ”Alkolås i min bil” the cost per saved life is estimated to € 4,6 mill. Assuming 40 lived years as an average in one life saved, this will give approximately €116.000 per saved life year. This is less cost-effective than the studies reported in BASt (2003).

According to the table, only *Lite lugnare tempo* and *Alkolås i min bil* can be regarded as unambiguously effective, both pure economically and in terms of Vision Zero. Also *Säkereken* would be regarded as economically effective, but in this case there is no documentation of lives saved compared to the rest of Sweden. Regarding the other campaigns the estimated benefit-cost ratios are well below 1.

We have emphasised that the basic data from all six campaigns in fact are too incomplete or too unclear for performing economic analysis. In all of the analyses we have applied our own assumptions in order to come close to economic appraisals. We have also emphasised that the ISA-project potentially could be profitable if the costs of equipment per car could be somewhat reduced, and it is also probable that the project as a whole would be effective in terms of safety via reduced (top) speed and reduced levels of injury. Both of these effects are important for Vision Zero as well for the economic analysis.

It looks like SPARK clearly is defeated in terms of an economically appraised effectiveness. This project is relatively expensive, per participating driver, and the effectiveness per car, and the value of this effectiveness, is apparently very limited. It seems that the valuation of CO_2-reduction has to be increased considerably for such a project to yield benefits larger than costs. One should consider other approaches if one wants to inspire car owners to drive in a manner that reduces effluents and CO_2. In combination with a less expensive dissemination of such knowledge to drivers, increased fuel prices would probably provide the stronger incentive to push for a manner of driving implying less fuel consumption and, hence, less emission of CO_2.

Apparently *Zkona Zebra-folket* results in a net loss of time value, i.e., given the values we have applied. However, this project is probably the one which to the least extent is suitable for economic analysis, since the issue addressed actually concerns the transfer of rights from one road user group – drivers – to another road user group – pedestrians.