Awareness raising and campaigns – Driving under the influence

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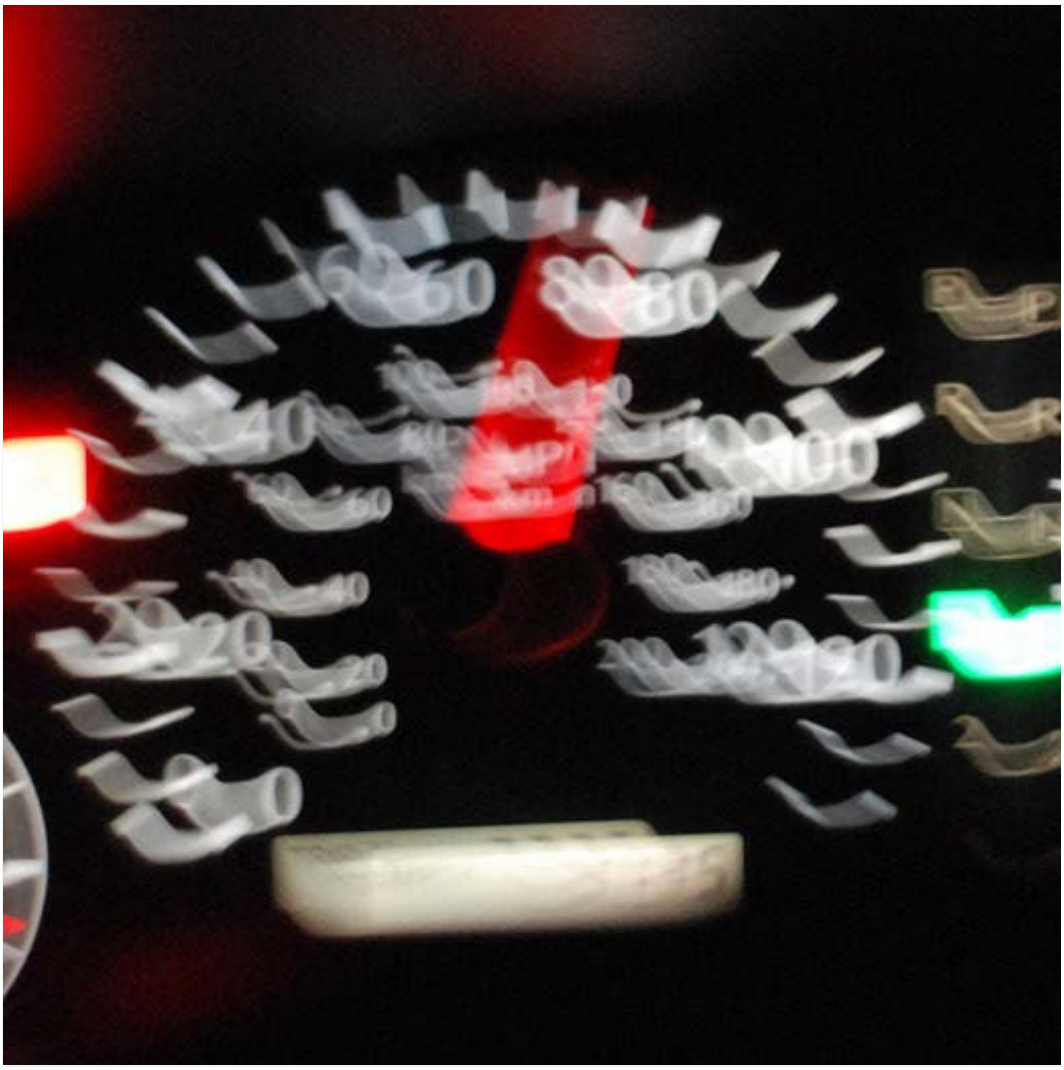

Please note: The studies included in this synopsis were selected from those identified by a systematic literature search of specific databases (see supporting document). The main criterion for inclusion of studies in this synopsis and the DSS was that each study provides a *quantitative effect estimate*, preferably on the number or severity of crashes or otherwise on road user behaviour that is known to be related to the occurrence or severity of a crash. Therefore, key studies providing qualitative information might not be included in this synopsis.

1 Summary

Eichhorn, A., Kaiser, S., June 2017

1.1 COLOUR CODE: LIGHT GREEN

There is some indication that drink-driving campaigns have a positive impact on attitudes towards drink-driving and even on the related accident occurrence. There is less evidence of the effectiveness of designated driver programmes.

1.2 KEY WORDS

Campaign, evaluation, impact, effectiveness, awareness raising, driving under the influence, drunk driving, drink-driving, impaired driving, drugged-driving, alcohol, designated driver, heroin, LSD, ketamine, cocaine, ecstasy, cannabis

1.3 ABSTRACT

The main purpose of DUI (Driving Under the Influence) campaigns is to raise awareness regarding impaired driving as well as to promote sober driving. Results provide some indication that drink-driving campaigns can have positive effects on road safety. One out of two meta-analyses showed an association with crash reduction. A further meta-analysis and other individual studies with indirect outcome measures showed mixed results. While self-reported drink-driving behaviour did not considerably change, attitudes towards drink-driving were favourably influenced to some extent. Designated driver programmes (assigning someone to not drink and drive and to bring others home safely) seem to have lower potential to prevent drink-driving. However, most of the coded individual studies focus on young drivers and to some extent on passengers aged up to 34 years. Thus, conclusions can only be drawn regarding this age group. Furthermore, it should be noted that some analysed DUI campaigns were accompanied by enforcement activities. Therefore, it is not clear to what extent the effects are attributable to the campaign itself.

1.4 BACKGROUND

This synopsis focuses on the effectiveness of campaigns addressing specifically driving under the influence. For more detailed information on campaigns and awareness raising in general, please also see the synopsis "Effectiveness of road safety campaigns".

How is 'campaign' as a road safety measure defined?

The EU project CAST[1] provides the following definition of campaigns in the field of road safety: "Road safety communication campaigns can be defined as purposeful attempts to inform, persuade, or motivate people in view of changing their beliefs and/or behaviour in order to improve road safety as a whole or in a specific, well-defined large audience, typically within a given time period by means of organised communication activities involving specific media channels often combined with interpersonal support and/or supportive actions such as enforcement, education, legislation, enhancing personal commitment, rewards, etc." (Elliott, 1993; Rice & Atkin, 1994; Vaa et al., 2008, as cited in Delhomme et al., 2009, p.16).

How do campaigns affect road safety?

[1] The EU-project CAST "Campaigns and Awareness-Raising Strategies in Traffic Safety" was carried out from 2006 to 2009 by 19 organisations from 15 European countries. This project identified essential parameters of campaigns effectiveness.

The effect of a campaign can be increased information, knowledge, raised awareness, changed attitude and changed behaviour to the extent that eventually the frequency of accidents is reduced. However, since accident occurrence is multicausal and highly influenced by chance, there is rarely a direct link from a campaign to accident reduction. Many campaigns are combined with enforcement and new legislation. It is difficult to attribute the effect to a single element of this combination. Campaigns can also be used to establish favourable preconditions in the public for new legislation.

Which factors influence the effect of a campaign on road safety and which are the modifying conditions?

Important factors for an effective campaign are clearly defined road safety problems and target groups, as well as a corresponding tailored message. Furthermore, it is necessary to use theoretical psychological models that explain the risk behaviour or safety problem (Delhomme et al., 2009). It is important to note that communication has to be based on the cultural codes used in the target community (national, regional, sub-groups etc.). Other influencing factors are the duration and intensity of a campaign. Other situational factors such as simultaneous competing events (e.g. tragic accident reported in media) can also have an impact on the campaign effects.

How is the effect of campaigns on DUI measured?

The following measures are used to assess the effectiveness of DUI-campaigns:

- Self-reported and intended behaviour
- Attitudes, opinions, perceived norm, knowledge, behavioural beliefs
- Accident occurrence

The vast majority of studies in this field apply a before-after design to measure the campaign effect. Accident statistics are seldom the means of evaluation because behaviour of road users is multicausal.

1.5 OVERVIEW OF RESULTS

Four meta-analyses on the effectiveness of drink-driving campaigns have been considered (Yadav & Kobayashi, 2015; Phillips et al., 2009 and 2011; Ditter et al., 2005). They show mixed results regarding the effects on road safety. Phillips et al. (2011) found a significant accident reduction due to drink-driving campaigns. Yadav & Kobayashi (2015) on the other hand reported non-significant effects on accident reduction. A meta-analysis on alternative outcome measures (other than crashes, but safety performance indicators such as risk behaviour, attitudes etc.) did not indicate a significant improvement of observed and self-reported drink-driving behaviour (Phillips et al., 2009). As regards designated driver programmes, Ditter et al. (2005) indicated insufficient evidence to determine their effectiveness.

With reference to drugged driving only one study was eligible for coding, which reports a significant positive change in the attitude that cannabis has a severe impact on driving. No such change could be found for all other surveyed drug types (Angle et al., 2009).

Nathanail and Adamos (2009) and Linkenbach (2005) analysed driver's self-reported drink-driving behaviour after DUI campaigns. None of the reported effects indicate a significant positive change. Concerning perceived impairment due to drink-driving, three studies indicate a (partly significant) improvement of young males' attitudes towards DUI. Another study, however, did not find a change in that respect (Nathanail & Adamos, 2009).

Evaluation studies of designated driver programmes show a (partly significant) increase in using a designated driver (Watson & Nielson, 2008; Linkenbach, 2005). However, acting as designated driver (committing to not drink and drive and to bring others home safely) did not significantly change (Watson & Nielson, 2008).

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In applying a regression model considering compulsory breath tests (before and after campaign) and a measure of retained awareness of a television advertising campaign Tay (1999) pointed out that the evaluated campaign is associated with a significant drop in drink-driving behaviour.
However, all analysed studies had at least minor limitations. Some of the evaluated campaigns were accompanied by enforcement activities, lacked details of reported significance testing or measured only short-term campaign effects.

2 Scientific details

2.1 THEORETICAL BACKGROUND

Aim and methods of awareness raising measures and campaigns

The main purpose of awareness raising measures and communication campaigns is to encourage road users to engage in safe behaviour in traffic. With respect to DUI campaigns, the primary aim is favourable attitudes against drink-driving and to restrain from impaired driving. The underlying concept of campaigns in road safety is social marketing which aims at influencing and changing social behaviours.

When developing a campaign, it is crucial to conduct a detailed analysis of the **road safety problem** and the **target group**. Furthermore, psychological theoretical models are very helpful in the development of the campaign message to increase the effectiveness (Robertson & Pashley, 2015). A description of these models – such as the Theory of Planned Behaviour (TPB) – can be found in Theofilatos et al. (2017).

Besides developing the message, the **campaign strategy** has to be defined. Campaigns may use an information approach or emotive, especially using fear to draw the attention of the target audience to the message. However, there are still controversial discussions regarding the effectiveness of fear-based messages (see e.g. Castillo-Manzano et al., 2012). Whether or not a message has reached the target group, is also a question of group characteristics and local culture.

To evaluate whether or not the message of the campaign can influence the behaviour of the target group as intended, a **pre-test of message** and slogan should be conducted (Delhomme et al., 2009; Hoekstra & Wegman, 2011).

For road safety campaigns the following **type of media** is generally used: television, radio, newspaper/magazines, cinema, web/online, social media, billboards, flyers/leaflets/posters, message signs and events involving face to face communication. An overview of advantages and disadvantages of different types of media for road safety campaigns can be found in Delhomme et al. (2009).

Campaign effects and influencing factors

Awareness raising activities and campaigns can positively influence a number of road safety relevant constructs, such as favourable attitudes, knowledge and perceptions as well as safe behaviour and therefore also accident rates. However, there are various factors to be considered to maximise impact. According to Phillips et al. (2011) the following factors of campaigns are associated with accident reduction:

- Personal communication
- Road side delivery (billboards, message signs)
- Drink-driving theme
- Combination with enforcement
- Short campaign duration (0-29 days)

Limitations of campaigns and challenges of evaluation

In the past, evaluations of campaigns were rarely carried out for various reasons. For one, there is sometimes a lack of awareness of the benefit of evaluating, or there may be budget and time constraints. Uncertainties in terms of methodological application are also a barrier.

As previously described, the effectiveness of road safety campaigns can be measured by various means. The most important **outcome measure** is a reduction in crashes. It is difficult though, to link an accident reduction to a campaign while controlling for all other possible contributing factors. The defined outcome measures to account for campaign effects are therefore often 'indirect', like intended behaviour or attitudes etc. Even though there is evidence concerning the influence of these

constructs on actual behaviour, there are always other additional determining factors (e.g. situational factors) that cannot be accounted for.
A before-after-design ideally includes a **meaningful reference group** to control for confounding factors (e.g. a similar geographical region without exposure to the contents of the campaign), which is however rarely the case.
Next to a lack of (systematical and valid) evaluation of effects, campaigns are often **combined or conducted simultaneously** with enforcement measures and implementation of new legislation. If an effect (improvement) is measured then, it remains unclear to which of the single components it is attributable, and to what extent.

2.2 CODED STUDIES

The literature search was carried out in three databases (Scopus, TRID and a KFV-internal literature database) with separate search strategies (for a detailed description see "Supporting documents"). Additionally, a free web-based search was conducted via Google.
Below first information on the characteristics of coded studies is given and subsequently the main research methods used for campaigns and awareness raising measures against driving under the influence is provided.

Description of coded studies

A more detailed description of the campaigns and the corresponding design of evaluation can be found in the supporting documents (3.2).

Description of the main research methods

In order to evaluate the effectiveness of DUI campaigns mainly before-after designs are used. Evaluations of DUI campaigns are rarely linked to accidents and focus mainly on outcomes of questionnaires and interviews using self-reported behaviour, attitudes, beliefs and opinions as measures of effectiveness. For the majority of the evaluation studies, it is not clear from the publication whether or not a theoretical psychological model was the basis for designing the respective campaigns.
The studies vary in whether significance tests are applied/reported or not. A control group is missing in most of the studies. Four meta-analyses calculated (weighted) average effects.

2.3 OVERVIEW OF RESULTS

The following table provides information on the main outcomes of coded studies on DUI campaigns and awareness raising.

Table 1: Summary of coded study results regarding DUI awareness raising and campaigns (sorted by author(s), meta-analyses first)

Author(s), year, country	Exposure variable	Dependant / outcome type	Effects on road safety		Main outcome - description
Ditter et al., 2005, Australia/ USA	Designated driver programmes	Self-reported behaviour (acting as designated driver)	/	Mean change = 0.9 (interquartile range: 0.3 - 3.2)	The programmes showed a mean increase of 0.9 designated drivers per night.
Phillips et al., 2009, international	Road safety campaigns on DUI	Observed and self-reported drink-driving	–	Percent change = -0.17 CL: 95%, CI: -0.46 - 0.28	Road safety campaigns on DUI are linked to a non-significant 17% decrease of drink-driving behaviour.
Phillips et.al, 2011, international	Road safety campaigns on DUI	Crashes	↗	Percent accident reduction = 0.18 CL: 95%, CI: 0.23-0.12	Road safety campaigns on DUI are linked to an 18% accident reduction.

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Author(s), year, country	Exposure variable	Dependant / outcome type	Effects on road safety		Main outcome - description
Yadav & Kobayashi, 2015, USA/Australia	Mass media campaigns for reducing DUI	Crashes	–	OR = 1	Summary effects show no evidence of media campaigns reducing the risk of alcohol-related injuries or fatalities.
Angle et al., 2009, UK	Drug-driving campaign "Eyes"	Attitude, impact of heroin on driving	–	Percent change = 0	No significant change in attitude that heroin has a severe impact on driving task
		Attitude, impact of LSD on driving	–	Percent change = -0.02	No significant change in attitude that LSD has a severe impact on driving task
		Attitude, impact of ketamine on driving	–	Percent change = 0	No significant change in attitude that ketamine has a severe impact on driving task
		Attitude, impact of cocaine on driving	–	Percent change = 0.01	No significant change in attitude that cocaine has a severe impact on driving task.
		Attitude, impact of ecstasy on driving	↘	Percent change = -0.05	Significant negative change in attitude (-5%) that ecstasy has a severe impact on driving task
		Attitude, impact of cannabis on driving	↗	Percent change = 0.06	Significant positive change in attitude (6%) that cannabis has a severe impact on driving task
Angle et al., 2012, UK	Drink-driving campaign "Personal Consequences"	Attitude, safe to drive after 1 drink	/	Percent change = 0.02	Increase in attitude (not safe to drive after one drink) by 2% for young males
		Attitude, safe to drive after 2 drinks	–	Percent change = 0	No change in attitude (not safe to drive after two drinks) for young males
		Unacceptability, driving after 2 pints	/	Percent change = 0.11	Increase in unacceptability (driving after two pints) by 11% for young males
Krol, 2009, Poland	"Drunk? Don't drive" media campaign combined with enforcement activities	Opinion, alcohol impairs ability to drive safely (definitely agree)	↗	Percent change = 0.08	Significant increase in opinion that alcohol impairs ability to drive safely by 8% among young drivers
		Opinion, one can drive safely only with no alcohol at all (definitely agree)	↗	Percent change = 0.11	Significant increase in opinion that one can only drive safely with no alcohol at all by 11% among young drivers
Linderholm, 2000, Sweden	TV-programme	Attitude towards drink-driving	/	Percent change = 0.06	The TV programme showed a 6% increase of young drivers thinking negatively about drink-driving (not tested for significance).
Linkenbach, 2005, USA	Road safety campaign on DUI	Perceived norm of peers drink-driving	/	Percent change = -0.05	5.1% decrease in believing that the average peer drove after drinking during the previous month (no test for significance reported; but significant difference compared to control group: 7.5%)
		Self-reported drink-driving behaviour (after two or more	/	Percent change = -0.02	2% decrease in self-reported drink-driving behaviour (no test for significance reported; but significant difference compared to control group: 13.7%)

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Author(s), year, country	Exposure variable	Dependant / outcome type	Effects on road safety		Main outcome - description
		drinks within the hour)			
		Self-reported behaviour (driving with a designated driver)	/	Percent change = 0.047	4.7% increase in self-reported behaviour to drive with a designated driver (no test for significance reported; but significant difference compared to control group: 15%)
Nathanail & Adamos, 2009, Greece	Road safety campaign on DUI	Behavioural beliefs	–	Absolute difference (t-test, CL: 95%)	Campaign showed a not significant change in belief regarding the ability to drive safely when drunk
		Behavioural beliefs	–	Absolute difference (t-test, CL: 95%)	Campaign showed a non-significant change in belief regarding being involved in accident when drink driving
		Normative beliefs	–	Absolute difference (t-test, CL: 95%)	Campaign showed a non-significant change in belief that passengers can persuade oneself not to drive when drunk
		Behavioural intention	–	Absolute difference (t-test, CL: 95%)	Campaign showed a non-significant change in likelihood to drive having drunk at least one glass of wine
		Self-reported behaviour	–	Absolute difference (t-test, CL: 95%)	Campaign showed a non-significant change in preference to not drive when drunk
		Behavioural intention	–	Absolute difference (t-test, CL: 95%)	Campaign showed a non-significant change in the likelihood of preventing the driver from drink-driving
		Behavioural intention	↗	Absolute difference (t-test, CL: 95%)	Campaign showed a significant change in likelihood to prevent the driver from drinking even a glass of alcohol
Tay, 1999, New Zealand	Road safety campaign on DUI	Retained campaign awareness (Adstock)	↗	Slope: R^2=0.63	All estimated coefficients of Adstock are statistically significant, indicating that the campaign has changed the structural relationship between advertising and drink-driving behaviour.
Watson & Nielson, 2008, Australia	Designated driver programme	Self-reported behaviour (acting as a designated driver)	–	Percent change = 0.04	The programme showed a non-significant increase by 4% in the proportion of participants who acted as a designated driver in the past 3 months.
		Self-reported behaviour (driving with a designated driver)	↗	Percent change = 0.15	The programme showed a significant increase by 15% in the proportion of participants who drove with a designated driver in the past 3 months.

* Effects on road safety are coded as: significant positive (↗), significant negative (↘), non-significant (–) or no test for significance reported (/)

Meta-analyses results

Yadav & Kobayashi (2015) carried out a meta-analysis with focus on drink-driving media campaigns, while Phillips et al. (2009, 2011) analysed the overall effect of road safety campaigns – with additional effect calculations of various campaign themes, including drink-driving.
Results are mixed regarding the effects on road safety. The most recent meta-analysis of Yadav & Kobayashi reported no significant effects on accident reduction. However, the authors indicate very heterogeneous approaches of the single studies, so results have to be considered carefully. Also Phillips et al. (2009) conclude that the analysed campaigns on DUI do not lead to a significant improvement of observed and self-reported drink-driving behaviour (impact on accident level not considered).

Phillips et al. (2011) on the other hand found a significant accident reduction due to drink-driving campaigns. All meta-analyses calculated effects of campaigns with and without enforcement components. Only Phillips et al. (2011) reported results adjusted for accompanied enforcement measures, however, not on the DUI-level. Considering different campaign themes it turned out that especially drink-driving campaigns can be associated with accident reduction (see also synopsis "Effectiveness of Road Safety Campaigns").
With regard to designated driver programmes Ditter et al. (2005) indicated an increase of the mean number of designated drivers per night. However, due to the small effect sizes observed there is insufficient evidence to determine the effectiveness of incentive programmes to promote designated driver use.

Additional studies on DUI campaigns

Additionally considered studies were quite different regarding the exposure variable(s) (different aims and resources of campaigns) and outcome variables. Furthermore, all studies had at least minor limitations and some lacked reported significance testing, so it was not feasible to give a summarised analysis in terms of meta-analysis or vote-count analysis.
Table **1** shows an overview of the main results of these studies.

Only one study could be found with respect to the effectiveness of **drugged-driving** campaigns. Angle et al. (2009) report a significant positive change in the attitude that cannabis has a severe impact on driving after the "Eyes" campaign. In contrast, a significant negative change was found regarding the attitude that ecstasy has a severe impact on driving. No change was found for heroin, LSD, ketamine and cocaine. Despite the fact that the study only assessed changes in attitudes, the reported facts do not show a clear trend and therefore, no conclusion can be drawn.

Nathanail & Adamos (2009) and Linkenbach (2005) analysed drivers' **self-reported drink-driving** behaviour after a DUI campaign. The latter found a small decrease of 2% (driving after two or more drinks within the hour), however, did not indicate whether this change is significant or not. The other study reported a non-significant change in the "preference to not drive when drunk" as well as a non-significant change regarding the likelihood to drive having drunk at least one glass of wine. Still, due to a small sample size, results have to be interpreted with caution.

Concerning the **perceived impairment** due to drink-driving Krol (2009) indicated a significant increase of 8% among young drivers and an 11% increase in thinking that one can only drive safely with no alcohol at all ("Drunk? Don't drive" media campaign). Also Angle et al. (2012) and Linderholm (2000) report an increase of young males (11% and 6%, respectively), who think negatively about drink-driving. However, no information concerning significance is provided. Nathanail & Adamos (2009) on the other hand found no difference in **beliefs** regarding either the ability to drive safely or being involved in an accident when drunk after a Greek DUI campaign.

Some of the coded studies evaluated **designated driver programmes**. Only Watson & Nielson (2008) found a significant increase in participants who drove with a designated driver after the Australian "Skipper" campaign. However, acting as designated driver did not significantly change. Linkenbach (2005) also reports an increase in passengers driving with a designated driver (no significance test reported).

In order to examine the relationship on advertising exposure (DUI campaign, New Zealand) and drink-driving behaviour Tay (1999) used regression models including the following two variables: compulsory breath tests (before and after campaign), advertising stock (measures the retained awareness of advertising). Different models show that the estimated coefficients for the Adstock variables are statistically significant and negative. Results of the **log-linear model** indicate that the television advertising campaign is associated with a significant drop in drink-driving behaviour

during the period analysed, after adjusting for changes in compulsory breath tests and seasonal trends.

Modifying conditions

Most of the coded individual studies focus on young drivers and to some extent on passengers aged up to 34 years. Thus, conclusions can only be drawn regarding this age group.
Phillips et al. (2011) carried out a meta-regression (model of predictor variables) based on 119 individual campaign effects to identify the relative importance of factors influencing the effectiveness of road safety campaigns. They identified the following factors of campaigns to be associated with accident reduction:

- Personal communication
- Road side delivery (billboards, message signs)
- Combination with enforcement
- Short campaign duration (0-29 days)

Phillips et al. (2009) outlined conclusions on a meta-regression by Vaa et al. (2004). They considered various outcome variables, not only accident reduction (e.g. self-reported behaviour or attitudes) and found the same factors to be beneficially influencing campaign outcomes.

2.4 CONCLUSION

General

The focus of this synopsis is on drink-driving campaigns, as only one study on a drug-driving campaign was identified and thus no general conclusions can be drawn.

Main results

Results provide some indications that drink-driving campaigns can have positive effects on road safety. One out of two meta-analyses showed an association with crash reduction. A further meta-analysis and other individual studies with indirect outcome measure (observed and self-reported behaviour) showed mixed results, as well. While self-reported drink-driving behaviour did not considerably change, attitudes towards drink-driving were favourably influenced to some extent.
The evaluation studies of designated driver programmes show a (partly significant) increase in using a designated driver. However, acting as designated driver did not significantly change.
Furthermore, one study indicated a significant drop in drink-driving behaviour after a television advertising campaign (number of positive compulsory breath tests).

Biases and transferability

All studies had at least minor limitations. It is difficult to link changes in accidents solely to a campaign. The defined outcome measures to account for campaign effects are therefore often 'indirect' like intended behaviour or attitudes. Even though there is evidence concerning the influence of these constructs on actual behaviour, there are also always other determining factors that cannot be accounted for. Furthermore, often self-reported data is used to assess effectiveness, which may introduce biases such as social desirability.
Another limitation is that some evaluated campaigns were accompanied by enforcement activities or other road safety measure. In that case, it is not clear to what extent the effects are attributable to the single measures. Also, all individual campaigns (exposure) were heterogeneous regarding design (exact target group, period, media etc.).
Moreover, many studies did not indicate whether significance was tested. Long term effects are available for only a few studies. Therefore, sustainable changes in behaviour due to campaigns remain unclear. Finally, to control for confounding factors ideally a meaningful reference group is included, which is rarely done.

3 Supporting documents

3.1 LITERATURE SEARCH STRATEGY

The literature search was conducted in December 2016. It was carried out in three databases and a complementary free internet search. The queried databases were

- Scopus: a large abstract and citation database of peer-reviewed literature
- TRID: a large online bibliographic database of transportation research
- DOK-DAT: a KFV-internal literature database.

Database: Scopus **Date:** 16th of December 2016

limitations: published: 2006 to present

Search No.	Search terms, logical operators, combined queries	Hits
#1	"Campaign" OR "awareness" OR "public information"	248,963
#2	"DUI" OR "driving under influence" OR "alcohol" OR "drunk driving" OR "drink driving" OR "drugged driving" OR "drugs" OR "medic*" OR "alcohol-impaired driving" OR "drug-impaired driving"	4,684,113
#3	"road safety" OR "traffic safety"	12,033
#4	#1 AND #2 AND #3	131
#5	Limit to Europe, Russia, USA, Canada, Australia and New Zealand	**80**

Table 2: Used search terms, logical operators, and combined queries of literature search (Scopus).

Detailed search terms as well as their linkage with logical operators and combined queries are shown in Table 2. Using search fields title, abstract and keywords (TITLE-ABS-KEY), and a general limitation to studies which were published from 2006 to current, led to 131 studies.
In a further reduction step, results were limited to European countries, as well as Russia, USA, Canada, Australia and New Zealand. This led to a final sample of 80 studies of literature search in the database Scopus (Table 2).

Database: DOK-DAT **Date:** 7th of December 2016

Search no.	Search terms, operators, combined queries	Hits
#1	"Werbung" (advertisement) AND "Sicherheit" (safety)	467
#2 (within #1)	"Wirksamkeit*" (effectiveness) OR "Evalu*" (evaluation) OR "Bewertung*" (assessment)	278

Table 3: Used search terms, logical operators, and combined queries of literature search (DOK-DAT).

German search fields 'Titel', 'ITRD Schlagworte' and 'freie Schlagworte' were used. Hits were only limited to the years 1990 to 2016 and got 278 more potential studies (Table 3).

Database: TRID database **Date:** 20th of December 2016

Search no.	Search terms / operators / combined queries	Hits
#1	"safety" AND "campaign" AND "evaluation"	240

Table 4: Used search terms, logical operators, and combined queries of literature search (TRID).

Search terms were "safety", "campaigns" and "evaluation". Hits were limited to the years 2000 to 2016 and got 240 potential studies (Table 4).

The literature search strategy, querying three databases, did not result in a sufficient number of evaluated awareness raising measures. Based on the expertise of the consortium, it became evident that some evaluation studies are not published in scientific journals (grey literature, conference papers etc.). Therefore, it was decided to complement the results with a non-standardised, free search with the internet search engine Google. In a first step, relevant road safety campaigns were identified. In a second step, the aim was to find according evaluation papers of these campaigns. The following search terms were used in different combinations: campaign, evaluation, effectiveness, awareness raising, driving under the influence, drunk driving, drink-driving, drug-driving and medication and led to 38 further studies for screening.

Results literature search

Database	Hits
Scopus (remaining papers after several limitations/exclusions)	80
DOK-DAT	278
TRID database	240
Free literature search (Google)	38
Total number of studies to screen title/ abstract	**636**

Table 5: Results of databases and free search after limitations

In all, literature search led to 636 potential titles/abstracts for screening.

Screening

Total number of studies to screen title/ abstract	**636**
Exclusion criteria: no campaign/evaluation or topic not or not sufficiently covered or duplicates	597
Studies to obtain full-texts	**39**

Table 6: Screening of abstracts

After screening the titles and abstracts 39 studies remained for screening the full-text.

Total number of studies to screen full-text	**39**
Full-text could be obtained	26
Reference list examined Y/N	Partly
Eligible papers	**26**

Table 7: Papers obtained for full-text screening

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Screening of the full texts

Total number of studies to screen full paper	26
Studies covered by another topic	3
Reported effect already covered in other considered study	3
Studies excluded because no evaluation or quantitative effects reported	3
Studies covered by meta-analysis	3
Not relevant	5
Remaining studies	**9**
DUI effects coded within "campaigns general" (meta-analysis)	2

Table 8: Screening of full-texts

Studies are presented in the following table sorted by authors' name, meta-analyses are mentioned first.

No.	Publication	Coded Y/N	Reason
1.	Yadav, R.-P. & Kobayashi, M. (2015). A systematic review: effectiveness of mass media campaigns for reducing alcohol-impaired driving and alcohol-related crashes. BMC Public Health, 15:857. DOI 10.1186/s12889-015-2088-4.	Y	
2.	Adam, D. (1994). AADAC bowls over teens with new ad campaign. Injury Prevention News, 7(3), 10-11.	N	No quantitative effects reported
3.	Angle, H., Bone, S., Goddard, E. & Johns, E. (2009). THINK! Road Safety Campaign Evaluation Post evaluation of the 'Eyes' THINK! Drug Drive campaign Report. BMRB/HA/SB/45108903	Y	
4.	Angle, H., Pinkney, S., Johns, E. & Cass, G. (2009). THINK! Road Safety Campaign Evaluation. Post evaluation of the 'Personal Consequences' Drink Drive campaign. TNS-BMRB Report.	Y	
5.	Bartl, G., Urbanek, K., Chaloupka-Risser, C., Gfrerer, W., Ortner, W., Schrader, C., Schützhofer, B., Strauss, B. & Stobl, C. (2010). Österreichische Alkolenker-Studie 2010. Wien: Institut alles-führerschein.at, November 2010, 48.	N	Not relevant
6.	Beck, K.H. (2009). Lessons learned from evaluating Maryland's anti-drunk driving campaign: assessing the evidence for cognitive, behavioral, and public health impact. Health Promot Pract., 10, 370–377.	N	Study covered by meta-analysis Yadav (2015)
7.	Boots, K., Midford, R. (1999). "Pick-a-Skipper": an evaluation of a designated driver program to prevent alcohol-related injury in a regional Australian city. Health Promotion International, 14(4), 337-345.	N	Study in other measures category
8.	Delaney, A., Lough, B., Whelan, M. & Cameron, M. (2004). A Review of Mass Media Campaigns in Road Safety. Report No.	N	Studies to be considered in campaigns general

	220, Monash University Accident Research Centre, ISBN: 0 7326 1730 8.		
9.	Elder R.W., Shults, R.A., Sleet, D.A., Nichols, J.L., Thompson, R.S. & Rajab, W. (2004). Effectiveness of Mass Media Campaigns for Reducing Drinking and Driving and Alcohol-Involved Crashes: A Systematic Review. American Journal of Preventive Medicine, 27(1), 57-65.	N	Study covered by meta-analysis Yadav (2015)
10.	Elliot, B. (1993) Road safety mass media campaigns: a meta-analysis. Canberra: Federal Office of Road Safety (report CR 118)	N	Study covered by meta-analysis Yadav (2015)
11.	Guria, J. (1999). An economic evaluation of incremental resources to road safety programmes in New Zealand., Accident Analysis & Prevention, 31(1) 91-99.	N	Study in other measures category
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13.	Van Lamoen, N. (2014). Evaluation of the "Safer Summer" road safety campaign. Final Report. Road Policing Support, Police National Headquarters, New Zealand.	N	Study in other measures category
14.	Linderholm, I. B. (2000). Drink and drive. Can media campaigns solve the problem? Paper presented at the proceedings of 2000 15th Conference On Alcohol, Drugs and Traffic Safety, Stockholm, Sweden.	Y	
15.	Linkenbach, J. & Perkins, H. W. (2005). Montana's MOST of Us Don't Drink and Drive Campaign. Social Norms Strategy to Reduce Impaired Driving Among 21-to-34-Years-Olds. Final Report. DOT HS 809 869, Montana State University.	Y	
16.	Macpherson, T. & Lewis, T. (1998). New Zealand Drink-driving Statistics: The Effectiveness of Road Safety Television Advertising. Marketing Bulletin, 9, 40-51.	N	Reported effect already covered in Tay (1999)
17.	Nathanail, T. & Adamos, G. (2009). Evaluation of the Greek drink driving campaign. In S. Forward & A. Kazemi (Ed.), A theoretical approach to assess road safety campaigns. Evidence from seven European countries. Belgian Road Safety Institute, 2009.	Y	
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21.	Tay, R. (2001). Methodological issues in evaluation models: The New Zealand road safety advertising campaign revisited. Road & Transport Research 10(2), 29ff.	N	Reported effect already covered in Tay (1999)
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24.	Whittam, K., Dwyer, W. & Simpson, P. (2006). Effectiveness of a media campaign to reduce traffic crashes involving young drivers. Journal of Applied Social Psychology, 36, 614–628.	N	Studies to be considered in campaigns aggressive behaviour
25.	U.S. Department of Transportation (2007). Evaluation of the National Impaired Driving High-Visibility Enforcement. Report No. DOT HS 810 789.	N	No quantitative effects reported
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3.2 DESCRIPTION OF CODED STUDIES

Table 9 provides a description of the background characteristics of the coded studies that deal with campaigns and awareness raising on Driving Under the Influence (DUI).

Table 9: Information on sample and design of coded studies (sorted by author(s), meta-analyses first)

Author(s), year, country	Measure description	Evaluation design	Research conditions
Ditter et al., 2005, Australia/USA	Designated driver programmes with incentives in 2 countries (before 2003)	Meta-analysis of 7 studies	Change in average number of designated drivers
Phillips et.al, 2009, international	Road safety campaigns on DUI partly combined with enforcement activities in 14 countries	Meta-analysis of 19 studies	A weighted average was calculated from 105 effects.
Phillips et.al, 2011, international	Road safety campaigns on DUI partly combined with enforcement activities in 12 countries (1975-2007)	Meta-analysis of 27 studies	A weighted average was calculated.
Yadav & Kobayashi, 2015, USA/Australia	Mass media campaigns on reducing alcohol impaired driving and alcohol-related crashes, with or without enforcement efforts in the USA and Australia (2002-2013)	Meta-analysis of 7 studies	A pooled summary effect was calculated from studies containing alcohol-related injuries and fatalities.
Angle et al., 2009, UK	THINK "Eyes" publicity campaign (TV, online, radio DJs and posters) focused on 17-34 year old drivers to reduce drug-driving (2009)	Before-after interviews: Before=July 2009 After=September 2009	In-home interviews, used Computer Assisted Personal Interviews (n=1,991)
Angle et al., 2012, UK	THINK "Personal Consequences" publicity campaign with a special focus on young drivers (17/18-29 years) to reduce drink-driving (2012)	Before-after interviews: Before=July 2007 After=January 2012	In-home interviews, used Computer Assisted Personal Interviews n=2,031
Krol, 2009, Poland	Mass media "Drunk? Don't drive" campaign (TV spot local/national, poster advertising) combined with enforcement activities on drink-driving with a focus on young drivers – 20-30 years (2008)	Before-after questionnaire: Before=March 2008 After=2 weeks after campaign	Random sample of n=800 regular drivers
Linderholm, 2000, Sweden	TV programme in 3 parts (aired in December 1998) that focused on young people aged 16-25 to raise awareness of drink-driving	Before-after questionnaire: Before=November 1998 After=February 1999	Random sample of n=2,000 drivers
Linkenbach, 2005, USA	"MOST of us Don't drink and drive" campaign (TV, radio, newspaper, billboard, movie slide-advertisements) with focus on young drivers and passengers aged 21-34 to reduce drink-	Before-after interviews (CATI) with non-exposed reference area: Before=November 2001 After=June 2003	Random sample of n before=1,000 n after=517

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Author(s), year, country	Measure description	Evaluation design	Research conditions
	driving (2002-2003)		
Nathanail & Adamos, 2009, Greece	Drink-driving campaign (brochures, posters, workshop) with focus on young drivers and passengers aged 18-30 (2008)	Before-after face to face interview: Before=2 weeks before campaign After=3 months after campaign	n before (test group)=66 n after (test group)=52
Tay, 1999, New Zealand	Drink-driving campaign (advertising) targeting drivers – combined with enforcement activities (October 1995)	Log-linear model (considering number of positive evidential breath tests, number of compulsory breath tests and advertising stock)	
Watson & Nielson, 2008, Australia	"Skipper", designated driver programme (supported by media and incentives) targeting drivers and passengers (July 2007)	Before-after questionnaire Before=3 weeks before programme After=4 months after implementation	n before=405 n after=410

3.3 REFERENCES

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