

The GOOD Life

A social norms intervention to reduce alcohol use and its harmful consequences among Danish adolescents

PhD thesis

Lotte Vallentin-Holbech

Unit for Health Promotion Research

Faculty of Health Sciences

University of Southern Denmark

2018

To be presented with permission of the Faculty of Health Sciences,
University of Southern Denmark for public examination on May 2nd 2018, room 113,
University of Southern Denmark, Niels Bohrs Vej 9-10, 6700 Esbjerg, Denmark

Correspondence

Lotte Vallentin-Holbech, MScPH

Unit for Health Promotion Research, University of Southern Denmark

Email: lvholbech@health.sdu.dk

Supervisor

Associate Professor Christiane Stock, PhD

Unit for Health Promotion Research, University of Southern Denmark

Assessment committee

Associate Professor Jan Toftegaard Støckel, PhD (Chairman)

Department of Sports Science Clinical Biomechanics, University of Southern Denmark

Associate Professor Diana Stark Ekman, MPH, MD

School of Health and Education, University of Skövde, Sweden

Associate Professor Lars Holmberg, PhD

Faculty of Law Research Centres, University of Copenhagen, Denmark

Submitted: October 31st 2017

Published: University of Southern Denmark Press, 2018

Publication of the Unit for Health Promotion Research, Series A; No. 13. 2018

ISBN: 978-87-91245-28-2

Electronic version (without original papers 1-3) available at: www.sdu.dk/healthpromotion

Cover illustration: Sabine Pedersen, Graphic Designer

List of papers included in this thesis

- Paper 1 Vallentin-Holbech, L., Rasmussen, B. M., & Stock, C. (2017). Are perceptions of social norms regarding peer alcohol and other drug use associated with personal use in Danish adolescents? *Scand J Public Health*, 45(8), 757-764. doi:10.1177/1403494817724313
- Paper 2 Vallentin-Holbech, L., Rasmussen, B. M., & Stock, C. (2017). Effects of the social norms intervention *The GOOD Life* on norm perceptions, binge drinking and alcohol-related harms: a cluster-randomised controlled trial. *BMC Public Health*, Submitted 06 July 2017, In review
- Paper 3 Vallentin-Holbech, L., Rasmussen, B. M., & Stock, C. (2017). Do implementation parameters moderate the effectiveness of the social norms alcohol prevention programme *The GOOD Life*? *Health Education & Behavior*, Submitted 07. December 2017, In review

Acknowledgments

The work presented in this thesis was carried out between 2014 and 2017 at the Unit for Health Promotion Research, Department of Public Health, University of Southern Denmark. The project was funded by a donation from TrygFonden, Denmark and a one-year PhD scholarship from the Faculty of Health Sciences at the University of Southern Denmark.

This work could not have been done without the support, guidance, inspiration and critique of several people. I wish to sincerely thank my academic supervisor Christiane Stock for your endless support, your constructive comments on numerous drafts, for sharing your extensive scientific insight, and last but not least for giving me the opportunity of becoming a PhD student. Working with you has been a pleasure and a privilege. My sincere gratitude also goes to Birthe Marie Rasmussen for being a valuable member of our research team, for the numerous hours of academic discussions, for reading drafts and giving valuable feedback, and for all your support.

Special thanks to Sabina Pedersen and Mathias Botfeldt for designing and providing all the graphical material for the intervention to perfection! I wish to thank Mads Faurby and Kadra Hassan for your contribution to the fieldwork and for embracing all the ad hoc tasks. Furthermore, my gratitude goes to Gary and Grace from Social Sense and also to all pupils, teachers, and school principals who gave their time to be involved in this project. Without your participation, this study would not have come through.

My profound thanks go to all my colleagues at the Unit for Health Promotion Research for creating a joyful and inspiring working environment and for your ongoing encouragement. My gratitude also goes to all the juniors for providing the best company for sharing ups and downs and for all the good laughs. I would also like to express my sincere appreciation to my colleagues at Center for Maritime Health and Society for your cheerful attitude and willingness to assist in any matters.

Finally, I would like to express my thanks to my lovely friends and my family for supporting and encouraging me throughout the years, and in particular Peter for bearing with me and always listening.

Lotte Vallentin-Holbech
Aarhus, October 2017

List of figures

Figure I	The Theory of Planned Behaviour
Figure II	Programme theory of the Social Norms Approach to health promotion
Figure IIIa	Feedback session with PowerPoint presentation presenting tailored social norms messages used in <i>The GOOD Life</i> intervention
Figure IIIb	Posters displaying tailored social norms messages used in <i>The GOOD Life</i> intervention
Figure IIIc	Web application with quiz using tailored social norms messages used in <i>The GOOD Life</i> intervention
Figure IV	Study design
Figure V	Participant flow through the trial
Figure VI	Intervention effect for the total study population and for the subgroups: any lifetime alcohol use, lifetime binge drinking and pupils with motivation to drink more in the future

List of tables

Table I	Overview of aims, data and methods for paper 1-3
Table II	Outcome measures and corresponding questions with response options and coding used in the analyses
Table III	Percentage of pupils overestimating the lifetime AOD use among peers
Table IV	Effects of implementation parameters on overestimation of peer drinking, frequent binge drinking and alcohol-related harms
Table V	Baseline differences for the outcome measure alcohol-related harms between non-response group and response group
Table VI	Sensitivity analyses for intervention effect on binge drinking and alcohol-related harms at 3-months follow-up
Table VII	Sensitivity analyses regards the intervention effect for the sub-group of pupils motivated to drink more alcohol in the future
Table VIII	Characteristics of pupils reporting frequent binge drinking at baseline

Abbreviations

AODs	Alcohol and Other Drugs
Chi ²	Pearson's chi-square test.
CI	Confidence Interval
ESPAD	European School survey Project on Alcohol and other Drugs
FASIII	Family Affluence Scale III
HBSC	Health Behaviour in School-aged Children
NNT	Number Needed to Treat
OR	Odds Ratio
SD	Standard Deviation
SNA	Social Norms Approach
SNIFE	Social Norms Intervention to prevent Polydrug use
SOC	Sense Of Coherence
SRS	Student Response System
TPB	Theory of Planned Behaviour

Summary

Background: Alcohol is still a commonly used substance among adolescents and is known to be related to severe consequences such as missing class, getting into fights or damaging property. Also, research shows that young people tend to overestimate alcohol and other drug (AOD) use in their respective peer group. Such misperceptions are predictive of higher rates of personal AOD use. According to social norms theory challenging misperceptions about peers' alcohol behaviour would lessen the social pressure on individuals and in turn decrease consumption. Interventions based on social norms theory have shown promising results in reducing alcohol use among adolescents and are widely used for adolescents under 18 years. However, only a few interventions are evaluated in Europe with rigorous research methods and under controlled conditions. While some studies show effects, other studies failed to find significant preventive effects among young adolescents. A previous Danish trial concluded that misperceptions of peers' risk behaviour related to AOD use existed among pupils aged 11-12 years, but the study was inconclusive regarding the effect on alcohol consumption. Further, within the last decade, the age for initiating drinking in Denmark has increased, suggesting that norm perceptions among older adolescents may be more relevant to study.

Aim: The purpose of this PhD project was to develop and evaluate the effect of the school-based social norms intervention *The GOOD Life*, which aims to reduce potential misperceptions, binge drinking (5 or more drinks per one occasion) and alcohol-related harms among Danish pupils aged 13-17 years. Three papers were included in this thesis, and the specific objectives were to:

- * analyse the associations between personal use of alcohol and other drugs (AODs) among pupils in Denmark and their perceptions of descriptive and injunctive norms regarding the use of AODs (paper 1)
- * examine the effect of *The GOOD life* on pupils' perception of peer drinking, on binge drinking and on alcohol-related harms (paper 2)
- * investigate whether the level of exposure to the intervention components as well as retention of the social norms messages have an impact on the intervention effects of *The GOOD life* (paper 3)

Methods: To test the effectiveness of *The GOOD Life* 135 eligible lower secondary public schools in the Region of Southern Denmark were invited to be enrolled in a cluster-randomised controlled trial. Between February 2015 and August 2016 46 schools were randomly allocated to either intervention or control group. Pupils in grade 8 and 9 were invited to participate in the study, and written consents from parents were obtained. Data were collected via confidential online surveys before the intervention and three months after baseline. The intervention schools received the intervention after the first survey and the control schools after the second survey. *The GOOD life* intervention provided normative feedback tailored for each grade at participating schools (n=38). The messages were delivered to pupils through three social norms components representing different communication channels, namely face-to-face communication (normative feedback session), printed communication (posters) and interactive media (web application). Participating pupils (n=1355) accessed the questionnaire by self-registration on the survey website. The questionnaires measured pupils' lifetime and last 30 days AOD use and approval of use as well as the perceived frequency of AOD use and approval of use among peers of their own grade. The primary outcome measures were overestimation of lifetime binge drinking among peers, binge drinking and alcohol-related harms. Also, the baseline questionnaire covered demographic information on age, grade, sex and family affluence. In the 3-months follow-up survey, pupils in the intervention group (n=641) were asked about their satisfaction with and their recollection of the intervention. All associations with the primary outcomes were examined using multilevel logistic regression models with school-level included as random effect.

Results: The study found that 44% of pupils overestimated lifetime binge drinking among peers. Further, the results showed a significantly increased risk of personal alcohol use for pupils that overestimated their peers' alcohol use and for pupils that perceived peers to approve of alcohol use (paper 1). The effect evaluation (paper 2) revealed that pupils exposed to the intervention were less likely to overestimate lifetime binge drinking among peers compared to those in the control group (OR: 0.52, 95%CI: 0.33-0.83). They were also less likely to report alcohol-related harms (OR: 0.59, 95%CI: 0.37-0.93). No significant effect of the intervention was found for frequent binge drinking (4 or more times during the last 30 days) in the whole group. However, among a subgroup of pupils

(n=296) who, at baseline, expressed a motivation to drink more alcohol in the future, the analyses showed a preventive effect on frequent binge drinking (OR: 0.37; 95%CI: 0.15-0.95). The analyses regarding the different implementation parameters (paper 3) showed that higher levels of exposure to as well as better retention of the social norms messages enhanced the intervention effect for all three outcomes.

Conclusion: The thesis highlights that pupils' exaggerated perceptions regarding their peers' use and approval of alcohol use were related to personal experience with alcohol. The findings from the effect evaluation suggested that the social norms approach could be a suitable preventive strategy for alcohol prevention among Danish adolescents. In addition, we found that increased exposure and retention of the intervention enhanced the intervention effect. Furthermore, a promising approach would be to include various intervention components that support pupils' comprehension of the intervention.

Sammenfatning (Danish summary)

Baggrund: Sammenlignet med unge i andre europæiske lande, drikker danske unge stadig meget alkohol. Et stort eller vedvarende forbrug af alkohol kan få alvorlige konsekvenser som for eksempel, at udeblive fra skole eller at medvirke til vold og hærværk. Studier har vist, at unge ofte har overdrevne forestillinger om hvor meget og hvor ofte deres jævnaldrende drikker, hvilket kan medføre at de sætter deres eget forbrug op for bedre at passe ind i en gruppe-kultur som de tror, er normalen.

Forebyggelsesprogrammer baseret på teorier om social pejling har vist lovende resultater i forhold til at reducere unges alkoholforbrug. Disse interventioner anvender en tilgang kaldet "the Social Norms Approach" (SNA) der arbejder med at mindske misforståelser om socialt pres og derved reducere det personlige forbrug af alkohol. Både i Danmark og andre europæiske lande anvendes interventioner baseret på SNA i vid udstrækning til unge under 18 år. Det er dog stadig uklart om de har en reel forebyggende effekt og kun få er tilstrækkeligt evalueret ved hjælp af forskningsmetoder under kontrollerede forhold. Et tidligere dansk studie har demonstreret, at der blandt elever i alderen 11-12 år forekom overdrevne forestillinger om jævnaldrendes brug af tobak og alkohol. Forskerne fandt dog ingen signifikant reduktion i disse elevers alkoholforbrug. Yderligere, er der gennem de sidste årtier flere danske unge der har udskudt deres alkoholdebut, hvilket tyder på at det vil være relevant, at undersøge social pejling relateret til alkoholforbrug blandt ældre teenagere.

Formål: Dette ph.d.-projekts formål var, at udvikle samt evaluere effekten af interventionen *Det GODE Liv*. Interventionen henvender sig til danske elever i alderen 13-17 år og sigter på at reducere potentielt overdrevne forestillinger omkring andres alkoholforbrug, samt reducere 'binge drinking' (5 eller flere genstande ved en lejlighed) og alkoholrelaterede problemer. Denne afhandling indeholder tre artikler der har følgende målsætninger:

- * at analysere sammenhængen mellem danske elevers brug af alkohol og andre rusmidler, og deres opfattelse af sociale normer vedrørende alkohol og andre rusmidler (artikel 1)

- * at undersøge effekten af *Det GODE Liv* på elevernes 'binge drinking', konsekvenser relateret til alkohol samt på elevernes opfattelse af deres jævnaldrendes alkoholforbrug (artikel 2)
- * at undersøge om eksponeringsniveauet af intervention og det eleverne husker af budskaberne i *Det GODE Liv*, har indflydelse på interventionseffekten (artikel 3)

Metoder: I alt blev 135 skoler i Region Syddanmark inviteret til at deltage i et cluster-randomiseret kontrolleret forsøg. Mellem februar 2015 og august 2016 blev 46 skoler tilfældigt fordelt til enten intervention eller kontrolgruppe. Elever i 8. og 9. klasse blev inviteret og skriftligt samtykke blev indhentet fra forældrene. Data blev indsamlet gennem fortrolige elektroniske spørgeskemaer før interventionen og tre måneder efter første spørgeskema. Skolerne i interventionsgruppen modtog interventionen efter første spørgeskemaundersøgelse og skolerne i kontrolgruppen efter anden spørgeskemaundersøgelse. Interventionen *Det GODE Liv* leverede skræddersyede budskaber til 8. og 9. klasser på de deltagende skoler (N=38). Budskaberne blev præsenteret via tre forskellige kommunikations-værktøjer; en præsentation på skolen/klassen, plakater og en webapplikation. De deltagende elever (n=1355) fik adgang til spørgeskemaet gennem selvregistrering på den tilhørende hjemmeside. I spørgeskemaerne blev der spurgt ind til elevernes brug af og mening om alkohol og andre rusmidler samt hvad de troede deres skole- og klassekammerater gjorde og mente. De overordnede udfaldsmål var: overvurdering af jævnaldrendes 'binge drinking', 'binge drinking' og alkoholrelaterede problemer. Det første spørgeskema inkluderede også oplysninger om alder, klassetrin, køn samt familiens socioøkonomiske status. I andet spørgeskema (efter tre måneder) blev elever i interventionsgruppen (n=641) spurgt om hvad de kunne huske og hvor tilfredse de var med interventionen. Alle statistiske analyser blev udført ved hjælp af multilevel logistiske regressions modeller.

Resultater: Studiet viste at 44% af eleverne overvurderede hvor mange af deres jævnaldrende der nogensinde havde drukket mere end 5 genstande ved én lejlighed. Endvidere viste resultaterne en signifikant øget risiko for at eleverne selv drak alkohol hvis de overvurderede andres alkoholforbrug eller troede at jævnaldrende syntes at det var i orden at drikke (artikel 1). Effektevalueringen (artikel 2) viste, at eleverne i

interventionsgruppen var mindre tilbøjelige til at overvurdere 'binge drinking' blandt jævnaldrende end eleverne i kontrolgruppen (OR: 0.52, 95%CI: 0.33-0.83). Det var også mindre sandsynligt at elever i interventionsgruppen rapporterede alkoholrelaterede problemer (OR: 0.59, 95%CI: 0.37-0.93). Samlet set blev der ikke fundet signifikant effekt af interventionen for hyppig 'binge drinking' (4 eller flere gange i de sidste 30 dage), men blandt en mindre gruppe af elever (n=296) der i det første spørgeskema udtrykte motivation til at drikke mere alkohol i fremtiden, viste analyserne en forebyggende effekt på hyppig 'binge drinking' (OR: 0.37; 95%CI: 0.15-0.95). Analyserne vedrørende elevernes erindring af og tilfredshed med de forskellige elementer i intervention (artikel 3), viste at højere eksponering og bedre erindring af budskaberne i interventionen, forbedrede interventionseffekten for alle tre udfaldsmål.

Konklusion: Resultaterne i denne afhandling fremhæver, at elevernes overdrevne opfattelser vedrørende deres jævnaldrenes brug af og meninger om alkohol, er stærkt relateret til deres personlige erfaringer med alkohol. Resultaterne fra effekt evalueringen peger desuden på, at SNA kunne være en egnet strategi for alkoholforebyggende tiltag blandt danske unge. Derudover viste studiet, at en øget eksponering og genkaldelse af budskaberne forbedrede interventionseffekten. Fremadrettet vil en lovende tilgang være, at inkludere forskellige interventions-elementer der understøtter elevernes forståelse af social pejling.

Table of contents

List of papers included in this thesis	i
Acknowledgments.....	ii
List of figures.....	iii
List of tables.....	iii
Abbreviations.....	iv
Summary	v
Sammenfatning (Danish summary)	viii
1 Introduction.....	3
1.1 Alcohol consumption among adolescents	3
1.2 The influence of social norms on risky behaviour.....	4
1.3 Incorrect norm perceptions	5
1.4 Aim	7
2 Theoretical approach	8
2.1 The Social Norms Approach.....	8
2.2 Criticisms of the Social Norms Approach.....	10
2.3 Designing The GOOD Life intervention.....	13
2.3.1 Normative feedback session	15
2.3.2 Posters.....	16
2.3.3 Web application.....	17
3 Method	18
3.1 Study design	18
3.1.1 Sample size calculation.....	20
3.2 Schools and participants' enrolment.....	20
3.3 Data collection	21
3.3.1 Questionnaire and outcome measures	21
3.3.2 Norm perception and alcohol use (paper 1)	23
3.3.3 Intervention effects (paper 2).....	23
3.3.4 Implementation parameters (paper 3)	24
3.3.5 Co-variables.....	25

3.4 Statistical analyses.....	26
3.4.1 Attrition analysis.....	27
3.5 Supplementary analyses.....	28
3.6 Ethical considerations and trial registration.....	28
4 Summary of results	30
4.1 Perception of social norms among Danish adolescents (Paper 1).....	31
4.2 Effectiveness of the intervention The GOOD life (Paper 2).....	33
4.3 The impact of implementation on the intervention effect (Paper 3).....	35
4.4 Drop-out.....	37
4.4.1 Loss to follow-up.....	37
4.4.2 Attrition analysis for alcohol-related harms	38
4.5 Supplementary analyses.....	39
4.5.1 Sensitivity analyses	39
4.5.2 Characteristics of frequent binge drinkers in the study population.....	40
5 Discussion.....	42
5.1 Summary of main findings.....	42
5.2 Applying the Social Norms Approach among Danish pupils	42
5.3 Effects of the social norms intervention The GOOD Life.....	45
5.4 Implementation of a social norm intervention in Danish schools.....	49
5.5 Methodological considerations.....	53
5.5.1 Selection bias.....	55
5.5.2 Measuring outcomes.....	56
5.5.3 Measuring implementation.....	57
5.5.4 Delivering the intervention.....	57
6 Conclusion	58
6.1 Implication for research	60
6.2 Implication for practice.....	61
7 References	63
8 Appendix – Questionnaire.....	71
9 Papers.....	85

1 Introduction

1.1 Alcohol consumption among adolescents

Alcohol is regularly consumed by adolescents and in the latest European school survey project on alcohol and other drugs (ESPAD) conducted in 2015, 80% of 15-16-year-olds in Europe reported lifetime experience with drinking alcohol. Additionally, 47% had started drinking alcohol already at the age of 13 years [1]. The ESPAD report also demonstrated that adolescents in Denmark have the highest prevalence of binge drinking (five or more drinks on one occasion) in Europe, with 56% reporting binge drinking within the last 30 days, while the average across all 35 participating countries was 35% [1], suggesting that many Danish adolescents have a risky behaviour both regarding the amount of alcohol and the frequency of alcohol use.

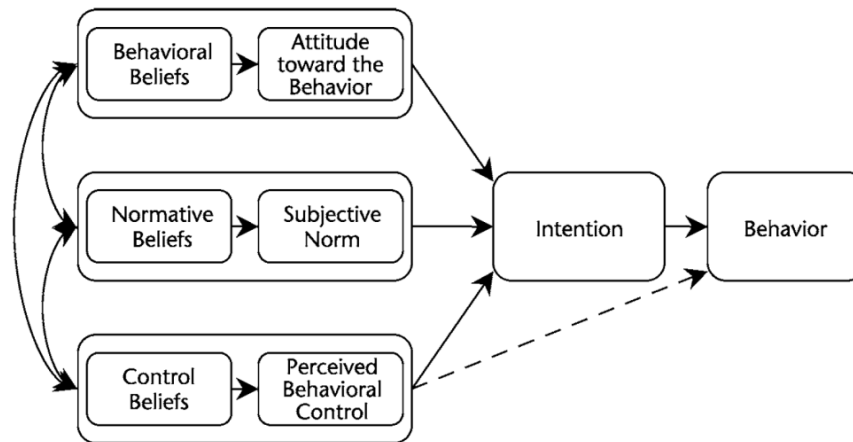
Excessive alcohol use is known to be related to various alcohol-related harms such as missing classes, getting into fights or damaging property [2, 3]. Also, studies have found that frequent consumption of alcohol in adolescence increases the likelihood of harmful drinking in adulthood [4, 5]. Similarly, an early debut with alcohol drinking increases the risk of alcohol dependency and alcohol-related diseases later in life [6, 7]. Further, Crosnoe and colleagues [3] concluded that by the end of high school, early alcohol consumption predicted declining socio-economic functioning with negative implications for adolescents' academic grades.

In Denmark, alcohol use is typically initiated around the age of 14 years and increases during high school years [8]. Data from the Danish Health Behaviour in School-aged Children (HBSC) survey in 2014 showed that 34% of 13-year-olds reported lifetime use of alcohol compared to 76% of 15-year-olds [9]. Also, research has demonstrated that Danish adolescents report several alcohol-related harms such as arguing with family or friends and not being able to attend school or work [10]. Hence, it can be argued that reduced use of alcohol among pupils in secondary school would diminish the risk of harmful alcohol-related events and potentially improve health and life prospects among adolescents in Denmark.

1.2 The influence of social norms on risky behaviour

For Danish adolescents, Johansen and colleagues [11] found that social aspects related to school had a stronger influence on students' substance use than family circumstances. Further, studies based on theories of social influence have demonstrated that risky personal behaviour related to substances such as alcohol, tobacco and cannabis is highly dependent on social relations and perceived social norms [12]. Young people are often strongly influenced by their perceptions of the behaviour and attitudes of those around them [13]. They frequently tend to have exaggerated perceptions of the use of alcohol and other drugs (AODs) in their respective peer groups [14]. With regard to alcohol use, these misperceptions can be related to quantity and frequency of peer alcohol use (*descriptive norms*), but can also be about how accepting peers are of such behaviour (*injunctive norms*).

Studies have found that misperceptions of alcohol norms can make excessive alcohol use appear common and accepted among adolescents [14]. Psychological theories of behaviour, such as the Theory of Planned Behaviour (TPB) [15], have suggested that such beliefs could motivate the individual to match his or her own alcohol consumption to the perceived norm in the peer group. These norm perceptions could consequently, against individual preferences, increase personal use due to supposed peer-pressure [12, 15]. Ajzen [16] that described the TPB in 1985 suggested that positive attitudes towards the behaviour, favourable subjective norms regarding the behaviour and perceived behavioural control, would lead to the formation of a strong behavioural intention to perform the target behaviour. Figure I presents the TPB and illustrates that beliefs are the informational foundation of intentions and that intention is assumed to be the immediate determinant of behaviour.

Figure I. The Theory of Planned Behaviour

Reproduced from Ajzen [16]

Research has demonstrated that misperceptions related to descriptive and injunctive norms regarding alcohol use could potentially increase personal drinking among college and university students [17-24] and also among pupils in secondary schools [25-29]. This relationship has repeatedly been studied among students in North America [17, 30, 31]. Some studies from Northern Europe also exist [23-26, 32] and a previous Danish study showed a positive relationship between norm perception and risk-behaviour among 11-12-year-old Danish pupils [29].

1.3 Incorrect norm perceptions

Consistently across countries, it has been found that perceived social norms regarding alcohol are highly associated with personal use and that misperceptions found among students often can be described as pluralistic ignorance and false consensus [12, 33].

Pluralistic ignorance occurs when a majority of students falsely assume that most of their fellow students drink more than they actually do. This type of misperception is mainly found among non- or light-drinkers who assume that their own behaviour or attitudes are different from others when actually the majority are non- or light-drinkers. According to the social comparison theory [13], pluralistic ignorance could potentially get students to suppress their healthy habits because of their desire to be socially accepted [34].

False consensus is the incorrect belief that most students in the respective peer group drink as much as oneself, when in fact they drink less. This type of misperception can serve to maintain excessive consumption of alcohol, as students will perceive their own behaviour as the norm. Students who engage in false consensus will often be heavy drinkers who may rely on this misperception to justify their own drinking behaviour and have favourable attitudes towards heavier drinking behaviour such as drunkenness [12, 35].

The combination of false consensus and pluralistic ignorance is mutually reinforcing. The combination strengthens the voice of heavy drinkers (the minority) and suppresses the voice of non- and light-drinkers (the majority) which then supports the conception of the norm to be; heavy and frequent alcohol use among students and other adolescents [12]. Further, research has found that individuals often lack awareness of how easily influenced they are by the norms of a particular group [36] or by media rhetoric which frequently perpetuates negative stereotypes [37]. For instance, Danish media often portray Danish youth as frequent heavy drinkers despite the fact that alcohol consumption among Danish adolescents has been declining in the last decade. Also in Denmark, the age for initiating drinking alcohol have steadily increased between 1984 and 2014 [8, 9]. A mixture of these factors may continually contribute to incorrect perceptions regarding the norms for alcohol use in adolescence.

In light of the potential added health benefits of reducing alcohol consumption during adolescence, and evidence of the strong association between norm perceptions and risky behaviour, this research project was initiated in 2014, with the purpose of correcting misperceived social norms regarding alcohol use. The project consisted of three main elements: development of the school-based social norms intervention *The GOOD Life* (In Danish: *Det GODE Liv*), a qualitative process evaluation and a quantitative effect evaluation. The current thesis aims to describe the latter.

1.4 Aim

The purpose of this PhD project was to evaluate the effect of the social norms intervention *The GOOD Life* that aimed to reduce potential misperceptions, binge drinking (5 or more drinks on one occasion) and alcohol-related harms among Danish pupils aged 13-17 years.

The specific aims of the three papers included in this thesis were to:

- * Analyse the associations between personal use of alcohol and other drugs among pupils in Denmark, and their perceptions of descriptive and injunctive norms regarding the use of alcohol and other drugs (paper 1)
- * Examine the effect of *The GOOD Life* on pupils' perception of peer drinking, on binge drinking and on alcohol-related harms (paper 2)
- * Investigate whether the level of exposure to the intervention components as well as retention of social norms messages have an impact on the intervention effects of *The GOOD Life* (paper 3)

2 Theoretical approach

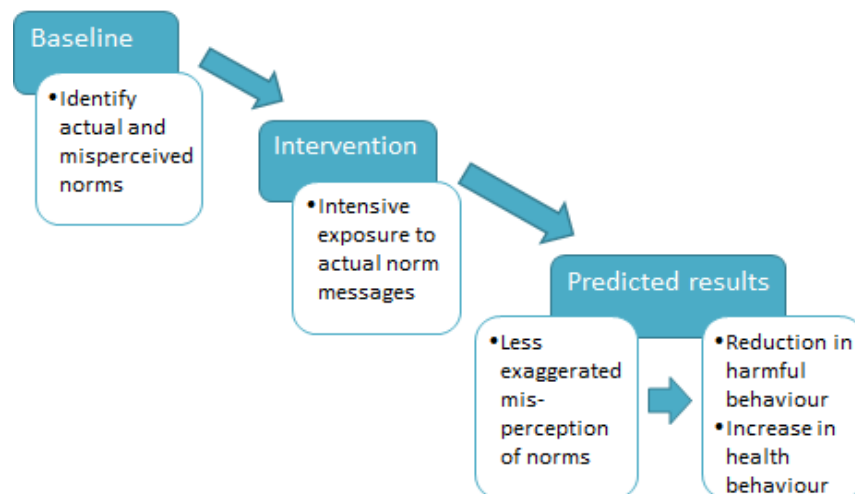
Most health promotion interventions seek to change health behaviour by changing health-related intentions, knowledge or attitudes. Often social psychological theories are used in the development of interventions for alcohol prevention [38, 39]. However, conventional forms of alcohol prevention such as mass media campaigns frequently utilise a moralistic or fear-arousing focus that may be dismissed by adolescents. They believe that the extreme negative outcomes depicted, are highly unlikely to occur and may trust their own judgements about the alcohol use and consequences in their peer group, to be a more valid perception of the norm. Moreover, interventions based upon the harms associated with the use of alcohol have been increasingly viewed as ineffectual, and at best have shown a modest effect on young people [39, 40].

2.1 The Social Norms Approach

The presence of misperceptions among students has been used as the foundation for a harm reduction approach towards behavioural change known as the Social Norms Approach (SNA) (see figure II) [12]. The social norms approach was first described by Perkins and Berkowitz in 1986 and operates on the premise that misperceptions regarding the amount and frequency of AOD use occur among students and that students' often hold exaggerated perceptions about their peers' AOD use. These assumptions derive from research exploring alcohol use among students in the American college system [27, 30, 41, 42]. Similar to the TPB, the SNA assumes that (mis)perceptions about the norm in the peer group predict individual behaviour [12]. According to TPB the change of subjective norms would produce a change in behavioural intentions and given adequate personal control over the behaviour the new intentions would be carried out when the opportunity arises [16]. Another essential construct embedded in the SNA is the salutogenic orientation defined by Antonovsky [43]. It is concerned with "the origin of health" and with the identification of the factors that help people to move towards health, which Antonovsky named the Sense of Coherence (SOC) [43, 44]. Antonovsky [43] describes SOC as the ability to comprehend the whole situation and the capacity to use the resources available, which is in harmony with 'perceived behavioural control' in the

TPB. This notion of empowered people would be equivalent to inform adolescents about their misperception of social norms and trust them to make their own decisions about using alcohol based on this information.

Figure II. Programme theory of the Social Norms Approach to health promotion



Reproduced from Perkins [30]

According to the SNA, describing the norm discrepancy about alcohol consumption would weaken peer influence to drink and thereby encourage the individual to decrease his or her own rate of alcohol use. The normative information, about the discrepancy, that are used to present the actual norm in the target population, would challenge misperceptions and help adolescents to be critical about their own norm perceptions [32]. For non- and light-drinkers, this could weaken peer influence to drink by assuring students that nondrinking or moderate drinking is actually the norm [34]. For heavy drinkers, this could induce them to drink less when they learn that the median rate for drinking is lower than they thought [12, 33]. Furthermore, systematic reviews suggest that the most effective ways to change adolescents' behaviour are programmes that have the following characteristics: they are based on social influence [45, 46], they include school-based activities [38], and they use interactive delivery methods that actively engage the target group [33, 46].

The actual and perceived norms of the target group need to be assessed to develop an effective intervention based on the SNA. Also, it should be verified that the individuals in the target group function as a group with respect to the behaviour in question [12, 30].

Moreover, to help facilitate ownership, it is essential to collect credible data on behaviour and norm perception from the target group [47]. Finally, data-based messages that focus on the positive behaviour of the majority, rather than blaming the negative behaviour of the minority should be developed and repeatedly displayed to the target group. By consistently telling the truth about the actual norms of risk behaviours, it is predicted that misperceptions will decline, and a more substantial proportion of the target group will begin to act in accordance with the more correctly perceived norms of healthy behaviours in the peer group [48]. The preventive strategy in the SNA differs fundamentally from other prevention approaches because it does not rely on negative or fear-based images and it does not contain any moralistic messages about how the target population should behave or what their attitudes should be [38, 39].

Interventions based on the SNA typically deliver normative feedback through different channels such as posters, websites, web applications, flyers and e-mails, similar to social marketing used in, for example, mass media campaigns [48]. Social norms interventions are often implemented in schools, colleges or universities because educational settings offer an efficient and relatively cheap way to reach a substantial number of adolescents [32, 38, 49]. In the Danish context, the secondary school provides a stable setting and peer-group because adolescents mainly attend the same school-class for the entire nine years of compulsory education. This means that schoolmates play an important role as a comparative and normative reference group for many Danish pupils [11]. Furthermore, the onset of substance use normally occurs during adolescence when young people are attending secondary school [50, 51].

2.2 Criticisms of the Social Norms Approach

As outlined in section 2.1, the SNA is based on the assumption that perceived norms predict risky behaviour such as drinking. In contrast to this, other research has suggested that people's norm-perception is based on their own behaviour [52]. The projection of one's behaviour onto a selected peer group may influence both perceived norms, and behaviour. Social norms interventions with the aim of changing perceived norms would, therefore, have limited effect. Furthermore, a prerequisite of the SNA is the existence of

misperceptions about the behaviour or attitudes of the majority of the target group. However, studies have suggested that it would be unlikely that the approach would support a decrease in alcohol consumption as the relationship between intervention messages and behavioural change would at best be through personal judgement, attitudes and intention towards the new behaviour [15, 53]. Hence, people that do not have exaggerated perceptions of peers' alcohol use would neither alter their judgement nor their intentions towards the behaviour. Even so, Borsari and Carey [14] demonstrated that the majority of adolescents have an exaggerated perception of peers' alcohol consumption and Neighbors et al. [52] found a mutual influence of the relationship between perceived norms and drinking behaviour. Moreover, they found that perceived norms were a stronger predictor of behaviour than behaviour was of perceived norms.

Several studies have found the SNA to be effective among heavy drinkers [54-56]. Others have questioned the SNAs harm reduction effect especially among students that do not drink [52, 57]. When exposed to normative messages, it is expected that students will move towards the advocated behaviour or attitude provided in the messages. However, as the SNA does not promote abstinence, non-drinkers could potentially feel pressurised to start drinking and develop more permissive attitudes towards alcohol use. Nevertheless, Neighbors et al. [52] found reduced perceived norms and a decrease in consumed drinks per week in their evaluation of a social norms-based intervention for non- and light-drinkers. Also, Faggiano et al. [58] described short-term preventive effects among light-drinkers exposed to a social norms intervention.

In a review by Foxcroft et al. [59], they found no evidence of any meaningful benefits of social norms interventions for preventing alcohol use among college and university students. The authors suggest that the small preventive effects observed in some studies were inflated due to bias in the study design such as lack of blinding, high attrition and no adjustment for clustering. Also, studies that do not produce evidence to support the effectiveness of norm-based interventions often report poor or no information on how and to what extent the intervention content was implemented [60, 61]. Morgenstern et al. [55] found no effect on alcohol use among 7th grade-pupils exposed to a school-based alcohol education programme. They suggested that the lack of preventive effects could be explained by implementation parameters which were not sufficiently documented in

their trial and by a high attrition rate among drinkers in the control group. Furthermore, Stockings et al. [62] concluded in their review that structural policy interventions seemed to be more effective for alcohol prevention among young people than interventions using social norms information.

However, other systematic reviews have found social influence to be a dominant factor in effective school-based drug prevention programmes [2, 45, 51, 63]. Reid et al. [45] found that descriptive norms strongly mediated the preventive effect of normative feedback interventions and Foxcroft and Tsertsvadze [51] found that psychosocial and social influence components could be effective ingredients in school-based drug prevention programmes. Carey et al. [2] demonstrated that motivational interviewing and personalised normative feedback predicted greater reductions in alcohol-related problems than alcohol education and role play, for example. Furthermore, studies that show no effectiveness of norm-based interventions often argue that the methods applied did not adequately fit the context of their study setting or target group [64-66]. This is consistent with the issues addressing the change in adolescents cognitive reasoning and risk-taking behaviour during the developmental stages of puberty, which Onrust et al. [67] focus on in their systematic review. They found that older adolescents benefitted more from universal programmes based on a social influences approach compared to younger adolescents. The authors argued that the differences in programme effectiveness were systematically related to psychological needs and capacities in the target group. In addition, studies have found that the use of more distal reference groups for comparison such as 'typical student' produces larger self-other discrepancy and less intervention effect [60], whereas more proximal reference groups have shown to increase intervention effects [47, 68].

The inconsistency in context, content and delivery of norm-based interventions make it difficult to assess which characteristics determine the effectiveness of SNA programmes. Several reviews have established that the current evidence base lacks controlled conditions and rigorous data to be able to evaluate social norms interventions in a more detailed and context-specific way [45, 46, 50, 51]. The current study developed the social norms intervention *The GOOD Life* to overcome some of these shortcomings on intervention content and delivery context.

2.3 Designing *The GOOD Life* intervention

The intervention was developed by the project team. The design and programme delivery were inspired by the European ‘Social Norms Intervention to prevent Polydrug use’ (SNIPE) study [32, 69], the North American ‘A Guide to Marketing Social Norms for Health Promotion in Schools and Communities’ by Haines et al. [48] and based on counselling from Social Sense Ltd., a company that produces and delivers social norms campaigns at schools in the United Kingdom.

Based on Haines et al. [48] and on recommendations from Social Sense Ltd. it was decided to combine different intervention components to increase the intervention duration and dose. The research team made a temporary licencing agreement with Social Sense Ltd. that enabled the use of their social norms products for the intervention. However, the actual use was limited to the access and technical assistance for a web application. In addition, Danish school principals and teachers were consulted to set a time frame for the duration of the programme fitting the school context.

The development phase resulted in the intervention *The GOOD life*, where normative feedback was delivered to pupils through three different components, namely face-to-face communication (normative feedback session), printed communication (posters) and interactive media (web application). The content of the intervention was to correct misperception on substance use among peers in general and not on a specific behaviour (e.g. binge drinking). This more general approach is frequently used in social norms interventions because studies have shown that the correction of misperception on one behaviour has the potential to impact the perception and use of other substances [29, 48].

The specific phrasing of the social norms messages was inspired by the messages delivered as online feedback to university students in the SNIPE study [32, 69]. For each participating school and grade, specific social norms messages were phrased to challenge potential overestimations of peer behaviour and attitudes towards substance use. All messages were based on self-reported data on substance use from a baseline survey conducted among pupils at each participating school. Examples of social norms messages used in this intervention are: “8 out of 10 pupils in 8th grade at [school name] have NEVER

been drunk” and “76% of pupils in 9th grade at [school name] believe that it is not okay to drink alcohol if it affects school” [70, 71]. The inclusion of class-year and school name in each message was expected to increase the perceived relevance and credibility of the intervention among pupils (see figure IIIa-IIIc). In accordance with the SNA no messages or statements on alcohol-related warnings or general health advice were delivered or displayed during the intervention period. Also, messages were only designed and displayed if the majority of the pupils (at least 51%) in the baseline survey reported that they had not performed the behaviour in question (e.g. had never been drunk).

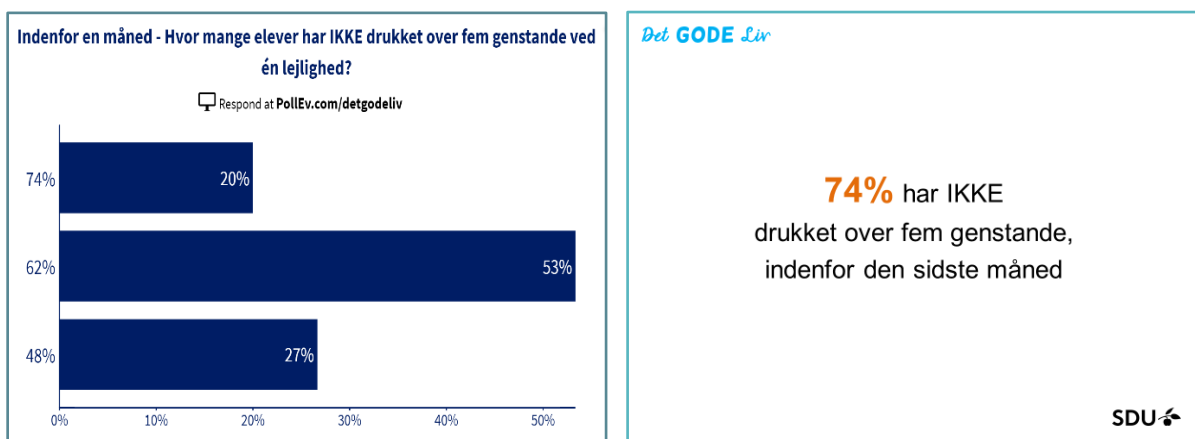
To accommodate the school schedule and resources, the duration of *The GOOD Life* intervention was approximately eight weeks and was conducted either in single classes or whole grades according to school preferences. According to Haines et al. [48] the eight-week period also ensured a long enough time period for sufficient exposure to the intervention. The school setting further provided an appropriate proximal reference group that the pupils easily could identify and relate to. Finally, the intervention components and delivery were pilot-tested in one class of 8th graders, and feedback from pupils was used to optimise the intervention design and construction (e.g. logo, posters and feedback session).

During the intervention period, the normative feedback messages were delivered by the research team using three different communication channels which are described and illustrated in the following sections.

2.3.1 Normative feedback session

At each school, *The GOOD Life* intervention commenced with a 40-minute normative feedback session facilitated by a trained member of the research team. This face-to-face component comprised different interactive features to motivate pupils and to enhance their comprehension of the intervention. By using Microsoft PowerPoint, pupils in a single class or grade were introduced to the principles of social influences and the discrepancy between perceived and actual consumption of alcohol and other drugs. Similar to Killos et al. [72], the sessions were based on pupils' participation in a Student Response System (SRS), which engaged the pupils in an online quiz including four to five social norms messages on the most pronounced discrepancies for the pupils in question. Additionally, messages on the discrepancy regarding binge drinking were included in all feedback sessions (see figure IIIa). The SRS instantly displayed what the group collectively assumed to be true estimates of alcohol use for their peer group (figure IIIa), and the discrepancies between perceived and actual norms were discussed with the participating pupils. Finally, the discrepancy between the actual and perceived frequency of 30-days alcohol consumption was illustrated by a bar-chart. The SRS used in the current intervention was Poll Everywhere, for which the University of Southern Denmark holds a licence agreement on for more than 40 participants.

Figure IIIa. Feedback session with PowerPoint presentation presenting tailored social norms messages used in *The GOOD Life* intervention



First slide: Question asked using SRS

Second slide: Display of survey data to initiate discussion on the discrepancy

2.3.2 Posters

After the feedback session, each school received four to six posters, professionally designed for *The GOOD Life*, with school-specific social norms messages. Through the acceptance of the trial protocol the coordinating teachers agreed to display the posters in areas where pupils would see them daily for the remaining intervention period of seven to eight weeks after the feedback session. The messages on the posters were framed in the same way as previously, but with some additional content than the messages in the feedback session. For example, the posters did not contain messages on binge drinking, but on other types of alcohol misuse. This was done to keep these messages different from the messages in the feedback session while still targeting alcohol use. The graphic design of the posters used text and pictures to display the messages, but without stigmatising any individuals. Also, considering some of the suggestions from the pilot-test, the graphic designer used distinctive colour schemes to create a “look” similar to popular adverts (figure IIIb).

This more traditional social marketing approach was incorporated as a reminder of the intervention and with the purpose of increasing pupils’ exposure to the messages. In addition, it was expected that some pupils may find printed communication more appealing or easier to understand than the classroom feedback session.

Figure IIIb. Posters displaying tailored social norms messages used in *The GOOD Life* intervention



2.3.3 Web application

At the feedback session and through posters pupils were encouraged to use QR codes to access a web-based application on their computers or smartphones. The integration of a web application added an innovative and interactive element to the intervention. In addition, it was anticipated that such a component potentially would improve the effectiveness of *The GOOD Life* through increased motivation among pupils, due to the novelty of the component [73, 74]. The web application contained a quiz where pupils could test their (mis)perceptions regarding social norms and received information on the actual alcohol-related norms at their school. The web application was designed for individual users and similar to the feedback session the setup involved a multiple-choice quiz that instantly showed the correct answer (figure IIIc). An existing application developed by Social Sense Ltd. was used in accordance to the temporary licence agreement and the login data to the application were provided by Social Sense to the research team for each school. The application was adapted for use at Danish schools in collaboration with the research team. The quiz features used in this intervention component would alternatively be available in other commercial apps such as Kahoot!.

Figure IIIc. Web application with quiz using tailored social norms messages used in *The GOOD Life* intervention

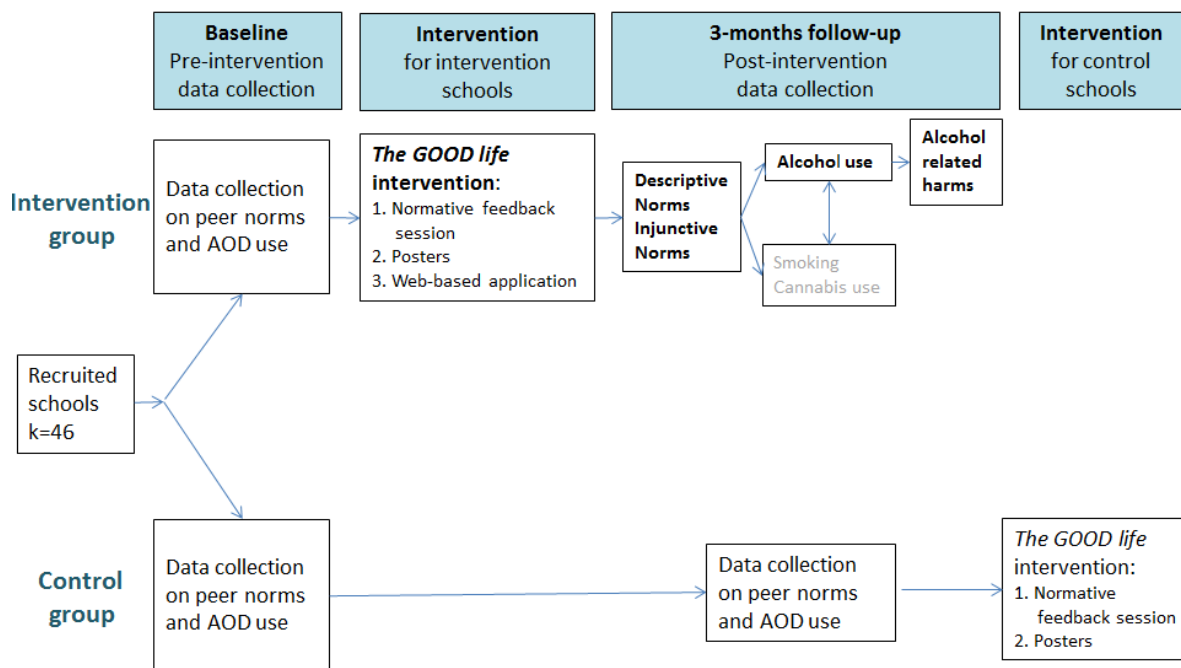


3 Method

3.1 Study design

To investigate the effectiveness of *The GOOD Life* intervention, the study was designed as a cluster-randomised controlled trial with a control group and an intervention group (figure IV). Data were collected at baseline and at 3-months follow-up using online questionnaires. Three to four weeks after the baseline survey schools in the intervention group received *The GOOD Life* intervention. After completing the data collection at 3-months follow-up, *The GOOD Life* was also offered to schools in the control group.

Figure IV. Study design



The study was initially designed with a follow-up period of 6 months. However, after consultation with school principals we were advised to limit the amount of work for teachers and to minimize the time required for conducting the intervention to fit the school terms of about five months. Also, the pilot study revealed that the school holidays

had a considerable influence on how pupils understood and responded to the questions about personal alcohol use as well as perceived peer alcohol use. Consequently, the follow-up period was reduced to 3 months in order to minimise potential response bias. Additionally, the shorter follow-up period made it possible to fit the intervention between New Year and summer vacation as well as between summer and Christmas holidays.

Paper 1 was based on data from the baseline survey and treated as a cross-sectional study. In paper 2 and 3 data from both baseline and follow-up surveys was used for the effect evaluation of the social norms intervention *The GOOD Life*. Table I presents an overview of aims, data and methods applied in paper 1-3.

Table I. Overview of aims, data and methods for paper 1-3

	Paper 1	Paper 2	Paper 3
Aim	To analyse the association between lifetime AOD use and norm perception	To examine the effect of <i>The GOOD Life</i> on descriptive norm perception, binge drinking and alcohol-related harms	To investigate whether implementation parameters have an impact on the effect of <i>The GOOD Life</i>
Data source	Baseline survey	Baseline survey and follow-up survey	Baseline survey and follow-up survey
Outcomes	<ul style="list-style-type: none"> * Lifetime alcohol consumption * Lifetime binge drinking * Lifetime drunkenness * Lifetime smoking * Lifetime cannabis use 	<ul style="list-style-type: none"> * Overestimation of peer lifetime binge drinking * Frequent binge drinking * Alcohol-related harms 	<ul style="list-style-type: none"> * Overestimation of peer lifetime binge drinking * Frequent binge drinking * Alcohol-related harms
Exposure	Norm perceptions <ul style="list-style-type: none"> * Descriptive * Injunctive 	<i>The GOOD Life</i> intervention	<i>The GOOD Life</i> intervention <ul style="list-style-type: none"> * Level of exposure * Level of satisfaction * Level of message recall
Subgroups	NA	<ul style="list-style-type: none"> * Lifetime alcohol consumption * Lifetime binge drinking * Motivation to drink more in the future 	NA
Statistical methods	Multilevel logistic regression	Multilevel logistic regression Stratified multilevel logistic regression	Multilevel logistic regression

3.1.1 Sample size calculation

Power calculation for cluster randomisation was used to calculate the sample size based on an estimated intra-class correlation of 0.02 [75]. A previous study [76] reported a significant reduction in binge drinking at follow-up, corresponding to an effect size of 0.2. In order to detect a 20% difference in the prevalence of binge drinking between intervention and control group at 3-months follow-up, at the level $\alpha=0.05$ and with 80% power, it was estimated that in total 39 schools with 35 pupils per school ($n=1.400$ pupils) needed to be included in the analysis. We strove to enrol 1.200 students in each group condition because it was assumed that 40% would be lost during the follow-up period.

3.2 Schools and participants' enrolment

A total of 135 secondary schools that provided teaching for grade 8 and 9 were located in the Region of Southern Denmark. Schools were invited to participate in the trial during autumn 2014, spring 2015 and spring 2016 and 46 schools accepting the invitation, were enrolled in the subsequent school semester. The 46 schools were randomly assigned to either intervention or control group. The randomisation was conducted using the Microsoft Excel randomisation function with a cut-off at 0.5. The allocation was carried out by a researcher not blinded to the identity of the schools, but with limited knowledge about each school.

At the 46 schools that wished to participate (34%), school principals or teachers invited pupils in grade 8 and 9 to participate. To enable participants to make an informed consent they all received a uniform letter explaining:

- * the purpose of the project
- * their part in the project as volunteers
- * that all data were collected anonymously and treated confidentially
- * the purpose of conveying the information
- * the potential benefits and drawbacks of the project

All participants in the trial were under-aged, and therefore informed consent for participating in the intervention was provided by parents or legal guardians.

Corresponding teachers at each school obtained the written parental consents before the intervention commenced and facilitated the data collections in a classroom setting during regular school hours. Access to the baseline questionnaire was mailed to 46 schools. However, adequate data were only received from 42 schools comprising responses from 2601 pupils that were included in paper 1. Additionally, four schools were excluded from the study because they did not comply with the trial protocol, resulting in 38 schools and 1355 pupils to be included in paper 2 and paper 3.

The study protocol provides an overview of the study, including details of the school setting [70].

3.3 Data collection

All data were self-reported by pupils using online questionnaires accessed by self-registration on the survey website. In the beginning and during the survey pupils were reminded that data were collected anonymously and treated confidentially. For pupils to have the possibility to complete the survey within one class session (45 minutes), the questionnaires were designed so the response time would not exceed 40 minutes. The average response time was 20 minutes.

3.3.1 Questionnaire and outcome measures

The research team developed the questionnaire based on existing surveys used to assess youth health and risk behaviours [48, 69, 77-79]. It was pre-tested among pupils in grade 8 and feedback on, e.g. phrasing and duration were used to revise the questions and layout. Both baseline and 3-months follow-up surveys measured pupils' lifetime AOD use, last 30 days AOD use, approval of AOD use and alcohol-related harms. Also, the questionnaires measured pupils' perceived frequency of AOD use and approval of AOD use among peers of their own grade and school. The baseline questionnaire also covered demographic information on age, grade, sex and family affluence. In the 3-months follow-up questionnaire for pupils in the intervention group (n=641), questions were included to assess their exposure to the intervention as well as their satisfaction with and retention of the intervention (see appendix).

Details of the origin of the measures on pupils' alcohol consumption and on pupils' norm perceptions have been reported in the study protocol article [70, 71].

In paper 1 the baseline measures on lifetime alcohol consumption, drunkenness and binge drinking, as well as lifetime smoking and lifetime cannabis use, were used as outcomes to examine the association between personal behaviour and norm perceptions. To evaluate the effectiveness of *The GOOD Life* intervention in paper 2 and 3 the outcome measures used were: overestimation of peer lifetime binge drinking, frequent binge drinking and two or more alcohol-related harms. Table II gives an overview of the questions and corresponding response options used as primary outcome measures in this thesis.

Table II. Outcome measures and corresponding questions with response options and coding used in the analyses

Outcome	Question	Response options	Coding
Personal lifetime binge drinking (paper 1)	Have you ever had 5 or more drinks on one occasion?	Yes / No	No (0) Yes (1)
Overestimation of peer lifetime binge drinking (paper 2-3)	How many of your classmates do you think ever had 5 or more drinks on one occasion?	Sliding bar: 0-100%	No overestimation (0) Overestimation (1)
Frequent binge drinking within the last 30 days (paper 2-3)	During the last 30 days, how many times did you drink 5 or more drinks on one occasion?	Never 1 time 2 times : 10+ times	0-3 times (0) 4-10+ times (1)
Two or more alcohol-related harms (paper 2-3)	Have you ever had one or more of the following problems because you had been drinking alcohol?	Yes / No 15 items on different consequences related to alcohol use	0-1 items (0) 2-15 items (1)

To obtain a measure on self-other discrepancy regarding descriptive norms related to alcohol consumption the prevalence of lifetime binge drinking was calculated based on the question: ‘Have you ever had 5 or more drinks on one occasion?’ The specific prevalences for lifetime binge drinking for each grade and school were then used as a school-specific estimate of the actual norm. Pupils, who estimated the prevalence of binge drinking among their peers to be more than 10% above the actual prevalence, were classified as having overestimated peers’ lifetime binge drinking (Table II).

The cut-off for frequent binge drinking on ‘4 or more times within the last 30 days’ was used to correspond with the definition in other studies that defined frequent binge drinking among adolescents as: ‘two or more episodes of consuming more than five drinks in a row in the previous two weeks’ [4]. Other cut-offs were also studied to minimise the risk of misclassification of the outcome measure.

Alcohol-related harms were measured using 15 items describing different potential consequences related to alcohol use. Pupils indicating that they had ever drunk alcohol were asked to answer “yes” if they had experienced the consequence in question. The summed score was then divided into two categories reflecting more (2-15 alcohol-related harms) or less (0-1 alcohol-related harms) consequences. Other cut-offs were also studied to minimise the risk of misclassification of the outcome measure.

3.3.2 Norm perception and alcohol use (paper 1)

To examine the hypothesised association between norm perception and behaviour in paper 1, the measure on ‘overestimation of peer lifetime binge drinking’ was used as independent variable in the statistical models and personal lifetime alcohol use were used as outcome measures.

3.3.3 Intervention effects (paper 2)

The main exposure in the trial was the social norms intervention *The GOOD Life* that was used as independent variable in paper 2. The outcome measure for misperception of descriptive norms (overestimation of peer lifetime binge drinking) was used to examine the hypothesised intervention effect on norm perception. Furthermore, the following outcome measures were examined to test the programme theory (figure II): frequency of

personal binge drinking (frequent binge drinking within the last 30 days), and number of adverse events pupils had experienced as a result of alcohol use, for example, memory loss and getting in to fights (two or more alcohol-related harms). The measure for alcohol-related harms was only obtained from 540 out of 815 eligible pupils due to an error in the 2016 data collection that left out this scale.

To assess the potential added benefits of *The GOOD Life* among subgroups of pupils, paper 2 included stratified analyses for pupils who already had experience with drinking and for those who at baseline were motivated to drink more in the future. Following variables were used for the subgroup analyses: *Lifetime alcohol consumption*, *Lifetime binge drinking* and *Motivation to drink more alcohol*.

The alcohol consumption variables were measured at baseline by pupils answering yes or no to: 'Have you ever drunk at least one drink of alcohol?' and 'Have you ever had 5 or more drinks on one occasion?'. The variable for motivation was assessed at baseline by asking pupils about their intention to drink more in the future. Pupils were categorised as 'without motivation to drink more' or 'with motivation to drink more'.

3.3.4 Implementation parameters (paper 3)

In paper 3 it was investigated whether implementation parameters had an impact on the preventive effect of *The GOOD Life* by using the same outcome variables as in paper 2. The following independent variables were measured among pupils in the intervention group (n=641):

The level of exposure to *The GOOD Life* was measured by the number of components of *The GOOD Life* each pupil recalled being exposed to (1-3 components) and the number of posters pupils could recall having seen (0-10 posters). Based on the 25% and 75% percentiles the number of posters seen was divided in three categories for the analysis: 0-3, 4-6 and 7-10 posters.

The level of satisfaction with *The GOOD Life* was measured among pupils exposed to the intervention. Based on a 5-point Likert-scale, ranging from 'very dissatisfied' to 'very satisfied', pupils were categorised as having *Low satisfaction*, *Okay satisfaction* or *High satisfaction* for each of the three components respectively.

The level of messages recalled from *The GOOD Life* intervention was measured among pupils exposed to intervention. To measure if the pupils had understood the purpose of the intervention, pupils were asked if they could recall the main messages from the three different intervention components. The measure was constructed to identify if pupils could distinguish between four correct and four incorrect statements regards the intervention content. Pupils received one point when they answered “yes” to the correct social norms messages or “no” to the incorrect alcohol statements, resulting in a total maximum score of eight for each component. By calculating the median for messages recalled at the 3-months follow-up the pupils were categorised into *Low recall* (0-5 messages) and *High recall* (6-8 messages) for all three components.

For the analysis of the impact of implementation parameters on the intervention effect only parameters for the feedback session and the posters were used. The decision was made because the overall use of the web application was limited to 33% of pupils in the intervention group compared to 82% for the feedback session and 54% for the posters. In addition, the logged data from the web application showed that 94% of the completed entries to the quiz provided in the application (n=228) was distributed on only 5 out of 18 intervention schools (28%) indicating that access to the web application was only promoted at 5 schools.

3.3.5 Co-variables

Existing evidence was used to guide the selection of co-variables for the analyses in the three studies. The selection was based on a priori discussions of potential confounders and modifiers of the relationship between exposure and outcome. The measure of age was included as a co-variable in the models to account for the different developmental stages for participating pupils. Age was prioritised because the age variable included more information than the measure on grade. Additionally, sex was included in the statistical models in all three papers because previous studies showed differences in norm perception as well as alcohol consumption between males and females [17].

In the study on norm perceptions (paper 1), we included the Family Affluence Scale III (FASIII) from the HBSC survey to collect information on family socioeconomic status [78]. However, we found that this scale was an unreliable measure in the context of this Danish

school setting (Cronbach's $\alpha=0.42$). In paper 2 a more subjective variable from the HBSC survey was used as a proxy for information on family socioeconomic status, *perceived family affluence*, where pupils had five response options ranging from 'very well off' (1) to 'not at all well off' (5) [79]. This variable was included in the multilevel logistic regression models as an ordinal variable. In paper 3 we left out the information on socioeconomic factors, as this was not regarded as relevant for the implementation fidelity. Also, sensitivity analysis revealed no statistically significant changes in the findings and verified that family affluence was not a confounder in these models.

3.4 Statistical analyses

Given the study design where participating pupils were clustered within the same school, the individual assessments were not statistical independent of each other. Ignoring such dependency would lead to underestimation of standard errors and consequently inflate the risk of type I errors. To account for the within-cluster correlation multilevel logistic regression models with random intercept for school-level were fitted to examine the associations in all three papers.

In paper 1 a total of 2509 responses were included in the multilevel logistic regression analyses. To control for potential confounding factors, age, sex and FASIII were included as co-variables in the models. Further, we assessed if grade would modify the association between norm perception and lifetime alcohol use. This effect-modification was examined by including an interaction term between grade and norm perception in the multilevel regression models. Additionally the interaction between sex and norm perception was examined.

To examine the intervention effects in paper 2 and 3 the data from the baseline and the 3-months follow-up survey were cleaned and linked using a 7-digit code individually generated by each participating pupil (e.g. 1-38-HA-2-6-2-1). Responses related to codes that could not be located in both the baseline and the follow-up survey, were excluded from the analyses (figure V). The multilevel logistic regression models included co-variables as well as baseline values for the outcome measures. To minimise the risk of misclassification of frequent binge drinking, additional analyses were conducted with the

cut-off set to 'binge drinking 3 or more times' and 'binge drinking 2 or more times'. In paper 2 we additionally stratified the analyses on the baseline values for *lifetime alcohol use*, *lifetime binge drinking* and *motivation to drink more in the future*, to investigate subgroup difference on the intervention effects.

The models for alcohol-related harms were only fitted for 540 cases. The questions that composed the scale were left out in the 2016 data collection, due to an error in the electronic questionnaire. Attrition analysis was conducted for the group of pupils that did not have the option to respond to these questions.

Characteristics of the study population were presented as a descriptive analysis in all three papers. Differences between groups were examined using Pearson's Chi-square test (Chi²) for categorical variables. The assessed continuous variables were not normally distributed, and the difference between groups was tested using Wilcoxon rank-sum test.

All analyses were performed using the statistical package STATA/IC 14.1 or 15.0, with a significance level set at $p < 0.05$. In all three papers estimates were presented as odds ratio (OR) with corresponding 95% confidence intervals (CI). The individual papers provide a detailed description of the applied statistical models.

3.4.1 Attrition analysis

Analyses were conducted to determine if there was differential attrition between pupils in the intervention and control groups and whether those who used alcohol at baseline had higher attrition rates than those who did not. The difference between completers and non-completers were assessed using Pearson's Chi-square test.

The error in the 2016 data collection caused missing data for the measure of alcohol-related harms that were not missing at random. Using Pearson's Chi-square test, it was investigated if the baseline values for the group of non-responses significantly differed from the group of responses included in the multilevel logistic regression models (n=540).

3.5 Supplementary analyses

The statistical models regarding alcohol-related harms as well as the models for the sub-group “Motivation to drink more alcohol” were based on relatively small sample sizes. To test the sensitivity, additional analyses were conducted for the sub-group ‘Motivation to drink more in the future’ on the outcomes: binge drinking and on alcohol-related harms. Also, sensitivity analyses were conducted on binge drinking and alcohol-related harms for the whole study population.

To assess the different characteristics of light-drinkers and heavier drinking pupils in the study population, descriptive analyses were conducted by calculating the prevalences of baseline values for pupils reporting ‘binge drinking 0-3 times’ and ‘binge drinking 4 or more times’, within the last 30 days.

3.6 Ethical considerations and trial registration

All three studies comply with national guidelines regarding ethical standards. Correspondingly, approval for conducting the trial was obtained from the Ethical Committee of the Region of Southern Denmark in December 2014 (project-ID: S-20140185) and subsequently registered at Current Controlled Trials with study ID ISRCTN27491960.

As described in section 3.2, informed consent was actively obtained from all participants. Further, to minimise any unintentional stigmatisation of pupils, it was ensured that data used for the social norms messages were based on at least ten responses, in order to conceal identification of individual pupils at participating schools. Also, the identification used to match the responses from the baseline and follow-up survey was created using an individually generated code similar to descriptions from Galanti et al. [80], ensuring anonymous linkage. Furthermore, the surveys were conducted separated from the intervention without the research team present during the data collection in classes. Thus, the research team had no direct impact on pupils’ self-administrated responses to the questionnaire.

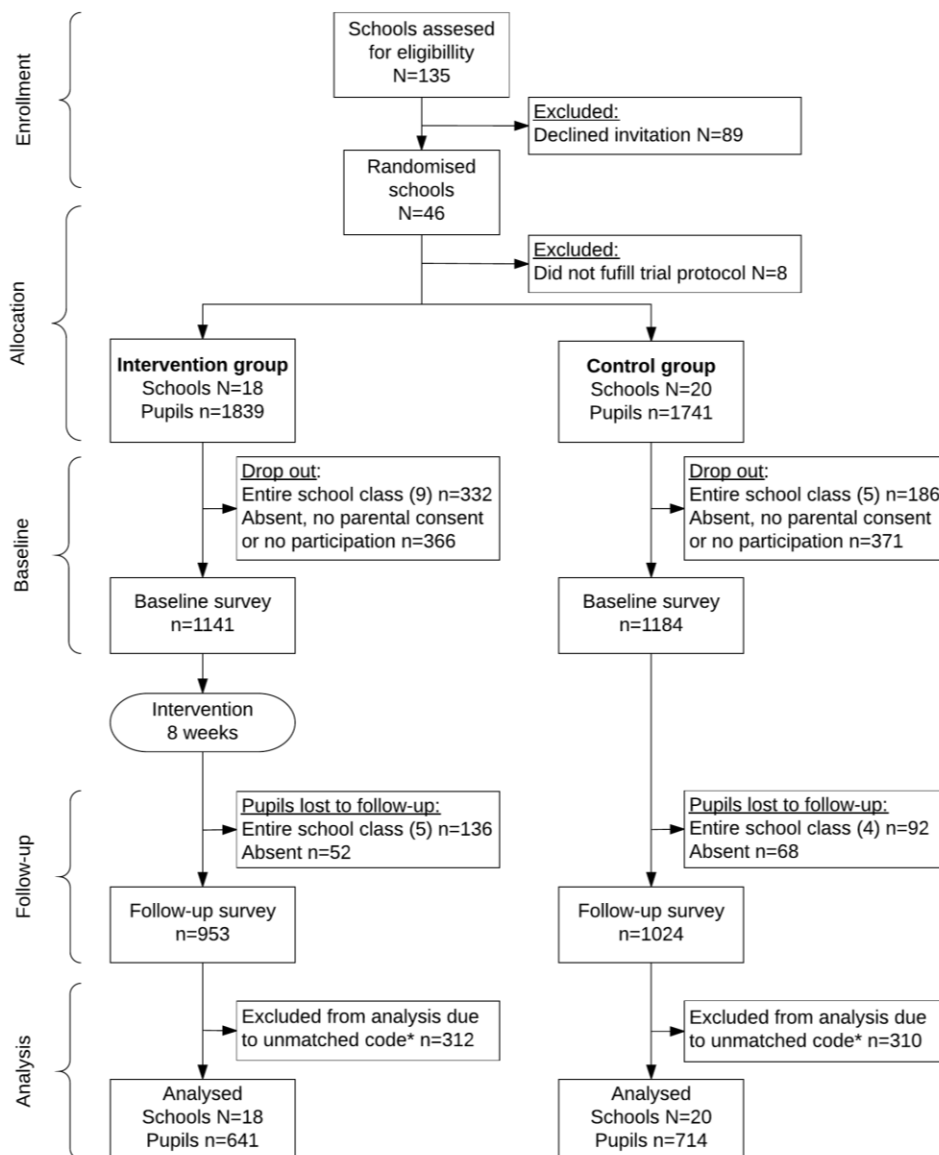
To ensure that all pupils enrolled in the trial would have the opportunity to receive the intervention the project applied a waiting-list approach where schools in the control group were offered the intervention after the follow-up survey was completed (figure IV). Also, this waiting-list design could potentially support teachers and pupils' engagement in the trial and encourage them to participate in both surveys regardless of the schools' allocation to the control group.

Finally, the intervention was designed with the purpose that schools and other implementers would have the opportunity to replicate and adapt the protocol. Thus, all components can be replicated with commercially available programmes similar to SurveyMonkey, Microsoft PowerPoint, Poll Everywhere and Kahoot!

4 Summary of results

The participant flow through the cluster-randomised controlled trial and number analysed in paper 2 and 3 are depicted in figure V. In total 1355 pupils from 38 schools completed both the baseline and follow-up questionnaires. In this group, the mean age was 14.8 (SD±0.67) years, 54% were girls, and 49% were attending grade 9. Further the cluster-size varied from 2 to 91 pupils, but did not significantly differ between control and intervention condition (Chi²(30)=27.9, p=0.572). The study sample in paper 1 was larger than that in paper 2 and 3 because eight schools did not comply with the trial protocol.

Figure V. Participant flow through the trial



4.1 Perception of social norms among Danish adolescents (Paper 1)

The first study aimed to assess the prevalence of lifetime alcohol use and to examine if norm perceptions were associated with personal lifetime AOD use. The descriptive analysis showed that 55% of pupils in grade 8 reported lifetime alcohol use compared to 75% in grade 9. Also, self-reported lifetime binge drinking differed between grades with 26% in grade 8 and 52% in grade 9. The prevalences for both alcohol use and attitudes towards alcohol use were significantly higher among pupils in grade 9 than pupils in grade 8. Furthermore, results showed that pupils misperceived the descriptive and injunctive norms related to alcohol in their respective peer group. Pupils' perceptions of peers' approval of alcohol use were significantly higher than pupils' personal approval of alcohol use. The same tendency was found for the discrepancy between perceived prevalences of peers' alcohol use and the actual prevalences of lifetime use. In addition, table III shows that more than 40% of the pupils overestimated their peers' lifetime alcohol use. We also found that pupils in grade 9 were more likely to overestimate their peers' excessive alcohol use, than pupils in grade 8 (Table III).

The multilevel logistic regression models showed that pupils that overestimated the descriptive norms related to alcohol use had a significantly increased risk of personal alcohol use (OR: 4.40, 95%CI: 3.60-5.38), of getting drunk (OR: 1.96, 95%CI: 1.61-2.38), and for engaging in binge drinking (OR: 2.40, 95%CI: 1.97-2.92). Additionally, we found significant effect modification between overestimation and grade, indicating a stronger association between perception and personal consumption of alcohol among pupils in grade 8 compared to pupils in grade 9. Similar, the multilevel logistic regression analyses showed that perceived peer approval of alcohol use (injunctive norms) was positively associated with personal lifetime alcohol use. However, no effect modification by grade was found for the associations between perceived peer approval and lifetime alcohol use. Also, the sensitivity analysis found no effect modification for perceived descriptive or injunctive norms and sex on any outcome measures of lifetime alcohol use. In summary, the analyses showed that pupils' exaggerated perceptions regarding their peers' use and approval of alcohol use were positively related to their personal experience with alcohol.

Table III. Percentage of pupils overestimating the lifetime AOD use among peers

	Total (n=2509) %	Grade 8 (n=1305) %	Grade 9 (n=1204) %	OR ^b	95% CI
At least one drink					
No overestimation	52.1	49.4	55.0		
Overestimation ^a	47.9	50.7	45.0	0.79	0.68-0.93
Been drunk					
No overestimation	43.7	46.7	40.3		
Overestimation ^a	56.3	53.3	59.7	1.30	1.11-1.52
Binge drinking					
No overestimation	56.6	57.1	56.0		
Overestimation ^a	43.5	42.9	44.0	1.04	0.89-1.22
Smoking					
No overestimation	38.6	41.2	35.8		
Overestimation ^a	61.4	58.9	64.2	1.25	1.07-1.47
Cannabis use					
No overestimation	57.0	61.1	52.5		
Overestimation ^a	43.0	38.9	47.5	1.42	1.21-1.66

^a Estimated prevalence among peers > actual prevalence in their grade and school + 10% tolerance.

^b Odds ratio for overestimating peer AOD use in 9th grade compared to 8th grade with sex as co-variable and 95% confidence interval (CI)

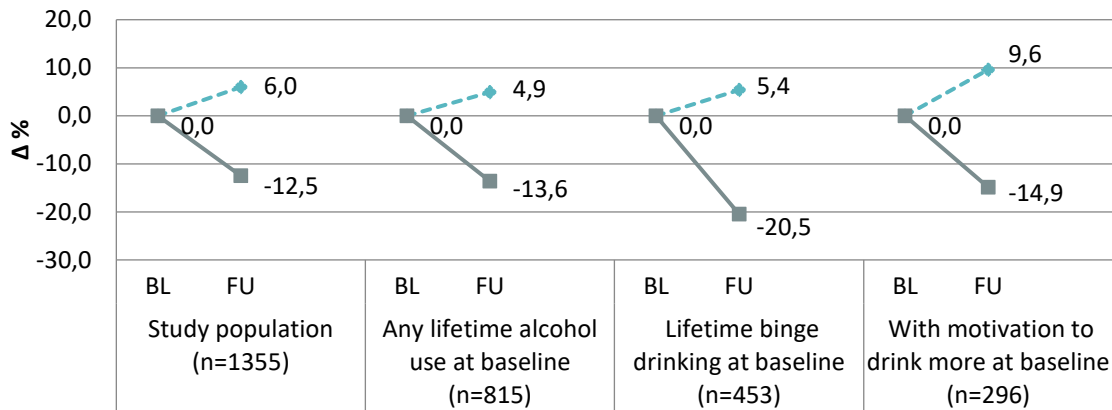
4.2 Effectiveness of the intervention *The GOOD life* (Paper 2)

The second study investigated the effect of *The GOOD Life* where 641 pupils from the intervention group and 714 pupils from the control group were included in the analyses. The baseline measures showed that 60% of the pupils reported any lifetime alcohol use, 34% reported lifetime binge drinking and 4% reported frequent binge drinking (binge drinking 4 or more times within the last 30 days). Significant differences between groups were only observed for age ($\text{Chi}^2(4)=35.0, p<0.001$) and overestimation of peer lifetime binge drinking ($\text{Chi}^2(1)=16.1, p<0.001$). At 3-months follow-up the multilevel analyses showed that pupils that received the intervention were significantly less likely to overestimate peers' lifetime binge drinking compared to pupils in the control group (OR: 0.52, 95%CI: 0.33-0.83). This finding was consistent in all three sub-group analyses. In addition, exposure to the intervention significantly decreased reported alcohol-related harms in the intervention group (OR: 0.59, 95%CI: 0.37-0.93). The subgroup analyses revealed a similar preventive effect on alcohol-related harms among pupils who reported lifetime binge drinking at baseline (OR: 0.55, 95%CI: 0.30-0.99), but only a borderline significant preventive effect among pupils with any lifetime alcohol use (OR: 0.65, 95%CI: 0.40-1.05), and no significant effect among those with motivation to drink more in the future (OR: 0.73, 95%CI: 0.32-1.67).

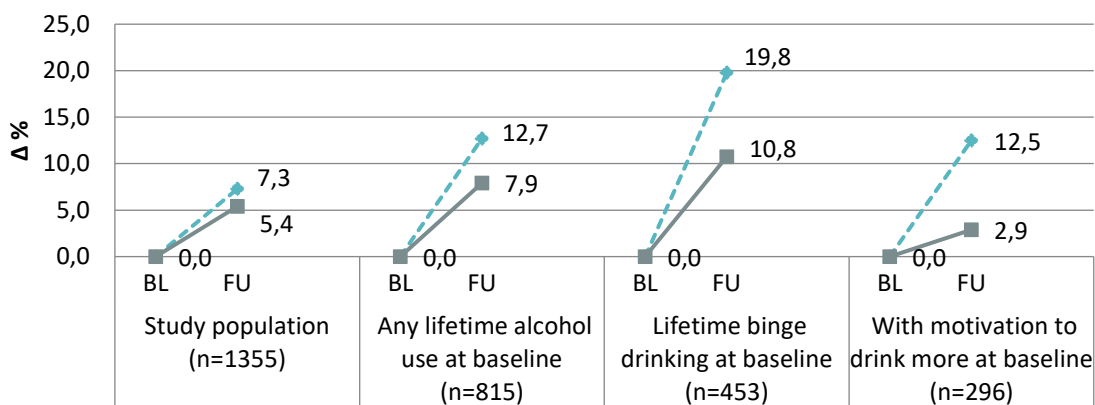
For frequent binge drinking a significant intervention effect was found for pupils motivated to drink more alcohol in the future ($n=296$, OR: 0.37, 95%CI: 0.15-0.95). However, significant preventive effects were not found for other sub-groups and neither for the whole study population (OR: 0.89, 95%CI: 0.49-1.61). Additionally, analyses for binge drinking within the last 30 days with the cut-off set to '3 or more times', '2 or more times' and '1 or more times' showed no significant intervention effect. In summary, the trial revealed that receiving the intervention had a positive effect on norm perceptions and alcohol-related harms, but a preventive effect on binge drinking was only found among pupils drinking alcohol and with an intention to drink more in the future. The changes in prevalence from baseline to 3-months follow-up for all three outcomes are illustrated in figure VI.

Figure VI. Intervention effects for the total study population and for the subgroups: any lifetime alcohol use, lifetime binge drinking and pupils with motivation to drink more in the future. Change in prevalence (Delta %) of outcomes from baseline (set as 0) to 3-months follow-up

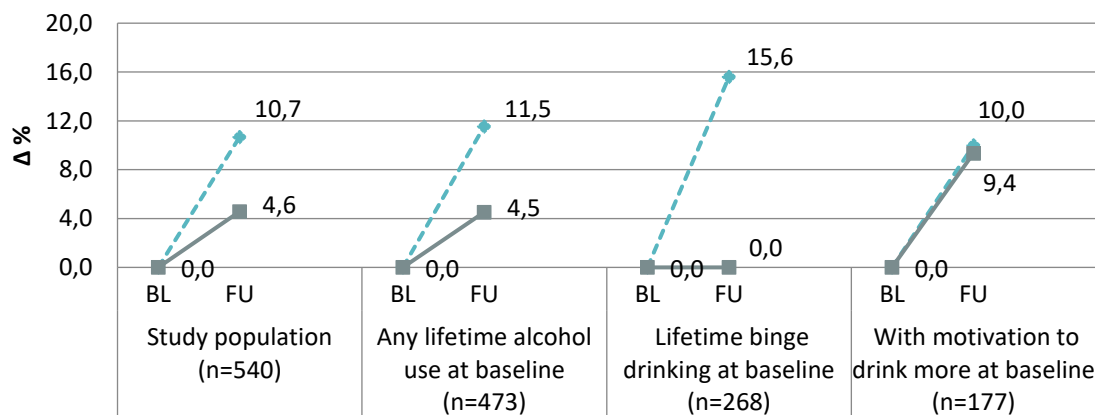
Overestimation of peer lifetime binge drinking



Frequent binge drinking within the last 30 days



Two or more alcohol-related harms



—◆— Control group —■— Intervention group
 BL: Baseline survey, FU: 3-months follow-up survey

4.3 The impact of implementation on the intervention effect (Paper 3)

In the third study, it was examined whether implementation delivery and quality had an impact on the preventive effect of the school-based social norms intervention *The GOOD Life*. In total 537 pupils (84%) in the intervention group indicated seeing or participating in at least one of the three intervention components. Overall the results suggest that higher levels of exposure, satisfaction and retention regarding the intervention messages increased the preventive effect on all three outcomes.

Regarding increased exposure level, the analyses showed an enhanced intervention effect on overestimation and on alcohol-related harms for pupils who participated in two or three components compared to those who participated in only one component. Regarding the outcome frequent binge drinking no such trend was observed, but the OR did decrease for pupils participating in two components (table IV). The findings on the impact of the number of posters on the intervention effect did not show a clear trend. The only significant preventive effect was found on overestimation of peer lifetime binge drinking among pupils having seen 0-3 posters. For those having seen 4-6 or 7-10 posters borderline significant effects on overestimation with similar effect sizes were noted. The effect estimates for frequent binge drinking and alcohol-related harms did decrease among pupils that recalled having seen a high number of posters, but no statistically significant effects were found.

Regarding the impact of level of satisfaction with feedback session and with posters, the analyses showed that among pupils who were medium or highly satisfied with the respective intervention component the intervention had stronger effects on overestimation than among pupils who had low satisfaction level (table IV). The analyses did not show a clear trend towards higher effects for higher satisfied student for the other two outcomes. In fact, for the outcome alcohol related harms the only significant effect was observed among pupils with 'Okay satisfaction' with the feedback session.

When studying the impact of the level of recall of the social norms messages from the feedback session or from posters, we found that for pupils with high recall (recalling 6-8 statements correctly) the intervention effect on overestimation was stronger than for

those with lower recall. Similar trends were observed for the other two outcomes, but without reaching statistically significant intervention effects in the high recall group. Further the analyses showed that high level of satisfaction (OR: 1.71, 95%CI: 1.12-2.60), a higher level of exposure (OR: 1.88, 95%CI: 1.01-3.49) and female sex (OR: 1.87, 95%CI: 1.24-2.82) were associated with better retention of the messages in the feedback session.

Table IV. Effects of implementation parameters on overestimation of peer drinking, frequent binge drinking and alcohol-related harms

	Overestimation of peer lifetime binge drinking (n=1355)		Frequent binge drinking within the last 30 days (n=1355)		Two or more alcohol-related harms (n=540)	
	OR ^a	95%CI	OR ^a	95%CI	OR ^a	95%CI
Main intervention effect						
Control group	Ref.		Ref.		Ref.	
Intervention group	0.52	0.33-0.83	0.91	0.50-1.64	0.59	0.37-0.93
Level of exposure to <i>The GOOD Life</i>						
Control group	Ref.		Ref.		Ref.	
1 component	0.64	0.36-1.13	0.87	0.38-1.96	0.71	0.38-1.38
2 components	0.41	0.24-0.69	0.69	0.31-1.52	0.51	0.27-0.94
3 components	0.45	0.25-0.79	0.87	0.37-2.04	0.51	0.24-1.06
Control group	Ref.		Ref.		Ref.	
0-3 posters	0.41	0.23-0.73	0.93	0.42-2.11	0.82	0.42-1.61
4-6 posters	0.59	0.33-1.05	0.90	0.37-2.18	0.50	0.24-1.02
7-10 posters	0.49	0.23-1.05	0.30	0.05-1.74	0.37	0.11-1.23
Level of satisfaction with <i>The GOOD Life</i>						
Control group	Ref.		Ref.		Ref.	
Low (feedback session)	0.51	0.21-1.22	0.99	0.26-3.71	0.60	0.18-1.95
Okay (feedback session)	0.45	0.27-0.75	0.49	0.22-1.10	0.44	0.22-0.89
High (feedback session)	0.50	0.30-0.82	1.02	0.50-2.08	0.58	0.30-1.13
Control group	Ref.		Ref.		Ref.	
Low (posters)	0.59	0.22-1.58	1.64	0.46-5.83	0.61	0.15-2.60
Okay (posters)	0.53	0.30-0.93	0.88	0.40-1.93	0.56	0.25-1.24
High (posters)	0.43	0.24-0.77	0.44	0.16-1.19	0.62	0.27-1.42
Level of recall of <i>The GOOD Life</i>						
Control group	Ref.		Ref.		Ref.	
Low (feedback session)	0.52	0.32-0.84	0.76	0.39-1.48	0.56	0.31-1.04
High (feedback session)	0.31	0.18-0.54	0.69	0.31-1.57	0.51	0.24-1.08
Control group	Ref.		Ref.		Ref.	
Low (posters)	0.58	0.33-1.02	0.91	0.40-2.09	0.69	0.34-1.40
High (posters)	0.36	0.19-0.66	0.73	0.28-1.89	0.51	0.24-1.08

^a Odds Ratios with corresponding 95% confidence interval (CI) based on multilevel logistic regression models with the control group as reference. All models were adjusted for baseline values of the corresponding outcomes, age, and sex, and school was included as random effect. Bold typeface indicates significant values (p<0.05).

4.4 Drop-out

In total 46 schools got access to the baseline questionnaire and 2601 pupils from 42 schools provided adequate responses that were included in the analyses in paper 1. The response rate for the study in paper 1 corresponded to 67% and the main reason for attrition was due to school-classes withdrawing. For example, several schools signed up three to four classes, but only two classes fulfilled the trial protocol (e.g. kept the deadline for consent or survey response).

Additionally, four schools were excluded due to not fulfilling the trial protocol (e.g. missing data, deadlines and/or consent), allowing 38 schools (n=3580 pupils) to be included in the analyses in paper 2 and paper 3. Out of 3580 enrolled pupils, 1255 (35%) did not participate in the baseline survey, 348 pupils (10%) did not complete the follow-up survey, and 622 (17%) were excluded from the analyses based on the individually generated identification code (unmatched).

4.4.1 Loss to follow-up

In total 970 pupils (42%) were lost to follow-up leaving 1355 pupils to be included in the analyses. Significant differences were found in attrition rates according to demographic variables, with boys ($\text{Chi}^2(1)=4.1, p=0.044$) and older pupils ($\text{Chi}^2(4)=25.3, p<0.001$) having higher attrition rates than girls and younger pupils. Also, higher attrition rates were found for the baseline measure of: *lifetime binge drinking* ($\text{Chi}^2(1)=26.5, p<0.001$), *frequent binge drinking* ($\text{Chi}^2(1)=7.4, p=0.007$) as well as *alcohol-related harms* ($\text{Chi}^2(1)=10.5, p=0.001$).

In addition, there was a significant difference in age between control and intervention group among drop-outs ($\text{Chi}^2(4)=32.6, p<0.001$), that is, older pupils in the intervention group were less likely to complete the follow-up survey. No other difference was found among drop-outs from the two groups. In summary, these analyses show that attrition was higher among those who drank alcohol at baseline which indicates that the tests for intervention effects provide more conservative effect estimates due to a restricted range of the primary outcome variables.

4.4.2 Attrition analysis for alcohol-related harms

The pupils not included in the analyses with alcohol-related harms as outcome (n=560 non-response) were all enrolled in the trial in 2016, and the majority (65%) was allocated to the control group. Table IV illustrates that the baseline characteristics of pupils did not significantly differ between non-response and response group except from age and overestimation, which also was unequally distributed between intervention and control group in the entire study population (n=1355).

Table V. Baseline differences for the outcome measure alcohol-related harms between non-response group and response group

	Non-response % (n)	Response % (n)	p-value
Intervention group	35.0 (196)	56.0 (445)	
Control group	65.0 (364)	44.0 (350)	<0.001
Male	45.7 (256)	46.2 (367)	
Female	54.3 (304)	53.8 (428)	0.870
Age			
13	0.5 (3)	0.5 (4)	
14	40.5 (227)	30.8 (245)	
15	51.6 (289)	51.9 (413)	
16	7.3 (41)	16.2 (129)	
17	0.0 (0)	0.5 (4)	<0.001
Grade 8	49.5 (277)	51.5 (409)	
Grade 9	50.5 (283)	48.5 (386)	0.472
Lifetime binge drinking			
No	68.0 (380)	65.5 (521)	
Yes	32.0 (179)	34.5 (274)	0.348
Overestimation of peer binge drinking			
No	59.4 (330)	52.2 (413)	
Yes	40.7 (226)	47.9 (379)	0.009
Frequent binge drinking			
0-3 times	95.9 (536)	96.2 (765)	
4 or more times	4.1 (23)	3.8 (30)	0.750
Alcohol-related harms			
0-1 items	71.0 (225)	69.6 (346)	
2-15 items	29.0 (92)	30.4 (151)	0.679

4.5 Supplementary analyses

4.5.1 Sensitivity analyses

Table VI. Sensitivity analyses for intervention effect on binge drinking and alcohol-related harms at 3-months follow-up

	Control n=713 %	Intervention n=640 %	OR^a	p-value	95% CI
Binge drinking within the last 30 days					
1 or more times	28.2	30.3	1.06	0.772	0.71-1.60
2 or more times	19.6	19.5	1.02	0.943	0.62-1.68
3 or more times	14.4	13.4	0.92	0.743	0.54-1.55
4 or more times	10.8	9.8	0.89	0.709	0.49-1.61
5 or more times	9.1	7.3	0.79	0.469	0.41-1.50
	Control n=234 %	Intervention n=306 %	OR^a	p-value	95% CI
Reported alcohol-related harms					
1 or more	50.9	45.8	0.93	0.772	0.55-1.57
2 or more	38.0	31.0	0.59	0.024	0.37-0.93
3 or more	25.2	18.6	0.55	0.028	0.32-0.94

^a Odds Ratios with corresponding 95% confidence interval (CI) based on multilevel regression models. All models were adjusted for baseline values, age, sex, perceived family affluence and with school included as random effect.

The additional analyses for binge drinking with cut-offs set to 'one or more times', 'two or more times', 'three or more times' and 'five or more times' showed insignificant effect estimates. However, the OR decreased with increase in frequency of binge drinking within the past 30 days. The analyses for alcohol-related harms with different cut-offs showed that the OR decreased with increasing number of self-reported harms. A statistically significant effect was found for two or more harms and even a stronger effect for three or more harms. No significant intervention effect was found for one or more harms.

Table VII. Sensitivity analyses regards the intervention effect for the sub-group of pupils motivated to drink more alcohol in the future

	Control n=152 %	Intervention n=142 %	OR^a	p-value	95%CI
Binge drinking within the last 30 days					
1 or more times	35.5	33.1	0.99	0.972	0.58-1.69
2 or more times	27.6	18.3	0.61	0.176	0.30-1.25
3 or more times	21.1	12.0	0.52	0.174	0.20-1.34
4 or more times	15.8	7.7	0.37	0.038	0.15-0.95
	Control n=70 %	Intervention n=107 %	OR^a	p-value	95%CI
Reported alcohol-related harms					
1 or more	44.3	36.4	0.86	0.711	0.39-1.92
2 or more	31.4	24.3	0.73	0.456	0.32-1.67
3 or more	20.0	11.2	0.39	0.080	0.14-1.12

^a Odds Ratios with corresponding 95% confidence interval (CI) based on multilevel regression models. All models were adjusted for baseline values, age, sex, perceived family affluence and with school included as random effect.

Sensitivity analyses for the at-risk group; Motivated to drink more alcohol, showed the same tendency as for the whole study population. The OR decreased with increased frequency of binge drinking in the past 30 days as well as with increase in self-reported alcohol-related harms. The OR for 'binge drinking 4 or more times' was the only statistically significant estimate.

4.5.2 Characteristics of frequent binge drinkers in the study population

The descriptive analyses of frequent binge drinkers showed an increase collectively, from 4% (n=53) at baseline to 10% (n=140) at 3-months follow-up (see figure VI). Table V shows that among frequent binge drinkers the baseline prevalence was higher for males, 9th graders and pupils overestimating their peers' lifetime binge drinking. Further, a higher prevalence of pupils reporting two or more alcohol-related harms was found among frequent binge drinkers. Also, frequent binge drinkers were more likely to hold permissive attitudes towards alcohol compared to non- or light-drinkers.

Table VIII. Characteristics of pupils reporting frequent binge drinking at baseline

	Frequent binge drinkers % (n)	Non-frequent binge drinkers %(n)	p-value
Intervention group	52.8 (28)	47.0 (612)	
Control group	47.2 (25)	53.0 (689)	0.408
Male	58.5 (31)	45.5 (592)	
Female	41.5 (22)	54.5 (709)	0.063
Age			
13	0.0 (0)	0.5 (7)	
14	11.3 (6)	35.8 (466)	
15	69.8 (37)	51.0 (664)	
16	18.9 (10)	12.3 (160)	
17	0.0 (0)	0.3 (4)	0.006
Grade 8	26.4 (14)	51.7 (672)	
Grade 9	73.6 (39)	48.3 (629)	<0.001
Overestimation of peer drinking			
No	37.7 (20)	55.8 (723)	
Yes	62.3 (33)	44.2 (572)	0.009
Alcohol-related harms			
0-1 items	30.8 (16)	72.8 (555)	
2-15 items	69.2 (36)	27.2 (207)	<0.001
Motivation to drink more			
Okay if I drank more	23.1 (12)	37.3 (284)	
Not okay if I drank more	76.9 (40)	62.7 (478)	0.040
Attitudes towards alcohol use			
Never okay to use	5.7 (3)	6.6 (86)	
Okay for adults	3.8 (2)	16.5 (214)	
Okay to use occasionally	66.0 (35)	68.3 (886)	
Okay to use frequently	24.5 (13)	8.7 (111)	<0.001
Level of satisfaction with the feedback session			
Low	8.3 (2)	6.8 (33)	
Okay	58.3 (14)	42.8 (208)	
High	33.3 (8)	50.4 (245)	0.260
Level of recall of social norms messages in the feedback session			
Low	70.0 (14)	62.5 (280)	
High	30.0 (6)	37.5 (168)	0.497

5 Discussion

5.1 Summary of main findings

The purpose of the studies included in this thesis was to evaluate the effect of the school-based social norms intervention *The GOOD Life* among Danish secondary-school pupils aged 13-17 years. The findings from paper 1 highlight that Danish adolescents hold misperceptions about their peers' alcohol norms. Also, paper 1 showed that exaggerated perceptions of peer alcohol consumption and peer approval of alcohol use were strongly associated with higher personal consumption. The findings from the cluster-randomised controlled trial (paper 2) revealed that pupils receiving the social norms intervention *The GOOD Life* reduced their overestimation of peer binge drinking and encountered less alcohol-related harms compared to pupils in the control group. Additionally, a decrease in frequent binge drinking was found among pupils with motivation to drink more alcohol in the future. Further, the findings in paper 3 suggest that increased implementation quality enhanced the preventive effect of *The GOOD Life* intervention.

5.2 Applying the Social Norms Approach among Danish pupils

The social norms approach should only be applied as a harm reduction strategy if the target group holds incorrect conceptions about risk behaviour and attitudes in their peer group. Further, the majority of the target population should not be engaged in the risk behaviour. Also, the behaviour in question should be associated with the perceived norms of the group [12, 30]. The self-other discrepancies found in paper 1 support these assumptions and add to previous findings on misperceptions of alcohol norms among younger adolescents [25, 27-29]. Two previous Danish studies found similar results. Balvig and Holmberg [29] found incorrect norm perceptions about peer smoking and alcohol use among 11-12-year-old pupils and in the SNIPE study McAlaney and colleagues [24] found a discrepancy for alcohol consumption among Danish university students. Even though these studies were conducted in restricted study populations (one municipality and two universities), together with the current findings they add to the

understanding of the link between incorrect norm perception and personal alcohol use among young Danes. Further, the diversity of schools included in this study with respect to both size and geographical area (rural and urban), may support that the current findings could apply to a broader audience and not be limited to specific geographical areas in Denmark.

Paper 1 demonstrated a distinction between pupils in grade 8 and 9, where pupils in grade 8 reported significantly less lifetime alcohol use compared to pupils in grade 9. Also, the self-other discrepancy between perceived and actual norms was smaller among pupils in grade 8 than among pupils in grade 9. Other studies have found considerable differences in the self-other discrepancy depending on age. Stock et al. [32] found that older university students were less likely to overestimate their peers' alcohol consumption, whereas Pedersen et al. [28] found that older middle-school pupils were more likely to overestimate their peers' alcohol use. Corresponding to the latter, the current study found that older pupils (9th graders) were more likely to overestimate peers' drunkenness, but less likely to overestimate peers' lifetime alcohol use. One explanation for this difference could be the different developmental stages in the two grades where younger pupils were initiating alcohol use, and older pupils were starting to experiment with heavier drinking [62, 67]. Research on norm perceptions has suggested that in the period of adolescence when young people begin to initiate drinking they may be more prone to pluralistic ignorance, and falsely assume that the majority of their peers are drinking alcohol and thereby creating a larger self-other discrepancy [34, 35]. This could also explain the "opposite" difference for lifetime drunkenness between pupils in grade 8 and 9, where older pupils would be relatively new to heavier drinking and therefore report a greater self-other discrepancy on drunkenness. However, the variation in the degree of misperception for lifetime alcohol use could reflect that older pupils may have a more accurate norm perception about peer drinking because the individuals have gained greater knowledge of the drinking behaviour of others in their peer group.

Other studies have found that heavier drinkers were more likely to overestimate their peers' alcohol consumption [23, 81], which could be due to false consensus where high-risk drinkers tend to justify their own drinking based on their misperception about peers' alcohol consumption. However, based on the relatively small group of frequent binge

drinkers in this study population (4%) the overestimation of drunkenness may rather be a reflection of the more noticeable nature of drunken behaviour which pupils incorrectly generalise to the wider group. Additionally, studies have demonstrated that the self-other discrepancy for alcohol behaviour is dependent on the relevance of the reference group used. Campo et al. [53] found that own drinking behaviour was positively related to perceptions of friends drinking, but unrelated to the perception of typical student drinking. Moreover, McAlaney and McMahon [81] found that a distal reference group created a larger self-other discrepancy than a more proximal group, such as close friends, which they demonstrated to be more strongly correlated with personal behaviour. In the current study, the reference group comprised of pupils in the same grade (similar age) and same school (similar social context), which for the vast majority of Danish adolescents remain consistent through all nine years of compulsory education. Accordingly, the applied reference group had the characteristics of a proximal reference group as it was comprised of both close friends and classmates that each pupil easily could identify and relate to. Therefore, it was expected that the findings would show a relatively strong association between norm perception and personal alcohol consumption. This was supported in paper 1, where the multilevel logistic regression analyses showed a strong positive association between misperceived norms regards peers' alcohol use and personal experience with drinking. Moreover, the result was consistent with previous studies that demonstrated that exaggerated norm perception of peers' alcohol consumption predicted higher personal consumption among pupils in secondary schools, both in North America [28] and in Europe [27, 58]. However, in our study, the association between misperception and personal behaviour was stronger among pupils in grade 8 than in grade 9. This may be explained by the lower overall experience with alcohol use among younger adolescents in grade 8, where the few heavier drinking pupils may overestimate to a larger extent, than heavier drinking pupils in grade 9. This, again, reflects that non- and light-drinkers may respond to pluralistic ignorance to a larger extent than more experienced drinkers.

Similar to the self-other discrepancies for descriptive norms the analyses also showed that pupils perceived their peers to hold more permissive attitudes towards alcohol use than themselves, and that this was positively associated with personal alcohol use. Studies

have suggested that injunctive norms in a group may be more stable over time than descriptive norms [82] and that changes to the perceived injunctive norms could result in long-term behavioural changes [24, 83]. Also, Mollen et al. [84] found that compared to descriptive norms, injunctive norms were less responsive to change, but that their influence on behavioural intentions was more persistent. On the other hand, overestimation of peer behaviour or attitudes could stem from self-serving bias when responding to questionnaires about sensitive issues such as alcohol use. Melson et al. [85] found that when questions about personal and peer behaviour were in the same survey, it produced a more extreme set of perceptions about peers, compared to surveys where pupils only had to report about peer behaviour. They argue that this was due to pupils putting themselves in a better light than the reference (peer) group.

Even if we take into account that self-serving bias may exist, the strong association between norm perceptions and behaviour found in our study suggests, that challenging perceived norms of alcohol use could result in a reduction of alcohol use among Danish adolescents. Also, the prerequisites for implementing an intervention based on the SNA were found among both 8th and 9th grade pupils enrolled in the current trial.

5.3 Effects of the social norms intervention *The GOOD Life*

According to the TPB [15] and the SNA [12] an increase in alcohol use in the peer group would also produce an increase in norm perceptions about alcohol use. In paper 2 it was demonstrated that pupils in both groups increased their alcohol consumption during the three months between the two surveys. However, the increase in frequent binge drinking was larger among pupils in the control group ($\Delta\%=7.3$) than among pupils in the intervention group ($\Delta\%=5.5$) suggesting that exposure to the intervention did not cause any adverse effects. In the control group, the perceived descriptive norms also increased during the intervention period, but the findings from the effect evaluation showed that *The GOOD Life* had a significant impact on pupils' overestimation of peer lifetime binge drinking in the intervention group (figure VI). Moreover, the subgroup analyses demonstrated a decrease in overestimation among pupils exposed to the intervention, regardless of their own consumption status. This was according to expectations, as

correction of misperceptions of descriptive norms has been suggested to mediate the effect of social norms interventions on drinking behaviour [45, 48]. In addition, the findings were consistent with the majority of previous social norms research that has shown a decrease in norm perception and to some extent in substance use among adolescents [33, 50, 86]. In a European study that included 170 secondary schools, Faggiano and colleagues found a change in norm perception as well as a persistent decrease in alcohol abuse among pupils exposed to the intervention “Unplugged” [87, 88]. Also, Balvig and Holmberg [29] found a preventive effect on norm perception towards drinking and smoking among 11-12-year-old Danish adolescents exposed to a social norms intervention in the Ringsted project.

The findings in paper 2 demonstrated no significant decrease in binge drinking. Nevertheless, the effect evaluation showed a difference in frequent binge drinking at 3-months follow-up of approximately 10% (OR: 0.89) between intervention and control group which was similar to the preventive effects found in other studies [51]. Also, the sensitivity analyses showed that the findings were consistent in relation to different cut-offs for the frequency of binge drinking within the last 30 days. However, the effect estimates did not reach the effect size of 20% found by Neighbors et al. [76] which was hypothesised for our study and used in the sample size calculation. The insignificant effect estimates may reflect a relatively weak link between normative expectancies and behavioural change that is postulated to have a causal relationship by the TPB [15]. According to the TPB intentions and behaviour are primarily predicted by: attitudes towards the behaviour, subjective norms, and perceived behavioural control (figure I). Ajzen [16] argues that it is reasonable to target an intervention to any one of the three predictors, but if the predictor does not account for significant variance in the behaviour, a change in the predictor would have little impact on the behaviour. Further, Campo et al. [53] suggest that a mediating effect of attitudes and/or intentions on the association between the predictor and behaviour has a high likelihood of concealing any preventive intervention effects on drinking behaviour. Additionally, the relatively high estimated number needed to treat (NNT) of 100, found for frequent binge drinking in paper 2, may reflect these dilemmas related to the theoretical assumptions about the different predictors for behavioural change.

Others have suggested that a lack of statistically significant main effects on alcohol use could be explained by the difficulties in changing light or moderate alcohol consumption in societies similar to the Danish culture where drinking is socially acceptable [56]. The predictor for behavioural change targeted in *The GOOD Life* was the normative beliefs about the alcohol norms in the peer group. At baseline half (51%) of the pupils in the intervention group reported normative beliefs regarding peer lifetime binge drinking that were higher than the actual rate (33%). Consequently, only one third would have the opportunity and thus ability, to decrease their relatively high alcohol consumption to correspond to the actual (lower) rate of alcohol use in their peer group. Also, the majority of pupils in our study could be categorised as non- or light-drinkers that according to, e.g. Neighbors et al. [89] would be less motivated to change behaviour because they already carry out behaviours which are consistent with the norm. Therefore, they would be neither motivated nor - due to abstinence - able to reduce their alcohol consumption to the median rate in their peer group during the intervention period of 3 months. In addition, the lack of more than one follow-up survey restricted the results to short-term effects. Hence, no opportunity was provided to draw conclusions on any delay in onset of alcohol use among non- and light-drinkers or any longer-term effects of a change in norm perceptions on future alcohol drinking.

Foxcroft and Tsertsvadze [90] suggested that the frequently observed small effect size for alcohol prevention programmes among pupils could be due to high attrition among heavier drinkers, which may result in underreporting of actual alcohol norms. The current study found a larger rate of dropouts among older and more frequent drinkers. However, no difference in attrition rate between intervention and control group was found, and the withdrawal mainly occurred at the class level. Moreover, the persistent reduction for overestimation of peer lifetime binge drinking showed that even if the self-other discrepancy was inflated due to methodological issues, the intervention did alter the pupils' normative beliefs about their peers' behaviour, as the norm perception in the control group increased along with the increase in alcohol consumption, whereas it decreased in the intervention group (see figure VI).

The findings in paper 1 showed that exaggerated norm perceptions were strongly associated with heavier drinking suggesting that behavioural change may be more likely

in subgroups of pupils with excessive use of alcohol. Moreover, subgroup effects have been found in previous studies among risky or heavy drinking college and university students [54, 74, 91]. Our subgroup analysis revealed a statistically significant intervention effect on frequent binge drinking among pupils with motivation to drink more in the future. The descriptive analysis of heavier drinkers showed that motivation to drink more in the future was more pronounced among light-drinkers, compared to frequent binge drinking pupils, and that non-frequent binge drinkers were holding less permissive attitudes towards frequently alcohol use. Research has suggested that positive attitudes towards a specific behaviour may have a more persistent influence on behavioural intentions when combined with favourable normative beliefs [16, 84]. The preventive effect among pupils reporting positive opinions towards increasing their alcohol use may suggest that *The GOOD Life* had the potential to impact the drinking behaviour among those that did not have rooted habits regarding alcohol, and consequently may be responding to peer-pressure to a larger extent. In this case, the normative messages would have the potential to decrease the perceived pressure and in turn have a positive impact on intentions towards drinking among light-drinkers. This may indicate that *The GOOD Life* was more effective among pupils who were most at risk of initiating heavier drinking. However, in practice it would not be advised to target a social norms intervention to any specific at-risk group of pupils, because this would violate the principles of the SNA that work with the healthy behaviour of the majority and not with the risky behaviours of the minority. Also, the calculated measure on the effectiveness (NNT) for *The GOOD Life* should be regarded as a theoretical estimate that can be used for comparison, but not for decision making in practice. The NNT is constructed to communicate the effectiveness of a health care treatment and it would be difficult in practice, to apply the NNT to interventions within the health promotion field that aim to change behaviour of larger population groups.

Previous studies [56, 92] have suggested that alcohol prevention among pupils has a greater chance of impact on less socially acceptable forms of alcohol-related behaviour such as problem drinking or noticeable harms related to alcohol. The findings from the effect evaluation supported this and showed a significant intervention effect on reported alcohol-related harms. In contrast to the relatively high consistency in frequent binge

drinking the variability in adverse events related to alcohol consumption may explain the intervention effect on this behavioural measure. To a large extent, alcohol-related harms were reported by frequent binge drinkers. Moreover, the subgroup analysis showed a significant intervention effect on reported alcohol-related harms among binge drinkers at baseline and among pupils with any alcohol experience at baseline. This could indicate a behavioural change among alcohol drinking pupils towards a more moderate drinking pattern where pupils do not encounter as many harmful events. In the subgroup of alcohol drinking pupils that thought that it would be okay for them to drink more in the future, no significant decrease on alcohol-related harms was found in the intervention group compared to the control group. This finding is difficult to interpret, but is most likely related to any unknown or unmeasured factors interfering with the outcome in this subgroup. However, due to a methodological error, only 540 pupils were included in this analysis and caution should be applied towards any conclusions.

Nevertheless, these results add to the understanding of how preventive strategies and approaches could influence behavioural changes among different developmental stages in adolescence (e.g. older vs younger or light- vs heavier-drinkers). Similar to the findings from the EU-DAP project “Unplugged” [58] and Project ALERT [56] our results suggested that school-based prevention programmes using social norms theory can persuade pupils to reflect on their attitudes and behaviours regarding alcohol use. In order to refine the development of alcohol prevention programmes future research should investigate the relative strength of the different predictors of alcohol consumption in adolescents such as attitudes, intentions and subjective norms.

5.4 Implementation of a social norm intervention in Danish schools

Given the presence of a strong association between norm perception and risk behaviour related to alcohol (paper 1), it could be argued that social norms can have an influence on Danish pupils’ risk-behaviour such as binge drinking. Also, the findings of misperceptions on descriptive norms in paper 1 demonstrated that the prerequisites for applying the social norms approach in a Danish school setting were given. Furthermore, the intervention effect found on overestimation suggests that pupils that were exposed to *The*

GOOD Life changed their estimations about peer alcohol consumption towards the median rate for drinking in their peer-group. Additionally, the analyses in paper 2 showed a preventive intervention effect among subgroups of pupils. Hence, the first “step” in the pathway towards behavioural change was influenced by the intervention. However, the relatively small effect size for frequent binge drinking found in paper 2 could also be related to implementation fidelity. Implementation research has suggested that quality and extent of the implementation often have a strong impact on the effectiveness of community-based interventions [33, 93, 94]. Several reviews found it difficult to assess the decisive components of successful interventions due to the difference in the theoretical foundation, different settings and difference in strategies to deliver the key components of the interventions [46, 51, 95]. A previous study in the Netherlands [26] failed to find significant effects of a social norms intervention delivered to students aged 18-24 years. The authors suggested that one explanation could be that the exposure to the intervention had not been intensive enough due to the relatively short duration (20 minutes) of the intervention. Authors of other studies that found no or weak intervention effect have speculated that the main effect may be concealed by poor implementation quality and difficulties in adaption to other contexts [55, 65, 66].

In our study, incomplete implementation could have contributed to the lack of a statistically significant main effect on binge drinking. While 82% of pupils participated in the feedback session only 28% received all three intervention components. In paper 3 we investigated, whether parameters related to the implementation had an impact on the intervention effect. The following parameters were examined; exposure level, pupils’ satisfaction with *The GOOD Life* and pupils’ retention of the social norms messages.

Studies investigating the level of dose delivered in alcohol prevention programmes have found that higher exposure to the programme through several messages and delivery modes could have an enhancing preventive effect on alcohol consumption [95, 96]. Consistently, this study showed that exposure to more than one component enhanced the intervention effect on all three outcome measures compared to the control condition. Even though the intervention effect remained insignificant for frequent binge drinking the results demonstrated that exposure to more than one intervention component (e.g. feedback session and posters) increased the preventive effect of *The GOOD Life*. Thus,

improving compliance of schools and teachers to hang up at least some of the posters and to inform about and to encourage pupils to use the web application would most likely increase the effect size as indicated by the dose-effect trends observed in paper 3.

Although it is important to include posters into the programme, the current study showed that a very high number of posters did not significantly benefit the intervention effect. This may reflect that pupils to a certain extent would become saturated by the repetition of the messages leaving the number of posters less relevant for the intervention effect. On the other hand, four to six tailored messages were used for the posters at each school and grade, which could indicate that pupils that recalled a higher number of posters remembered seeing messages intended for pupils in another grade. In such case, pupils would not feel the same relevance of the messages as they would do for messages tailored for pupils in their own grade and school. The exposure to more messages than intended may dilute the impact because the intervention could be perceived as a more generic campaign where the individual not instantly would relate to the reference group used, even though the school name and grade were apparent from the poster messages.

Miller and Prentice [33] suggest in their review that groups sharing a salient social identity appear to be more receptive to be influenced by normative feedback and that credibility of the messages is essential for measuring effects of a social norms intervention. Lewis and Neighbors [68] found that among North American college students, highly group-specific normative feedback was perceived as more credible and they suggested that high credibility have the potential to increase the effect of alcohol prevention interventions. The social norms messages in *The GOOD Life* were designed to be group-specific by distinctly including references to a proximal peer group. Also, the messages were based on self-reported data which according to the SNA would be perceived by pupils as relevant and credible [12, 30]. Nevertheless, group-specific and data-based messages are not a guarantee that the receiver (the pupils) will be persuaded by the argument delivered, or accept the messages as credible. However, previous research [97, 98] has demonstrated that the acceptance of a message was related to the perceived overall appeal of the message. Therefore, the appeal may have the potential to affect the perceived credibility of the arguments delivered by the social-norms messages. To assess the appeal of the intervention components, the pupils in the intervention group

were asked about how satisfied they were with *The GOOD Life*. Interestingly the results showed an optimal intervention effect among pupils perceiving the feedback session to be “okay”, but to a lesser extent among pupils perceiving it as “good”. However, the majority (93%) reported satisfaction with the intervention components, which may indicate that most of the pupils perceived the arguments presented as relevant. Moreover, studies have suggested that high appeal of the intervention components could increase pupils’ attention to the messages delivered and in turn help them to comprehend the key arguments better [93, 94].

In the current study, enhanced intervention effects on all outcomes were found among pupils with a better recall of the social norms messages. This is consistent with other studies that found a relationship between intervention effects and the retention of information delivered during the intervention period [99]. In addition, the analyses showed that high exposure to the intervention components, as well as satisfaction with the feedback session, both significantly increased the correct recall of the social norms messages. Furthermore, the results suggest that female pupils recalled the social norms messages better than male pupils, which may be explained by females being more attentive in class and more willing to participate in alcohol prevention than male pupils [2]. These findings reflect that the effectiveness of a social norms intervention relies not only on the level and type of exposure, but also on the level of the pupils’ ability to recall and understand the social norms messages delivered. To support pupils’ comprehension of school-based prevention programmes, previous research has recommended to actively engage pupils in the intervention through interactive delivery methods [33, 46, 88]. Besides the interactive “face-to-face” feedback session, the web application in *The GOOD Life* was designed to engage pupils and to increase the level of exposure. Unfortunately, the logged data obtained from the web application showed that pupils completing the quiz provided in the application, was distributed at only five schools resulting in no exposure to the web application for more than 70% of the intervention schools. However, preliminary analyses showed that more male than female pupils accessed the web application indicating that the idea of including a web application component could facilitate a higher exposure and retention for male pupils. A recent study found that a gamified social norms-based intervention enhanced the reduction in alcohol use

compared to a standard social norms intervention [73]. Also, the authors suggest that delivering alcohol prevention interventions within the context of a gamified web application allows more fun elements and may curb bias related to attrition and self-reported alcohol use. Further, an ongoing game could be used to assess later behaviour and make the follow-up data collection more organic and less expensive. Combining the results from the different implementation parameters, we suggest that social norms interventions in a Danish school-context should expose pupils to normative feedback messages through different delivery modes that best enable pupils' retention of the messages delivered.

Besides the significance of the delivery mode of interventions Domitrovich et al. [93] found that school-level factors such as available resources and school-climate had a substantial influence on implementation, and on the effectiveness of school-based interventions. In such case, it would be likely that the high level of exposure, satisfaction and message recall reflect not only a high quality of implementation, but also a supporting and overall positive school attitude towards the intervention. This suggests that implementation fidelity regarding both the intervention model and the surrounding support system may have contributed to the effectiveness of *The GOOD Life* [93, 94]. The voluntary enrolment in the trial could reflect a favourable disposition, where schools accepting the invitation would have prioritised alcohol prevention and allocated resources beforehand. However, the allocation to the intervention group was not known to the schools at the first invitation, and it can be assumed the control schools had similar motivations for enrolling in the trial, as intervention schools.

5.5 Methodological considerations

The current study was designed as a two-armed cluster-randomised controlled trial which did not allow to compare the intervention components separately. Hence, it could not be determined if any of the components contributed to a larger or smaller degree to the intervention effect. Also, recall of the correct messages from the three different components could not be clearly differentiated, because pupils with a high recall of the messages in the feedback session may be more likely to recall the correct messages from

the posters and web application. This would cause a “spillover effect” from the questions related to the feedback session to the questions related to the posters and web application.

The change in the follow-up period from 6 months to 3 months exclude the possibility of making conclusions on any long-term effects both regarding the maintaining of the corrected norm perceptions and any future behavioural changes. However, Doumas et al. [66] found that preventive effects found at a 3-months follow-up were not sustained at 6-months follow-up survey, suggesting that school-based prevention programmes could benefit from a booster session to maintain reductions in alcohol use for more than 6 months. Also, behavioural theories suggest that when using a short follow-up period, a change in behaviour is not able to be manifested in the target population and therefore not possible to measure within the relatively short time period. This could explain the small effects estimates in the current study. However, the 3-months follow-up survey is essential for the assessment of the intervention theory and to assess the effect of the intervention with minimal interference from other universal interventions such as the Danish Health Authority alcohol campaign in week 40. Also, the schools in the control group were asked to neglect all teaching activity related to substance use during the intervention period. Considering, Danish pupils’ increase in alcohol consumption and experimental behaviour during the years in grade 8 and 9 it would be unethical to ask schools and teachers not to discuss substance use and related harms with the pupils for a period of 6 months or more.

To obtain the calculated sample size, all public schools in the region of Southern Denmark that provided teaching to pupils in grade 8 and 9 were invited to participate in the trial. The recruitment was done two times (2015 and 2016) from the same pool of eligible schools. The reason to repeat the recruitment was that the first invitations were sent out in the same period as a major Danish school-reform was initiated. This induced many schools to decline the study invitation and to assign their resources to job rotations and new curriculum. However, the different time points of enrolment provided the study with a more diverse study population regarding generations, geography and school semesters (spring and autumn).

Finally, the effects found in the different stratified analyses should be interpreted with caution. The limited number of responders included in each stratified model could cause a loss of power because the sample size calculation was based on all pupils in grade 8 and 9 at each school. Also, the sample size calculation was based on an ICC of 0.02. However, the analyses revealed that the ICC for this study sample was 0.1. Hence, the clustering effect was larger than expected and the calculated sample size was therefore not sufficient to detect an effect size for binge drinking corresponding to 0.2 between control and intervention group at 3-months follow-up as suggested by Neighbors et al. [76].

5.5.1 Selection bias

The current study did not obtain systematic information from schools on the reasons for not participating in the study. However, the reason for declining the invitation frequently involved lack of time and resources for additional/new projects. Only a few schools declined because they did not consider alcohol consumption as a problem at their school. The voluntary participation could induce a selection bias where schools with a higher level of resources or higher rate of alcohol consumption among pupils would be more inclined to enrol in the study. This may have resulted in an overestimation of the prevalence of alcohol use and overestimation of the intervention effects. In addition, the sample size calculation was performed assuming a fixed mean cluster size. In practice, the number of pupils at each school varied from 2 to 91 participating in the study. This high variability in cluster size may have decreased the statistical power as the number of clusters remained the same [100]. This lack of power may be reflected in the insignificant intervention effects found in paper 2 and paper 3.

The response rate was relatively low for both the baseline survey (67%) and for the follow-up survey (58%). Even though the attrition for both baseline and follow-up survey mainly occurred at school and class level, selection bias cannot be ruled out, but the effect of individual selection bias may be limited. However, in previous studies, people with high alcohol consumption have been found to be less likely to participate in alcohol prevention research [101]. The drop out in this study occurred more frequently among older pupils that had a higher and more frequent use of alcohol. This bias towards heavier drinkers could underestimate the prevalence of alcohol use in the study population and may also

provide an underestimation of the intervention effect because the variance in the predictor for behavioural intentions would be decreased.

Despite the randomisation, there were baseline differences between intervention and control groups regarding age and descriptive norm perception of peers' lifetime binge drinking. Despite controlling for these differences in the statistical analyses, it was not possible to exclude any additional unmeasured baseline differences that could have reduced the internal validity of the study.

5.5.2 Measuring outcomes

The current study used self-administered questionnaires to obtain data on personal substance use among pupils. In surveys collecting data on alcohol consumption by self-reporting it is not possible to exclude any intentional and unintentional response bias. However, the confidential online survey allowed pupils to answer questions on sensitive issues anonymously. Also, surveys on alcohol use are in general considered valid and using a confidential online survey to collect information on substance use among university students has shown to produce data of high quality [102, 103].

The considerable amount of missing data for alcohol-related harms contributed to a lower power of the statistical analysis for this outcome, and the effect estimates should be interpreted with caution. However, the attrition analysis for alcohol-related harms showed that the non-response group (n=560) did not significantly differ from the rest of the study population regarding the primary behavioural outcomes. Furthermore, multiple-imputation was not undertaken because the variable in question was used as the outcome measure and because imputation depends on the assumption of data missing at random which is not considered to be satisfied in this situation [104].

The measurements of perception of peer alcohol use are a critical issue in social norms interventions [47, 68, 85]. When pupils need to make judgements about the prevalence of peers' alcohol use, it seems to be very important towards which group of peers the judgement should be made [68]. Also, it has to be acknowledged that any discrepancy could be a result of genuine inaccuracies of estimating other individuals' behaviour and could simply reflect methodical artefacts [85]. In this study, pupils were asked to relate

their judgements to 'the pupils in your own school and grade' to ensure that it was easy for them to identify the exact group of peers they were supposed to think about when answering the questionnaire [33, 68]. Further, any inflated estimates of peer drinking norms that could be caused by methodological bias were accounted for by adding a "buffer" of plus 10% to the actual prevalence calculated for each school and grade.

5.5.3 Measuring implementation

The measurements regarding the implementation parameters did not allow distinguishing between a lack of exposure to the intervention and a lack of interest from pupils in using or paying attention to individual intervention components (posters and web application). Also, this study did not provide any information on the teachers' role and willingness to manage the exposure to the posters and the web application or their engagement and attitudes towards the intervention. This lack of measures of factors related to the actual implementation of poster and web application makes it difficult to assess the context in which the intervention was delivered, beyond the feedback session. Hence, bias related to the exposure to and recall of intervention components cannot be ruled out.

5.5.4 Delivering the intervention

In order to minimise the variability in the delivery of the feedback session it was decided that trained members of the research team conducted the 40 minutes session at all schools. This set-up, where the external facilitators were members of the research team may cause an enhanced emphasis on the discrepancies between actual and perceived norms related to alcohol use, because correcting misperceptions was a predefined aim of the intervention. This predefined aim could bias the results displayed in the intervention towards a larger discrepancy between the actual and perceived norms in the peer group. Although any conflict of interest and biased conclusions cannot be ruled out due to the fact that delivery and evaluation of the intervention was done by the same research team, the effect is diminished, because the research team - while composing existing modes of delivery to a new programme - did not develop or invent the social norms approach as such. Therefore, the trial can be regarded as a replication of testing existing intervention components in a new setting.

6 Conclusion

This PhD thesis aimed to evaluate the effect of the social norms intervention *The GOOD Life* on norm perceptions and alcohol use among 13-17-year-old adolescents in Denmark using data from a cluster-randomised controlled trial. The results suggest that short-term interventions based on the social norms approach are a promising preventive strategy for correcting mistaken norm perceptions about peers' alcohol use and also for reducing harmful alcohol behaviour among Danish adolescents. Further, the findings revealed that better implementation fidelity could enhance the intervention effect.

Based on the baseline findings new insights were gained about personal alcohol use and the level of misperceived norms among Danish pupils. Differences between pupils in grade 8 and 9 were found for lifetime alcohol experience as well as for frequent binge drinking (5 or more drinks on one occasion) with heavier drinking pupils in 9th grade and more non- and light-drinking pupils in 8th grade. Moreover, pupils in grade 9 misperceived the rate of heavy alcohol consumption among their peers to a larger extent than pupils in grade 8. This may indicate that pupils in both grades falsely assumed that the majority of their peers was performing a more risky behaviour than themselves (pluralistic ignorance). In addition, it was evident that exaggerated perceptions regarding peer alcohol use and peers' approval of alcohol use were strongly associated with higher personal experience with alcohol. However, the level of misperception was somewhat higher among 9th graders compared to 8th graders, whereas the association between misperceptions and personal alcohol use were stronger among 8th graders. This may reflect the variation between heavier drinking pupils and light-drinking pupils. The findings in paper 1 supported the prerequisites for the application of the Social Norms Approach to a Danish school context, and these were employed in the development of the social norms intervention *The GOOD Life*.

The intervention *The GOOD Life* was designed as a theory-based prevention programme with a clear framing of the core components, repetitive information, classroom engagement, and low demand for school resources. In previous studies, these factors have been found to influence the effectiveness of social norms interventions. First of all, this

study showed a decrease in exaggerated perceptions of peer drinking among pupils exposed to the intervention. These findings add to the evidence supporting the theoretical framework for the social norms approach, where exposure to normative messages should correct pupils' misperceptions about their peers' risk behaviour. Secondly, the study demonstrated that *The GOOD life* had a preventive effect on alcohol-related harms, although the evidence for this finding was based on a limited sample size. Thirdly, there is indication for a preventive effect among at-risk adolescents, but more research is needed to confirm this. The findings also suggest that increased exposure to and better retention of the social norms messages enhanced the intervention effect, whereas the overall appeal of the intervention seemed to be less important for the effectiveness of *The GOOD Life*. This displays the importance of ensuring that the normative feedback messages are delivered through different channels and components to support pupils' comprehension of the intervention. Moreover, the cluster-randomised controlled trial demonstrated that both the content and delivery of *The GOOD Life* intervention was suitable in order to reduce harmful drinking behaviour among Danish pupils aged 13-17 years. Even though no statistically significant decrease was found for alcohol use, the study showed that misperception about peer alcohol use exists among Danish pupils aged 13-17 years, that such misperception could be corrected and that alcohol-related harms could be reduced. Hence, based on the findings presented in this thesis it can be concluded that a social norms intervention such as *The GOOD Life* could have a potential preventive effect on pupils' future use of alcohol and its harmful consequences and therefore may improve health and wellbeing among Danish adolescents.

6.1 Implication for research

This study adds to the existing research on the feasibility of the Social Norms Approach in European school-settings. Our findings show that the link between misperception and risk-behaviour still needs to be approached and further investigated to fully understand the predictors of substance use among adolescents. Also, the potential for more persistent effects by using injunctive norms in social norms interventions would be beneficial to study in more detail and to explore any additional effects of school-based interventions [83, 84]. Further, the subgroup analysis and the investigation of issues related to the implementation fidelity added to our understanding of the pathway between intervention and behavioural change. However, future research should strengthen the understanding of the link between behavioural intention and behavioural change. In addition, research is needed to assess the full potential of implementing the SNA in the Danish school-system. Especially, evaluations conducted by external evaluators using scientific guidelines described by e.g. ‘American Evaluation Association Guiding Principles for Evaluators’ (<http://www.eval.org/p/cm/ld/fid=51>) could support policy decisions regarding school-based prevention programmes. Also, evaluations conducted by external actors would minimise any conflict of interest and biased conclusions that might weaken the credibility of the evaluation.

Promising effects of *The GOOD Life* were found when pupils were exposed to engaging and various components. Other research has suggested that gamified components [73] and components that train resistance skills in adolescents [105] may enhance the effects of school-based prevention programmes. How and to what extent such components in a novel way, could be incorporated in social norms interventions would be relevant to investigate in future studies.

An ongoing implication within the research of school-based alcohol prevention is the lack of measuring long-term effects. This is caused both by restrictions in study designs and by insufficient attention to maintenance and implementation [2]. In this study, information on the contextual factors related to implementation was not collected, and therefore school-level factors such as adherence to the intervention protocol or influence of teachers’ involvement were not assessed. Hence, it would be relevant that future

studies investigate social norms in more context specific and detailed ways, where implementation parameters are reported and included in the assessments. One way to accomplish this would be to separate the development and delivery of the intervention from the process and effect evaluation. This would make it possible to rigorously test the programme and to make evidence-based recommendations for scaling up the intervention.

6.2 Implication for practice

The current study suggests that SNA is a promising preventive strategy to reduce harmful alcohol use and its consequences among Danish adolescents. However, the intervention seemed to work better among pupils already drinking (heavily) and in the current study these pupils compose a relatively small group. Hence, it would be difficult to target only these heavy-drinking pupils without the risk of blaming them for their behaviour which would be ethically questionable and against the principles in the SNA. Also, by targeting all pupils, the intervention will have the potential to reduce pupils' overestimation of peer substance use and over time influence pupils' intentions to engage less in harmful drinking such as frequent binge drinking.

The study also revealed that high exposure only did not ensure effectiveness, but that appropriate channels for delivery (interactive and engaging) were important for the appreciation and effectiveness of the social norms intervention *The GOOD Life*. Moreover, the consistency between these results and the findings in previous Danish studies (the Ringsted project [29] and SNIPE [24]) imply that the approach is adaptable across settings and may also apply to other risk-behaviours such as mobbing, doping and crime. In a recent report from the Danish crime prevention council (Det Kriminalpræventive Råd), it is revealed that Danish citizens overestimate the prevalence of crime in Denmark such as juvenile delinquency and home robberies [106]. Also, the Danish crime prevention council have an ongoing collaboration with local communities and schools about social norms and crime prevention among adolescents [107].

However, studies have shown that when prevention programmes emerge into more routine implementation, it can be difficult to replicate the findings from the initial

research led by the programmes' developers [65]. With *The GOOD Life* intervention, this is to some extent accommodated by using a design that requires minimal school resources and no adherence to an extensive school curriculum. However, implementers' basic understanding of the Social Norms Approach is imperative for the effectiveness of the intervention. For any dissemination of social norms intervention for alcohol prevention, it is recommended that the implementers focus on issues such as the emphasis on credibility and origin of data, adequate repetition, exposure to the key components and appropriate engagement from the school and teachers. Further, studies need to investigate the long-term effects as well as the costs and public benefits of using the SNA among Danish adolescents aged 13-17 years and if social norms interventions should be combined with a programme targeting resilience towards peer pressure regards substance use.

In addition, research has found that theory-based prevention programmes that are well accepted by both students and teachers are more likely to be effective across different populations [105, 108]. To facilitate this, it could be beneficial to apply the salutogenic orientation to a larger extent which could help people to be more resilient and facilitate the persons' move towards health [44]. Research has suggested that a persons' ability to assess and understand the situation he or she is in, can mediate their intentions towards and the actual performance of healthy behaviour. Further, salutogenesis in an ecological system such as the school setting can support effective coping during adolescence by enabling pupils' capacity to move towards healthy behaviour both as single individuals and together as a peer group [43, 109]. For the implementation of an alcohol prevention intervention, such capacities could support the engagement of both pupils and teachers (school) in developing a school environment that promotes health.

7 References

1. Kraus L, Leifman H and Vicente J. *ESPAD Report 2015: Results from the European School survey Project on Alcohol and other Drugs*. Luxembourg: Publications Office of the European Union; 2016.
2. Carey KB, Scott-Sheldon LA, Carey MP and DeMartini KS. Individual-level interventions to reduce college student drinking: a meta-analytic review. *Addict Behav.* 2007;32(11):2469-94.
3. Crosnoe R, Benner A and Schneider B. Drinking, socioemotional functioning, and academic progress in secondary school. *J Health Soc Behav.* 2012;53(2):150-64.
4. Viner RM and Taylor B. Adult outcomes of binge drinking in adolescence: findings from a UK national birth cohort. *J Epidemiol Community Health.* 2007;61(10):902-7.
5. Newton-Howes G and Boden JM. Relation between age of first drinking and mental health and alcohol and drug disorders in adulthood: evidence from a 35-year cohort study. *Addiction.* 2016;111(4):637-44.
6. White A and Hingson R. The burden of alcohol use excessive alcohol consumption and related consequences among college students. *Alcohol Res Health.* 2013;35(2):201-18.
7. Dawson DA, Goldstein RB, Patricia Chou S, June Ruan W and Grant BF. Age at first drink and the first incidence of adult-onset DSM-IV alcohol use disorders. *Alcohol Clin and Exp Res.* 2008;32(12):2149-60.
8. Sundhedsstyrelsen. *Alkoholstatistik 2015. Nationale data [Alcohol statistics 2015, Denmark]*. Copenhagen: Sundhedsstyrelsen; 2015.
9. Rasmussen M, Pedersen TP and Due P. *Skolebørnsundersøgelsen 2014 [Health behaviour in school-aged children survey - Denmark 2014]*. Rasmussen M, Pedersen TP, Due P, editors. Copenhagen: Statens Institut for Folkesundhed; 2015.
10. Bloomfield K, Elmeland K and Villumsen S. *Rusmidler i Danmark - forbrug, holdninger og livsstil [Substance use in Denmark -consumption, attitudes and lifestyle]* Aarhus: Centre for Alcohol and Drug Research, Aarhus University; 2013.
11. Johansen A, Rasmussen S and Madsen M. Health behaviour among adolescents in Denmark: Influence of school class and individual risk factors. *Scand J Public Health.* 2006;34(1):32-40.
12. Berkowitz A. An overview of the Social Norms Approach. In: Lederman L, Stewart L, editors. *Changing the culture of college drinking: A socially situated health communication campaign*. Cresskill, NJ.: Hampton Press; 2005.
13. Festinger LA. A theory of social comparison processes. *Human Communi.* 1954;7:117-40.
14. Borsari B and Carey KB. Peer influences on college drinking: a review of the research. *J Subst Abuse.* 2001;13(4):391-424.
15. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process.* 1991;50(2):179-211.

16. Ajzen I. *Attitudes, Personality and Behavior*. 2 ed. Berkshire, UK: McGraw-Hill Education; 2005.
17. Borsari B and Carey KB. Descriptive and injunctive norms in college drinking: a meta-analytic integration. *J Stud Alcohol*. 2003;64(3):331-41.
18. Kypri K and Langley JD. Perceived social norms and their relation to university student drinking. *J Stud Alcohol*. 2003;64(6):829-34.
19. Pischke CR, Helmer SM, McAlaney J, Bewick BM, Vriesacker B, Van Hal G, et al. Normative misperceptions of tobacco use among university students in seven European countries: Baseline findings of the 'Social Norms Intervention for the prevention of Polydrug use' study. *Addict Behav*. 2015;51:158-64.
20. Martens MR, Page JC, Mowry ES, Damann KM, Taylor KK and Cimini MD. Differences between actual and perceived student norms: An examination of alcohol use, drug use, and sexual behavior. *J Am Coll Health*. 2006;54(5):295-300.
21. Bertholet N, Faouzi M, Studer J, Daepfen JB and Gmel G. Perception of tobacco, cannabis, and alcohol use of others is associated with one's own use. *Addict Sci Clin Pract*. 2013;8:15.
22. Franca LR, Dautzenberg B, Falissard B and Reynaud M. Peer substance use overestimation among French university students: a cross-sectional survey. *BMC Public Health*. 2010;10.
23. Andersson A, Wirehn AB, Olvander C, Ekman DS and Bendtsen P. Alcohol use among university students in Sweden measured by an electronic screening instrument. *BMC Public Health*. 2009;9:229.
24. McAlaney J, Helmer SM, Stock C, Vriksacker B, Van Hal G, Dempsey RC, et al. Personal and perceived peer use of and attitudes toward alcohol among university and college students in seven EU countries: Project SNIPE. *J Studies Alcohol Drugs*. 2015;76(3):430-8.
25. Lintonen TP and Konu AI. The misperceived social norm of drunkenness among early adolescents in Finland. *Health Educ Res*. 2004;19(1):64-70.
26. Voogt CV, Larsen H, Poelen EAP, Kleinjan M and Engels R. Longitudinal associations between descriptive and injunctive norms of youngsters and heavy drinking and problem drinking in late adolescence. *J Subst Use*. 2013;18(4):275-87.
27. Page RM, Ihasz F, Hantiu I, Simonek J and Klarova R. Social normative perceptions of alcohol use and episodic heavy drinking among Central and Eastern European adolescents. *Subst Use Misuse*. 2008;43(3-4):361-73.
28. Pedersen ER, Miles JNV, Ewing BA, Shih RA, Tucker JS and D'Amico EJ. A longitudinal examination of alcohol, marijuana, and cigarette perceived norms among middle school adolescents. *Drug Alcohol Depend*. 2013;133(2):647-53.
29. Balvig F and Holmberg L. The ripple effect: a randomized trial of a social norms intervention in a Danish middle school setting. *J Scand Stud Criminol Crime Prev*. 2011;12(1):3-19.
30. Perkins HW. *The Social Norms Approach to preventing school and college age substance abuse: A handbook for educators, counselors, and clinicians*. Perkins HW, editor. San Francisco, CA: Jossey-Bass; 2003. 320 s. p.

31. D'Amico EJ, Ellickson PL, Wagner EF, Turrisi R, Fromme K, Ghosh-Dastidar B, et al. Developmental considerations for substance use interventions from middle school through college. *Alcohol Clin Exp Res.* 2005;29(3):474-83.
32. Stock C, McAlaney J, Pischke C, Vriesacker B, Van Hal G, Akvardar Y, et al. Student estimations of peer alcohol consumption: Links between the Social Norms Approach and the Health Promoting University concept. *Scand J Soc Med.* 2014;42(15_suppl):52-9.
33. Miller DT and Prentice DA. Changing norms to change behavior. *Annu Rev Psychol.* 2016;67:339-61.
34. Miller DT and McFarland C. Pluralistic ignorance - when similarity is interpreted as dissimilarity. *J Pers Soc Psychol.* 1987;53(2):298-305.
35. Marks G and Miller N. 10 years of research on the false-consensus effect - an empirical and theoretical review. *Psychol Bull.* 1987;102(1):72-90.
36. Darley JM. Social organization for the production of evil. *Psychol Inq.* 1992;3(2):199-218.
37. Demant J and Krarup TM. The structural configurations of alcohol in Denmark: Policy, culture, and industry. *Contemp Drug Probl.* 2013;40(2):259-89.
38. Jepson RG, Harris FM, Platt S and Tannahill C. The effectiveness of interventions to change six health behaviours: a review of reviews. *BMC Public Health.* 2010;10:538.
39. Sundhedsstyrelsen. *Er der effekt af forebyggelseskampagner? [Are prevention campaigns effective in Denmark?]*. Copenhagen: Sundhedsstyrelsen; 2013.
40. Foxcroft DR, Ireland D, Lister-Sharp DJ, Lowe G and Breen R. Longer-term primary prevention for alcohol misuse in young people: a systematic review. *Addiction.* 2003;98(4):397-411.
41. Perkins HW, Meilman PW, Leichter JS, Cashin JR and Presley CA. Misperceptions of the norms for the frequency of alcohol and other drug use on college campuses. *J Am Coll Health.* 1999;47(6):253-8.
42. Haines M and Barker G. The NIU experiment: A case study of the social norms approach. In: Perkins H, editor. *The social norms approach to preventing school and college age substance use: A handbook for educators, counselors and clinicians.* San Francisco, CA: Jossey-Bass; 2003. p. 21-34.
43. Antonovsky A. The salutogenic model as a theory to guide health promotion. *Health Promot Int.* 1996;11(1):11-8.
44. Lindstrom B and Eriksson M. Salutogenesis. *J Epidemiol Community Health.* 2005;59(6):440-2.
45. Reid AE and Carey KB. Interventions to reduce college student drinking: State of the evidence for mechanisms of behavior change. *Clin Psychol Rev.* 2015;40:213-24.
46. Cuijpers P. Effective ingredients of school-based drug prevention programs - A systematic review. *Addict Behav.* 2002;27(6):1009-23.

47. Hummer JF and Davison GC. Examining the role of source credibility and reference group proximity on personalized normative feedback interventions for college student alcohol use: A randomized laboratory experiment. *Subst Use Misuse*. 2016;51(13):1701-15.
48. Haines MP, Perkins HW, Rice R and Barker G. *Guide to marketing Social Norms for Health Promotion in schools and communities*. Michigan: National Social Norms Resource Center; 2005.
49. WHO Expert Committee on Comprehensive School Health Education and Promotion. *Promoting health through schools: report of a WHO Expert Committee on Comprehensive School Health Education and Promotion*. Geneva: World Health Organization; 1997.
50. Carney T, Myers BJ, Louw J and Okwundu CI. Brief school-based interventions and behavioural outcomes for substance-using adolescents. *Cochrane Database Syst Rev*. 2016(1).
51. Foxcroft DR and Tsertsvadze A. Universal school-based prevention programs for alcohol misuse in young people. *Cochrane Database Syst Rev*. 2011(5).
52. Neighbors C, Dillard AJ, Lewis MA, Bergstrom RL and Neil TA. Normative misperceptions and temporal precedence of perceived norms and drinking. *J Stud Alcohol*. 2006;67(2):290-9.
53. Campo S, Brossard D, Frazer MS, Marchell T, Lewis D and Talbot J. Are social norms campaigns really magic bullets? Assessing the effects of students' misperceptions on drinking behavior. *Health Commun*. 2003;15(4):481-97.
54. Kypri K, Hallett J, Howat P, McManus A, Maycock B, Bowe S, et al. Randomized controlled trial of proactive web-based alcohol screening and brief intervention for university students. *Arch Intern Med*. 2009;169(16):1508-14.
55. Morgenstern M, Wiborg G, Isensee B and Hanewinkel R. School-based alcohol education: results of a cluster-randomized controlled trial. *Addiction*. 2009;104(3):402-12.
56. Ellickson PL, McCaffrey DF, Ghosh-Dastidar B and Longshore DL. New inroads in preventing adolescent drug use: results from a large-scale trial of project ALERT in middle schools. *Am J Public Health*. 2003;93(11):1830-6.
57. Campo S and Cameron KA. Differential effects of exposure to social norms campaigns: A cause for concern. *Health Commun*. 2006;19(3):209-19.
58. Faggiano F, Galanti MR, Bohrn K, Burkhart G, Vigna-Taglianti F, Cuomo L, et al. The effectiveness of a school-based substance abuse prevention program: EU-Dap cluster randomised controlled trial. *Prev Med*. 2008;47:537-43.
59. Foxcroft DR, Moreira MT, Almeida Santimano NM and Smith LA. Social norms information for alcohol misuse in university and college students. *Cochrane Database Syst Rev*. 2015;1:Cd006748.
60. Wechsler H, Nelson TF, Lee JE, Seibring M, Lewis C and Keeling RP. Perception and reality: A national evaluation of social norms marketing interventions to reduce college students' heavy alcohol use. *J Stud Alcohol*. 2003;64(4):484-94.

61. Strøm HK, Adolfsen F, Handegård BH, Natvig H, Eisemann M, Martinussen M, et al. Preventing alcohol use with a universal school-based intervention: results from an effectiveness study. *BMC Public Health*. 2015;15(1):337.
62. Stockings E, Hall WD, Lynskey M, Morley KI, Reavley N, Strang J, et al. Prevention, early intervention, harm reduction, and treatment of substance use in young people. *Lancet Psychiatry*. 2016;3(3):280-96.
63. Simpson K and Freeman R. Critical health promotion and education—a new research challenge. *Health Educ Res*. 2004;19(3):340-8.
64. Turhan A, Onrust SA, ten Klooster PM and Pieterse ME. A school-based programme for tobacco and alcohol prevention in special education: effectiveness of the modified 'healthy school and drugs' intervention and moderation by school subtype. *Addiction*. 2017;112(3):533-43.
65. Malmberg M, Kleinjan M, Overbeek G, Vermulst A, Monshouwer K, Lammers J, et al. Effectiveness of the 'Healthy School and Drugs' prevention programme on adolescents' substance use: a randomized clustered trial. *Addiction*. 2014;109(6):1031-40.
66. Doumas DM, Hausheer R, Esp S and Cuffee C. Reducing alcohol use among 9th grade students: 6 month outcomes of a brief web-based intervention. *J Subst Abuse Treat*. 2014;47(1):102-5.
67. Onrust SA, Otten R, Lammers J and Smit F. School-based programmes to reduce and prevent substance use in different age groups: What works for whom? Systematic review and meta-regression analysis. *Clin Psychol Rev*. 2016;44:45-59.
68. Lewis MA and Neighbors C. Who is the typical college student? Implications for personalized normative feedback interventions. *Addict Behav*. 2006;31(11):2120-6.
69. Pischke CR, Zeeb H, van Hal G, Vriesacker B, McAlaney J, Bewick BM, et al. A feasibility trial to examine the social norms approach for the prevention and reduction of licit and illicit drug use in European University and college students. *BMC Public Health*. 2012;12(1):882-9.
70. Stock C, Vallentin-Holbech L and Rasmussen BM. The GOOD life: Study protocol for a social norms intervention to reduce alcohol and other drug use among Danish adolescents. *BMC Public Health*. 2016;15:704.
71. Stock C, Vallentin-Holbech L and Rasmussen BM. Erratum to: The GOOD life: Study protocol for a social norms intervention to reduce alcohol and other drug use among Danish adolescents. *BMC Public Health*. 2017;17(1):501.
72. Killos LF, Hancock LC, Wattenmaker McGann A and Keller AE. Do "Clicker" educational sessions enhance the effectiveness of a Social Norms Marketing campaign? *J Am Coll Health*. 2010;59(3):228-30.
73. Boyle SC, Earle AM, LaBrie JW and Smith DJ. PNF 2.0? Initial evidence that gamification can increase the efficacy of brief, web-based personalized normative feedback alcohol interventions. *Addict Behav*. 2017;67:8-17.
74. Bewick BM, Trusler K, Mulhern B, Barkham M and Hill AJ. The feasibility and effectiveness of a web-based personalised feedback and social norms alcohol intervention in UK university students: A randomised control trial. *Addict Behav*. 2008;33(9):1192-8.

75. Siddiqui O, Hedeker D, Flay BR and Hu FB. Intraclass correlation estimates in a school-based smoking prevention study. Outcome and mediating variables, by sex and ethnicity. *Am J Epidemiol.* 1996;144(4):425-33.
76. Neighbors C, Larimer ME and Lewis MA. Targeting misperceptions of descriptive drinking norms: efficacy of a computer-delivered personalized normative feedback intervention. *J Consult Clin Psychol.* 2004;72(3):434-47.
77. Nielsen GA, Ringgaard L, Broholm K, Sindballe A and Olsen SF. *Unge livsstil og dagligdag 2000: forbrug af tobak, alkohol og stoffer [Young people's lifestyle and daily life: use of tobacco, alcohol and drugs]*. Copenhagen: The Danish Cancer Society and National Board of Health; 2002.
78. Currie, Molcho M, Boyce W, Holstein B, Torsheim T and Richter M. Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) family affluence scale. *Soc Sci Med.* 2008;66(6):1429-36.
79. Currie, Inchley J, Molcho M, Lenzi M, Veselka Z and Wild F. *Health Behaviour in School-aged Children (HBSC) study protocol: Background, methodology and mandatory items for the 2013/2014 survey*. St Andrews: CAHRU; 2014.
80. Galanti MR, Siliquini R, Cuomo L, Melero JC, Panella M and Faggiano F. Testing anonymous link procedures for follow-up of adolescents in a school-based trial: the EU-DAP pilot study. *Prev Med.* 2007;44(2):174-7.
81. McAlaney J and McMahon J. Normative beliefs, misperceptions, and heavy episodic drinking in a british student sample. *J Stud Alcohol Drugs.* 2007;68(3):385-92.
82. Jacobson RP, Mortensen CR and Cialdini RB. Bodies obliged and unbound: Differentiated response tendencies for injunctive and descriptive Social Norms. *J Personality Social Psychol.* 2011;100(3):433-48.
83. LaBrie JW, Hummer JF, Neighbors C and Larimer ME. Whose opinion matters? The relationship between injunctive norms and alcohol consequences in college students. *Addict Behav.* 2010;35(4):343-9.
84. Mollen S, Rimal RN, Ruiters RAC, Jang SA and Kok G. Intervening or interfering? The influence of injunctive and descriptive norms on intervention behaviours in alcohol consumption contexts. *Psychol Health.* 2013;28(5):561-78.
85. Melson AJ, Davies JB and Martinus T. Overestimation of peer drinking: error of judgement or methodological artefact? *Addiction.* 2011;106(6):1078-84.
86. Bewick BM, Trusler K, Barkham M, Hill AJ, Cahill J and Mulhern B. The effectiveness of web-based interventions designed to decrease alcohol consumption - A systematic review. *Prev Med.* 2008;47(1):17-26.
87. Faggiano F, Vigna-Taglianti F, Burkhart G, Bohrn K, Cuomo L, Gregori D, et al. The effectiveness of a school-based substance abuse prevention program: 18-month follow-up of the EU-Dap cluster randomized controlled trial. *Drug Alcohol Depend.* 2010;108(1-2):56-64.
88. Giannotta F, Vigna-Taglianti F, Galanti MR, Scatigna M and Faggiano F. Short-term mediating factors of a school-based intervention to prevent youth substance use in Europe. *J Adolesc Health.* 2014;54(5):565-73.

89. Neighbors C, Jensen M, Tidwell J, Walter T, Fossos N and Lewis MA. Social-norms interventions for light and nondrinking students. *Group Process Intergroup Relat.* 2011;14(5):651-69.
90. Foxcroft DR and Tsertsvadze A. Universal alcohol misuse prevention programmes for children and adolescents: Cochrane systematic reviews. *Perspect Public Health.* 2012;132(3):128-34.
91. Bertholet N, Daepfen JB, Cunningham JA, Burnand B, Gmel G and Gaume J. Are young men who overestimate drinking by others more likely to respond to an electronic normative feedback brief intervention for unhealthy alcohol use? *Addict Behav.* 2016;63:97-101.
92. Caria MP, Faggiano F, Bellocco R and Galanti MR. Effects of a school-based prevention program on European adolescents' patterns of alcohol use. *J Adolesc Health.* 2011;48(2):182-8.
93. Domitrovich CE, Bradshaw CP, Poduska JM, Hoagwood K, Buckley JA, Olin S, et al. Maximizing the implementation quality of evidence-based preventive interventions in schools: A Conceptual Framework. *Adv Sch Ment Health Promot.* 2008;1(3):6-28.
94. Durlak JA and DuPre EP. Implementation matters: a review of research on the influence of implementation on program outcomes and the factors affecting implementation. *Am J Community Psychol.* 2008;41(3-4):327-50.
95. Scott-Sheldon LAJ, Carey KB, Elliott JC, Garey L and Carey MP. Efficacy of alcohol interventions for first-year college students: A meta-analytic review of randomized controlled trials. *J Consult Clin Psychol.* 2014;82(2):177-88.
96. Bewick BM, West RM, Barkham M, Mulhern B, Marlow R, Traviss G, et al. The effectiveness of a Web-based personalized feedback and social norms alcohol intervention on United Kingdom university students: randomized controlled trial. *J Med Internet Res.* 2013;15(7):106-16.
97. Petty RE and Cacioppo JT. The Elaboration Likelihood Model of Persuasion. *Adv Exp Soc Psychol.* 1986;19:123-205.
98. Petty RE and Brinol P. Emotion and persuasion: cognitive and meta-cognitive processes impact attitudes. *Cogn Emot.* 2015;29(1):1-26.
99. Jouriles EN, Brown AS, Rosenfield D, McDonald R, Croft K, Leahy MM, et al. Improving the effectiveness of computer-delivered personalized drinking feedback interventions for college students. *Psychol Addict Behav.* 2010;24(4):592-9.
100. Lauer SA, Kleinman KP and Reich NG. The effect of cluster size variability on statistical power in cluster-randomized trials. *PLoS One.* 2015;10(4):e0119074.
101. Biglan A, Hood D, Brozovsky P, Ochs L, Ary D and Black C. Subject attrition in prevention research. *NIDA.* 1991;107.
102. Ekholm O, Strandberg-Larsen K, Christensen K and Grønbaek M. Comparison of assessment methods for self-reported alcohol consumption in health interview surveys. *Eur J Clin Nutr.* 2008;62(2):286-91.
103. Cooper AM, Sobell MB, Sobell LC and Maisto SA. Validity of alcoholic's self-reports: duration data. *Int J Addict.* 1981;16(3):401-6.

104. StataCorp. *Multiple-Imputation reference manual, Release 15*. College Station, Texas: Stata Press; 2017. 387 p.
105. Giannotta F and Weichold K. Evaluation of a life skills program to prevent adolescent alcohol use in two European countries: One-year follow-up. *Child Youth Care Forum*. 2016;45(4):607-24.
106. Rambøll. *Danskernes forestillinger, bekymringer og adfærd i forhold til kriminalitet [Perceptions, concerns and behavior in relation to crime in Denmark]*. Copenhagen: Danish crime prevention council; 2016.
107. Bannow M, Hvidemose M, Aarslev A and Olesen KE. *SSP – en guide til samarbejdet [SSP - a guide for collaboration]*. Nickelsen AK, editor. Copenhagen: Danish crime prevention council; 2012.
108. Botvin GJ, Griffin KW, Diaz T and Ifill-Williams M. Drug abuse prevention among minority adolescents: posttest and one-year follow-up of a school-based preventive intervention. *Prev Sci*. 2001;2(1):1-13.
109. Braun-Lewensohn O, Idan O, Lindstrom B and Margalit M. Salutogenesis: Sense of Coherence in adolescence. In: Mittelmark MB, Sagy S, Eriksson M, Bauer GF, Pelikan JM, Lindstrom B, et al., editors. *The Handbook of Salutogenesis*. Cham (CH): Springer; 2017.

8 Appendix – Questionnaire

QUESTIONNAIRE

Det GODE Liv

Welcome!

In this study, you will be asked to answer personal and important questions about the use of alcohol, drugs and smoking, also about what you think other pupils in your class do.

In approximately 3 months you will be asked to complete a similar questionnaire. Therefore, it is essential that you answer all questions and are careful entering your answers. All information that you provide to us in connection with the questionnaire will be treated confidentially and anonymously. Neither teacher nor parents will see your response. We would therefore ask you to answer as honestly as possible. This survey is part of the research project 'The GOOD Life', conducted at the University of Southern Denmark in Esbjerg.

How to complete the questionnaire

Read each question and all response categories before you answer, and please note that unless stated otherwise, only one answering category can be selected. Some questions are easier to answer than others. If in doubt, simply tick the box that best suit you.

Remember: it is not a test, and there are therefore no right or wrong answers. You can give the answers that suit you.

To be able to compare your answers in 3 months with today's questionnaire **without** we or anyone else exactly knows who you are, we need to create a code of letters.

1. Please enter the first and last letter of your mother's first name.

First letter _____

Last letter _____

Personal information

Now we will ask you questions about your background.

2. What grade are you in?

- (1) 8th grade
- (2) 9th grade
- (3) 10th grade.

3. What year where you born?

- (1) 1996
- (2) 1997
- (3) 1998
- (4) 1999
- (5) 2000
- (6) 2001
- (7) 2002
- (8) 2003
- (9) 2004

4. What month where you born?

- | | |
|---------------------------------------|--|
| (1) <input type="checkbox"/> January | (7) <input type="checkbox"/> July |
| (2) <input type="checkbox"/> February | (8) <input type="checkbox"/> August |
| (3) <input type="checkbox"/> March | (9) <input type="checkbox"/> September |
| (4) <input type="checkbox"/> April | (10) <input type="checkbox"/> October |
| (5) <input type="checkbox"/> May | (11) <input type="checkbox"/> November |
| (6) <input type="checkbox"/> June | (12) <input type="checkbox"/> December |

5. What is your gender?

- (1) Boy
- (2) Girl

Family

In the following questions, you should answer based on the FAMILY / HOUSEHOLD where you mostly stay. If you have multiple homes, choose one and base your answers on this for all issues.

6. Does your family own a car, van or truck? (Currie et al., 2008)

- (1) None
- (2) One
- (3) Two
- (4) Three or more

7. Do you have your own bedroom for yourself? (Currie et al., 2008)

- (1) Yes
- (2) No

8. Does your family have a dishwasher at home? (Currie et al., 2008)

- (1) Yes
- (2) No

9. How many bathrooms (room with a bath/shower or both) are in your home? (Currie et al., 2008)

- (1) None
- (2) One
- (3) Two
- (4) Three or more

10. How many times did you and your family travel abroad for a holiday/vacation last year? (Currie et al., 2008)

- (1) None
- (2) One
- (3) Two
- (4) Three or more

11. How many computers do your family own (including laptops and tablets, not including game consoles and smartphones)? (Currie et al., 2008)

- (1) None
- (2) One
- (3) Two
- (4) Three or more

12. How well off do you think your family is? (Currie et al., 2014)

- (1) Very well off
- (2) Quite well off
- (3) Average
- (4) Not so well off
- (5) Not at all well off

Health and well-being

13. Would you say your health is.....? (Currie et al., 2014)

- (1) Excellent
- (2) Good
- (3) Fair
- (4) Poor

14. Do you think that your life is satisfying? (Nielsen, Ringgaard, Broholm, Sindballe, & Olsen, 2002)

- (1) Always
- (2) Normally
- (4) Rarely
- (5) Never

15. How do you feel about school at present? (Currie et al., 2014)

- (1) I like it lot
- (2) I like it a bit
- (3) I don't like it very much
- (4) I don't like it at all

16. In your opinion, what does your class teacher(s) think about your school performance compared to your classmates? (Currie et al., 2014)

- (1) Very good
 - (2) Good
 - (3) Average
 - (4) Below average
-

Now we will ask you some questions on your consumption of tobacco, alcohol and drugs. Remember all information that you provide for us, will be **treated confidentially and anonymously**.

Smoking

17. Have you ever smoked tobacco, minimum 1 whole cigarette, cigar or pipe?

- (1) Yes
- (2) No

18. How often do you smoke tobacco at present?

- (1) Yes every day
- (2) At least once a week, but not every day
- (3) Less than once a week
- (4) I do not smoke anymore
- (5) I have never smoked

19. Have you been smoking tobacco within the past 30 days?

- (1) Yes
- (2) No

Alcohol

In the following, **one drink** corresponds to an alcoholic beverage of the following:

1 bottle of beer, one glass of wine, 1 alcoholic cider, 1 alcopops, 1 drink / cocktail, 1 big shot (eg. Vodka) or 2 big shots of “Gajol”

In addition, similar 1 bottle of wine corresponds to 6 drinks and one bottle of liquor to 20 drinks.



Have you to ever:	Yes	No
20. Been drinking alcohol?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>
21. Been drunk? (been drinking so much, that you either are very happy, sad, dizzy or tired)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>
22. Been drinking 5 or more drinks on the same occasions?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>

Consider the past 30 days: At how many occasions (parties, gatherings etc.) have you? (Nielsen et al., 2002)

	Never	1	2	3	4	5	6	7	8	9	+10
23. Been drinking alcohol?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>	(8) <input type="checkbox"/>	(9) <input type="checkbox"/>	(10) <input type="checkbox"/>	(11) <input type="checkbox"/>
24. Been drunk?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>	(8) <input type="checkbox"/>	(9) <input type="checkbox"/>	(10) <input type="checkbox"/>	(11) <input type="checkbox"/>
25. Been drinking 5 or more drinks?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>	(8) <input type="checkbox"/>	(9) <input type="checkbox"/>	(10) <input type="checkbox"/>	(11) <input type="checkbox"/>

26. How many alcoholic drinks would you normally have on a day that you drink alcohol? (Pischke et al., 2012)

(1) <input type="checkbox"/>	1	(7) <input type="checkbox"/>	7	(13) <input type="checkbox"/>	13	(19) <input type="checkbox"/>	19	(25) <input type="checkbox"/>	25
(2) <input type="checkbox"/>	2	(8) <input type="checkbox"/>	8	(14) <input type="checkbox"/>	14	(20) <input type="checkbox"/>	20	(26) <input type="checkbox"/>	26
(3) <input type="checkbox"/>	3	(9) <input type="checkbox"/>	9	(15) <input type="checkbox"/>	15	(21) <input type="checkbox"/>	21	(27) <input type="checkbox"/>	27
(4) <input type="checkbox"/>	4	(10) <input type="checkbox"/>	10	(16) <input type="checkbox"/>	16	(22) <input type="checkbox"/>	22	(28) <input type="checkbox"/>	28
(5) <input type="checkbox"/>	5	(11) <input type="checkbox"/>	11	(17) <input type="checkbox"/>	17	(23) <input type="checkbox"/>	23	(29) <input type="checkbox"/>	29
(6) <input type="checkbox"/>	6	(12) <input type="checkbox"/>	12	(18) <input type="checkbox"/>	18	(24) <input type="checkbox"/>	24	(30) <input type="checkbox"/>	30

27. What is the highest number of alcoholic drinks you have had in a single session in the past 30 days? (Pischke et al., 2012)

- | | | | | |
|--------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| (1) <input type="checkbox"/> 1 | (7) <input type="checkbox"/> 7 | (13) <input type="checkbox"/> 13 | (19) <input type="checkbox"/> 19 | (25) <input type="checkbox"/> 25 |
| (2) <input type="checkbox"/> 2 | (8) <input type="checkbox"/> 8 | (14) <input type="checkbox"/> 14 | (20) <input type="checkbox"/> 20 | (26) <input type="checkbox"/> 26 |
| (3) <input type="checkbox"/> 3 | (9) <input type="checkbox"/> 9 | (15) <input type="checkbox"/> 15 | (21) <input type="checkbox"/> 21 | (27) <input type="checkbox"/> 27 |
| (4) <input type="checkbox"/> 4 | (10) <input type="checkbox"/> 10 | (16) <input type="checkbox"/> 16 | (22) <input type="checkbox"/> 22 | (28) <input type="checkbox"/> 28 |
| (5) <input type="checkbox"/> 5 | (11) <input type="checkbox"/> 11 | (17) <input type="checkbox"/> 17 | (23) <input type="checkbox"/> 23 | (29) <input type="checkbox"/> 29 |
| (6) <input type="checkbox"/> 6 | (12) <input type="checkbox"/> 12 | (18) <input type="checkbox"/> 18 | (24) <input type="checkbox"/> 24 | (30) <input type="checkbox"/> 30 |

Have you ever had one or more of the following problems because you had been drinking alcohol? (Nielsen et al., 2002; Pischke et al., 2012)

- | | Yes | No |
|--|------------------------------|------------------------------|
| 28. Missed a class or other commitment? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 29. Performed poorly on a test or assignment? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 30. Experienced memory loss? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 31. Felt hungover or ill the following morning? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 32. Got into fight or other confrontation? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 33. Been injured? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 34. Had to receive emergency medical treatment? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 35. Damaged property, own or others? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 36. Ruined your close or other things? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 37. Lost money or other things of value? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 38. Short of money | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 39. Got into trouble with police? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 40. Had problems in regard to your parents? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 41. Had problems in regard to friends? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |
| 42. Had problems in regard to your teachers? | (1) <input type="checkbox"/> | (0) <input type="checkbox"/> |

43. What is your opinion to your consumption of alcohol? (Nielsen et al., 2002)

- (1) It would be okay if I drank more alcohol
 (2) I drink an appropriate amount of alcohol
 (3) I drink a bit too much alcohol
 (4) I drink way too much alcohol

44. Do your parents think that you drink too much alcohol? (Nielsen et al., 2002)

- (1) Yes
 (2) No
 (3) I don't know

Cannabis and other illegal drugs**45. Have you ever used (eaten, smoked or been drinking) cannabis or marihuana?**

- (1) Yes
 (2) No

46. How many times have you used cannabis or marihuana within the past 30 days?

- (1) Never (5) 4 times (9) 8 times
 (2) 1 time (6) 5 times (10) 9 times
 (3) 2 times (7) 6 times (11) +10 times
 (4) 3 times (8) 7 times

47. Have you ever used any other illegal drugs than cannabis or marihuana for example amphetamine, ecstasy, heroin or cocaine? (Nielsen et al., 2002)

- (1) Yes
 (2) No

Attitude towards smoking, alcohol and drugs.

Which of the following describes best your attitude to using each of these substances? (Pischke et al., 2012)

	It is never a good idea regardless of age	It is okay if you are grown up – but not at my age	Sometimes it is okay at my age, as long as it is not affecting school or other obligations.	Sometimes it is okay at my age, even if it affects school and other obligation.	It is okay at my age to do frequently, if that is what the person wants to do.
48. TOBACCO e.g. cigarettes or cigars?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
49. ALCOHOL e.g. beer, wine, spirits, alcopops and -cider?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
50. Larger amount of alcohol, so one becomes drunk?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
51. Cannabis or marihuana?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Other pupils' consumption of alcohol, drugs and tobacco (Haines, Perkins, Rice, & Barker, 2005; Pischke et al., 2012).

Now we will ask you questions regarding what percentage of student at your school and grade you believe to EVER have done one of the following things.

If you believe that it is 10 out of 40 pupils at your grade, this will correspond to 25%.

If you believe it is 30 out of 40 pupils at your grade, it corresponds to 75%.

52. What percentage of pupils, at your grade, do you believe have ever smoked cigarettes?

---- Slide bar used to rate the percentage (0-100%)

53. What percentage of pupils, at your grade, do you believe have ever drunk a whole alcoholic drink?

---- Slide bar used to rate the percentage (0-100%)

54. What percentage of students, at your grade, do you believe have ever been drunk?

---- Slide bar used to rate the percentage (0-100%)

55. What percentage of students, at your grade, do you believe have ever been drinking 5 or more drinks on the same drinking session?

---- Slide bar used to rate the percentage (0-100%)

56. What percentage of students, at your grade, do you believe have ever used cannabis or marihuana?

---- Slide bar used to rate the percentage (0-100%)

57. What percentage of students, at your grade, do you believe have ever used other illegal drugs than cannabis and marihuana for example amphetamine, ecstasy, heroin or cocaine?

---- Slide bar used to rate the percentage (0-100%)

Which of the following statements do you think best describe the attitude of most (at least 51%) of the pupils at your grade to the use of each of these substances? (Pischke et al., 2012)

	It is never a good idea regardless of age	It is okay if you are grown up - but not at my age	Sometimes it is okay at my age, as long as it is not affecting school or other obligations.	Sometimes it is okay at my age, even if it affects school and other obligation.	It is okay at my age to do frequently, if that is what the person wants to do.
58. TOBACCO e.g. cigarettes, chewing tobacco, cigars?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
59. ALCOHOL e.g. beer, wine, spirits, alcopops and -cider?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
60. Larger amount of alcohol, so one becomes drunk?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
61. Cannabis or marihuana?	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Now the focus of the questionnaires will be what you believe pupils from your grade have done within the past 30 days.

62. How many times, do you believe, that most pupils (at least 51%) have used alcohol (beer, spirits, alcopops or –cider) within the past 30 days?

- | | | |
|--------------------------------------|--------------------------------------|---|
| (1) <input type="checkbox"/> Never | (5) <input type="checkbox"/> 4 times | (9) <input type="checkbox"/> 8 times |
| (2) <input type="checkbox"/> 1 time | (6) <input type="checkbox"/> 5 times | (10) <input type="checkbox"/> 9 times |
| (3) <input type="checkbox"/> 2 times | (7) <input type="checkbox"/> 6 times | (11) <input type="checkbox"/> +10 times |
| (4) <input type="checkbox"/> 3 times | (8) <input type="checkbox"/> 7 times | |

63. What percentage of pupils, at your grade, do you believe have smoked cigarettes during the past 30 days? (Teen Norms)

---- Slide bar used to rate the percentage (0-100%)

64. What percentage of pupils, at your grade, do you believe have used alcohol during the past 30 days? (Teen Norms)

---- Slide bar used to rate the percentage (0-100%)

65. What percentage of students, at your grade, do you believe have been drunk during the past 30 days?

---- Slide bar used to rate the percentage (0-100%)

66. What percentage of students, at your grade, do you believe have been drinking 5 or more drinks at the same drinking session during the past 30 days? Own

---- Slide bar used to rate the percentage (0-100%)

67. How many alcoholic drinks do you think most (at least 51%) of pupils at your grade normally have on a day that they drink alcohol? (Pischke et al., 2012)

- | | | | | |
|--------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| (1) <input type="checkbox"/> 1 | (7) <input type="checkbox"/> 7 | (13) <input type="checkbox"/> 13 | (19) <input type="checkbox"/> 19 | (25) <input type="checkbox"/> 25 |
| (2) <input type="checkbox"/> 2 | (8) <input type="checkbox"/> 8 | (14) <input type="checkbox"/> 14 | (20) <input type="checkbox"/> 20 | (26) <input type="checkbox"/> 26 |
| (3) <input type="checkbox"/> 3 | (9) <input type="checkbox"/> 9 | (15) <input type="checkbox"/> 15 | (21) <input type="checkbox"/> 21 | (27) <input type="checkbox"/> 27 |
| (4) <input type="checkbox"/> 4 | (10) <input type="checkbox"/> 10 | (16) <input type="checkbox"/> 16 | (22) <input type="checkbox"/> 22 | (28) <input type="checkbox"/> 28 |
| (5) <input type="checkbox"/> 5 | (11) <input type="checkbox"/> 11 | (17) <input type="checkbox"/> 17 | (23) <input type="checkbox"/> 23 | (29) <input type="checkbox"/> 29 |
| (6) <input type="checkbox"/> 6 | (12) <input type="checkbox"/> 12 | (18) <input type="checkbox"/> 18 | (24) <input type="checkbox"/> 24 | (30) <input type="checkbox"/> 30 |

Strength and Difficulties Questionnaire (SDQ) (Goodman, Meltzer, & Bailey, 1998)

For each item, please mark the box for Not True, Somewhat True or Certainly True.

Please give your answers based on how things have been for you over the past 6 months.

	Not true	Somewhat true	Certainly true
68. I try to be nice to other people. I care about their feelings	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
69. I am restless, I cannot stay still for long	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
70. I get a lot of headaches, stomach-aches or sickness	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
71. I usually share with others (food, games, pens etc.)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
72. I get very angry and often lose my temper	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
73 I am usually on my own. I generally play alone or keep to myself	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
74. I usually do as I am told	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
75. I worry a lot	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
76. I am helpful if someone is hurt, upset or feeling ill	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
77. I am constantly fidgeting or squirming	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
78. I have one good friend or more	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
79. I fight a lot. I can make other people do what I want	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>

	Not true	Somewhat true	Certainly true
80. I am often unhappy, down-hearted or tearful	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
81. Other people my age generally like me	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
82. I am easily distracted, I find it difficult to concentrate	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
83. I am nervous in new situations. I easily lose confidence	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
84. I am kind to younger children	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
84. I am often accused of lying or cheating	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
85. Other children or young people pick on me or bully me	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
86. I often volunteer to help others (parents, teachers, children)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
87. I think before I do things	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
88. I take things that are not mine from home, school or elsewhere	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
89. I get on better with adults than with people my age	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
90. I have many fears, I am easily scared	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>
91. I finish the work I'm doing. My attention is good.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>

Thank you for participating! If you have any comments about the questionnaire or project, you can write them here:

ADDITIONAL QUESTIONS IN THE 3-MONTHS FOLLOW-UP SURVEY ON IMPLEMENTATION PARAMETERS

In the following we will ask about The GOOD Life project that you and your school participated in.

101. Did you participate when the project The GOOD Life visited your school and gave a feedback on alcohol and smoking?

- (1) Yes
 (2) No
 (3) Don't know

102. Which of the following messages do you recall from The GOOD Life feedback session? (Chose 4 that fits best)

- (1) 9 out of 10 choose not to smoke
 (2) Drink responsibly!
 (3) It is okay to say no to alcohol
 (4) It is bad for your health to drink alcohol
 (5) Less pupils than you would think drink alcohol
 (6) It is stupid and uncool to drink alcohol
 (7) It is illegal to smoke cannabis
 (8) The majority of pupils rarely drink alcohol
 (9) None of the above

103. Besides the feedback session, The GOOD Life campaign also provided posters for your school. Did you see the posters about smoking and alcohol?

- (1) Yes
 (2) No

104. How many posters did you see during the last month?

- | | | |
|--------------------------------|--------------------------------|--|
| (1) <input type="checkbox"/> 0 | (5) <input type="checkbox"/> 4 | (9) <input type="checkbox"/> 8 |
| (2) <input type="checkbox"/> 1 | (6) <input type="checkbox"/> 5 | (10) <input type="checkbox"/> 9 |
| (3) <input type="checkbox"/> 2 | (7) <input type="checkbox"/> 6 | (11) <input type="checkbox"/> 10 or more |
| (4) <input type="checkbox"/> 3 | (8) <input type="checkbox"/> 7 | |

105. Which of the following messages do you recall from the posters? (Chose 4 that fits best)

- (1) 9 out of 10 choose not to smoke
 (2) Drink responsibly!
 (3) It is okay to say no to alcohol
 (4) It is bad for your health to drink alcohol
 (5) Less pupils than you would think drink alcohol
 (6) It is stupid and uncool to drink alcohol
 (7) It is illegal to smoke cannabis
 (8) The majority of pupils rarely drink alcohol
 (9) None of the above

106. The GOOD Life campaign also offered a web-based quiz. Did you try the quiz on your mobile or computer?

- (1) Yes
 (2) No

107. Which of the following messages do you recall from the web-based quiz? (Chose 4 that fits best)

- (1) 9 out of 10 choose not to smoke
 (2) Drink responsibly!
 (3) It is okay to say no to alcohol
 (4) It is bad for your health to drink alcohol
 (5) Less pupils than you would think drink alcohol
 (6) It is stupid and uncool to drink alcohol
 (7) It is illegal to smoke cannabis
 (8) The majority of pupils rarely drink alcohol
 (9) None of the above

108. To be able to improve The GOOD Life campaign, we would like your opinion on the FEEDBACK SESSION

What do you think was good about the feedback session? _____

What do you think could be done better in the feedback session? _____

109. Overall, how satisfied are you with the feedback session?

- (1) Very satisfied
 (2) Satisfied
 (3) Somewhat satisfied
 (4) Dissatisfied
 (5) Very dissatisfied

110. To be able to improve The GOOD Life campaign, we would like your opinion on the POSTERS

What do you think was good about the posters? _____

What do you think could be done better about the posters? _____

111. Overall, how satisfied are you with the posters?

- (1) Very satisfied
 (2) Satisfied
 (3) Somewhat satisfied
 (4) Dissatisfied
 (5) Very dissatisfied

112. To be able to improve The GOOD Life campaign, we would like your opinion on the WEBBASED QUIZ

What do you think was good about the web quiz? _____

What do you think could be done better about the web quiz? _____

113. Overall, how satisfied are you with the web-based quiz?

- (1) Very satisfied
 (2) Satisfied
 (3) Somewhat satisfied
 (4) Dissatisfied
 (5) Very dissatisfied

REFERENCES TO THE QUESTIONNAIRE

- Currie, Inchley, J., Molcho, M., Lenzi, M., Veselka, Z., & Wild, F. (2014). *Health Behaviour in School-aged Children (HBSC) study protocol: Background, methodology and mandatory items for the 2013/2014 survey*. St Andrews: CAHRU.
- Currie, Molcho, M., Boyce, W., Holstein, B., Torsheim, T., & Richter, M. (2008). Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) family affluence scale. *Social Science & Medicine*, *66*(6), 1429-1436.
- Goodman, R., Meltzer, H., & Bailey, V. (1998). The Strengths and Difficulties Questionnaire: A pilot study on the validity of the self-report version. *European Child and Adolescent Psychiatry*, *7*, 125-130.
- Haines, M. P., Perkins, H. W., Rice, R., & Barker, G. (2005). *Guide to marketing Social Norms for Health Promotion in schools and communities*. Michigan: National Social Norms Resource Center.
- Nielsen, G., Ringgaard, L., Broholm, K., Sindballe, A., & Olsen, S. (2002). *Unge's livsstil og dagligdag 2000: forbrug af tobak, alkohol og stoffer [Young people's lifestyle and daily life: use of tobacco, alcohol and drugs]*. Copenhagen: The Danish Cancer Society and National Board of Health.
- Pischke, C. R., Zeeb, H., van Hal, G., Vriesacker, B., McAlaney, J., Bewick, B. M., . . . Mikolajczyk, R. T. (2012). A feasibility trial to examine the social norms approach for the prevention and reduction of licit and illicit drug use in European University and college students. *Bmc Public Health*, *12*(1), 882-889. doi:10.1186/1471-2458-12-882

9 Papers

Paper 1

Paper 2

Paper 3