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An interrupted time-series analysis

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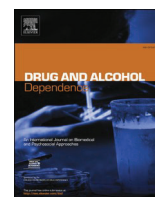
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The impact of an annual mass media campaign on treatment seeking for alcohol use disorders in the Danish population: An interrupted time-series analysis

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ABSTRACT

Introduction: A minority of individuals with alcohol use disorder (AUD) seek treatment. In Denmark, a mass media campaign, “RESPEKT”, aiming to increase treatment seeking, has been broadcasted nationwide since 2015. The campaign is unique from an international perspective. Similar interventions have, up until now, not been scientifically evaluated.

Aim: To investigate whether there was an association between campaign periods and treatment seeking for AUD. A secondary aim was to investigate possible gender differences. The hypotheses were that treatment seeking would increase during the campaign periods, and that men would increase their treatment seeking more compared to women.

Method: Study design: Interrupted time-series analysis.

Participants: Adults aged 18 years and above in the Danish population seeking AUD treatment.

Exposure: Campaign periods year 2015–2018.

Outcome: Changes in treatment seeking defined as treatment entry respectively filled prescription of AUD pharmacotherapy.

Data: National Alcohol Treatment Register on treatment entries for specialist addiction care and National Prescription Registry for filled prescriptions on AUD pharmacotherapies 2013–2018.

Analysis: Segmented negative binomial regression, including the full cohort and stratified by sex.

Results: The results show no association between campaign periods and treatment seeking. Nor were there any gender differences in treatment seeking. The hypotheses were not confirmed.

Conclusion: The campaign periods showed no association with treatment seeking. Eventual future campaigns should possibly focus on earlier steps of the treatment seeking process, as problem recognition, to increase treatment seeking. There is a great need to develop other ways to narrow the treatment gap for AUD.

1. Introduction

Currently, Alcohol Use Disorder (AUD) directly affects 100 million individuals worldwide (GBD 2016 Alcohol and Drug Use Collaborators, 2018). Globally, the total alcohol consumption is predicted to increase over the coming 10 years, which can lead to an increase in the number of individuals suffering from AUD and alcohol related consequences (World Health Organization, 2018). In comparison to other countries in Western Europe, the level of alcohol consumption is high in Denmark. The prevalence of AUD in Denmark is estimated to 17% of the adult

Danish population (Hansen et al., 2011).

There are effective treatments for AUD available, both pharmacological and psychological, which can reduce alcohol use and its negative consequences (Carvalho et al., 2019). However, there is a large treatment gap (Degenhardt et al., 2017), meaning that only a minority of those affected ever seek treatment. Estimates of the size of the gap vary greatly between countries, where the pooled rates between countries show that 83% of those with AUD never seek treatment (Mekonen et al., 2021). In Denmark, it is estimated that circa 10% of all individuals with AUD seek treatment (Schwarz et al., 2018). Treatment seeking for AUD

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is thus markedly lower compared to other psychiatric disorders (Mekonen et al., 2021). One effective way to decrease the alcohol related harm in society is to increase treatment seeking (Carvalho et al., 2019).

There is a paucity of literature on interventions aimed at increasing treatment seeking. Attempts to increase mental health literacy and to decrease stigma have shown to increase treatment seeking for psychiatric disorders in the short term, while interventions focusing on motivational enhancement show positive long term effects on treatment seeking (Xu et al., 2018). Moreover, digital interventions that broadly target mental health issues have also shown a positive effect on attitudes to treatment seeking (Johnson et al., 2022). However, very few studies focus specifically on AUD (Xu et al., 2018, Johnson et al., 2022).

Globally, most efforts to increase treatment seeking for AUD have thus far been on implementing the Screening, Brief Interventions, and Referral to Treatment (SBIRT) model, mainly within health care settings (Bray et al., 2017). The SBIRT model includes: screening for hazardous alcohol use; raising the individuals' awareness about consequences of alcohol use; when needed, eliciting motivation to reduce alcohol use; and - in the presence of AUD - refer the individual to treatment. However, there is a lack of evidence that referral to treatment leads to higher treatment utilization (Frost et al., 2020). During the past 15 years, there has been no increase in the treatment rates for AUD (Mekonen et al., 2021). There is therefore a great need to find new approaches to close the treatment gap for AUD.

1.1. Mass media campaigns

Mass media campaigns have the advantage of being easily implemented, with a potential high outreach. Both mass media campaigns and unplanned mass media coverage, seem to show a positive association with treatment-seeking in general and the use of self-help for reducing alcohol use (Grilli et al., 2002; Garnett et al., 2021), and are thus promising approaches for further investigation. Mass media campaigns aim to target both the individual-level determinants of health behaviors, such as awareness, knowledge, attitudes, and motivation; as well as the structural-level determinants such as social norms (Dykxhoorn et al., 2022). However, little attention has been given specifically to the associations between exposure to mass media campaigns and subsequent treatment-seeking for AUD.

1.2. The RESPEKT campaign

The Danish organizations "Alkohol & Samfund" and "Trygfonden", in cooperation with media / PR agencies and local alcohol treatment services, have developed a media campaign, "RESPEKT," which has been broadcasted annually across Denmark since 2015. The campaign includes TV and Internet advertisements, local activities in cooperation with the councils; posters, pamphlets on social media and in public places, and also short movies. During the years included in the present study, the campaign also included a prime-time TV campaign, focusing on positive consequences of treatment-seeking, such as gaining respect from others. The primary target group for the campaign was in year 2015–2017 men aged 35–65 with AUD and in year 2018 it was men aged 40–70 with AUD, since the treatment gap was considered the largest in this group. The RESPEKT campaign is unique from an international perspective, both with its aim to increase treatment-seeking for AUD and the repeated exposure to it.

The hypothesized mechanism of change is a chain of events: firstly, recall of the campaign, secondly, understanding of the campaign message and thirdly, responses to the campaign, attitudinal and emotional. This can then increase knowledge, awareness, attitudes, and motivation associated with information-seeking about treatment and, in turn, treatment-seeking behaviors (Stead et al., 2019).

In a cross-sectional study, we have shown that the campaign was successful in evoking positive attitudes towards AUD treatment

(Wallhed Finn et al., 2022). Contrary to the hypothesized mechanism of change – no increase in self-reported information seeking for AUD treatment was seen. Moreover, in an experimental randomized controlled trial we evaluated effects of exposure to video materials used in the RESPEKT campaign and found no increase in motivation to seek treatment (Wallhed Finn et al., submitted). However, it has also been shown in anonymous surveys, that the willingness to self-report stigmatized behaviors as treatment seeking for AUD can be low (Andreasson et al., 2013). To fully understand the potential effects of these types of campaigns there is a need to also use data from national registers, which do not pose the same risk of bias as self-reported data. In Denmark, national registers with high quality data covering the total Danish population are available. Using an interrupted time series design (ITS), the aim of this study was to investigate whether there was an association between the RESPEKT campaign periods and treatment seeking for AUD. ITS study designs are increasingly being used for the evaluation of public health interventions, including mass media campaigns, that target population-level health outcomes. In an ITS study, a time series of an outcome of interest, in this case entry to AUD treatment, is used to establish an underlying trend. The intervention, here the RESPEKT campaigns, are then added as 'interruptions', to evaluate whether they have an impact on the underlying trend.

The hypothesis was that treatment seeking would increase during the campaign periods.

A secondary aim was to investigate possible gender differences in the association between the RESPEKT campaign periods and treatment seeking for AUD, and also to investigate the effect on the campaign on the target group, men aged 40–70.

The hypothesis was that men would increase their treatment seeking more compared to women, as the campaign primarily targets men.

2. Methods

The study was approved by the Research Ethics Committee at the University of Southern Denmark on the 14th of January 2021, registration number: 20/70424.

2.1. Study design

Interrupted time-series analysis.

2.2. Study population

Adults age 18 years and older in Denmark seeking AUD treatment.

In Denmark, two modalities of treatment are registered nationwide in national registers: entry into publicly funded specialist addiction treatment; and prescriptions filled for AUD pharmacotherapies, which covers all prescriptions in the total population, also those made in for example primary care. These two registers were used to define the study population. Data from two years previous the campaign, year 2013–2014, and during the first four years of the campaign, year 2015–2018 was used.

The first register used in this study is the National Alcohol Treatment Register (NAB). Since 2006, it is mandatory for all public (and to some extent private) alcohol treatment centers to register all individuals seeking publicly funded treatment (Schwarz et al., 2018). All new individuals entering treatment were included.

The second register used was the National Prescription Registry (NPR), which stores individual-level data on prescriptions filled by Danish residents at community pharmacies, including type of medication and date of retrieval (Pottegård et al., 2017). In the current study all individuals that filled any of the following ATC codes (WHO-defined Anatomical Therapeutic Chemical codes) were included: N07BB01 (Disulfiram), N07BB03 (Acamprosate), N07BB04 (Naltrexone) and N07BB05 (Nalmefene). These are approved for treatment of AUD in Denmark, and not used for other indications.

2.3. Exposure

The original campaign dates were shifted slightly for modeling purposes. Even if an individual takes immediate contact with the treatment facility or General Practitioner (GP) for an appointment to get a prescription, there will be a delay before treatment entry or filling a prescription. To capture this delayed effect, the first week after the actual start date was defined as the week when the campaign begins, and the week ending the campaign was defined as two weeks after the actual end-date. This lag in time covers the time from contacting the clinic for an appointment to the first appointment where treatment seeking is registered. [Table 1](#).

We defined a week as starting on a Monday, the first week was the first Monday in 2013, and the last week ended on 31st of December 2018. We defined the month for a given week as the month of that Monday, and the year of a week as the year of that Monday. Easter was defined as the two weeks which include Danish public holidays connected to Easter (Maundy Thursday, Good Friday and Easter Sunday). Christmas/New Year's was defined as the week including December 24th and two weeks onwards, except in the case where December 24th fell on a Sunday, when it was defined as the week after and two weeks onwards.

2.4. Outcome

Changes in treatment seeking for AUD.

From the NAB register all dates of entry into treatment were utilized. All treatment entries, regardless of time since last treatment, were included. Individuals can choose to enter treatment anonymously.

In NPR, the dates of retrieval were used, we defined a filled prescription as a new treatment if the time since last filled prescription for any medication for AUD was at least 6 months.

2.5. Statistical analysis

To model the data, the number of entries to treatment and the number of prescriptions were aggregated at a weekly level. This was a pragmatic choice to avoid having to model weekday and weekend fluctuations. This created time-series which could be used in an ITS design, with multiple interruptions caused by the campaigns. The campaign periods were categorized for the first model as 0: before any campaign (years 2013 and 2014), 1: campaign period (active campaign period in 2015, 2016, 2017 and 2018), 2: between or after campaign periods (between the campaign periods and after the last campaign in 2018)– and for the second model each campaign and before/between/after campaign was a separate category (results in appendix).

Segmented negative binomial regression on weekly counts of entries to treatment was used to evaluate the impact of the mass media campaigns. This is an appropriate modeling method for analyzing interrupted time-series data ([Wagner et al., 2002](#)). As the data was over dispersed, the negative binomial model was favored over a Poisson model. Huber White Robust Standard Errors were used in all models to control for some non-normality in the residuals.

All models had five explanatory variables in common— campaign period (as described above), year (2013–2018, modeled categorically), a variable indicating Easter, a variable indicating Christmas, and a categorical variable indicating month of the year.

The campaign period was included to model level changes in the

Table 1
The RESPEKT campaign periods.

Year	2015	2016	2017	2018
Dates	12th to 29th of January	21st January to 4th February	21st January to 6th of March	11th January to 11th March
Days (n)	18	15	42	60

number of entries into treatment/number of collected prescriptions per week.

The month, Easter and Christmas indicators were added to model seasonality in treatment entry and prescription retrieval, while month was added to capture seasonality and year was added to capture variation over time. Week was added as continuous variable to model a trend over time in the analyses of entry to treatment as it improved model fit as by likelihood ratio test. No such improvement was found in the models for prescription drugs. We also tested for interaction terms between campaign period and week to investigate a change in trend in treatment entry before and during or after campaigns, but this term did not improve model fit in any case.

One outlier in 2015 were detected among treatment entries, were one municipality reported 422 entries for one day where their median was less than three a day. This was modeled by a binary outlier variable. A sensitivity analysis excluding this municipality (data not shown) did not change the results.

To investigate if the results differed by gender, the analyses was repeated stratified by gender. Furthermore, an analysis of the group “Men aged 40–70” was added to analyse the effect in the targeted population of the campaign.

Incidence rate ratios were reported with 95% confidence intervals, and a 5% value was used to test for statistical significance. The analyses were not preregistered and should be considered exploratory. Analyses were completed in Stata 17.

3. Results

During the study period, a total of n=60 175 treatment entries were made, respectively n=33 112 prescriptions of AUD pharmacotherapies were filled ([Table 2](#)). 68% of the study population were men. The mean age at treatment entry was 49 years respectively 51 years when collecting pharmacotherapy.

There was no change in the number of treatment entries or number of prescriptions of pharmacotherapies for AUD during the campaign period

Table 2
Demographic data and absolute numbers of treatment entry according to NAB and filled pharmacotherapies for AUD according to NPR.

		NAB	NPR
		N=60,175	N=33,112
Age, mean(sd)		48.5 (12.4)	51.1 (12.1)
Gender, N (%)	Male	41,133 (68.4%)	22,528 (68.0%)
	Female	19,042 (31.6%)	10,584 (32.0%)
Year, N (%)	2013	9838 (16.3%)	5472 (16.5%)
	2014	9868 (16.4%)	5538 (16.7%)
	2015	11,397 (18.9%)	5716 (17.3%)
	2016	10,040 (16.7%)	5512 (16.6%)
	2017	9976 (16.6%)	5345 (16.1%)
	2018	9056 (15.0%)	5529 (16.7%)
Which type was the observed entry/prescription retrieval, N (%)	First in observed time period	34,129 (56.7%)	17,744 (53.6%)
	Recurring in period	17,697 (29.4%)	15,368 (46.4%)
	Anonymous entry (only NAB)	8349 (13.9%)	-
Which drug was prescribed (only NPR), N (%)	Disulfiram		26,263 (79.3%)
	Acamprostate		5563 (16.8%)
	Naltrexone		685 (2.1%)
	Nalmefene		601 (1.8%)

compared to before the campaign or between or after campaigns (Fig. 1).

Table 3 shows the results of the negative binomial regression. Compared to the time before campaigns (year 2013 and 2014), the number of filled pharmacotherapies was significantly lower between/after campaigns overall (IRR 0.87 (95% CI 0.78;0.97), $p=0.013$). For men, both the rate of entry to treatment (IRR 0.92 (95% CI 0.86;0.98), $p=0.013$) and the number of filled pharmacotherapies (IRR 0.87 (95% CI 0.77;0.97), $p=0.016$) was lower between/after campaigns compared to before any campaign. When stratifying on primary target group, men aged 40–70, significant differences in rates were found when comparing the time between/after campaigns to before any campaign (NAB: IRR 0.87 (95% CI 0.86;0.98), NPR: IRR 0.87 (95% CI 0.79;0.96)). Furthermore, the number of filled pharmacotherapies also was significantly lower during the campaigns (IRR 0.89 (95% CI 0.82;0.93)).

The campaign periods had lower incidence rates than the pre-campaign period in both the overall group and among men, though not significant, and there were no other significant differences regarding treatment entry or number of filled pharmacotherapies for AUD, when comparing campaign periods or between/after campaign periods to the period before campaigns.

4. Discussion

The aim of this study was to investigate whether there was a positive association between the RESPEKT campaign periods and treatment seeking for AUD, using register data of utilization of specialist addiction treatment and prescription rates of pharmacotherapies for AUD,

Table 3
Incidence rate ratios for treatment entry according to NAB and number of filled pharmacotherapies for AUD according to NPR.

Group		NAB		NPR	
		IRR (95% CI)	p-value	IRR (95% CI)	p-value
All	before any campaign	Reference	.	Reference	.
All	campaign period	0.99 (0.91; 1.08)	0.878	0.91 (0.81; 1.03)	0.130
All	between or after campaigns	0.95 (0.88; 1.03)	0.223	0.87 (0.78; 0.97)	0.013
Men	before any campaign	Reference	.	Reference	.
Men	campaign period	0.99 (0.92; 1.07)	0.778	0.90 (0.79; 1.01)	0.082
Men	between or after campaigns	0.92 (0.86; 0.98)	0.010	0.87 (0.77; 0.97)	0.016
Men aged 40–70	before any campaign	Reference	.	Reference	.
Men aged 40–70	campaign period	0.95 (0.89; 1.03)	0.202	0.89 (0.80; 0.99)	0.039
Men aged 40–70	between or after campaigns	0.87 (0.82; 0.93)	<0.001	0.87 (0.79; 0.96)	0.004
Women	before any campaign	Reference	.	Reference	.
Women	campaign period	1.00 (0.77; 1.29)	0.975	0.95 (0.82; 1.09)	0.445
Women	between or after campaigns	1.03 (0.80; 1.32)	0.844	0.88 (0.78; 1.00)	0.052

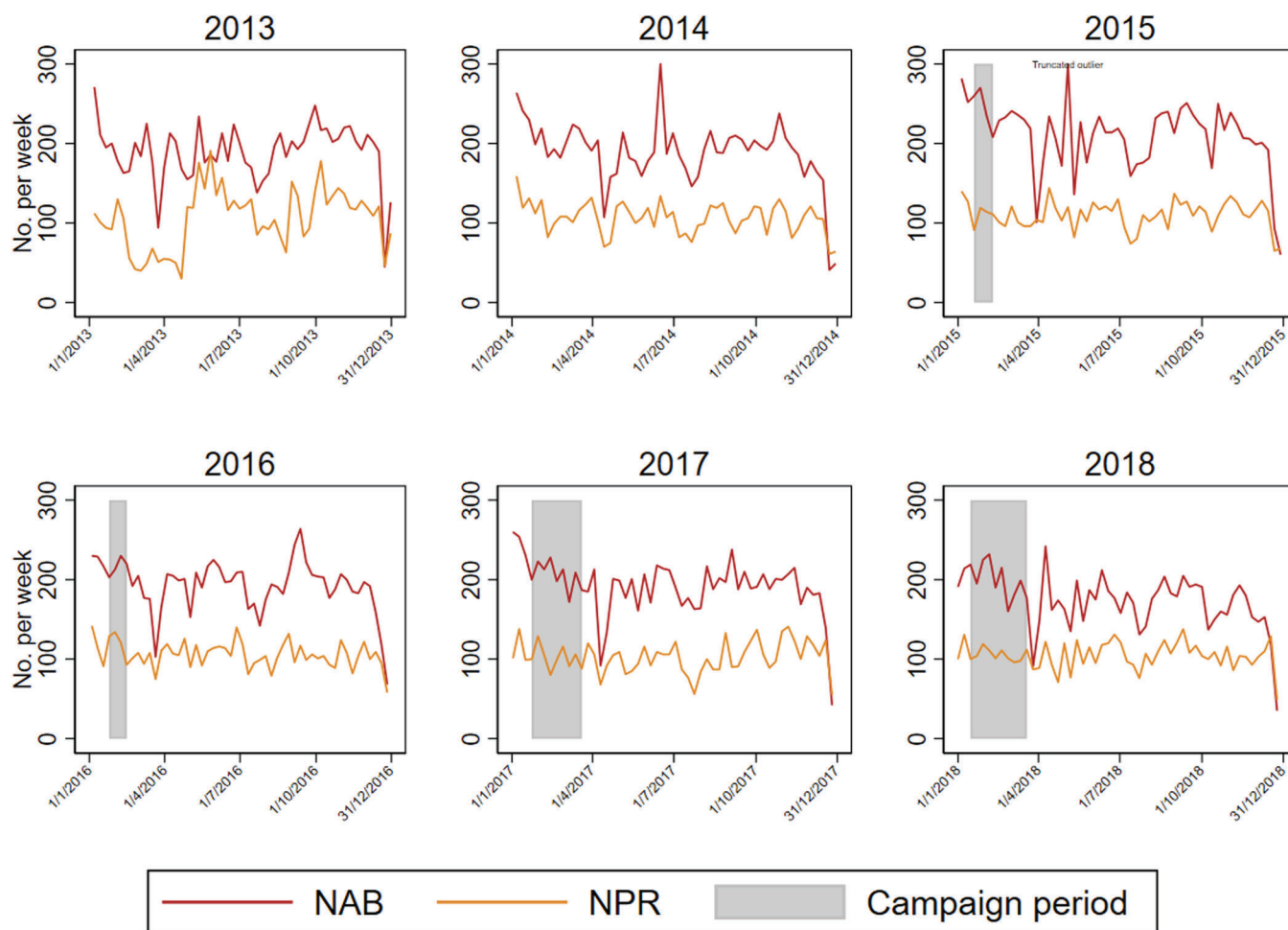


Fig. 1. Shows the weekly number of entries into treatment and collected prescriptions in the years 2013–2018.

covering the total Danish population in addition to investigating possible gender-related differences. The results show no positive association between the campaign periods and treatment seeking, neither overall, nor separately for men, women or the target group of the campaign, men aged 40–70 years. The two hypotheses were thus not confirmed.

Our findings - or rather lack of findings - are in contrast to previous studies showing that mass media campaigns and mass media coverage, have a positive association with general treatment-seeking (Grilli et al., 2002). However, our findings are in line with our previous studies related to the RESPEKT campaign, suggesting that there is no association between exposure to the campaign or self-reported information seeking about treatment (Wallhed Finn et al., 2022) nor motivation to seek treatment (Wallhed Finn, Mejldal. et al. submitted).

4.1. Treatment seeking

The RESPEKT campaign made use of targeted communication, so one path forward could be to test nontargeted messages that are applicable for a larger proportion of the population (Kreuter and Wray, 2003). As AUD is highly stigmatized, individuals may distance themselves from identifying as having unhealthy alcohol use, to avoid being stigmatized, a phenomenon called “label avoidance” (Corrigan, 2004; Morris, Moss et al., 2022).

A study from England has shown an association between mass media attention and an increased use of a self-help app (Garnett et al., 2021). This suggests that media attention can increase an interest to find out more about one’s own alcohol use. The lack of effect on actual treatment seeking in the current study indicates that there is a need for more attention to the progression in the care continuum from information seeking and self-tests, to actual treatment seeking. Among the most common barriers to treatment seeking for AUD are; perceived lack of need for treatment, stigma, and not wanting to give up drinking (May et al., 2019; Frost et al., 2022). It is possible that these barriers specifically need to be addressed to increase treatment seeking.

The first step of a treatment seeking process is *problem recognition*, followed by the decision that not only change is needed, but also the decision that treatment is needed (Saunders et al., 2006). However, recognition of AUD is low – only 31% (Smith et al., 2022), even if it increases with higher severity (Oleski et al., 2010; Smith et al., 2022). The last step is actual treatment seeking, where estimates show that only circa one in five perceive a need for help (Smith et al., 2022). The RESPEKT campaign mainly targeted the latter steps of the treatment seeking process with its focus on increasing health literacy: that AUD treatment is available and free of charge; and the positive consequences of treatment seeking, as gaining respect from others. The lack of effect in the current project suggests it is possible that the campaign should rather address earlier steps of the treatment seeking process, as recognition of unhealthy alcohol use, to have an effect. Moreover, there is also an urgent need for reducing the stigma associated with AUD.

A review of clinical interventions aiming at increasing treatment seeking for substance use disorders shows promising results for the use of strategies from cognitive behavior therapy (CBT) (Vogel et al., 2020). The CBT inspired intervention consisted of a one-session telephone call, where the therapist addresses beliefs and barriers around treatment seeking (Stecker et al., 2012). There is also incipient evidence that digital interventions delivered as apps can improve the link between in- and outpatient care and increase sustained adherence to AUD treatment (Glass et al., 2017). The interventions were based on self-determination theory, targeting competence, relatedness, and autonomy, and lasted for 8 months, suggesting that strengthening engagement in treatment can be a long process, and that the briefer exposure from a mass media campaign may be too short to spark change. Individuals with AUD tend to report a long delay in treatment seeking (Chapman et al., 2015), with a median of 12 years in Denmark (Schwarz et al., 2018). It is therefore possible that repeated exposure over a longer time-period is needed for

mass media campaigns to be effective. As non-treatment seekers are a heterogenous group with different levels of alcohol use and readiness to seek treatment (Maisto et al., 2022), it is most probable that interventions at different levels are needed to meet the range of needs.

4.2. Treatment for AUD

As only a minority of those in need seek existing treatment services for AUD, it is important to also consider how the treatment services are viewed. Disheartening, only one in five perceive their first treatment seeking episode for AUD as helpful (Degenhardt et al., 2021). It is possible that this perception has spread in the general population and that needs to be addressed – in communication with the public, but also in concrete improvements of clinical practice. Regarding public communication, there is tentative evidence that the message that AUD treatment is effective is associated with treatment seeking (Russell et al., 2022). Regarding clinical practice, there are suggestions that the quality of AUD treatments can be improved, for example by improving utilization of pharmacotherapies (Wallhed Finn, Lundin et al., 2021). One strategy to address the barrier of *not wanting to give up drinking*, is to offer treatment goals beyond abstinence only (Witkiewitz and Tucker, 2020) to better meet the needs and wishes among those who potentially wish to seek treatment. Moreover, development of digital interventions, as smartphone apps, and blended interventions can be novel ways of reaching new groups (Garnett et al., 2017; Mellentin et al., 2021).

An additional way to lower the threshold for treatment seeking for AUD, which also could bridge the lack of effectiveness for the referral to treatment in the SBIRT model, is to integrate AUD treatment in primary care and initiate treatment where individuals with AUD already seek treatment for other health care issues (Lavingia et al., 2020). GPs are highly regarded in Denmark (Pedersen et al., 2012) and in a previous study we have shown that there is a strong preference to seek AUD treatment with a GP both among those with high respectively low levels of stigma (Wallhed Finn et al., 2023). A preference for seeking primary care for AUD has also been reported in other studies (Davies et al., 2019). There are treatment methods for AUD, that are feasible to implement in primary care settings (Wallhed Finn et al., 2020; Wallhed Finn, Hammarberg et al., 2021; Schøler et al., 2022). This is in line with coordinated care models, which also show promising results in increasing treatment seeking (Vogel et al., 2020). This includes integrated services that can link patients to treatment and facilitate treatment initiation where the patient is in the treatment system.

4.3. The future of mass media interventions

In the light of the absence of effect on treatment seeking - is there a value of mass media campaign around AUD? We believe there is. In a previous paper we have shown that the RESPEKT campaign was associated with an increase in the support for alcohol policies, as free treatment of AUD (Wallhed Finn et al., 2022). Mass media campaigns can also play an important role in sparking public discussions about alcohol use and contribute to changing attitudes, which are aspects that have been emphasized as important to for improving public health (McCambridge, 2021). This is especially important as the vast majority of alcohol related content on social media is pro-alcohol use, and also pro-heavy drinking (Russell et al., 2021). Moreover, mass media campaigns can contribute to widening the perspectives of AUD and decrease stigma, which especially is important as mass media attention around AUD has been shown to reinforce stigmatizing views (Ghosh et al., 2022). To offer more heterogenous perspectives on AUD and change of alcohol use can possibly also increase recognition of AUD (Morris, Cox et al., 2022). This is possibly of extra importance in countries as Denmark, where heavy drinking is normalized; and where a smaller proportion compared to other countries, with similar level of alcohol use, report intentions to cut down their alcohol use (Davies et al., 2019).

4.4. Limitation

Participation in self-help groups such as Alcoholics Anonymous can be important for changing alcohol use (Kelly et al., 2020), but was not measured in the current study. However, as the RESPEKT campaign focus is formal treatment seeking, there is no reason to believe that informal help seeking would increase from this intervention.

Another limitation is that it is not possible to quantify the exposure, i.e. the number of individuals exposed, to the campaign. In a previous cross-sectional study, we have showed that 40% of the participants endorsed seeing the campaign in year 2017 and 2018, however the length of exposure was not measured, nor is it known how many individuals with AUD that were exposed. Also, the timing of the RESPEKT campaign was the same, in all years, in January. There is a general increase in treatment seeking for AUD in January, and possibly altering the timing of the campaign could facilitate treatment seeking more effectively. Moreover, it is not known whether the prevalence of AUD changed in Denmark during the study period. However, national data on sales of alcohol from year 2013 to 2018 does not indicate any changes (Danmarks Statistik, 2023). An important strength of the study is the use of nation-wide register-based data, which covers objective treatment seeking behaviors. Previous studies are limited to self-reported data (Stecker et al., 2012). Using nation-wide registers also minimizes the risk for selection bias. Another strength is that the study includes five years of treatment seeking, including both years with and without campaigns.

Finally, there is a limitation in the choice of model. The negative binomial regression model does not take autocorrelation or moving averages into account. Another possibility would be using the Box-Jenkins method (Wagner et al., 2002). However, we are modeling count data, which do not follow a normal distribution normally assumed in Box-Jenkins models. Furthermore, these models are of great value for predicting future trends, but of less use in examining changes at

measured time points (Wagner et al., 2002).

5. Conclusions

There was no positive association between the RESPEKT mass media campaigns and treatment seeking for AUD. Possible future studies on mass media campaigns should investigate whether it is more effective to focus on earlier steps of the treatment seeking process, as recognition of AUD. There is a great need to develop other means to narrow the treatment gap, for example strengthening the role of primary care for AUD treatment.

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CRediT authorship contribution statement

Sara Wallhed Finn: Conceptualization, Methodology, Writing – original draft. **Anna Mejldal:** Methodology, Data curation, Statistical analysis, Writing – review & editing. **Anette Søgaard Nielsen:** Conceptualization, Methodology, Writing – review & editing.

Declaration of Competing Interest

None to declare.

Data availability

The data underlying this article cannot be shared publicly.

Appendix. Incidence rate ratio before, during and between or after campaign periods for treatment entry according to NAB and filled pharmacotherapies for AUD according to NPR

Group		NAB		NPR	
		IRR (95% CI)	p-value	IRR (95% CI)	p-value
All	before any campaign	Reference	.	Reference	.
All	campaign 2015	0.99 (0.90; 1.09)	0.876	0.86 (0.74; 1.01)	0.068
All	between period 2015–2016	0.95 (0.86; 1.05)	0.296	0.86 (0.76; 0.97)	0.017
All	campaign 2016	1.01 (0.87; 1.18)	0.870	0.96 (0.72; 1.28)	0.801
All	between period 2016–2017	0.99 (0.85; 1.16)	0.933	0.82 (0.61; 1.10)	0.181
All	campaign 2017	0.94 (0.77; 1.16)	0.579	0.81 (0.55; 1.19)	0.275
All	between period 2017–2018	0.93 (0.75; 1.15)	0.494	0.78 (0.52; 1.17)	0.228
All	campaign 2018	1.05 (0.80; 1.39)	0.721	0.77 (0.47; 1.25)	0.287
All	after 2018 campaign	0.97 (0.72; 1.31)	0.850	0.73 (0.44; 1.23)	0.240
Men	before any campaign	Reference	.	Reference	.
Men	campaign 2015	1.01 (0.92; 1.11)	0.870	0.87 (0.72; 1.04)	0.131
Men	between period 2015–2016	0.92 (0.84; 1.00)	0.064	0.86 (0.75; 0.98)	0.021
Men	campaign 2016	1.01 (0.85; 1.20)	0.899	0.96 (0.70; 1.31)	0.777
Men	between period 2016–2017	0.97 (0.82; 1.14)	0.682	0.80 (0.57; 1.13)	0.204
Men	campaign 2017	0.94 (0.74; 1.19)	0.599	0.74 (0.49; 1.12)	0.154
Men	between period 2017–2018	0.93 (0.72; 1.19)	0.555	0.76 (0.49; 1.18)	0.226
Men	campaign 2018	1.13 (0.81; 1.57)	0.472	0.81 (0.49; 1.35)	0.419
Men	after 2018 campaign	1.00 (0.71; 1.40)	0.981	0.77 (0.45; 1.32)	0.343
Women	before any campaign	Reference	.	Reference	.
Women	campaign 2015	0.95 (0.73; 1.25)	0.727	0.86 (0.69; 1.07)	0.171
Women	between period 2015–2016	1.01 (0.78; 1.32)	0.911	0.87 (0.75; 1.01)	0.070
Women	campaign 2016	1.01 (0.75; 1.36)	0.965	0.98 (0.68; 1.43)	0.932
Women	between period 2016–2017	1.04 (0.77; 1.41)	0.782	0.85 (0.60; 1.21)	0.368
Women	campaign 2017	0.94 (0.66; 1.35)	0.745	0.97 (0.59; 1.59)	0.909
Women	between period 2017–2018	0.92 (0.64; 1.31)	0.642	0.82 (0.49; 1.37)	0.444
Women	campaign 2018	0.88 (0.57; 1.36)	0.564	0.68 (0.37; 1.28)	0.237

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Group		NAB		NPR	
		IRR (95% CI)	p-value	IRR (95% CI)	p-value
Women	after 2018 campaign	0.91 (0.58; 1.41)	0.672	0.66 (0.34; 1.31)	0.235
Men 40–70	before any campaign	Reference	.	Reference	.
Men 40–70	campaign 2015	1.00 (0.90; 1.10)	0.961	0.86 (0.70; 1.06)	0.156
Men 40–70	between period 2015–2016	0.87 (0.80; 0.95)	0.002	0.85 (0.76; 0.94)	0.003
Men 40–70	campaign 2016	0.95 (0.81; 1.12)	0.533	0.93 (0.67; 1.28)	0.639
Men 40–70	between period 2016–2017	0.89 (0.76; 1.05)	0.166	0.78 (0.56; 1.07)	0.121
Men 40–70	campaign 2017	0.90 (0.70; 1.14)	0.379	0.68 (0.46; 1.02)	0.064
Men 40–70	between period 2017–2018	0.87 (0.67; 1.13)	0.301	0.73 (0.47; 1.11)	0.141
Men 40–70	campaign 2018	1.03 (0.75; 1.41)	0.852	0.74 (0.46; 1.19)	0.213
Men 40–70	after 2018 campaign	0.91 (0.65; 1.29)	0.606	0.69 (0.41; 1.15)	0.155

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