Internet Interventions 19 (2020) 100298

Contents lists available at ScienceDirect

Internet Interventions

journal homepage: www.elsevier.com/locate/invent

A randomized trial of brief web-based prevention of unhealthy alcohol use: Participant self-selection compared to a male young adult source population

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ARTICLE INFO

Keywords:
Randomized controlled trial
Representative
Source population
Web-based alcohol intervention

ABSTRACT

Background: How much a randomized controlled trial (RCT) sample is representative of or differs from its source population is a challenging question, with major implications for generalizability of results. It is particularly crucial for freely-available web-based interventions tested in RCTs since they are designed to reach broad populations and could increase health disparities if they fail to reach the more vulnerable individuals. We assessed the representativeness of a sample of participants in a primary/secondary prevention web-based brief intervention RCT in relation to its source population. Then we compared those recruited to those not recruited in the RCT.

Methods: There is a mandatory army recruitment process in Switzerland at age 19 for men. Between August 2010 and July 2011, 12,564 men (source population) attended two recruitment centers and were asked to answer a screening questionnaire on alcohol use. Among 11,819 (94.1%) who completed it, 7027 (59.5%) agreed to participate in a longitudinal cohort study with regular assessments. In 2012, these participants were invited to a web-based brief intervention RCT. Participation was not dependent on the presence or quantity of alcohol use. We assessed the representativeness of the RCT sample in relation to the source population and compared participants recruited/not recruited in the RCT with respect to education level and alcohol use.

Results: The RCT sample differed from the source population: individuals 20 and over were significantly less represented (34.3% vs 37.9%, $p = 0.006$), as were those with lower education level (58.6% vs 63.0%, $p = 0.0009$). The prevalence of any alcohol use was higher in the RCT population (92.3% vs 90.6%, $p = 0.03$) but unhealthy alcohol use was less represented (37.1% vs 43.2%, $p < 0.0001$). Differences on alcohol use measures and education were similarly found when those recruited in the RCT were compared to those who were not, including in a multivariable model, showing independent associations between less unhealthy alcohol use and higher education and recruitment in the RCT.

Conclusions: RCT participants differed from other members of the source population, with those participating in the RCT having higher prevalence of any alcohol use but lower levels of consumption and lower prevalence of indicators of unhealthy alcohol use. Individuals with higher education were overrepresented in the RCT sample. Selection bias may exist at both ends of the drinking spectrum and individuals with some indicators of greater vulnerability were less likely to participate. Results of web-based studies may not adequately generalize to the general population.

Trial registration: The trial was registered at current controlled trials: ISRCTN55991918.

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https://doi.org/10.1016/j.invent.2019.100298
Received 15 May 2019; Received in revised form 22 November 2019; Accepted 25 November 2019
Available online 28 November 2019

1. Background

Knowing how much a study sample is representative from its source population is crucial to assess to what extent study results can be generalized. This is especially important for studies of interventions that are ultimately aimed at being disseminated broadly. Self-selection of trial participants (a sampling bias due to self-selection into the study) may limit the translation of study results to broader populations (Dzewaltowski et al., 2004). The effect of self-selection is often hard to determine, since there is usually little or no information on those who do not want to participate in research studies. In observational studies, it has been shown that participants may differ from those choosing not to participate on health-related measures: those choosing to participate are often healthier, from both a psychological and physical point of view, and of higher socio-economic status (Knudsen et al., 2010; Ganguli et al., 1998). Self-selection may be influenced by topic sensitivity: some individuals may choose not to participate in a study focusing on alcohol use because they do not want to talk about it or have a fear of stigmatization or are uncomfortable with study procedures that may underline a behavior that they consider sensitive and problematic (Tourangeau and Yan, 2007). Self-selection may also, or rather, be influenced by topic saliency: the subject may not be of sufficient interest for people to accept the potential hassle related to study participation such as follow-up evaluations, study assessments, etc. (Groves et al., 2004). As such both persons who drink the most and those who do not drink may be likely to choose not to participate in research studies on alcohol prevention interventions. Other factors may play a role in the decision to participate in a research study; altruism, demands of the researchers, trust in the research institution or in the person conducting the study, fear of lack of confidentiality, having friends suffering from the problem under study, prior experience with research studies, education, beliefs about the good intentions of researchers, study on an important health subject at a timely point, and likely many others (Ross et al., 1999; Campbell et al., 2007). There is limited evidence on who decides to participate or not in internet intervention trials. In an Australian internet mental health intervention trial, interested participants were more likely to be older, better educated, more likely to have a history of mental health problems and had low personal stigma (Crisp and Griffiths, 2014). Similarly, in an internet treatment trial for depression, more educated people were more likely to participate as were those with a prior diagnosis of depression (Donkin et al., 2012). In both studies, women were more likely to participate than men.

Unhealthy alcohol use represents a spectrum of patterns of alcohol use associated with varying risks of harm, including at-risk use, hazardous use, and alcohol use disorders (Saitz, 2005). Over the past decades, there has been a large increase in the development of web-based interventions for unhealthy alcohol use (Kaner et al., 2017; Tansil et al., 2016; Riper et al., 2011; Khadjesari et al., 2011; Dedert et al., 2015; Riper et al., 2018). These interventions have been developed with the goal to reach a broad population who do not necessarily seek treatment (Cunningham and Breslin, 2004). Freely accessible on the web, these interventions can virtually be accessed by anyone, irrespective of their drinking. There is a growing evidence of effectiveness of web-based interventions for unhealthy alcohol use (Riper et al., 2018) (Riper et al., 2009; Bewick et al., 2008; White et al., 2010). Studies have used various ways to recruit participants, and recruitment methods may impact results of trials (Kypri, 2007). Among participants randomized to receive an intervention in a naturalistic web-based intervention study, significant differences were observed between participants who did or did not access the intervention (Cunningham et al., 2011). Those who accessed the web site were more frequently users of the web, older, and drinking less. Also, attrition in web-based intervention is a challenge as keeping participants involved in interventions requiring multiple web-contacts may improve the intervention's efficacy (Postel et al., 2011). In addition, there may be differences between those agreeing to participate in the study and the source population. In addition, the perspective of receiving feedback or information with regard to drinking and the tasks related to being part of a research study (i.e. follow up questionnaires) may prevent certain people from participating, especially people with heavier alcohol use if the participation in research is accompanied by fear of stigma.

Indeed, population level interventions may increase health disparities while improving general heath: more vulnerable strata of the population may either not respond to or not access these interventions because of disparities in reach and differing perceptions of the interventions (Keyes and Galea, 2016). While a shift may be observed for the population as a whole in terms of health outcomes such as alcohol use, less vulnerable individuals are likely to benefit more from the interventions, therefore calling for more specifically tailored interventions for vulnerable populations (Frohlich and Potvin, 2008). If inferences made on potential efficacy of web-based interventions are based on data that do not represent the more vulnerable strata of the population the expected effect of the intervention will likely be biased, or may lead to an overestimation of its benefits in populations more likely to need its effects (Watt, 2002). Specifically, individuals with lower indicators of socio-economic status, higher use of substances, and more consequences of use should be adequately represented. If self-selection occurs on factors related to study outcomes and on vulnerability markers, generalizing study results to the entire population may result in interventions and/or programs that do not adequately account for factors that put individuals at increased risk of risks and may result in increased health disparities (Frohlich and Potvin, 2008; Keyes and Galea, 2016). In the case of interventions that are intended to reach the general population, it is of crucial importance to determine who is participating in research studies, since these studies will likely be used to estimate general population effects. Unfortunately, but for obvious logistical reasons, detailed information on research study source populations are often incomplete or minimal.

The present study takes advantage of a general population-based primary and secondary preventive alcohol web-based intervention randomized controlled trial (RCT): Electronic screening and brief intervention for young adults (E-SBI): a randomized controlled trial (Bertholet et al., 2015b; Bertholet et al., 2015a). Based on the rationale that, when made available to the public, web-based interventions are likely to be accessed not only by people with unhealthy alcohol use but by a broader sample of the entire population (i.e. including people with lower risk use and people who do not drink), the RCT was designed to test the efficacy of both primary and secondary prevention approaches. Because the RCT is embedded within a general population cohort that included a screening questionnaire on alcohol use for 94% of the source population, it offers a unique opportunity to compare RCT participants to the source population. The present study aims to assess how much the E-SBI RCT study sample is representative or differs from its source population with respect to alcohol use and socio-demographic characteristics. Thus, we compared the E-SBI RCT sample to the source population and then compared those recruited and not recruited in the E-SBI RCT. We hypothesized that participants would be have lower levels of alcohol use than the source population and that those with other markers of vulnerability may be less likely to participate than those without.

2. Methods

2.1. Study populations

For the present study, we capitalized on a natural opportunity to compare a source population—reflective of the general population—to a recruited population of young men in Switzerland.

2.1.1. Source population

Switzerland has a mandatory army recruitment process whereby all

20-year old males are required to visit an army recruitment center to determine whether they are eligible to serve in the army. Between August 2010 and July 2011, all attendees were offered the opportunity to complete a short screening questionnaire on alcohol use at two of these centers (Lausanne, Windisch), and most did. Specifically, among the 12,564 20-year old men who attended the two army recruitment centers and were offered the screening questionnaire, the vast majority (n = 11,819, 94%) responded, thus enabling description of alcohol use in a census of 20-year old Swiss men (the "source population").

2.1.2. Recruited population

During the same period, men attending these recruitment centers and a third center that did not offer the short alcohol use screen were invited to participate in a large longitudinal cohort study (the Cohort Study on Substance Use Risk Factors, C-SURF). Among the 11,819 who responded to the alcohol use screen at the two army recruitment centers in which it was offered, 7027 (59.5%) agreed to participate in C-SURF. The risk of bias associated with participation/non-participation in C-SURF has been examined and participants can generally be considered to be representative of its source population (Studer et al., 2013b; Studer et al., 2013a). In 2012, we began recruiting for the RCT of E-SBI from those previously recruited to C-SURF. Specifically, irrespective of their drinking, C-SURF cohort participants were invited to participate in an internet study about young Swiss men and alcohol use in which they could receive information about their own alcohol use (Bertholet et al., 2015a; Bertholet et al., 2015b). The internet study's objectives were to test the efficacy of a primary intervention, aiming at preventing the development of unhealthy alcohol use, and of a secondary prevention intervention, aiming at reducing unhealthy alcohol use. Therefore, participation was not dependent on the presence or quantity of alcohol use. Cohort participants were invited according to the recruitment calendar in the cohort study (i.e. cohort participants were invited to participate in the RCT in the order they were recruited and completed the cohort study assessments). Invitations were sent until recruitment goals were met for the RCT (according to a priori power computations). The acceptance rate of participating in the RCT was 37% (Bertholet et al., 2015b; Bertholet et al., 2015a), with 1633 persons total participating in the RCT (Bertholet et al., 2015b, Bertholet et al., 2015a), 1549 of whom were recruited from these two army recruitment centers. Fig. 1 presents the recruitment process.

These 1549 participants recruited to the RCT from the two centers at which the alcohol use screen was asked make up the recruited population for the present study. The C-SURF study and the E-SBI RCT were approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (C-SURF: Protocol No. 15/07, RCT: Protocol No. 260/2011). Both studies were supported by the Swiss National Science Foundation.

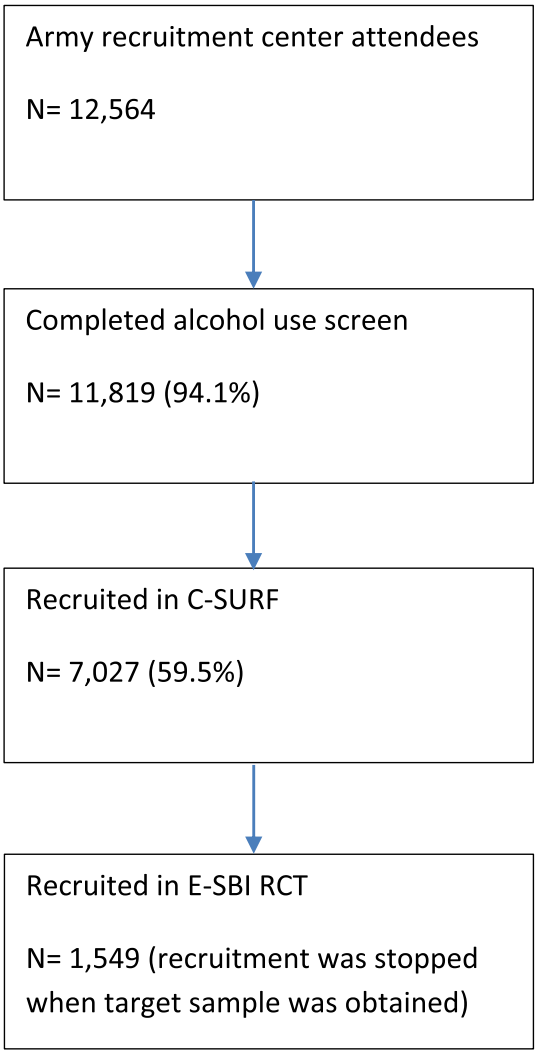

Fig. 1. Recruitment process of the RCT sample.
Note:
C-SURF: Cohort on Substance Use Risk Factors.
E-SBI RCT: Electronic Screening and Brief Intervention Randomized Controlled Trial.

2.2. Assessments

Army recruitment center attendees completed a short questionnaire on alcohol use. The questionnaire assessed:

1.) Past 12-month drinking frequency (*How often do you have a drink containing alcohol*? with answer choices of # days/week (open-ended), 2–3 times a month, monthly or less, and never)
2.) Alcohol quantity (*How many drinks containing alcohol do you have on a typical day when you are drinking*? with a single open-ended answer, i.e. # standard drinks)
3.) Past 12 months frequency of heavy drinking episodes (*How often do you have 6 or more drinks on one occasion*? With answer choices of 4 or more times a week, 2–3 times a week, monthly, less than monthly, never)
4.) Past 12 months maximum number of drinks consumed in one day (*What is the maximum number of drinks you had in one day*? With a single open-ended answer, i.e. # standard drinks)
5.) In addition, to questions 1–3 presented above (i.e. questions 1–3 of the AUDIT questionnaire but with extended answer options for questions 1 and 2), participants completed the full Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993).

A standard drink was defined as 100 ml of wine, 250 ml of beer, 275 ml of pre-mixed drink containing spirits, or 25 ml of spirits (each containing about 10 g ethanol). Pictures of the drink equivalences accompanied each questionnaire. Information was also collected on three sociodemographic characteristics of interest, including age, the highest completed education level at the time of inclusion (obligatory school or elementary professional training only vs more), and living environment (urban vs countryside).

2.3. Analyses

2.3.1. Sample representativeness

First, to study the representativeness of the E-SBI sample, we compared the distributions of socio-demographic characteristics and alcohol use measures using chi-square tests between the full source population (n = 11,819) and the RCT sub-sample (n = 1549). The

following categorical variable were used: age (< 20 vs ≥20), living in urban environment (yes vs no), highest completed education level (obligatory school or basic formation only vs more), prevalence of any alcohol use (any use over the past 12 months, yes vs no), Alcohol Use Disorders Identification Test (AUDIT, score < 8 vs ≥8), prevalence of heavy episodic drinking (≥6 drinks on one occasion at least monthly, yes vs no), and prevalence of unhealthy alcohol use (either weekly risky drinking or heavy episodic drinking or both: > 210 g of ethanol/week and/or ≥1 heavy drinking episode/month, yes vs no).

2.3.2. Comparison of those recruited in the RCT to those not recruited:

Second, using chi-square and *t*-test, we compared screening data of those recruited in the RCT (n = 1549) to those who were not (n = 11,819 − 1549 = 10,270) with respect to socio-demographic characteristics (age, living in urban environment, highest completed education level), and 6 alcohol measures: 1.) prevalence of any alcohol use (any use over the past 12 months), 2.) weekly alcohol use (mean number of drinks per week, obtained by multiplying frequency and quantity of alcohol use), 3.) maximum number of drinks/occasion, 4.) Alcohol Use Disorders Identification Test (AUDIT), mean score, 5.) prevalence of heavy episodic drinking (≥6 drinks on one occasion at least monthly), and 6.) prevalence of unhealthy alcohol use (i.e. either weekly risky drinking or heavy episodic drinking or both: > 210 g of ethanol/week and/or ≥1 heavy drinking episode/month). The independent associations between socio-demographic and alcohol use variables and being recruited in E-SBI RCT were assessed with a logistic regression model. Because most alcohol use variables were highly correlated, the regression model included age, living in urban environment, highest completed education level, any use of alcohol and presence of unhealthy alcohol use (i.e. either weekly risky drinking or heavy episodic drinking, or both). The two alcohol variables "any use of alcohol" and "presence of unhealthy alcohol use" were a priori preferred to other alcohol use variable because they adequately summarized the alcohol use data and are more easily interpretable.

Statistical significance was set at alpha = 0.05 on all tests.

3. Results

E-SBI RCT participants included 1549 persons, representing 13.1% of the source population.

3.1. Sample representativeness

The E-SBI RCT sample differed from the source population: individuals aged 20 and over were less represented in the RCT sample (34.3% vs 37.9%, p = 0.006), as were those reporting completing obligatory school only at the time of recruitment (58.6% vs 63.0%, p = 0.0009). The prevalence of heavy episodic drinking (36.7% in RCT sample vs 43.0% in the source population, p < 0.0001), the prevalence of weekly risky drinking (3.9% vs 6.3%, p = 0.0003) and the prevalence of unhealthy alcohol use (i.e. either heavy episodic drinking, weekly risky drinking or both: 37.1% vs 43.2%, p < 0.0001) were lower in the RCT sample. The proportion of people with an AUDIT score > 8 was lower in the RCT sample (38.1% vs 42.4%, p = 0.001). The prevalence of any alcohol use was higher in the RCT population compared to the source population (92.3% vs 90.6%, p = 0.03). No difference was observed for living in an urban environment (39.3% vs 41.1%, p = 0.17).

3.2. Comparison of those recruited in the RCT to those not recruited

Comparisons of individuals from the source population recruited and not recruited in RCT are presented in Table 1. Individuals from the source population recruited in RCT were slightly younger on average and had a lower proportion of individuals who reported completing obligatory school only at the time of recruitment and reported lower levels of alcohol use than individuals from the source population not recruited in RCT (n = 10,270) but did not differ on living environment. All alcohol use measures differed across groups. While the prevalence of any alcohol use was higher among those recruited in RCT compared to those not recruited (92.2% vs 90.3%, χ^2 = 5.83, p = 0.016), those recruited reported lower levels of use. Specifically, mean (SD) drinks/week were 6.2(8.1) vs 7.4(10.7) drinks/week for recruited versus non-recruited (p < 0.0001), and maximum number of drinks/occasion were 9.7(7.7) vs 10.3(9.1) (p = 0.009). Individuals from the source population recruited in RCT had lower mean AUDIT scores: 6.6(4.4) vs 7.2(4.9) (p < 0.0001), and lower prevalence of both heavy episodic drinking (36.7% vs 43.9%, p < 0.0001) and unhealthy alcohol use (37.1% vs 44.1%, p < 0.0001) relative to individuals from the source population not recruited in RCT.

In the multivariable logistic regression model including age, living in urban environment, highest completed education level, any use of alcohol and presence of unhealthy alcohol use, reporting any use of alcohol was associated with increased odds of being recruited in the RCT (Adjusted Odds Ratio (AOR), [95%CI]: 1.43 [1.17; 1.76]), while reporting unhealthy alcohol use (AOR: 0.69 [0.61; 0.77]), completing obligatory school only (AOR: 0.73 [0.65; 0.82]), and age (AOR: 0.87 [0.83; 0.91]) were associated with lower odds of being recruited. Living in an urban environment was not associated with being recruited (AOR 1.07 [0.96; 1.19]).

4. Discussion

We capitalized on a natural opportunity to compare young Swiss males who were and were not recruited to a trial of E-SBI on characteristics related to alcohol use and demographics. We found that the recruited population differed from other members of the source population in that they were younger, had higher levels of education, and reported lower levels of alcohol use and related consequences, but were also more likely to report any alcohol use, suggesting self-selection of participants with regard to both sociodemographic characteristics and alcohol use at both ends of the drinking spectrum. Specifically, when facing the possibility to participate in a study in which they could receive alcohol counseling or information about alcohol use, those with unhealthy alcohol use and those reporting no alcohol use were less likely to enroll. Thus, both topic sensitivity and topic saliency may play a role in the decision to participate in a web-based alcohol research study. These differences were observed consistently in sample representativeness analyses and comparisons between those recruited and not recruited in RCT, and findings were upheld in a multivariable model, indicating that being recruited to the RCT was independently associated with alcohol use measures, education and age.

On the contrary to what has been shown for web-based intervention for depression (Donkin et al., 2012), a condition for which self-selection of participants in research trials does not appear to play a major role, web-based alcohol intervention trials are likely to be affected since participants seem to self-select on factors usually considered as outcomes (i.e. alcohol use). It is not known whether the individuals who do not participate in research studies will then access the web-based intervention once they are available online (especially if these are anonymous interventions). It seems that when made anonymously available, persons with unhealthy alcohol use do access these interventions (Bertholet et al., 2011), and anonymity appears to be an important aspect of electronic brief interventions (Lapham et al., 2012). Interventions developed for anonymous help seekers have the potential to reach large number of people with unhealthy alcohol use (Johansson et al., 2017; Sinadinovic et al., 2010). Even though confidentiality is assured in research studies, this does not strictly correspond to anonymity, and some individuals may choose not to participate to protect their anonymity. This may also be related to stigma as higher stigma has been shown to limit participation in online mental health trials (Crisp and Griffiths, 2014).

Table 1
Comparisons of individuals recruited and not recruited in RCT.

	Individuals from the source population not recruited in RCT (n = 10,270)	Individuals recruited in RCT (n = 1549)	p (chi-square/t-test, source population not recruited in RCT vs RCT sample)
Age, mean (SD)	20.0 (1.2)	19.8 (1.2)	< 0.0001
Living in urban environment (vs countryside)	41.4%	39.3%	0.1
Highest completed education level at inclusion (obligatory school or basic formation only)	63.6%	58.6%	< 0.0001
Number of drinks per week, mean (SD)	7.4 (10.7)	6.2 (8.1)	< 0.0001
Maximum number of drinks per occasion, mean (SD)	10.3 (9.1)	9.7 (7.7)	0.009
AUDIT score, mean (SD)	7.2 (4.9)	6.6 (4.4)	< 0.0001
Prevalence of heavy episodic drinking[a]	43.9%	36.7%	< 0.0001
Prevalence of weekly risky drinking[b]	6.6%	3.9%	< 0.0001
Prevalence of unhealthy alcohol use[c]	44.1%	37.1%	< 0.0001
Prevalence of any alcohol use	90.3%	92.2%	0.02

Note: all drinking variables: self reported measures, past 12 months.
[a] Defined as ≥6 drinks on one occasion at least monthly.
[b] Defined as > 210 g of ethanol/week.
[c] Defined as > 210 g of ethanol/week and/or ≥1 heavy drinking episode/month.

Our results show that participants were more likely to report any alcohol use but that they had lower prevalence of unhealthy alcohol use and heavy episodic drinking, lower AUDIT scores, and lower levels of alcohol use, indicating that those who participated had lower severity than those who did not (Rubinsky et al., 2013). Self-selection may also arise on factors such as education level. The fact that individuals with higher education were more represented within the recruited population is important, notably because lower education is a marker of vulnerability given that it is a risk factor for multiple adverse health outcomes (Braveman et al., 2011; Glymour et al., 2014; Whitehead et al., 2016). Therefore, more vulnerable individuals may be less likely to participate in research studies of E-SBI. As a result, the generalization of study results and/or dissemination of programs built on study results may not adequately account for characteristics that put people at risk, and additional strategies may be needed to reach more vulnerable individuals (Frohlich and Potvin, 2008).

Our study has several limitations: first, it relies on self-report only. Even though measures were implemented to ensure confidentiality and to inform army recruitment centers attendees that the study was independent from the army and that no data was communicated to the army, the conditions in which the screening was conducted may have influenced answers and/or participation. Because it was designed as a brief screen, the questionnaire did not extensively assess demographic variables, so only limited information on the respondents are available (i.e. those reported in the present report). Furthermore, being an E-SBI RCT participant was a two-step process: young men had to first agree to participate in the cohort study and then were invited to participate in the E-SBI RCT. It is possible that some individuals may have been willing to participate in the E-SBI RCT among those who refused to participate in the cohort study. Third, the study was conducted among young Swiss men and may not be generalizable to older men, non-Swiss men, or women. Because alcohol use patterns differ between men and women, and the reason to participate or not in a research study and the perception of one's own alcohol use is also likely to differ across sex, further studies should be conducted among women to assess recruitment bias. Also, given that we obtained data from 94% of the source population, some degree of self-selection is possible here as well.

The present analysis also has notable strengths. In particular, because of its implementation within a larger research project that obtained data on alcohol use for 94% of the source population, we were able to compare the drinking of E-SBI RCT participants to the quasi-totality of its source population. In addition, screening data was collected at the same time for all individuals analyzed herein, so results are unlikely to be influenced by changes in drinking practices over time. Thus, the data offered a unique perspective to study self-selection.

5. Conclusions

Overall, the study provides important information regarding self-selection in web-based trials of alcohol-related interventions, which are generally thought to be universally accessible and a strong strategy for targeting the general population. It also focused on a population—young men—that is most impacted by consequences of drinking (mostly heavy alcohol use) (Rehm et al., 2007). Our results suggest that caution should be used when simulating population effects of web-based interventions and when envisioning the possible impact of large-scale implementation of interventions. One should be cautious in extrapolating study results likely influenced by self-selection of participants. Indeed, it is possible that people who do not participate in RCTs may access the interventions once they are available online, and, as of today, we have very limited knowledge as to what will happen when these individuals receive the intervention. In addition, our results suggest the possibility that generalizing results and disseminating a program more broadly may not adequately respond to the need to decrease health disparities if no additional measures are taken to reach more vulnerable strata of the population. Education inequality in mortality from alcohol-attributable causes, with mortality being higher in lower educated groups, indicates that there is a need to address unhealthy alcohol use especially among individuals with lower levels of education (Mackenbach et al., 2015; Mackenbach et al., 2008). Internet interventions can reach groups of individuals that may not be reached with other types of interventions (Postel et al., 2005), nevertheless, they may still miss to reach specific vulnerable subgroups. If effective internet interventions only reach persons with higher levels of education, improvements in behaviors may be expected only in these groups, which then could increase gaps adverse health behaviors between those with higher and lower levels of education. Additional measures are needed to understand why persons with lower levels of education may not participate in internet interventions trials. This could be done by prospectively investigating why people chose not to participate in trials and to determine which measures may convince them to do so.

List of abbreviations

AUDIT	Alcohol Use Disorders Identification Test
C-SURF	Cohort Study on Substance Use Risk Factors
E-SBI	Electronic screening and brief intervention for young adults
RCT	randomized controlled trial
SD	standard deviation

Ethics approval and consent to participate

The C-SURF study and the E-SBI RCT have been approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (C-SURF: Protocol No. 15/07, RCT: Protocol No. 260/2011). Informed consent was obtained from study participants in written form (C-SURF) and electronic form (E-SBI).

Consent for publication

Not applicable.

Availability of data and material

Data: Study data can be obtained at data.iumsp.ch (http://data.iumsp.ch/bertholet/1), a stable data repository. Data.iumsp.ch is managed by the Institute of social and preventive medicine, Department of community medicine and health, Lausanne University Hospital, Switzerland. Request for the detailed, de-identified data must be addressed at data.iumsp.ch. Requests are reviewed by the data sharing committee, for ethical and legal purposes. Participants did not consent for data to be used for commercial purposes. The Institutional Review Board has approved this consent procedure.

Funding

The C-SURF study and the E-SBI RCT were supported by the Swiss National Science Foundation (FN 33CSCO-122679 and 325130_135538/1). The Swiss National Science Foundation had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. Swiss National Science Foundation: www.snf.ch/en.

Author's contributions

Conceived and designed the experiment: NB JBD JS ECW JAC GG and BB. Performed the experiments: NB JBD JS JAC GG BB. Analyzed the data: NB JS ECW BB. Wrote the paper: first draft: NB ECW JS BB, final version: NB JBD JS ECW JAC GG BB. Secured funding: NB JBD JAC GG BB.

Declaration of competing interest

The authors declare they have no competing interests.

Acknowledgements

Not applicable.

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