

## Health literacy and substance use in young Swiss men

Petra Dermota · Jen Wang · Michelle Dey · Gerhard Gmel ·  
Joseph Studer · Meichun Mohler-Kuo

Received: 14 December 2012 / Revised: 28 May 2013 / Accepted: 24 June 2013 / Published online: 11 July 2013  
© Swiss School of Public Health 2013

### Abstract

**Objectives** The purpose of the present study was to describe health literacy and its association with substance use among young men.

**Methods** The present study was part of the Cohort Study on Substance Use Risk Factors that included 11,930 Swiss males participating in initial screening from August 2010 to July 2011. Self-completed questionnaires covered use of three substances and three components of health literacy.

**Results** Roughly 22 % reported having searched the Internet for health information and 16 % for information on substances over the past 12 months. At-risk and not at-risk users of alcohol (adjusted odds ratio (AOR) = 2.50 and 1.46), tobacco (AOR = 2.51 and 1.79) and cannabis (AOR = 4.86 and 3.53) searched for information about substances significantly more often via the Internet than abstainers. Furthermore, at-risk users reported better knowledge of risks associated with substance use and a marginally better ability to understand health information than abstainers.

**Conclusions** Substance users appear to be more informed and knowledgeable about the risks of substance use than non-users. Consequently, interventions that focus only on information provision may be of limited benefit for preventing substance use.

**Keywords** Health literacy · Substance use · Alcohol · Smoking · Cannabis · Young adults

### Introduction

Substance abuse is the greatest risk factor for mortality and morbidity among young people in developed countries (Rehm et al. 2006) and is also associated with various high-risk behaviors like violence, sexual risk behaviors, injury, and school dropout (Santelli et al. 2001; Grant et al. 2012; Eaton et al. 2006). Public health professionals have used media campaigns (e.g., TV campaigns, distributing health-related materials) as interventions to prevent and/or reduce substance abuse among youths. However, their impact on behavior change has been limited, inconsistent and sometimes even counterproductive (Wakefield et al. 2010; Farrelly et al. 2003).

Mass media have also been used by industry to propagate both smoking and alcohol consumption. As one counter-measure, classroom-based education in media literacy has emphasized the development of critical thinking skills among pupils vis-à-vis media advertisements and portrayals of substance use (Bergsma and Carney 2008). While there is growing evidence that such interventions can change knowledge, attitudes/expectations, and skills vis-à-vis smoking (Gonzalez et al. 2004; Pinkleton et al. 2005) and alcohol (Weintraub Austin and Johnson 1997), it remains unclear whether such improvements in media literacy actually translate into less or less risky substance use.

A more general skills framework has been forwarded in the fields of public health, health promotion, and clinical health care under the term health literacy. Mirroring the limited and broader meanings of the term ‘literacy’ itself (Berkman et al. 2010), the conceptualizations and

P. Dermota · J. Wang · M. Dey · M. Mohler-Kuo (✉)  
Institute of Social and Preventive Medicine, University  
of Zurich, Hirschengraben 84, 8001 Zurich, Switzerland  
e-mail: m.mohler@ifspm.uzh.ch

P. Dermota  
e-mail: petra.dermota@uzh.ch

G. Gmel · J. Studer  
Alcohol Treatment Centre, Lausanne University Hospital  
CHUV, Lausanne, Switzerland

approaches in health literacy span health-related reading skills (Jordan et al. 2011) to competencies for health (Wang et al. 2012). Most assessments of health literacy have focused on health-related reading skills (Jordan et al. 2011), and while it has been shown to be correlated with many important outcomes (Paasche-Orlow et al. 2005; Berkman et al. 2011), one of the most widely cited definitions of health literacy is broader: “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services they need, to make appropriate health decisions” (by Nielsen-Bohman et al. 2004).

The emphasis on health information is timely as new information communication technologies (ICT) like the Internet are turning many societies into information societies, allowing people to be not just consumers but also vectors and creators of information. Studies in Europe have shown steady increases in the proportion of the general population searching for health information online (from 42.3 % in 2005 to 52.2 % in 2007) (Kummervold et al. 2008). As penetration of some of these technologies are highest among young people, they have been searching the Internet for health information in similar proportions (Rideout 2001; Borzekowski and Rickert 2001; Jiménez Pernet et al. 2010). Substance use is one of the main health topics for this population, along with sexual health, mental health, weight/body image, and violence (Rideout 2001; Jiménez Pernet et al. 2010). These top issues have been confirmed by focus groups (Skinner et al. 2003) as well as visitor data from the main adolescent health websites in Switzerland (Padlina 2007; Association romande CIAO 2012).

Despite findings on health information seeking above and media literacy initiatives targeting the school-age population, the concept of health literacy as a whole has not been elaborated for or studied among adolescents and young people (Manganello 2008). It is important to assess health literacy among young adults and explore its relationship to substance use, one of the main health issues in this population. In order to address the research gap, the present study aimed (1) to examine the prevalence of Internet use to seek information on health and substances among young men in Switzerland; (2) to describe health literacy and its association with substance use; and (3) to examine various patterns of health literacy among different types of substance users (i.e., non-users, not at-risk users, and at-risk users).

## Methods

### Study design

The present paper is part of the Cohort Study on Substance Use Risk Factors (C-SURF) in Switzerland. The participants

were recruited on a weekly basis between August 2010 and July 2011, at two out of the six army recruitment centers, one located in Windisch (German-speaking) and the other in Lausanne (French-speaking) during the mandatory conscription process. Every Swiss man is called up at age 19 years to determine his eligibility for military, civil or no service. These two army recruitment centers cover 15 of the 26 cantons in Switzerland, including all French-speaking cantons. As there is no pre-selection to army conscription, a representative sample of the Swiss male population in this age group was eligible for the study. A short 10-minute self-completed questionnaire containing questions on demographics, substance use and health literacy was administered to all conscripts during their routine check-up. Individuals were informed that they could interrupt the questionnaire at any time, following the principles of the Helsinki Declaration. C-SURF was approved by the Ethics Committee for Clinical Research of Lausanne University Medical School (Protocol No. 15/07).

### Participants

A total of 14,393 young men presented to the two participating recruitment centers during the study recruitment period. Among them, 1,829 (12.7 %) were never seen by the research staff because they were either sick (not chronically ill) or not informed about the study by military staff. Of the 12,564 informed conscripts, 11,930 (95 %) completed the short questionnaire in a separate room, independent of their army recruitment process and physical exams. To reduce possible bias in reporting substance use in the context of the army recruitment process, the conscripts were assured in writing that their personal information and survey responses are kept highly confidential by the research team, and that the army has no access to their completed questionnaires.

The participants' mean age was  $19.95 \pm 1.24$  years (range from 17 to 26 years), and 62 % were younger than 20 years. Slightly more than half (51.1 %) were from the French-speaking part of Switzerland, and nearly 60 % lived in a rural area. Most of the respondents were still in school; therefore, 63 % of the participants reported primary school as their highest completed level of education, with an additional 13 % having completed high school.

### Measures

#### *Health literacy*

As a brief assessment, three competencies which cover accessing and understanding health information were measured with items taken or adapted from the Swiss Health Literacy Survey (Wang et al. 2012):

1. “Seeking health information” was assessed via two questions. Participants were asked if they used the Internet (a) to look for health or health care information and (b) to learn more about a substance (alcohol, tobacco, cannabis or any other drug) in the past year.
2. “Ability to understand health information” was measured indirectly by a set of questions on the comprehensibility of health information in each of the following media: (a) in newspapers and magazines, (b) on TV and radio, and (c) on the web. Participants responded on a four-point scale ranging from 1 “very easy to understand” to 4 “very difficult to understand”.
3. “Knowledge about risks” associated with three different substances, (a) drinking too much alcohol, (b) smoking tobacco, and (c) using cannabis, was self-rated by respondents using 10-point scales ranging from 1 “very poor” to 10 “very good”. Very good knowledge about the risks of alcohol, tobacco or cannabis was defined as scores ranging from 8 to 10.

Two questions measured generic health literacy, and two questions were adapted to measure accessing and understanding health information specifically with regards to substance use. Given similar response patterns, the three types of media (newspaper/magazines, TV/radio, and Internet) were summarized into the factor “ability to understand health information” (Cronbach’s alpha = 0.80), and the three types of substances (alcohol, tobacco and cannabis) were summarized into the factor “knowledge about the risks of substance use” (Cronbach’s alpha = 0.81). For the comparison of health literacy by substance use patterns, only the item “ability to understand health information” on the Internet was used, because this is the most common media source among this age group.

#### *Socio-demographic variables*

Age (dichotomized into younger than 20 and 20 or older); language region (German- vs. French-speaking); residence (rural vs. urban, if more than 10,000 inhabitants); highest completed education (summarized into (1) primary school, (2) professional or higher vocational school, and (3) pre-college high school or a Bachelor’s degree); and occupation (categorized into (1) professional school and/or employed, (2) pre-college high school, university, or Swiss Federal Institute of Technology (ETH), and (3) unemployed, on disability pension, or on sabbatical) were assessed.

#### *Alcohol use*

Alcohol use was assessed via three questions: usual quantity, frequency of alcohol use, and frequency of risky single occasion drinking (RSOD, occasions with at least six

standard drinks). “*At-risk RSOD*” was defined as RSOD at least monthly. Drinking frequency was assessed with an open-ended question about the average number of days per week on which alcohol is usually consumed. Non-weekly users were given choices of “2–3 times per month” (coded as 38/52), “once per month or less” (coded as 6/52), or “never” (coded as 0). Quantity was evaluated with an open-ended question about the number of standard drinks consumed on drinking days. Pictures of standard drinks containing approximately 10–12 grams of pure alcohol were provided. The number of drinking days in a week multiplied by the usual number of drinks on drinking days yielded the weekly alcohol volume. “*At-risk volume drinking*” was defined as 21 or more drinks per week. A total alcohol risk measure was defined if respondents either showed at-risk RSOD or at-risk volume drinking.

#### *Smoking tobacco*

Participants were asked whether they smoked, even occasionally, or were former or never smokers. “*At-risk smoking*” was defined as daily smoking.

#### *Cannabis use*

Frequency of cannabis use over the past 12 months was measured with categories of “never” (coded 0), “once per month or less often” (coded as 6/52), “2–4 times per month” (coded as 36/52), “2–3 times per week” (coded as 2.5 days a week), and “4 times or more often per week” (coded as 4 days a week). “*At-risk cannabis use*” was defined as at least twice weekly.

#### *Statistical analysis*

We conducted the analysis using SPSS 19 and SAS 9.3. Contingency tables were used to present the prevalence of at-risk use for each substance (alcohol, tobacco, and cannabis) and the prevalence of “seeking health information” by socio-demographic characteristics. Differences in the prevalence of at-risk use for each substance were compared by socio-demographic characteristics using Pearson Chi-square analysis. Odds ratios were used to assess the association between socio-demographic characteristics and the types of health information seeking. Mean scores were calculated for ability to understand health information and knowledge about the risk of substance use, and compared across socio-demographic subgroups using analysis of variance (ANOVA). The association between type of substance use and health literacy was analyzed using logistic regression. To investigate whether the associations between substance use and health literacy were influenced by socio-demographic variables, the logistic regression

models were adjusted for age, type of residence, linguistic region and occupation. Since the variables education and occupation are very similar, we only adjusted for occupation in order to avoid statistical collinearity.

## Results

The socio-demographic characteristics and substance use patterns of the sample are shown in Table 1. The prevalence of at-risk use for each of the substances, by socio-demographic characteristics, is shown in Table 2. Those participants with vocational-level education were more likely to report being engaged in at-risk RSOD ( $p < 0.001$ ) and volume drinking ( $p = 0.003$ ), whereas participants with higher-level education were less likely to engage in at-risk use of all substances ( $p = <0.001$  for tobacco;  $p = 0.039$  for cannabis). Participants living in a rural area were more likely to engage in risky alcohol use ( $p = 0.002$  for volume drinking/ $p < 0.001$  for binge drinking), whereas participants living in urban areas were more likely to engage in the at-risk use of tobacco ( $p < 0.001$ ) and cannabis ( $p < 0.001$ ). Those from French-speaking cantons of Switzerland were significantly more likely to smoke cannabis ( $p < 0.001$ ), but no significant differences were found between German- and French-speaking cantons in at-risk alcohol ( $p = 0.271$  for volume drinking/ $p = 0.441$  for binge drinking) or tobacco ( $p = 0.701$ ) use.

Concerning health literacy, approximately 22 % of the young men reported having searched the Internet for health-related information and 16 % for substance-related information over the past 12 months. About one-third of the participants found the information on health they came across in newspapers or magazines, or on TV, radio or the Internet very easy to understand (newspapers and magazines, 30.2; TV and radio, 32.1; Internet, 35.1 %), and about half found it easy to understand (newspapers and magazines, 53.1; TV and radio, 50.5; Internet, 48.9 %). Roughly three quarters of the young men considered their knowledge of the health risks associated with excessive alcohol drinking (70 %) and smoking tobacco (74 %) very good, respectively, while 56 % considered themselves having very good knowledge of the risks associated with smoking cannabis.

Table 3 shows the findings for health literacy by socio-demographic characteristics, including crude and adjusted odds ratios (OR and AOR) for the two types of “health information seeking”. Relative to young men living in rural areas, participants living in urban areas reported having searched more often health-related information or advice and also learned more about substances on the Internet over the past year. Furthermore, they reported better knowledge about the risks associated with using

**Table 1** Health literacy and substance use in young Swiss men. Socio-demographic characteristics and substance use among young Swiss men ( $N = 11,930$ ), C-SURF 2010–11

	Total <sup>a</sup>	%
Age (mean 19.95, $s = 1.24$ )		
Younger than 20	7,252	62.1
20 or older	4,423	37.9
Type of residence		
Urban	4,865	41.1
Rural	6,960	58.9
Region		
French	6,099	51.1
German	5,831	48.9
Education		
Primary school	7,440	62.9
Professional school/higher vocational school	2,817	23.8
Pre-college high school/bachelor's	1,568	13.3
Occupation		
Professional school, employed	8,337	71.7
Pre-college high school, university, ETH	2,470	21.3
Unemployed, disability, gap year	814	7.0
Alcohol use		
Abstainer	1,125	9.4
Not at-risk user	5,640	47.3
At-risk user	5,165	43.3
Volume drinking (>21 drinks/week)		
Not at-risk user and abstainer	11,180	93.7
At-risk user	750	6.3
RSOD (>once/month)		
Not at-risk user and abstainer	6,797	57.0
At-risk user	5,133	43.0
Tobacco use		
Abstainer	6,584	55.5
Not at-risk user	1,580	13.3
At-risk user	3,695	31.2
Cannabis use		
Abstainer	7,533	63.7
Not at-risk user	2,854	17.1
At-risk user	1,448	19.3

<sup>a</sup> The number of subjects ( $N$ ) varies between the subscale scores due to missing data

alcohol, tobacco and cannabis than rural respondents. Young men in the French-speaking part of Switzerland reported having looked more often for information or advice about health or health care in general, whereas young men in the German-speaking part had sought more specific information about substances on the Internet. Higher-level education and occupation were associated with greater health literacy, i.e., higher rates of searching the Internet for health information, better self-reported

**Table 2** Health literacy and substance use in young Swiss men. The prevalence of 12-month at-risk substance use by socio-demographic characteristics among young Swiss men (*N* = 11,930), C-SURF 2010–11

	Alcohol					Tobacco		Cannabis		
	Total <sup>a</sup>	%	% at-risk binge drinking	$\chi^{2b1}$	% at-risk volume drinking	$\chi^2$	% at-risk	$\chi^2$	% at-risk	$\chi^2$
Age (mean 19.95, s = 1.24)										
Younger than 20	7,252	62.1	44.3	16.54***	6.1	0.315 n.s.	28.8	48.06***	11.3	12.69***
20 or older	4,423	37.9	40.5		6.4		34.9		13.5	
Type of residence										
Urban	4,865	41.1	39.2	46.57***	5.4	9.56**	33.0	14.09***	14.6	44.61***
Rural	6,960	58.9	45.5		6.8		29.8		10.5	
Region										
French	6,099	51.1	43.4	0.60 n.s.	6.5	1.21 n.s.	31.3	0.15 n.s.	13.9	31.38***
German	5,831	48.9	42.7		6.0		31.0		10.5	
Education										
Primary school	7,440	62.9	42.0	11.83**	5.9	24.51***	32.6	124.08***	12.5	6.49*
Professional school/higher vocational school	2,817	23.8	45.7		8.1		33.9		12.6	
Pre-college high school/bachelor's	1,568	13.3	42.4		4.6		19.1		10.3	
Occupation										
Professional school, employed	8,337	71.7	43.5	2.79 n.s.	6.7	28.71***	33.9	334.89***	12.5	136.51***
Pre-college high school, university, ETH	2,470	21.3	43.2		4.0		16.7		7.4	
Unemployed, disability, gap year	814	7.0	40.5		8.0		44.1		22.6	

n.s. not significant

<sup>a</sup> The number of subjects (*N*) varies between the subscale scores due to missing data

<sup>b</sup>  $\chi^2$  comparisons significant as follows: \* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

ability to understand health information, and better self-reported knowledge of the various risks associated with the use of alcohol, tobacco and cannabis. Adjusting for socio-demographic characteristics had a negligible impact on most ORs with “health information seeking”, with the exception of seeking general health information by type of residence and occupation.

The associations between health literacy and substance use are presented in Table 4. Compared to alcohol and tobacco abstainers, at-risk users of alcohol and tobacco were less likely to have searched the Internet for health information over the past year (AOR = 0.86); whereas not at-risk users of cannabis were more likely than abstainers to search for health information on the Internet (AOR = 1.34). With regard to using the Internet to learn more about substances, a reverse pattern was observed. Users were much more likely than abstainers to report having consulted the Internet to learn more about substances, and among the users, at-risk users were much more

likely than not at-risk users to do so for alcohol (AOR = 2.50 vs. 1.46), tobacco (AOR = 2.51 vs. 1.79) and cannabis (AOR = 4.86 vs. 3.53).

A marginally higher proportion of at-risk users than abstainers of alcohol, tobacco and cannabis found the health information that they came across in the Internet easy to understand. Furthermore, alcohol users (not-at-risk and at-risk), at-risk users of tobacco, and users of cannabis were much more likely to report “very good” knowledge of various risks associated with their particular substance. Contrary to the comparison between abstainers versus (both at-risk and not at-risk) alcohol users, the “ability to understand health information” and “knowledge about the various health risks of alcohol” did not differ between the groups “at-risk RSOD” and “at-risk volume drinkers” vs. “not at-risk alcohol users and abstainers”. In general, the crude and adjusted ORs were quite similar, with slightly greater effects after adjusting for socio-demographic characteristics.

**Table 3** Health literacy and substance use in young Swiss men. Health literacy by socio-demographic characteristics, among young Swiss men ( $N = 11,930$ ), C-SURF 2010–11

	<i>N</i>	Seeking information or advice about health or health care on the internet in the past year		Using email or the internet to learn more about substances in the past year		The information on health in newspapers and magazines/TV and radio/Internet is easy to understand		My knowledge of the various health risks associated with drinking too much alcohol/smoking tobacco/smoking cannabis is...			
		% Yes answers	OR [95 % CI] <sup>e</sup>	AOR <sup>d</sup> [95 % CI]	% Yes answers	OR [95 % CI]	AOR [95 % CI]	Mean (strongly disagree 1 to strongly agree 4)	F <sup>c</sup>	Mean (very poor, 1 to very good, 10)	F
Total <sup>a</sup>	11,825	21.9			15.7		3.12			7.81	
Age											
Younger than 20 <sup>b</sup>	7,252	20.7	1.00	1.00	16.4	1.00	3.14	14.52***	7.79	1.06 n.s.	
20 or older	4,423	24.3	1.23 [1.12–1.34]	1.18 [1.01–1.29]	14.8	0.89 [0.80–0.98]	3.09		7.83		
Type of residence											
Urban	4,865	25.5	1.41 [1.29–1.54]	1.18 [1.08–1.30]	17.1	1.19 [1.08–1.32]	3.12	0.56 n.s.	7.88	13.48***	
Rural <sup>a</sup>	6,960	19.5	1.00	1.00	14.8	1.00	3.12		7.75		
Region											
French <sup>a</sup>	6,099	27.4	1.00	1.00	15.0	1.00	3.07	68.12***	7.92	46.74***	
German	5,729	16.1	0.51 [0.47–0.56]	0.58 [0.53–0.64]	16.5	1.15 [1.01,1.23]	3.17		7.69		
Education											
Mandatory school <sup>a</sup>	7,440	19.9	1.00	1.00	16.1	1.00	3.13	11.67***	7.78	6.30**	
Professional school/higher vocational school	2,817	20.1	1.01 [0.91–1.13]		13.8	0.83 [0.74,0.94]	3.07		7.79		
Pre-college high school/bachelor's degree	1,568	34.9	2.16 [1.92–2.43]		17.2	1.08 [0.93,1.24]	3.16		7.96		
Occupation											
Professional school, employed <sup>a</sup>	8,337	18.9	1.00	1.00	14.6	1.00	3.09	44.16***	7.75	13.97***	
Pre-college high school, university, ETH	2,470	32.6	2.07 [1.88–2.29]	1.92 [1.73–2.13]	19.2	1.39 [1.23,1.56]	3.23		7.98		
Unemployed, disability, gap year	814	24.0	1.35 [1.14–1.60]	1.14 [0.96–1.36]	18.1	1.28 [1.06,1.55]	3.06		7.82		

OR odds ratio, CI confidence interval, n.s. not significant

<sup>a</sup> The number of subjects (*N*) varies between the subscale scores due to missing data

<sup>b</sup> Referent group

<sup>c</sup> CI estimates are significantly different from the reference group if their confidence intervals do not contain 1.00

<sup>d</sup> Adjusted odds ratio: adjusted by age, type of residence, region and occupation

<sup>e</sup> ANOVA comparisons; significant as follows: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 4** Health literacy and substance use in young Swiss men. Health literacy by type of substance users among young Swiss men (N = 11,930), C-SURF 2010–11

	N <sup>b</sup>	Seeking advice about health or health care on the internet in the past year			Using email or the internet to learn more about substances in the past year		
		% Yes answers	OR [95 % CI] <sup>c</sup>	AOR <sup>d</sup> [95 % CI]	% Yes answers	OR [95 % CI]	AOR [95 % CI]
<b>Alcohol use</b>							
Abstainer <sup>a</sup>	1,125	24.5	1.00	1.00	9.2	1.00	1.00
Not at-risk user	5,640	22.3	0.88 [0.76–1.02]	0.94 [0.80–1.10]	13.0	1.47 [1.18–1.83]	1.46 [1.17–1.82]
At-risk user	5,165	21.0	0.82 [0.70–0.95]	0.86 [0.74–1.01]	20.1	2.48 [2.00–3.07]	2.50 [2.01–3.11]
<b>Volume drinking (&gt;21 drinks/week)</b>							
Not at-risk user and abstainer <sup>a</sup>	11,180	22.2	1.00	1.00	15.3	1.00	1.00
At-risk user	750	18.1	0.78 [0.64–0.94]	0.80 [0.65–0.97]	21.4	1.50 [1.25–1.80]	1.57 [1.30–1.89]
<b>RSOD (&gt;once/month)</b>							
Not at-risk user and abstainer <sup>a</sup>	6,797	22.7	1.00	1.00	12.4	1.00	1.00
At-risk user	5,133	21.0	0.91 [0.83–0.99]	0.91 [0.83–0.99]	20.1	1.77 [1.60–1.95]	1.79 [1.62–1.98]
<b>Tobacco use</b>							
Abstainer <sup>a</sup>	6,584	23.3	1.00	1.00	11.2	1.00	1.00
Not at-risk user	1,580	22.0	0.93 [0.82–1.06]	0.98 [0.86–1.13]	18.3	1.78 [1.53–2.06]	1.79 [1.54–2.08]
At-risk user	3,695	19.5	0.80 [0.72–0.88]	0.86 [0.78–0.96]	22.7	2.33 [2.09–2.60]	2.51 [2.24–2.81]
<b>Cannabis use</b>							
Abstainer <sup>a</sup>	7,533	20.6	1.00	1.00	8.5	1.00	1.00
Not at-risk user	2,854	24.7	1.49 [1.33–1.67]	1.34 [1.20–1.51]	23.5	3.71 [3.26–4.22]	3.53 [3.10–4.03]
At-risk user	1,448	23.4	1.03 [0.92–1.16]	1.03 [0.92–1.16]	37.6	4.74 [4.21–5.35]	4.86 [4.30–5.50]
<b>N<sup>b</sup> The information on health in the web is easy to understand</b>							
<b>% strongly agree</b>							
		OR [95 % CI] <sup>c</sup>	AOR <sup>d</sup> [95 % CI]			% Very good	AOR <sup>d</sup> [95 % CI]
<b>My knowledge of the various health risks associated with drinking too much alcohol/smoking tobacco/smoking cannabis is...</b>							
<b>Drinking too much alcohol</b>							
Abstainer <sup>a</sup>	1,125	30.8	1.00	1.00	66.4	1.00	1.00
Not at-risk user	5,640	36.1	1.27 [1.10–1.46]	1.25 [1.06–1.44]	71.1	1.24 [1.09–1.43]	1.20 [1.04–1.38]
At-risk user	5,165	35.0	1.21 [1.05–1.39]	1.21 [1.05–1.40]	69.9	1.17 [1.03–1.35]	1.14 [0.99–1.31]
<b>Volume drinking (&gt;21 drinks/week)</b>							
Not at-risk user and abstainer <sup>a</sup>	11,180	35.0	1.00	1.00	70.0	1.00	1.00
At-risk user	750	37.4	1.11 [0.95–1.30]	1.17 [1.00–1.37]	72.8	1.15 [0.97–1.36]	1.18 [1.00–1.40]
<b>RSOD (&gt;once/month)</b>							
Not at-risk user and abstainer <sup>a</sup>	6,797	35.3	1.00	1.00	70.3	1.00	1.00
At-risk user	5,133	34.9	0.98 [0.91–1.06]	1.00 [0.92–1.08]	70.0	0.99 [0.91–1.07]	0.98 [0.90–1.06]
<b>Tobacco use</b>							
Abstainer <sup>a</sup>	6,584	34.5	1.00	1.00	70.9	1.00	1.00



Table 4 continued

	N <sup>b</sup>	The information on health in the web is easy to understand			My knowledge of the various health risks associated with drinking too much alcohol/smoking tobacco/smoking cannabis is...		
		% strongly agree	OR [95 % CI] <sup>c</sup>	AOR <sup>d</sup> [95 % CI]	% Very good	OR [95 % CI]	AOR <sup>d</sup> [95 % CI]
Not at-risk user	1,580	35.8	0.96 [0.86–1.08]	0.96 [0.85–1.08]	72.9	1.10 [0.97–1.24]	1.10 [0.97–1.24]
At-risk user	3,695	33.7	1.10 [1.01–1.20]	1.14 [1.04–1.24]	78.3	1.48 [1.35–1.63]	1.56 [1.41–1.71]
Cannabis use					Smoking cannabis		
Abstainer <sup>a</sup>	7,533	34.4	1.00	1.00	71.4	1.00	1.00
Not at-risk user	2,854	36.3	1.05 [0.95–1.17]	1.02 [0.91–1.13]	77.3	1.31 [1.19–1.45]	1.31 [1.18–1.45]
At-risk user	1,448	36.7	1.14 [1.03–1.25]	1.15 [1.04–1.27]	76.8	2.30 [2.08–2.54]	2.26 [2.04–2.50]

OR odds ratio, CI confidence interval

<sup>a</sup> Referent group

<sup>b</sup> The number of subjects (N) varies between the subscale scores due to missing data

<sup>c</sup> CI estimates are significantly different from the reference group if their confidence intervals do not contain 1.00

<sup>d</sup> Adjusted odds ratio: adjusted by age, type of residence, region and occupation

## Discussion

The present paper is the first empirical report of the association between substance use and health literacy among young men in Switzerland. As seen elsewhere (Jiménez Pernet et al. 2010), friends/family, family doctors, and the Internet are the three most common sources of health information for adolescents and young adults in Switzerland (Wang and Schmid 2009). Compared to the general population, this age group is less likely to use newspapers/magazines and more likely to use the Internet for health information (Wang and Schmid 2009). More than one in five young Swiss men had searched the Internet for health information over the last 12 months, with roughly one in six of them using email and the Internet to learn more about substances over that same time period. Although the level of Internet use for health information in the past 12 months is lower than reported elsewhere (Baker et al. 2003), searchers for information on substances represented a large majority of the searchers for health information generally (72 %), underscoring the importance of this issue for this age group. Consistent with the general population (Wang and Schmid 2009), higher education and occupation as well as living in urban areas were associated with higher levels of each of the health literacy components measured. Even after adjusting for possible confounding by socio-demographic factors, at-risk use was associated with significantly higher health literacy outcomes for all components of health literacy, except for seeking general health information.

In a survey of youths in Argentina, higher media literacy related to smoking was significantly associated with both lower rates of current smoking and susceptibility to future smoking (Salgado et al. 2012). We found that at-risk male substance users in Switzerland are not only more active in obtaining substance-related information but also consider their knowledge of the risks associated with substances and their ability to understand health-related information better than abstinent and not-at-risk substance users. This implies that competencies in media literacy (scepticism and critical thinking vis-à-vis media portrayals) and competencies in health literacy (e.g., access to health information presented through the media and understanding the risks associated with substance use) work differently, and the latter alone may not necessarily prevent young adults from substance use or risky substance use (Rosendahl et al. 2005; Miller 2006).

The underlying model of health information and risk leading to abstinence may be too facile. Another paradigm may be at work here. Due to greater personal interest and concern, substance users may be more likely to search for information on substances, just as patients are more likely to search for information on their disease and treatment



(Bansil et al. 2006; Renahy et al. 2008; Siquilini et al. 2011), and consequently demonstrate greater understanding of that particular subject matter. Within this paradigm, the findings of greater access and greater knowledge of substance use-specific indicators of health literacy are not surprising. That at-risk users also reported marginally better understanding of health information generally may be a reflection of the primacy of substance use as a health issue in this age group, i.e., substance use motivates both searching for any health information in the first place and subsequently greater exposure to and experience with health information. Indeed, information on health and risk can serve harm reduction, but the initial cross-sectional screening does not capture potential risk reduction among users. Just as foresighted health policy makers and health literacy speak of and advocate informed patients (Detmer et al. 2003; Kickbusch and Maag 2005), the field of substance use needs to better understand the reality of informed users. Qualitative data may provide better understanding of the motivation and attitudes of substance users and bring deeper insight of how and why information is sought, understood, and used (Skinner et al. 2003; Gray et al. 2005).

The present study should be interpreted within some caution. First, health literacy was measured using self-reported Likert-type items based on behavior, motivation, knowledge and skills. Even though some researchers emphasize that self-assessment of some health-specific and general competencies are highly correlated with more objective assessments (Battersby et al. 2003; Williams et al. 2003), self-reports of young adults may not be an accurate predictor of their actual health information competencies (Ivanitskaya et al. 2006). Moreover, such items may be prone to social response bias which was not assessed in the brief screening questionnaire. Second, the indicators of health literacy measured in this study were all based on the dimension “information and knowledge” of health literacy (Wang et al. 2012) and, therefore, do not represent all domains of health literacy. The Swiss Health Literacy Survey (Wang et al. 2012) provided empirical confirmation that health literacy is indeed a multi-faceted concept (Berkman et al. 2010), just like media literacy (Primack et al. 2009) and eHealth literacy (Norman and Skinner 2006). However, most measures of health literacy to date assess literacy as it relates to reading comprehension and do not test other aspects of health literacy, such as the ability to communicate orally or think critically (Manganello 2008), or media literacy, failing to detect differences in “active processing” of health messages in the media (Weintraub Austin and Johnson 1997; Weintraub Austin et al. 2007). In particular, critical decision-making, which is also a competency for health (Wang et al. 2012), could serve as a bridge between health literacy and media

literacy. It is possible that measuring additional dimensions of health literacy may paint a different picture. Third, the use of cross-sectional data does not allow for conclusions about causality or temporal relationships. Longitudinal research will be necessary to evaluate the potential causal associations between health literacy and substance use behaviors.

## Conclusions

Little attention has been paid to health literacy among young adults and its association with substance use. The results of the present study suggest that substance users appear to demonstrate greater health literacy, especially access to and understanding of information on substances. These findings suggest that information on and knowledge of risks associated with substances alone may not prevent young adults from adopting risky substance use behaviors. They may also point to the existence of informed, savvy users. Given the international push for health information and prevention, the findings of this initial explorative study merit further investigation. Future research should develop and validate tools to measure health literacy in young adult populations and also those competencies specific to the field of substance use. In addition, it will be important to develop and evaluate interventions that promote such competencies among adolescents and young adults to assess the potential impact of health literacy on actual substance use, including harm reduction.

**Acknowledgments** We are grateful to Charlotte Eidenbenz for her extensive efforts in coordinating the study. This work has been supported by the Swiss National Science Foundation (33CS30\_139467).

**Conflict of interest** The authors declare that they have no conflicts of interest.

## References

- Association romande CIAO (2012) Statistiques 2012 du site ciao.ch. Lausanne: Association romande CIAO
- Baker L, Wagner TH, Singer S, Bundorf MH (2003) Use of the Internet and e-mail for health care information. *JAMA* 289:2400–2406
- Bansil P, Keenan NL, Zlot AI, Gilliland JC (2006) Health-related information on the Web: results from the HealthStyles Survey, 2002–2003. *Prev Chron Dis* 3(2):A36
- Battersby M, Ask A, Reece M, Markwick M, Collins J (2003) The partners in health scale: the development and psychometric properties of a generic assessment scale for chronic condition self-management. *Aust J Prim Health* 9:41–52
- Bergsma LJ, Carney ME (2008) Effectiveness of health-promoting media literacy education: a systematic review. *Health Educ Res* 23(3):522–542
- Berkman ND, Davis TC, McCormack L (2010) Health literacy: what is it? *J Health Commun* 15:9–19

- Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K (2011) Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med* 155(2):97–107
- Borzekowski DLG, Rickert VI (2001) Adolescents, the Internet, and health-issues of access and content. *J Appl Dev Psychol* 22(1):49–59
- Detmer DE, Singleton PD, MacLeod A, Wait S, Taylor M, Ridgwell J (2003) *The informed patient: study report*. Cambridge University Health, Cambridge
- Eaton DK, Kann L, Kinchen S, Ross J, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D, Shanklin S, Lim C, Grunbaum JA, Wechsler H (2006) Youth risk behavior surveillance—United States, 2005. *J Sch Health* 76(7):353–372
- Farrelly MC, Niederdeppe J, Yarsevich J (2003) Youth tobacco prevention mass media campaigns: past, present, and future directions. *Tob Control* 12:I35–I47
- Gonzalez R, Glik D, Davoudi M, Ang A (2004) Media literacy and public health: integrating theory, research, and practice for tobacco control. *Am Behav Sci* 48(2):189–201
- Grant JD, Scherrer JF, Lynskey MT, Agrawal A, Duncan AE, Haber JR, Heath AC, Bucholz KK (2012) Associations of alcohol, nicotine, cannabis, and drug use/dependence with educational attainment: evidence from cotwin-control analyses. *Alcohol Clin Exp Res* 36(8):1412–1420
- Gray NJ, Klein JD, Noyce PR, Sesselberg TS, Cantrill JA (2005) Health information seeking behaviour in adolescence: the place of the internet. *Soc Sci Med* 60:1467–1478
- Ivanitskaya L, O’Boyle I, Casey AM (2006) Health information literacy and competencies of information age students: results from the interactive online research readiness self-assessment (RRSA). *J Med Internet Res* 8(2):e6
- Jiménez Pernet J, de Labry Olry, Lima A, Bermúdez Tamayo C, García Gutiérrez JF, MdC Salcedo Sánchez (2010) Use of the internet as a source of health information by Spanish adolescents. *BMC Med Inform Decis Mak* 10:6
- Jordan JE, Osborne RH, Buchbinder R (2011) Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weaknesses. *J Clin Epidemiol* 64(4):366–379
- Kickbusch I, Maag D (2005) Health literacy: towards an active health citizenship. In: Sprenger M. (Hrsg.) *Public Health in Österreich und Europa*. Festschrift anlässlich der Emeritierung von Univ.-Prof. Dr. med. Horst Richard Noack PhD. Lengreich: Papst Science Publishers
- Kummervold PE, Chronaki CE, Lausen B, Prokosch H-U, Rasmussen J, Santana S, Staniszewski A, Wangberg SC (2008) eHealth trends in Europe 2005–2007: a population-based survey. *J Med Internet Res* 10(4):e42
- Manganello JA (2008) Health literacy and adolescents: a framework and agenda for future research. *Health Educ Res* 23(5):840–847
- Miller WR (2006) Motivational factors in addictive behaviors. In: Miller WR, Carroll KM (eds) *Rethinking substance use: what the science shows, and what we should do about it*. The Guilford Press, New York
- Nielsen-Bohlman L, Panzer AM, Kindig DA (eds) (2004) *Health literacy: a prescription to end confusion*. The National Academies Press, Washington
- Norman CD, Skinner HA (2006) eHealth literacy: essential skills for consumer health in a networked world. *J Med Internet Res* 8(2):e9
- Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR (2005) The prevalence of limited health literacy. *J Gen Intern Med* 20(2):175–184
- Padlina O (2007). Ergebnisse aus einer internetbasierten Studie im schulischen Setting über feelok und über das Gesundheitsverhalten der Jugendlichen. Zürich: Institut für Sozial- und Präventivmedizin (Universität Zürich) und Zentrum für Organisations- und Arbeitswissenschaften (ETH Zürich)
- Pinkleton BE, Weintraub Austin E, Hust SJT, Cohen M (2005) Evaluation of an American Legacy Foundation Washington State department of health media literacy pilot study. *Health Commun* 18(1):75–95
- Primack BA, Sidani J, Carroll MV, Fine MJ (2009) Associations between smoking and media literacy among college students. *J Health Commun* 14:541–555
- Rehm J, Taylor B, Room R (2006) Global burden of disease from alcohol, illicit drugs and tobacco. *Drug Alcohol Rev* 25(6):503–513
- Renahy E, Parizot I, Chauvin P (2008) Health information seeking on the Internet: a double divide? Results from a representative survey in the Paris metropolitan area, France, 2005–2006. *BMC Public Health* 8:69
- Rideout V (2001) How young people use the internet for health information. Generation Rx.com, Kaiser Family Foundation, Menlo Park
- Rosendahl KI, Galanti MR, Gilljam H, Ahlbom A (2005) Knowledge about tobacco and subsequent use of cigarettes and smokeless tobacco among Swedish adolescents. *J Adolesc Health* 37:224–228
- Salgado MV, Perez-Stable EJ, Primack BA, Kaplan CP, Mejia RM, Gregorich SE, Alderete E (2012) Association of media literacy with cigarette smoking among youth in Jujuy, Argentina. *Nicotine Tob Res* 14(5):516–521
- Santelli JS, Robin L, Brener ND, Lowry R (2001) Timing of alcohol and other drug use and sexual risk behaviors among unmarried adolescents and young adults. *Fam Plann Perspect* 33(5):200–205
- Siquilini R, Ceruti M, Lovato E, Bert F, Bruno S, De Vito E, Liguori G, Manzoli L, Messina G, Minniti D, La Torre G (2011) Surfing the Internet for health information: an Italian survey on use and population choices. *BMC Med Inform Decis Mak* 11:21
- Skinner H, Biscope S, Poland B, Goldberg E (2003) How adolescents use technology for health information: implications for health professionals from focus group studies. *J Med Internet Res* 5(4):e32
- Wakefield MA, Loken B, Hornik RC (2010) Use of mass media campaigns to change health behaviour. *Lancet* 376(9748):1261–1271
- Wang J, Schmid MR. Swiss Health Literacy Survey (HLS CH). Oral plenary presentation at the Swiss Public Health Conference, 25–27 Aug 2009, in Zurich, Switzerland
- Wang J, Schmid MR, Thombs BD (2012) The Swiss Health Literacy Survey: development and psychometric properties of a multidimensional instrument to assess competencies for health. *Health Expect*
- Weintraub Austin E, Johnson KK (1997) Immediate and delayed effects of media literacy training on third graders’ decision making for alcohol. *Health Commun* 9(4):323–349
- Weintraub Austin E, Pinkleton BE, Funabiki RP (2007) The desirability paradox in the effects of media literacy training. *Commun Res* 34(5):483–506
- Williams J, Clemens S, Oleinikova K, Tarvin K (2003) *The skills for life survey: a national needs and impact assessment of literacy, numeracy and ICT skills*. Department for Education and Skills, London