



Research Paper

The role of alcohol use and cigarette smoking in sickness absence: Are there social inequalities?

Ingeborg Lund*, Inger Synnøve Moan

Norwegian Institute of Public Health, Department of Alcohol, Tobacco and Drugs, Tobacco and Drugs PB 222 Skøyen, 0213 Oslo, Norway

ARTICLE INFO

Keywords:

Sickness absence
Alcohol use
Smoking
Social inequality
Educational groups

ABSTRACT

Background: While studies have found a social gradient in negative consequences of drinking and smoking, evidence is less clear for a gradient also in alcohol use and smoking's association with sickness absence. We investigate the association between alcohol use and cigarette smoking and general sickness absence, and examine the moderating role of socio-economic status for these associations when controlling for general health status.

Method: Questions on alcohol use, measured by the Alcohol Use Disorders Identification Test (AUDIT-C), smoking, general health and sickness absence were included in annual national cross-sectional telephone surveys on alcohol, tobacco and drug use (2015–18) amongst Norwegian adults aged 16–79-years (average response rate=59%). The analytic sample comprised 4719 full- and part-time employees aged 25–79 years (46.7% were female, mean age=44.3 years). Individual-level data on education were obtained from national registries.

Results: In adjusted negative binomial regression analyses, current and former daily smoking were associated with a higher occurrence of sickness absence in groups with low educational attainment, but not in groups with high educational attainment. Alcohol use was negatively associated with sickness absence. While a significantly higher number of sickness days was reported by smokers in the low compared with the high education group, educational attainment did not moderate the alcohol use – sickness absence association.

Conclusion: Daily smoking is associated with sickness absence. A negative social gradient was found in the smoking – absence association. Reduced daily smoking might give a reduction in sickness absence.

Background

Social inequalities in health have important real life consequences, as demonstrated by recent results indicating a 14-year longer life expectancy for the richest Norwegians compared to the poorest (Kinge et al., 2019). Sickness benefits contribute to reduce such social inequality in health (Bambra et al., 2010), and are important elements of the welfare state model. However, they are costly to maintain, and states generally wish to keep them at low levels.

Under the Norwegian system, employees can report in sick for shorter periods without a doctor's attestation of illness. Full wage remuneration is given from the first day, and all costs are borne by employers and society. Despite a political goal to achieve a reduction, Norwegian sickness absence levels have remained stable at around 6% for several years (Statistics Norway, 2020). This is a higher prevalence than in other European countries (Barmby, Ercolani, & Treble, 2002), and with an annual spending of 2–3% of gross domestic product (GDP), Norwegian sickness and disability benefits are also higher than in the other Nordic countries (IMF, 2019).

Cigarette smoking and alcohol use are modifiable factors that have been linked to absence from work in several studies. For example, an association between self-reported smoking and registered sickness absence was found in Finland (Laaksonen, Piha, Martikainen, Rahkonen, & Lahelma, 2009), and health care workers who were smokers were more likely to have had absence due to back pain in a Spanish case control study (Lana, de León, García, & Jaime, 2005). For alcohol, an international review study covering the years 1980 to 2014 supported an association between alcohol use and absence from work, with a stronger effect for short-term than for long-term absence (Schou & Moan, 2016). Norwegian studies suggest associations between alcohol use and both registered (Østby et al., 2016) and self-reported (Grimsmo & Rossow, 1997) sickness absence. There are also studies that support an effect on the macro level, as positive associations have been demonstrated between population drinking and national absence levels both in Norway (Norström & Moan, 2009) and in Sweden (Norström, 2006).

In studies examining the association between alcohol use and smoking and sickness absence, associations seem better established for smoking than for alcohol. Two studies (Denmark and Holland) based on regis-

* Corresponding author.

E-mail address: ingeborg.lund@fhi.no (I. Lund).

tered general sickness absence were inconclusive with regard to alcohol use, while smoking was associated with long-term (Alavinia, van den Berg, van Duivenbooden, Elders, & Burdorf, 2009; Christensen, Lund, Labriola, Bültmann, & Villadsen, 2007) and shorter-term (Alavinia et al., 2009) absence. Similarly, a recent Norwegian study based on self-reported sickness absence, found an association for daily smoking, but not for occasional smoking and alcohol use (Lund, Moan, & Edvardsen, 2019). However, in a study based on registered diagnosis-specific absence from several European countries, both smoking and heavy episodic drinking were associated with absence due to depressive disorders and absence due to external causes, e.g. injuries and poisonings (Virtanen et al., 2018).

In Norway, long-term sickness absence tends to be more common in lower social strata than in higher (Hansen & Ingebrigtsen, 2008), but how socioeconomic position might alter the relationship between sickness absence and alcohol use or smoking is not known. Internationally, even though research is sparse (Schou & Moan, 2016), findings suggest a stronger relationship between alcohol use and sickness absence in lower social strata (Johansson, Böckerman, & Uutela, 2009; Spak, Hensing, & Allebeck, 1998; Vahtera, Poikolainen, Kivimäki, Al-Mursula, & Pentti, 2002). Furthermore, Laaksonen et al. (2009) found smoking to be more strongly associated with medically certified sickness absence amongst manual workers than amongst managers and professionals, while Kaikkonen, Härkänen, Rahkonen, Gould, & Koskinen (2015) found that health behaviours, including smoking and heavy drinking, contributed to social inequalities in sickness absence amongst Finnish employees.

Health is obviously important for sickness absence. A possible explanation offered for the social gradient in the association between substance use and sickness absence, is that individuals in lower social strata **more often** suffer from combined health challenges that exacerbate the effects of alcohol-and tobacco-attributable harms (Bellis et al., 2016). However, few studies addressing the substance use – sickness absence association have examined the potential impact of general health (see e.g., Schou & Moan, 2016).

Given the scarcity of research on possible social inequality in the association between substance use and sickness absence, the aim of this paper was twofold: (i) to investigate the associations between alcohol use and cigarette smoking and general sickness absence amongst Norwegian employees, and (ii) to examine whether there are social inequalities in these associations, when controlling for general health status.

Methods

Sample and weighting

The data stems from the annual Norwegian Survey on Tobacco and Substance Use (NSTSU) for the years 2015–2018. This is a telephone survey based on probability sampling, randomly drawing 3000 16–79-year-old Norwegians from Statistics Norway's population registry each year. To counteract low response rates in lower age segments, additional random samplings of 700 individuals were performed for persons aged 16–30. The total sample consisted of 8692 respondents, with annual response rates ranging from 57% to 61% (average response rate = 59%).

For the present analyses, we selected respondents aged 25 and above to focus on those of working age who have completed their education. The analytic sample comprise 4719 full- and part-time employees aged 25–79 years (46.7% female, mean age = 44.3 years). Register data from educational institutions, regional (county) administrations, and the Norwegian State Educational Loan Fund was used for information about educational attainment. amongst these employees, 19.3% had completed elementary school or less education, 39.2% had completed upper secondary school, 28.6% had completed up to 3 years of university or college education, and 13% had completed more than 3 years of higher education.

Table 1

Distribution of sickness absence days*, overall and in groups (N = 4679)**.

	Mean	SE
All respondents	7.31	0.43
High education	6.05	0.46
Low education	8.22	0.65
Heavy drinkers (5+)	5.70	0.95
Moderate drinkers (1–4)	6.37	0.56
Non-drinkers	10.04	1.61
Daily smokers	9.33	1.59
Former daily smokers	8.54	0.95
Never daily smokers	6.59	0.53

* Range 0–230 days.

** Weighted results.

The data was weighted according to sampling design and non-response, with weights calibrated against registry data on age (6 age groups), education (4 groups), geographical region (7 regions), sex, and interactions between sex and age, and sex and education (Statistic Norway, 2019).

Measures

Sickness absence: The sickness absence variable was based on self-reports, with respondents reporting the number of days away from work due to sickness in the past 12 months. The mean number of sickness days reported was 7.02 (Table 1). The distribution of sickness absence was highly skewed, with the majority (57.9%) reporting zero sickness absence days (Table 2).

Daily smoking: A three point variable separates self-reported current daily smokers from former daily smokers and never daily smokers. Occasional smoking was not taken into account, as previous research has suggested that this is not associated with sickness absence (Lund et al., 2019).

Alcohol use: AUDIT-C was used to measure alcohol use. Based on visual (stem-and leaf) inspection of the distribution of AUDIT-C scores, a three-point variable was constructed, separating non-drinkers (Audit-C-score 0), from moderate drinkers (AUDIT-C-score 1–4), and heavy drinkers (AUDIT-C-score 5 and above).

General health: Based on self-reported general health, a three-point variable was constructed with categories good/very good, medium, and poor/very poor health.

Socio-economic status (SES) was measured through attained education: Several terms have been used in epidemiological literature to describe the social and economic factors that may influence health and illness, including social status, social class, SES, and social stratification (Lynch & Kaplan, 2000). Socio-economic status is typically operationalized using income, education or occupation (Bloomfield, Grittner, Kramer, & Gmel, 2006). In the present study, education was chosen as the main indicator of socio-economic status. Compared with income, education has a practical advantage because income often is regarded as sensitive information and thus can be challenging to obtain. In a study of social inequality in alcohol consumption and alcohol-related problems using comparative data from 15 countries, education was indeed the most widely asked indicator of SES and had the fewest number of missing responses (Bloomfield et al., 2006). Moreover, compared with other indicators such as occupational prestige, education has been said to more accurately convey what it is about social position that may causally be related to increased risk (Marmot, 1996). In the present study, education was included as a dummy variable, with categories lower education, i.e. upper secondary school or lower levels, and higher education, i.e. college and university levels (regardless of length).

Table 2
Sample composition ($N = 4719$)*.

		Proportion of analytic sample (%)	Proportions within educational groups (%)	
			Lower	Higher
Gender	Men	53.3	59.6	44.3
	Women	46.7	40.4	55.7
Age group	25–35 years	26.7	24.8	29.3
	36–45 years	27.5	26.1	29.5
	46–79 years	45.8	49.1	41.2
Education	Higher	41.5	0.0	100.0
	Lower	58.5	100.0	0.0
Sickness absence	Zero days	57.9	62.0	52.0
Audit-C score	5+ (Heavy drinking)	19.9	20.5	19.0
	1–4 (Moderate drinking)	62.0	58.3	67.5
	Zero (No drinking)	18.1	21.2	13.5
Health	Poor/very poor	2.5	3.4	1.2
	Medium	9.5	11.8	6.3
	Good/very good	88.0	84.8	92.5
Daily smoking	Current	12.3	18.1	4.2
	Former	25.7	29.6	20.4
	Never	62.0	52.2	75.4

* Weighted results.

Table 3
Results from negative binomial regressions on sickness absence days ($N = 2935$).

	IRR	95% CI
Women	2.3***	1.87–2.8
Age	1.00	0.99–1.01
Smoking (ref=never daily)		
Daily	0.56	0.28–1.10
Former daily	0.78	0.54–1.11
Lower education	0.97	0.76–1.25
Interaction effect		
Daily smoking x lower education	3.01**	1.38–6.55
Former daily smoking x lower education	2.35***	1.47–3.76
General health (ref=good/very good)		
Poor/very poor	5.26***	2.06–10.62
Medium	2.47***	1.73–3.52
Audit-C (ref=zero)		
5+ score (heavy drinking)	0.62**	0.45–0.86
1–4 score (moderate drinking)	0.77	0.59–1.01
Constant	4.76***	2.55–7.04
/lnalpha	1.94	1.87–2.01
Alpha	6.95	6.49–7.45

IRR: Incidence-rate ratio; CI: Confidence interval; *** $p < .001$, ** $p < .01$, * $p < .05$.

Statistical analyses

Sickness absence was measured in number of days, and associations were estimated using count regression. Due to over-dispersion, Poisson regression was not suitable, and a negative binomial model was used to regress smoking and alcohol use on past year sickness absence days, controlling for gender, age, educational attainment and general health. To investigate any moderating effect of socio-economic status, interaction terms between alcohol use and education, and smoking and education were included.

Effect sizes are reported as incidence rate ratios (IRR), i.e. the sickness absence incidence rate for the category at hand, compared with the sickness absence incidence rate for the reference category. Results from the regression analysis are reported in Table 3.

Sensitivity analyses, omitting general health from the regressions (results not displayed in table), did not alter the relationship between variables significantly. All analyses were conducted in STATA 15. Furthermore, as educational attainment did not significantly moderate the effect of alcohol use on sickness absence, this interaction was not included in the analysis reported in Table 3.

Results

Descriptive results

The number of sickness absence days reported by the employees ranged from zero to 230 in all groups reported in Table 1. Employees with higher education reported a lower average number of sickness days than employees with lower education. The average number of sickness absence days reported by non-drinkers were almost twice as high as the average number of sickness days reported by heavy drinkers, with moderate drinkers falling in between. Daily smokers reported more sickness absence days on average than never daily smokers. Former daily smokers reported a number of days lower than daily, and higher than never daily smokers.

The proportion of men in the sample was slightly higher than the proportion of women (Table 2). The majority of respondents had not been absent from work during the past 12 months, were moderate drinkers with an AUDIT-C score of 4 or less, reported good or very good health, and had never been daily smokers. The composition of the higher education group differed significantly from the composition of the lower education group for all factors (Chi-sq, $p < .001$ for all).

Results from regression analyses

For those with high education, results from negative binomial regression (Table 3) showed no significant association between smoking and sickness absence. However, in the low education group, daily smokers (IRR 3.01, CI 1.38–6.55) and former smokers (IRR 2.35 CI 1.47–3.76) were likely to have markedly more sickness absence than never smokers. Employees with high alcohol consumption (Audit C 5+) had less sickness absence days than non-drinkers (IRR 0.62, CI 0.45–0.86), and there was no significant interaction between alcohol use and education. There was no direct association between education and sickness absence. Furthermore, being a woman (IRR 2.3, CI=1.87–2.85), and having poor (IRR 5.25, CI=2.60–10.62) and medium health (IRR 2.47, CI=1.73–3.52), were associated with a higher occurrence of sickness absence. There was no significant association between sickness absence and age.

Discussion

In this sample of Norwegian employees, the occurrence of sickness absence was higher in daily and former daily smokers with lower educational attainment, amongst women, and in people with poor and medium health. While evidence of a social gradient was found for smok-

ing, no such gradient was found for alcohol. Heavy drinking was associated with a lower incidence of sickness absence, while there was no significant association between moderate drinking and sickness absence.

The finding that smoking, but not alcohol use, is associated with a higher occurrence of sickness absence is in line with results from international studies of alcohol use and smoking (Alavinia et al., 2009; Christensen et al., 2007), and a recent Norwegian study based on a sample of employees from selected industries (Lund et al., 2019). It is in contrast to two previous Norwegian studies showing an association between alcohol use and sickness absence (Grimsø & Rossow, 1997; Østby et al., 2016).

The negative association found between heavy drinking and sickness absence may partly be attributed to how sickness absence was measured in this study. Alcohol use have been found to be stronger associated with short-term than long-term sickness absence (Schou & Moan, 2016), possibly related to the acute and ephemeral consequences of alcohol use like e.g. intoxication, hangovers, and increased risk of accidents or violence (Gunn, Mackus, Griffin, Munafò, & Adams, 2018). When counting single sickness days, individuals with a high number of single absence days due to alcohol use might be difficult to extricate from individuals with longer absence spells due to non-alcohol-related absence. Moreover, because the current sample comprise employees and because heavy drinkers typically are under-represented in surveys (Johnson, 2014), the heaviest drinkers are likely not represented in this study, possibly resulting in an underestimation of the alcohol use – sickness absence association.

It is likely that the association between former smoking and sickness absence reflects a higher occurrence of health problems in this group of employees, as there are close links between lifetime cigarette smoking and several serious illnesses (SCENIHR, 2008).

While there is a shortage of studies testing the importance of social class for the association between substance use and sickness absence, earlier findings do indicate a general negative social gradient, where higher status groups overall tend to experience fewer negative consequences of their own alcohol use and smoking, while lower status groups experience more (Bloomfield et al., 2006; Grittner, Kuntsche, Gmel, & Bloomfield, 2013; Jones, Bates, McCoy, & Bellis, 2015). The present study provides empirical support for a negative social gradient for smoking, revealing a higher number of sickness absence days amongst smokers with a lower compared to a higher educational level. The results correspond with findings from two Finnish studies (Kaikkonen et al., 2015; Laaksonen et al., 2009).

A possible explanation for the social gradient found in the smoking – absence association might be different smoking patterns in people from higher and lower strata (Bellis et al., 2016). Some support for this notion is found in Lund & Lund (2005), where Norwegian smokers from lower social-economic strata had higher smoking intensities, a lower average debut age, and a tendency to smoke more dangerous products, than smokers from higher socio-economic strata. An additional factor to take into consideration is the higher occurrence of manual labour often found in the lower educational group. Negative health effects of smoking and lower productivity due to alcohol use, might to a lesser extent influence work attendance for individuals working behind a desk compared with manual workers. Although no previous studies have investigated any such effect for smoking, recent results have demonstrated that people from higher social strata are more inclined to turn up at work in an impaired state due to alcohol use the previous day (Moan & Halkjelsvik, 2020). Moreover, a large comparative study on general presenteeism (i.e., working while ill), found that manual workers had a lower incidence of presenteeism than non-manual workers, suggesting a positive social gradient also for general presenteeism (Kwon, 2020).

In contrast to some previous studies (Johansson et al., 2009; Spak et al., 1998; Vahtera et al., 2002), the present study found no moderating effect of socio-economic status on the alcohol use – sickness absence association. This might indicate that this social gradient is less pronounced in Norway. Firstly, Norway is one of the richest and most egalitarian countries in the world, with a large proportion of the popu-

lation having higher education (Kwon, 2020). Secondly, alcohol use and smoking have different social profiles. While the majority of Norwegian adults use alcohol, population smoking has declined in recent years, such that smoking is now more common in people with lower educational attainment (Lund, 2015; Vedoy, 2019). However, we cannot rule out the possibility that using a different measure for socio-economic status would have given other results. In the current study, socio-economic status was measured through attained education, which is only one of several possible indicators of social status. On the other hand, a negative social gradient in the alcohol use – sickness absence association has previously been found both when using education (Johansson et al., 2009) and when using income (Spak et al., 1998; Vahtera et al., 2002) as a measure of social status.

It has been suggested that individuals from lower social strata to a greater extent suffer from combined health challenges which exacerbate effects of alcohol-and tobacco-attributable harms (Bellis et al., 2016). In the present study, individuals in lower social strata reported poorer general health than individuals in higher social strata (Table 2). However, the results from the present study showed that even when controlling for general health status, the negative social gradient in the smoking – sickness absence association was significant. A sensitivity analysis, omitting health from the regression analyses, did not alter the results significantly suggesting that health, smoking and alcohol use represent distinct dimensions that influence sickness absence in different ways.

Methodological considerations

Problems of underreporting and selection bias are well-known in survey research on substance use. Heavy drinkers are typically underrepresented in surveys, and alcohol use is underreported by respondents (Johnson, 2014), both due to recall bias and social desirability bias. If these phenomena interact with education, this may have affected our results. However, it was not possible to determine whether this was the case in the current study. Social status is not directly measurable in our data. Therefore, and in line with previous research (e.g., Bloomfield et al., 2006; Grittner et al., 2013; Jones et al., 2015), we have used education as a proxy. Education is one of several possible indicators of social status. Using other indicators, e.g., income or occupation, may have provided other results. Moreover, although it is common practice to use education as a measure of social status, it also implies the uncertainty that the results at least partly might stem from an effect of education itself (Cutler & Lleras-Muney, 2010). Another limitation is that this study is based on data from Norwegian-speaking employees, which precludes the foreign workers in Norway, which may differ from the analytic sample in several ways e.g., in terms of drinking and smoking patterns. Finally it should be noted that the data is cross-sectional, and causation can therefore not be established.

Conclusion

Daily smoking is related to sickness absence, and the association between smoking and sickness absence is markedly stronger amongst employees in lower social strata than in higher. Measures associated with reduced smoking might give reduced sickness absence. These measures can be directed either at individuals, e.g. treatment and information, or at the population as a whole, e.g. restrictions on availability and affordability.

Declarations of Interest

The authors report no conflicts of interests.

Acknowledgments

This work was supported by the Norwegian Institute of Public Health and the Norwegian Directorate of Health.

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