Research report

Alcohol Consumption Levels and Health Care Utilization in Germany

Results from the GEDA 2014/2015-EHIS Study

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Abstract: *Aims:* Due to large inconsistencies in previous studies, it remains unclear how alcohol use is related to health care utilization. The aim of this study was to examine associations between alcohol drinking status with utilization of outpatient and inpatient health care services in Germany. *Methodology:* Survey data of the GEDA 2014/2015-EHIS study with *n* = 23,561 German adults were analyzed (response rate: 27 %). Respondents were categorized as lifetime abstainers, former drinkers, and non-weekly drinkers, as well as weekly low-risk drinkers and risky drinkers. Outpatient services included GP, specialist, and hospital visits; inpatient services included hospital overnight stays in the last 12 months. For both settings, binary logistic regression models were applied, adjusted for possible confounders. *Results:* For specialist visits, elevated odds were found among former drinkers (odds ratio (OR) = 1.93, 95 % confidence interval (95 % CI) = 1.50-2.49), non-weekly drinkers (OR = 1.24, 95 % CI = 1.05-1.47), weekly low-risk drinkers (OR = 1.39, 95 % CI = 1.17-1.67), and risky drinkers (OR = 1.28, 95 % CI = 1.04-1.57) compared to lifetime abstainers. In contrast, lower odds for inpatient service use were found among non-weekly drinkers (OR = 0.76, 95 % CI = 0.62-0.93), low-risk drinkers (OR = 0.66, 95 % CI = 0.53-0.81), and risky drinkers (OR = 0.65, 95 % CI = 0.51-0.84). No differences were observed for GP and outpatient hospital visits. *Conclusions:* While the increased odds of consulting a specialist are consistent with higher health care needs among former and current drinkers, the lower use of inpatient care among current drinkers is contrary to known health risks associated with alcohol consumption and evidence from hospitalized populations. The findings also highlight the need to differentiate between lifetime abstainers and former drinkers in their use of health services.

Keywords: alcohol consumption, health care services, outpatient service, hospital stay, epidemiology

Alkoholkonsum und die Inanspruchnahme von Gesundheitsleistungen in Deutschland: Ergebnisse der GEDA 2014/2015-EHIS Studie

Zusammenfassung: *Zielsetzung:* Aufgrund großer Inkonsistenzen in früheren Studien bleibt unklar, wie Alkoholkonsum mit der Inanspruchnahme von Gesundheitsleistungen zusammenhängt. Ziel dieser Studie war es, Zusammenhänge zwischen Alkoholkonsum und der Inanspruchnahme von ambulanten und stationären Gesundheitsleistungen in Deutschland zu untersuchen. *Methodik:* Umfragedaten der GEDA 2014/2015-EHIS Studie mit *n* = 23.561 Erwachsenen aus Deutschland (Antwortrate: 27 %) wurden ausgewertet. Die Befragten wurden in Lebenszeitabstinenzler, ehemalig Konsumierende, nicht-wöchentlich Konsumierende sowie in wöchentlich risikoarm und riskant Konsumierende eingeteilt. Zu den ambulanten Leistungen gehörten Hausarzt-, Facharzt- und Krankenhausbesuche; zu den stationären Leistungen gehörten Krankenhausübernachtungen in den letzten 12 Monaten. Für beide Settings wurden binäre logistische Regressionsmodelle berechnet, die um mögliche konfundierende Variablen adjustiert wurden. *Ergebnisse:* Für Facharztbesuche wurde eine erhöhte Wahrscheinlichkeit unter

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ehemalig Konsumierenden (odds ratio (OR) = 1.93, 95 % Konfidenzintervall (95 % KI) = 1.50-2.49), nicht-wöchentlich Konsumierenden (OR = 1.24, 95 % KI = 1.05-1.47), wöchentlich risikoarm Konsumierenden (OR = 1.39, 95 % KI = 1.17-1.67) und riskant Konsumierenden (OR = 1.28, 95 % KI = 1.04-1.57) im Vergleich zu Lebenszeitabstinenzlern festgestellt. Im Gegensatz dazu wurde eine geringere Wahrscheinlichkeit für die Inanspruchnahme stationärer Leistungen bei nicht-wöchentlich Konsumierenden (OR = 0.76, 95 % KI = 0.62-0-93), bei risikoarm Konsumierenden (OR = 0.66, 95 % KI = 0.53-0.81) und bei riskant Konsumierenden (OR = 0.65, 95 % KI = 0.51-0.84) festgestellt. Bei Hausarztbesuchen und ambulanten Krankenhausaufenthalten wurden keine Unterschiede beobachtet. *Schlussfolgerungen:* Während die erhöhte Wahrscheinlichkeit, einen Facharzt aufzusuchen, dem höheren Bedarf an medizinischer Versorgung bei ehemalig und gegenwärtig Konsumierenden entspricht, steht die geringere Inanspruchnahme von stationärer Versorgung bei gegenwärtig Konsumierenden im Widerspruch zu bekannten Alkohol-assoziierten Gesundheitsrisiken und Erkenntnissen aus hospitalisierten Bevölkerungsgruppen. Die Ergebnisse verdeutlichen außerdem die Notwendigkeit der Differenzierung von Lebenszeitabstinenzlern und ehemalig Konsumierenden bei der Inanspruchnahme von Gesundheitsleistungen.

Schlüsselwörter: Alkoholkonsum, Gesundheitsleistungen, ambulante Versorgung, Krankenhausaufenthalt, Epidemiologie

Introduction

Alcohol consumption is a major cause of global burden of disease, leading to high morbidity, mortality, and disability (Rehm, Gmel, Sempos & Trevisan, 2003). In general, the risk of alcohol-attributable morbidity and mortality increases with the amount of alcohol consumed (Rehm et al., 2017). In 2018, 18.1% of the adult population in Germany reported risky alcohol consumption, exceeding the recommended levels of 12 g of pure alcohol per day for women and 24 g per day for men (Atzendorf, Rauschert, Seitz, Lochbühler & Kraus, 2019).

The impact of alcohol use on health as well as medical treatment varies according to drinking status and drinking levels. The risk for alcohol-related disease and mortality and associated health service use is lowest among those who never drink alcohol (Griswold et al., 2018). In contrast, many former drinkers have quit drinking due to alcohol-related consequences or health impairment and thus utilize health care services more often than lifetime abstainers and current drinkers (Baumeister, Meyer et al., 2006; Kunz, 1997; Rice et al., 2000) – a phenomenon known as the 'sick quitter effect' (Shaper, Wannamethee & Walker, 1988). Heavy drinking and dependence are associated with high comorbidity and disability and thus increase the need for medical treatment. However, the need for treatment does not equate actual health care utilization (Kraus, Piontek, Pfeiffer-Gerschel & Rehm, 2015), as alcohol use disorders are severely stigmatized (Kilian et al., 2021), with known negative consequences for both offering and seeking care (Hanschmidt et al., 2017; Probst, Manthey, Martinez & Rehm, 2015).

The literature on the association of alcohol consumption levels with utilization of both outpatient and inpatient care shows some inconsistencies. For example, several studies showed positive associations between current alcohol use and health care utilization (Armstrong, Midanik & Klatsky, 1998; Artalejo et al., 2000; Kunz, 1997; Rice et al., 2000; Zarkin, Bray, Babor & Higgins-Biddle, 2004), while other findings indicated a negative association (Armstrong et al., 1998; Artalejo et al., 2000; Baumeister, Meyer et al., 2006; Rice & Duncan, 1995; Zarkin et al., 2004), or a U-shaped association (Anzai et al., 2005). However, the reported inconsistencies may be due to methodological differences, as different categories of alcohol use were selected, associations were adjusted for various sets of confounders, and different forms of health care utilization were considered.

In order to improve the understanding of health care service utilization among drinkers, we aimed to examine the association of alcohol drinking status and utilization of outpatient care and inpatient care in a nationwide sample of adults living in Germany, and to explain given associations by considering possibly confounding variables.

Methodology

This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (von Elm et al., 2007).

Design

For this study, data from a representative cross-sectional survey "Gesundheit in Deutschland aktuell" (GEDA 2014/2015EHIS) were obtained from the Robert Koch Institute (RKI, 2019). The GEDA 2014/2015 study is the German part of the European Health Interview Survey (EHIS) – a European population-based health-monitoring. The target population of the EHIS study were German-speaking persons aged 15 years and older with their main

residence in Germany. However, for the national analyses of the GEDA study, and thus for this study, only the population aged 18 years and older was considered and is included in the Public Use File.

The data collection took place between November 2014 and July 2015 in a mixed-mode design, with standardized online questionnaires or standardized paper-and-pencil questionnaires. All randomly selected residents received a letter inviting them to participate online via URL link and login code to access the questionnaire, as well as the consent form and detailed information about the study and data protection. They were also informed that they would receive a paper questionnaire if they did not participate online within four weeks. After four weeks, all residents who had not yet participated online or who had not explicitly refused to participate received another letter with the same information and, in addition, the questionnaire in paper form and a stamped return envelope. After further four weeks, another reminder letter was sent with online access to the questionnaire.

After completing the questionnaire, participants aged 15–34 received a 10 Euro voucher, while participants aged 35 years and older had the chance to win one of 400 vouchers worth 50 Euros each.

For further information about the survey, see Saß et al. (2017).

Sample

A population registry based sampling frame was applied by following a two-staged stratified cluster sampling approach (Lange, Finger et al., 2017). First, 301 municipalities of different sizes in Germany were randomly selected. Second, permanent residents were randomly selected of each municipality using local population registries. To achieve the required sample size of 20,000 participants, an average of 67 residents had to participate in each of the 301 municipalities.

Overall, data of 24,016 participants aged 18 and older (11,742 males and 12,273 females), corresponding to a response rate of 26.9 %, were available. We excluded $n = 455$ participants due to missing self-reports on frequency and quantity of alcohol consumption.

Alcohol Consumption

Daily alcohol consumption was assessed in two steps. With a first question, the frequency of alcohol consumption was recorded as the number of drinking days per week in the last 12 months. Second, the quantity of alcohol consumed on days during the week (Monday to Thursday) and on weekends (Friday to Sunday) was asked based on standard drinks (0.33 l beer; 0.125 l wine; 40 ml spirits). The first question also included response options for non-weekly drinking (people who drank only monthly), former drinking (people who drank in the past but not in the last 12 months), and lifetime abstinence (or people who rarely drank any alcohol in their life).

Based on these data, a five-level categorical variable was created from reported drinking status, which is in accordance with the German S3 Guideline for "Screening, diagnosis and treatment of alcohol-related disorders" (DGPPN & DG-Sucht, 2020) and used similarly in a previous report from the GEDA 2014/2015-EHIS study (Lange, Mankertz & Kuntz, 2017): lifetime abstainers, former drinkers, non-weekly drinkers, weekly low-risk drinkers (0–10 g of pure alcohol per day for females, 0–20g/day for males; less than one or two standard drinks in Germany, respectively), and weekly risky drinkers (>10g/day for females, >20g/day for males; more than one or two standard drinks).

Health Care Service Utilization

With four binary variables (with answer options: yes, no), participants were asked whether they used three different types of outpatient services and one type of inpatient service in the last 12 months. Outpatient service utilization included a visit to a general practitioner (GP) or family physician (hereafter: primary care visit), a specialist (e.g., cardiologist or dermatologist), and a hospital. Inpatient service utilization referred to an overnight hospital stay.

Potentially Confounding Variables

The following indicators closely related to alcohol consumption were considered as possible confounders: having a chronic disease (at least one out of: myocardial infarction [Gaziano et al., 1999], diabetes mellitus [Howard, Arnsten & Gourevitch, 2004], chronic liver disease [Blachier, Leleu, Peck-Radosavljevic, Valla & Roudot-Thoraval, 2013], hypertension [Briasoulis, Agarwal & Messerli, 2012], and coronary heart disease [Zhao, Stockwell, Roemer, Naimi & Chikritzhs, 2017]); having had a stroke (Reynolds et al., 2003); having experienced an injury (Cherpitel, 1993, 2007) due to a traffic accident, at home, or during leisure time; heavy episodic drinking (HED; [Kuntsche, Kuntsche, Thrul & Gmel, 2017]) – categorized according to the frequency of having six or more standard drinks on one occasion (grouped into: at least weekly, monthly, less than monthly, and never or not in

the last 12 months). All variables referred to the last 12 months. Life satisfaction (Koivumaa-Honkanen et al., 2012) was considered as an overall rating, ranging from 0 (not at all satisfied) to 10 (totally satisfied). The socioeconomic status (SES; [Collins, 2016]) reported by the participants was included with three categories (low and high, each comprising 20 % of the population; and medium, comprising 60 %). The SES index of each participant is a sum score (with a range of values from 3.0 to 21.0) composed of the indicators education and professional training, employment, and net equivalent income, each of which can take values from 1.0 to 7.0 (Lampert, Kroll, von der Lippe, Müters & Stolzenberg, 2013).

As further confounders we also considered sex (male, female), age groups (18–29, 30–39, 40–49, 50–59, 60–69, and +70), self-perceived health (ranging from 1 = 'very bad' to 10 = 'very good'), smoking status (daily smoking, occasional smoker, former smoking, and never smoked), and physical activity (number of days per week with at least 10 minutes of sport, fitness, or physical activity).

Statistical Analysis

All analyses were weighted to account for sampling bias and expected to give representative results for the German adult population (n = 66,046,907).

First, we described the sample of current drinkers by examining differences in covariates of interest between risky drinkers and non-risky current drinkers (i.e., non-weekly and low-risk drinkers) using χ^2 and t-tests (Bonferroni-adjusted for multiple testing [n = 11 tests]: $\alpha = 0.005$). We considered the latter group of drinkers to be a good "natural control group", as they face the lowest health risks from drinking while making up 70.3 % of the entire sample. Thus, the sample description contributed to identify possible confounders for the link of alcohol use and health care utilization.

Next, binary logistic regression models were performed separately for the utilization of each type of outpatient and inpatient care in order to examine the association between alcohol drinking status and health care utilization. Four unadjusted models for each type of health care utilization, which only included drinking status as covariate, were calculated. In a second step, the models were adjusted for the covariates of interest. In each model, lifetime abstainers served as the reference group. All models were compared with likelihood ratio tests to ensure that adjustment for covariates improved data fit (Vuong, 1989).

All statistical analyses were performed using R Version 4.1.0 (The R Foundation, 2013).

Results

Description of the Sample

The sample characteristics of n = 23,561 participants are summarized in Table 1. Overall, 86.3 % of the sample were current drinkers and of these, 18.5 % drank riskily (females: 44.2 %; males: 55.8 %). Compared with other current drinkers, risky drinkers had a higher proportion of 50- to 59-year-olds and of participants with high SES; they also had a higher proportion of participants who had suffered at least one injury and reported daily smoking and heavy episodic drinking at least once a month in the last 12 months (results from χ^2 tests, all $p < 0.001$). Furthermore, t-test results showed that risky drinkers reported lower average life satisfaction than non-risky current drinkers (7.38 vs. 7.54, $p < 0.001$). No differences were found in reporting chronic diseases, strokes, and self-perceived health; risky drinkers also did not differ from current non-risky drinkers in reporting days of physical activity (1.95 vs. 1.96 days/week).

The Association of Drinking Status with Health Care Utilization

Figure 1 shows the associations of drinking status with utilization of each health care service in both the unadjusted and adjusted logistic regression models, with lifetime abstainers as the reference category.

Primary Care Visit

In the unadjusted model, non-weekly drinkers did not differ in primary care visits compared with lifetime abstainers, whereas former drinkers had higher odds (odds ratio [OR] = 1.52, 95 % confidence intervals [95 % CI] = 1.12–2.08). In contrast, low-risk drinkers (OR = 0.82, 95 % CI = 0.68–0.97) and risky drinkers (OR = 0.75, 95 % CI = 0.61–0.91) had lower odds of visiting a primary care physician.

After adjusting for confounders, the odds for former drinkers, low-risk drinkers, and risky drinkers did not remain significant. The results of the likelihood ratio test confirmed an improved model fit due to the adjustment ($\chi^2[df = 23] = 1020.5, p < .001$).

Specialist Visit

Without adjustment, former drinkers had higher odds of vising a specialist (OR = 1.86, 95 % CI = 1.46–2.37), while groups of current drinkers did not differ from lifetime abstainers.

In the adjusted model, the odds for former drinkers further increased (OR = 1.93, 95 % CI = 1.50–2.49) as compared to lifetime abstainers. Furthermore, the odds for non-weekly drinkers (OR = 1.24, 95 % CI = 1.05–1.47), low-

Table 1. Participant characteristics by alcohol drinking status

Variable	Total sample % (95 % CI)	Lifetime abstainers	Former drinkers	Non-weekly drinkers	Low-risk drinkers	Risky drinkers
		9.1 % (7.5-10.7)	4.6 % (3.0-6.2)	38.9 % (37.7-40.2)	31.4 % (30.2-32.7)	16.0 % (14.6-17.4)
Sex						
Female	51.0 % (50.0-52.1)	69.2 % (66.2-72.2)	50.5 % (45.3-55.7)	61.8 % (60.3-63.3)	36.0 % (33.8-38.1)	44.2 % (41.5-46.9)
Male	49.0 % (47.8-50.1)	30.8 % (25.9-35.6)	49.5 % (44.1-54.9)	38.2 % (36.1-40.3)	64.0 % (62.3-65.7)	55.8 % (53.1-58.4)
Age						
18–29	17.2 % (15.7-18.7)	17.9 % (12.5-23.2)	12.1 % (4.4-19.8)	21.1 % (18.7-23.5)	13.4 % (10.6-16.1)	16.2 % (12.3-20.2)
30–39	14.8 % (13.3-16.4)	15.3 % (9.8-20.9)	13.7 % (6.4-21.0)	17.4 % (15.0-19.8)	13.6 % (10.8-16.3)	11.0 % (7.2-14.9)
40–49	17.9 % (16.5-19.2)	14.2 % (9.3-19.0)	11.0 % (4.4-17.6)	18.2 % (16.0- 20.3)	19.8 % (17.4-22.2)	17.6 % (14.3-20.8)
50–59	18.9 % (17.6-20.3)	13.6 % (9.0-18.2)	18.7 % (12.4-25.1)	16.9 % (14.7-19.1)	20.4 % (18.0-22.8)	24.2 % (20.9-27.4)
60–69	13.5 % (12.2-14.9)	12.1 % (7.5-16.8)	18.4 % (12.0-24.8)	11.0 % (8.8-13.2)	15.0 % (12.6-17.4)	16.1 % (12.9-19.4)
70+	17.6 % (16.1-19.1)	26.9 % (21.9-31.8)	26.0 % (19.4-32.7)	15.4 % (13.0-17.9)	17.9 % (15.3-20.4)	14.9 % (11.3-18.4)
SES[a]						
Low	19.9 % (18.4-21.5)	35.7 % (30.9-40.4)	32.4 % (26.0-38.8)	20.2 % (17.8-22.7)	14.9 % (12.1-17.7)	16.4 % (12.5-20.3)
Medium	60.0 % (58.9-61.0)	54.9 % (51.2-58.5)	55.0 % (49.9-60.1)	63.7 % (62.2-65.3)	58.9 % (57.1-60.8)	57.1 % (54.5-59.7)
High	20.1 % (19.0-21.3)	9.5 % (5.3-13.7)	12.6 % (7.0-18.2)	16.0 % (14.1-17.9)	26.2 % (24.2-28.1)	26.5 % (23.8-29.2)
Primary care visit[b]	80.5 % (79.8-81.2)	82.7 % (80.4-85.0)	85.1 % (82.2-88.1)	81.5 % (80.4-82.6)	79.2 % (77.9-80.4)	78.3 % (76.5-80.1)
Specialists visit[c]	65.1 % (64.2-66.1)	65.5 % (62.3-68.7)	75.3 % (71.5-79.1)	65.2 % (63.7-66.6)	64.3 % (62.6-65.9)	63.7 % (61.4-66.0)
Hospital visit[d]	10.6 % (9.1-12.2)	10.9 % (5.5-16.3)	13.1 % (6.2-20.1)	10.6 % (8.2-13.1)	9.6 % (6.9-12.3)	11.7 % (7.8-15.5)
Hospital night[e]	15.9 % (14.5-17.4)	23.7 % (18.8-28.7)	29.6 % (23.1-36.1)	15.4 % (13.1-17.8)	13.1 % (10.5-15.7)	14.4 % (10.7-18.1)
Chronic disease[f]	35.0 % (33.7-36.3)	40.4 % (36.1-44.6)	49.2 % (43.7-54.6)	32.4 % (30.3-34.5)	34.5 % (32.2-36.7)	35.5 % (32.4-38.6)
Stroke[g]	1.1 % (0.0-2.8)	3.2 % (0.0-9.2)	1.8 % (0.0-8.1)	1.0 % (0.0-3.5)	0.8 % (0.0-3.6)	0.7 % (0.0-5.1)
Injury[h]	10.1 % (12.8-15.9)	13.5 % (8.1-18.9)	13.5 % (6.3-20.8)	14.0 % (11.5-16.4)	14.1 % (11.5-16.8)	16.5 % (12.7-20.2)
HED [i]	33.3 % (32.0-34.6)	-	-	28.9 % (26.7-31.1)	38.4 % (36.2-40.7)	62.5 % (60.1-64.9)
Smoking[j]						
Never	45.5 % (44.3-46.6)	66.4 % (63.2-69.6)	29.4 % (23.2-35.6)	50.2 % (48.4-51.9)	44.1 % (42.0-46.1)	29.6 % (26.5-32.7)
Former	30.6 % (29.3-31.9)	17.1 % (12.1-22.1)	42.9 % (37.3-48.5)	26.6 % (24.4-28.7)	35.3 % (33.1-37.6)	35.0 % (32.0-38.1)
Occasional	5.4 % (3.9-6.9)	1.8 % (0.0-7.2)	2.3 % (0.0-9.5)	4.8 % (2.4-7.2)	6.7 % (4.0-9.4)	7.5 % (4.0-11.1)
Daily	18.5 % (17.0-20.0)	14.7 % (9.5-20.0)	25.4 % (18.6-32.3)	18.5 % (16.0-20.9)	13.9 % (11.2-16.6)	27.8 % (24.4-31.3)
Self-perceived Health[k]						
Very bad	0.7 % (0.0-2.4)	2.4 % (0.0-8.5)	3.4 % (0.0-11.0)	0.5 % (0.0-3.2)	0.3 % (0.0-3.0)	0.5 % (0.0-4.3)
Bad	4.8 % (3.2-6.4)	10.8 % (5.5-16.1)	15.1 % (7.9-22.4)	3.9 % (1.5-6.4)	2.9 % (0.0-5.9)	3.9 % (0.0-7.9)
Medium	25.8 % (24.5-27.2)	33.9 % (29.5-38.4)	36.0 % (30.0-42.1)	26.0 % (23.8-28.2)	22.6 % (20.1-25.1)	24.3 % (20.9-27.7)
Good	53.7 % (52.6-54.7)	39.7 % (35.4-44.0)	36.4 % (30.5-42.3)	54.7 % (53.0-56.4)	57.4 % (55.6-59.2)	56.9 % (54.4-59.4)
Very good	15.0 % (13.5-16.4)	13.1 % (7.7-18.6)	9.1 % (2.1-16.1)	14.9 % (12.5-17.2)	16.8 % (14.3-19.3)	14.4 % (10.9-17.9)
Mean (SE)						
Physical activity[l]	1.9 (0.01)	1.6 (0.05)	1.6 (0.07)	1.9 (0.02)	2.1 (0.02)	1.9 (0.03)
Life satisfaction[m]	7.4 (0.01)	7.1 (0.05)	6.8 (0.07)	7.4 (0.02)	7.7 (0.02)	7.4 (0.03)

Notes. HED: Heavy episodic drinking (at least monthly); SE: standard error; SES: socioeconomic status; 95 % CI = 95 % confidence interval. Missing data: [a] n = 53; [b] n = 105; [c] n = 155; [d] n = 585; [e] n = 115; [f] n = 881; [g] n = 1,324; [h] n = 332; [i] n = 139; [j] n = 36; [k] n = 101; [l] n = 272; [m] n = 94

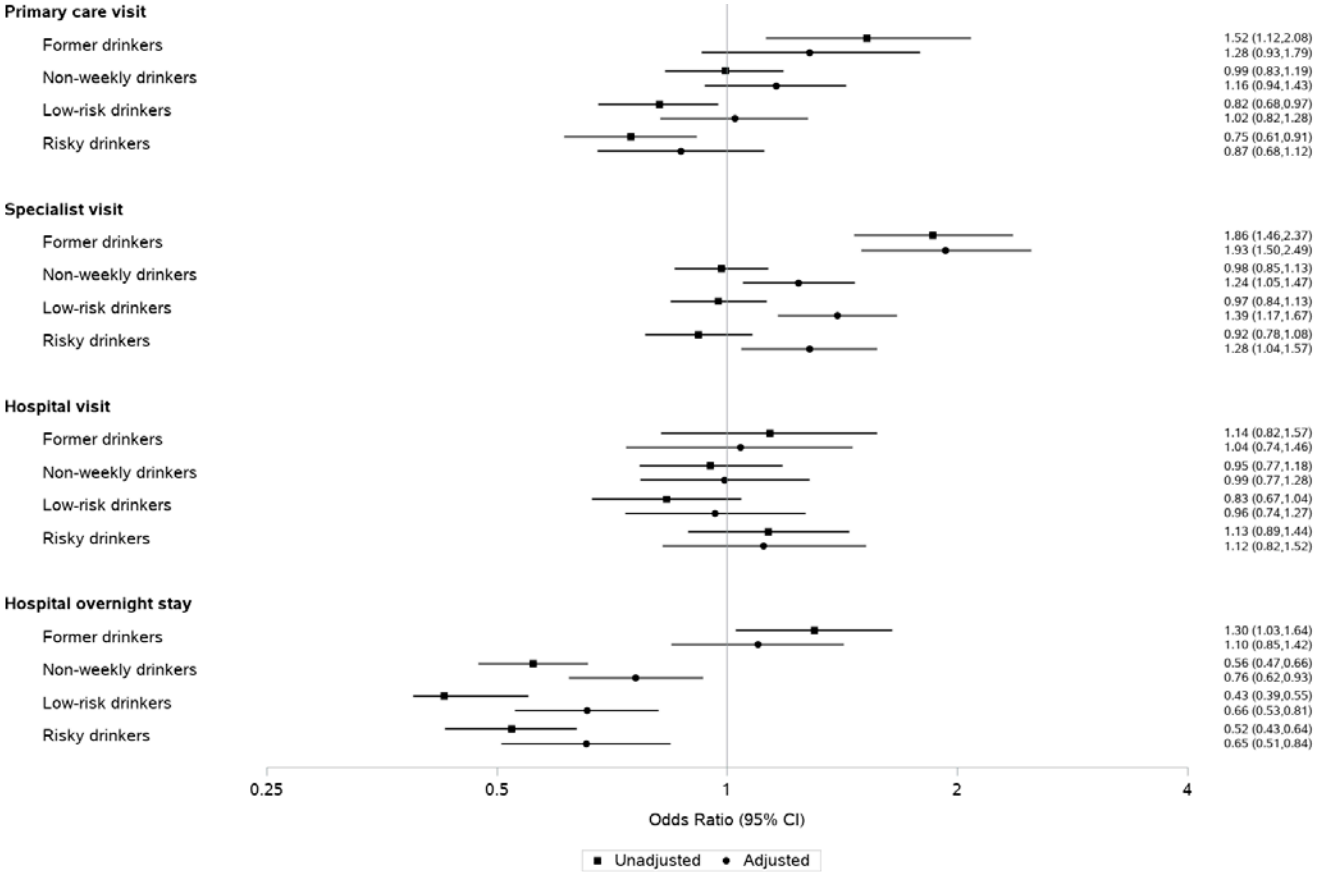

Figure 1. Associations of drinking status with utilization of health care services. Reference category: lifetime abstainers.

risk drinkers (OR = 1.39, 95% CI = 1.17–1.67), and risky drinkers (OR = 1.28, 95% CI = 1.04–1.57) were elevated after adjustment. As with primary care visits, adjusting improved the model fit ($\chi^2[df = 23] = 1027.2$, $p < .001$).

Hospital Visit

The odds of visiting a hospital did not significantly differ between any group of former or current drinkers when compared to lifetime abstainers in the unadjusted model.

Adjusting the model for selected confounders did not result in significant changes in odds but did improve the fit of the data ($\chi^2[df = 23] = 450.8$, $p < .001$).

Hospital Overnight Stay

In the unadjusted model, former drinkers had higher odds (OR = 1.30, 95% CI = 1.03–1.64) of staying overnight in a hospital compared to lifetime abstainers. All current drinkers had lower odds of a hospital overnight stay, and these were similar among non-weekly drinkers (OR = 0.56, 95% CI = 0.47–0.66), low-risk drinkers (OR = 0.43, 95% CI = 0.39–0.55), and risky drinkers (OR = 0.52, 95% CI = 0.43–0.64).

The adjustment attenuated the elevated odds for former drinkers and turned differences insignificant. The lower odds for non-weekly drinkers (from OR = 0.56 to OR = 0.76, 95% CI = 0.62–0.93), low-risk drinkers (from OR = 0.43 to OR = 0.66, 95% CI = 0.53–0.81), and risky drinkers (from OR = 0.52 to OR = 0.65, 95% CI = 0.51–0.84) were slightly attenuated but remained significant. Adjustment resulted in a better model fit ($\chi^2[df = 23] = 830.9$, $p < .001$).

In each adjusted model, most of the selected covariates were significantly associated with the outcome – except for sex (with primary care and specialist visits only), life satisfaction (with all services except for specialist visits), HED (with specialist visits only), and stroke (with hospital overnight stays only). For detailed results of each unadjusted and adjusted regression model, see electronic supplementary material [ESM] 1.

Discussion

This study aimed to examine the associations of alcohol drinking status with the utilization of outpatient and inpatient care in a representative general population sample of German adults and thus to provide a more up-to-date

overview, since the last studies to examine corresponding associations for Germany were published 15 years ago (Baumeister, Meyer et al., 2006; Baumeister, Schumann et al., 2006). In the models adjusted for select confounders, we found that, compared to lifetime abstainers, former drinkers, non-weekly drinkers as well as weekly low-risk and risky drinkers were more likely to visit a health care specialist. Odds for inpatient service use were lower in current drinkers compared to lifetime abstainers – irrespective of drinking levels. Compared to unadjusted models, confounders related to alcohol use and/or health care utilization were found to attenuate the link between health care utilization and drinking status for several outcomes and groups.

First, we would like to address the observed differences in health care utilization among groups of non-drinkers. In this context, it is necessary to consider the underlying motivation for abstinence. While the most important motive for older lifetime abstainers was that they disliked the taste or smell of alcohol, former drinkers reported 'loss of control' resulting from alcohol use as their main motive for quitting their consumption (Delle, Seitz, Atzendorf, Mühlig & Kraus, 2021). These findings support the sick quitter effect, which assumes cessation of consumption due to (alcohol-related) health problems. Thus, former drinkers should have a higher need for medical treatment due to their past use. In this sample, they were more likely to visit a specialist. However, lifetime abstainers and former drinkers did not differ in utilizing other select health care services. Therefore, further studies are needed to identify other possible reasons for the observed differences between groups of non-drinkers in their use of health care services.

While increased odds for specialist visits among former drinkers and groups of current drinkers are in line with elevated risks for a range of diseases and injuries associated with alcohol consumption, lower odds for hospital overnight stays among drinkers are not. In particular, these associations are in stark contrast to high drinking levels and high rates of alcohol use disorders found among hospitalized patients (e.g., [Kremer, 2001; Saitz, Freedner, Palfai, Horton & Samet, 2006]). We would like to provide two further, general explanations of these results. First and assuming survey data to correctly describe reality, utilization of health care services among risky drinkers may be avoided out of fear of being stigmatized by health care professionals (e.g., GPs [Hanschmidt et al., 2017]). Further, among individuals with alcohol use disorder, a lack of (alcohol) problem awareness could also be a driver for not seeking treatment (Probst et al., 2015), in addition to being less reliable in keeping primary care appointments (Ford, Trestman, Tennen & Allen, 2005). Second, the observed patterns could be due to data biases. It is well known that surveys do not capture the full extent of alcohol use in a country (Kilian et al., 2020), which is probably an interplay of limitations in self-report methods (Del Boca & Darkes, 2003) and lack of representativeness (Rehm, Kilian, Rovira, Shield & Manthey, 2020) in modern surveys. With heavy drinking individuals having higher levels of morbidity and thus have higher risks to be hospitalized for alcohol or other treatment (see e.g., [Manthey, Laramée, Parrott & Rehm, 2016; Rehm, Manthey, Struzzo, Gual & Wojnar, 2015]), they would be excluded from the sampling frame, which could introduce a major selection bias and explain low odds for hospitalizations for this group of drinkers. It is also important to note that homeless persons, among whom alcohol use disorders are highly prevalent (Schreiter et al., 2017), are not typically included in household-based samples (Shield & Rehm, 2012).

Compared with previous studies, the findings for specialist visits among current drinkers in this sample are mostly inconsistent, as mainly negative associations with different types of outpatient care were observed (Anzai et al., 2005; Armstrong et al., 1998; Artalejo et al., 2000; Kunz, 1997; Rice & Duncan, 1995; Rice et al., 2000; Zarkin et al., 2004). On the other hand, increased health care utilization among former drinkers was previously observed (Armstrong et al., 1998; Artalejo et al., 2000; Zarkin et al., 2004) and is in line with elevated mortality risks in this group (Stockwell et al., 2016). Similarly, the results for any hospital overnight stay confirm previous results, observing lower odds among current drinkers for the utilization of inpatient care compared to non-drinkers (Armstrong et al., 1998; Artalejo et al., 2000; Zarkin et al., 2004).

Previous studies on the link between alcohol use and health service utilization differ to ours in several aspects. First, different categories of drinking levels (e.g., pure alcohol in grams per day or per week, the number of standard drinks/drinking units per week), reference categories (e.g., lifetime abstainers, low-risk drinkers), and health care services were considered. In addition, studies derived samples from other countries, for example, the United States (Armstrong et al., 1998; Cherpitel & Ye, 2015; Li & Jensen, 2011; Polen, Green, Freeborn, Mullooly & Lynch, 2001; Rice & Duncan, 1995; Rice et al., 2000; Zarkin et al., 2004), Canada (Kunz, 1997), England (Cryer et al., 1999), Spain (Artalejo et al., 2000), and Japan (Anzai et al., 2005). Health care quality and access may differ from Germany due to different health care and insurance systems. Some samples were also drawn from subpopulations, such as members of health maintenance organizations (Armstrong et al., 1998; Polen et al., 2001; Zarkin et al., 2004) or individuals aged 60 and older (Li & Jensen, 2011; Rice & Duncan, 1995), or were restricted to males (Anzai et al., 2005). Last, 9 out of 13 studies analyzed samples from years before 2000, thus

potential changes in health care systems could have impacted health care utilization behavior in different population groups. In summary, these differences do not allow to compare our results with previous studies.

Limitations

There are some limitations in this study, which have to be considered. First of all, the response rate (27%) was relatively low, limiting the conclusions drawn. The data on alcohol consumption relies on self-reports, with known problems, such as selective answering, purposeful incorrect reports, and social desirability (Choi & Pak, 2005; Davis, Thake & Vilhena, 2010; Krumpal, 2013). Furthermore, the level of health literacy in the population is likely to be very high as the GEDA 2014/2015-EHIS survey was restricted to German speaking participants (Diederichs, Jordan, Domanska & Neuhauser, 2018), which in turn may have an impact on health and health care use (Berkman, Davis & McCormack, 2010).

With regard to health care utilization, the estimates could be biased for several reasons. First, as data were obtained through self-report, actual health care utilization may not have been accurately remembered or correctly reported. Thus, linking participant data to archival data would provide more accurate results than relying solely on self-reports. Second, health care use is not necessarily due to illness or health-related problems, but may also occur due to a need of, for example, health checks. Third, we did not have data on the respondents' health insurance status, but it has been demonstrated that insurance type (statutory vs. private) is impacting health care access and utilization (for a systematic review, see [Huber & Mielck, 2010]).

Our results are also limited because we did not consider possible referral pathways in our analyses. In Germany, as in other countries, visits to specialized health services, such as specialists and hospitals, often require referrals from primary health care providers, making utilization interdependent. As we analyzed the use of each service separately and therefore did not consider possible referrals, we cannot exclude that these have an influence on the associations.

Conclusions

This study sought to improve the understanding of the association between alcohol consumption and utilization of health care services in Germany. For the first time, three types of outpatient services and one type of inpatient care were analyzed.

Three main conclusions emerge from our findings. First, when analyzing the association between alcohol use and health care utilization, former drinkers should be separated from lifetime abstainers, as they report different health care utilization. Second, we showed that accounting for health determinants in the statistical analyses had a substantial impact on the associations between alcohol drinking status and health service utilization. Third, the risk of hospitalization seems to be reduced among current drinkers, which is in stark contrast to known health risks associated with alcohol consumption and evidence from hospitalized populations. However, given the limitations of this study, it is necessary to further elaborate on this association. Lower service use rates among risky drinkers may be a result of stigmatization, which should be addressed to promote optimal health care provision.

Electronic Supplementary Material

The electronic supplementary material (ESM) is available with the online version of the article at https://doi.org/10.1024/0939-5911/a000767

ESM 1. Results of regression models for the association between alcohol drinking status and health care utilization (Tables)

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