Aus dem Institut für Epidemiologie und Sozialmedizin

der Medizinischen Fakultät der Ernst-Moritz-Arndt-Universität Greifswald

Direktor: Prof. Dr. Ulrich John

Alcohol problem drinking among general hospital inpatients: Proportions and subtypes in a northeastern area of Germany

Inaugural - Dissertation

zur

Erlangung des akademischen Grades

Doktor der Naturwissenschaften in der Medizin

(Dr. rer. med.)

der

Medizinischen Fakultät

der

Ernst-Moritz-Arndt-Universität

Greifswald

2009

vorgelegt von: Beate Coder

geboren am: 31.05.1978

in: Zwickau

Dekan: Prof. Dr. Heyo K. Kroemer

1. Gutachter: Prof. Dr. Ulrich John (Greifswald)

2. Gutachter: Prof. Dr. Alfons Hamm (Greifswald)

3. Gutachter: Prof. Dr. Harald J. Freyberger (Greifswald)

4. Gutachter: Prof. Dr. Gerhard Bühringer (Dresden)

Ort, Raum: Greifswald,   Hörsaal   der   Klinik   und   Poliklinik   für
                   Hautkrankheiten, Fleischmannstr. 42-44

Tag der Disputation: 10. Juni 2009

Summary

Alcohol-related somatic disorders are highly prevalent among general hospital inpatients. Alcohol problem drinking can be differentiated into alcohol use disorders (alcohol dependence and alcohol abuse) and three subtypes of drinking above recommended levels (at-risk drinking only, heavy episodic drinking only, at-risk and heavy episodic drinking). Whereas alcohol use disorders are ascertained via different diagnostic criteria, drinking above recommended levels is defined solely by the frequency and quantity of alcohol consumption. According to the British Medical Association, at-risk drinkers are characterized by a daily average consumption of 30g or more of pure alcohol for men and 20g or more for women. Heavy episodic drinkers are individuals with irregular excessive alcohol consumption. The aims of this study were threefold. First, proportions of alcohol problem drinking among general hospital inpatients in a region of north-eastern Germany were estimated (study 1). Second, among individuals with alcohol problem drinking the association between beverage preference and alcohol-related diseases was tested (study 2). Third, subtype differences regarding demographics, alcohol-related variables, motivation to change drinking behaviors, and the risk to develop short-term alcohol dependence between individuals with at-risk drinking only (AR), heavy episodic drinking only (HE) and at-risk and heavy episodic drinking (ARHE) were analyzed (study 3).

The data presented in this dissertation are based on the randomized controlled trial "Early Intervention at General Hospitals", which is part of the Research Collaboration Early Substance Use Intervention (EARLINT). Study 1 includes a sample of consecutively admitted general hospital inpatients between 18 and 64 years old (n = 14,332). The study adopted a two-stage-sampling approach: (a) screening and (b) ascertainment of alcohol problem drinking. Those who were identified with alcohol problem drinking were asked for written consent for further study participation. This included further baseline assessment, the consent to use routine treatment diagnoses and participation in a follow-up interview 12 months after hospitalization. For study 2, routine treatment diagnoses were provided by hospital physicians for a total of 1,011 men with problem drinking. These diagnoses were classified into three categories according to their alcohol-attributable fractions (AAF): diseases totally attributable to alcohol by definition (AAF=1), diseases partially attributable to alcohol (AAF<1) and diseases with no empirical relationship to alcohol or with a possibly protective effect associated with alcohol (AAF=0). Study 3 was restricted to study participants with drinking above recommended levels (n=425).

Study 1: Among all general hospital inpatients, 8.9% were identified with current problem drinking in the following descending order: 5.3% exhibited alcohol use disorders and 3.6% drinking above recommended levels. Higher proportions of problem drinking were found at rural sites compared to urban sites (13.7 vs. 7.5%, p<.001). Study 2: Because of the low proportion of women with alcohol problem drinking the following analyses were restricted to males. Multinomial regression analyses revealed different risks for alcohol-related diseases in relation to beverage preference while controlling for alcohol-associated and demographic confounders. Compared to all other groups, spirits only drinkers had the highest risk for having a disease with AAF>0; e.g., beer only drinkers had lower odds of having a disease with AAF<1 (odds ratio, OR=0.50, 95% confidence interval, CI: 0.27-0.92). Study 3: Men with alcohol use disorder were excluded from the following analysis. At baseline, multinomial logistic regression revealed differences between individuals with AR, HE and ARHE while controlling for age. ARHE was associated with higher odds of having a more severe alcohol problem (OR=2.06, CI: 1.23-3.45), using formal help (OR=2.21, CI: 1.02-4.79), and having a disease with AAF=1 (OR=3.43, CI: 1.58-7.43), compared with AR. In addition, individuals with ARHE had higher odds of taking action to change drinking behaviors (i.e., beginning to implement change) than individuals with HE (OR=2.29, CI: 1.21-4.34) or AR (OR=2.11, CI: 1.15-3.86). At follow-up, individuals with ARHE had higher odds of having alcohol dependence according to the DSM-IV (OR=4.73, CI: 1.01–22.20) compared to individuals with AR.

In addition to alcohol use disorders, drinking above recommended levels is a common problem among general hospital inpatients. Thus, the implementation of systematic alcohol screening and brief interventions should be considered. These data suggest an association between beverage preference and alcohol-related diseases. Among hospitalized problem drinkers, spirits only drinkers had the greatest risk of having diseases with AAF>0. Of the three subtypes of drinking above recommended levels, ARHE seems to be particularly problematic because there appears to be an indication of a subclinical diagnosis. To provide adequate intervention, clinical practice should distinguish between the three groups of drinking above recommended levels. Brief alcohol intervention should be tailored to the individual's motivation to change and to the type of alcohol problem drinking. The effectiveness of such a procedure remains to be evaluated in further studies.

Zusammenfassung

Alkoholbezogene Erkrankungen treten unter Allgemeinkrankenhauspatienten häufig auf. Problematischer Alkoholkonsum kann in alkoholbezogene Störungen (Alkoholabhängigkeit und –missbrauch) und drei Subgruppen riskanten Alkoholkonsums (ausschließlicher Risikokonsum, ausschließlicher Rauschkonsum, Risiko- und Rauschkonsum) unterschieden werden. Während alkoholbezogene Störungen durch unterschiedliche diagnostische Kriterien definiert sind, wird riskanter Alkoholkonsum ausschließlich über die Trinkhäufigkeit und -menge festgelegt. Nach der British Medical Association besteht Risikokonsum, wenn Männer täglich mehr als 30g und Frauen mehr als 20g Reinalkohol trinken. Rauschkonsum ist ein unregelmäßiger, exzessiver Alkoholkonsum. Die vorliegende Arbeit hatte drei Ziele. Erstens wurde der Anteil von Allgemeinkrankenhauspatienten mit problematischem Alkoholkonsum innerhalb einer Region Nordostdeutschlands bestimmt (Studie 1). Zweitens wurde der Zusammenhang zwischen der Präferenz für bestimmte alkoholisches Getränke und alkohol-attributablen Erkrankungen getestet (Studie 2). Drittens wurden Subgruppenunterschiede analysiert hinsichtlich Demographie, alkoholbezogener Variablen, Veränderungsmotivation des Trinkverhaltens und des Risikos innerhalb der nächsten 12 Monate eine Alkoholabhängigkeit zu entwickeln zwischen Personen mit ausschließlichem Risikokonsum (AR), ausschließlichem Rauschkonsum (HE) und sowohl Risiko- als auch Rauschkonsum (ARHE; Studie 3).

Die Daten der vorliegenden Arbeit basieren auf der Kontrollgruppenstudie „Kurzintervention im Allgemeinkrankenhaus", welche innerhalb des Forschungsverbundes Research Collaboration Early Substance Use Intervention (EARLINT) durchgeführt wurde. Studie 1 umfasste eine Stichprobe konsekutiv aufgenommener Allgemeinkrankenhauspatienten zwischen 18 und 64 Jahren (n=14332). Das Rekrutierungsverfahren war zweistufig: (a) Screening und (b) Bestimmung problematischen Alkoholkonsums. Personen mit problematischem Alkoholkonsum wurden um ihr schriftliches Einverständnis zur weiteren Studienteilnahme gebeten, welche eine weiterführende Erstbefragung, die Verwendung der Behandlungsdiagnosen und die Teilnahme an einer Nachbefragung nach 12 Monaten beinhaltete. In Studie 2 wurden für 1011 Männer mit problematischem Alkoholkonsum die Behandlungsdiagnosen durch die Krankenhausärzte bereitgestellt. Diese Diagnosen wurden anhand ihrer alkohol-attributablen Fraktionen (AAF) klassifiziert: vollständig alkohol-attributable Erkrankungen (AAF=1), teilweise alkohol-attributable Erkrankungen (AAF<1) und Erkrankungen ohne Bezug zu Alkohol (AAF = 0). Studie 3 beschränkte sich auf Studienteilnehmer mit riskantem Alkoholkonsum (n=425).

Studie 1: Unter allen Allgemeinkrankenhauspatienten wiesen 8,9% problematischen Alkoholkonsum auf: 5,3% hatten alkoholbezogene Störungen und 3,6% riskanten Alkoholkonsum. Höhere Anteile von Personen mit problematischem Alkoholkonsum wurden in ländlichen Krankenhäusern im Vergleich zu städtischen Krankenhäusern gefunden (13,7 vs. 7,5%; p<,001). Studie 2: Aufgrund der geringen Anzahl von Frauen mit problematischem Alkoholkonsum wurden die folgenden Analysen auf Männer beschränkt. Multinomiale Regressionen unter Kontrolle alkoholassoziierter und demographischer Variablen zeigten Unterschiede für das Risiko einer alkohol-attributablen Erkrankung hinsichtlich der Präferenz bestimmter alkoholischer Getränke. Personen, die ausschließlich Spirituosen konsumierten, hatten im Vergleich mit allen anderen Präferenzgruppen das höchste Risiko für Erkrankungen mit AAF>0; z.B. hatten Personen, die ausschließlich Bier tranken ein geringeres Risiko für eine Erkrankung mit AAF<1 (Odds ratio, OR=0,50; 95% Konfidenzintervall, KI: 0,27-0,92). Studie 3: Männer mit einer alkoholbezogenen Störung wurden von den folgenden Analysen ausgeschlossen. Zum Zeitpunkt der Erstbefragung ergaben sich in multinomialen Regressionen unter Kontrolle des Alters Unterschiede zwischen Personen mit AR, HE und ARHE. Im Vergleich zu Personen mit AR zeigten Personen mit ARHE ein höheres Risiko für ein schwerwiegenderes Alkoholproblem (OR=2,06; KI: 1,23-3,45), häufigere Inanspruchnahme alkoholbezogener Hilfen (OR=2,21; KI: 1,02-4,79) und eine Erkrankung mit AAF=1 (OR=3,43; KI: 1,58-7,43). Außerdem hatten Personen mit ARHE im Vergleich zu denjenigen mit HE oder AR eine höhere Chance ihr Trinkverhalten bereits zu verändern (OR=2,29; KI: 1,21-4,34 bzw. OR=2,11; KI: 1,15-3,86). Zur Nachbefragung hatten Personen mit ARHE im Vergleich zu denen mit AR ein höheres Risiko alkoholabhängig nach DSM-IV zu sein (OR=4,73; KI: 1,01–22,20).

Im Allgemeinkrankenhaus sollten zusätzlich zu den Patienten mit alkoholbezogenen Störungen diejenigen mit riskantem Alkoholkonsum stärkere Beachtung finden. Die Implementierung von systematischem Alkoholscreening und Alkoholkurzinterventionen sollte in Betracht gezogen werden. Es zeigte sich ein Zusammenhang zwischen der Präferenz für bestimmte alkoholische Getränke und alkohol-attributablen Erkrankungen. Unter Allgemeinkrankenhauspatienten mit problematischem Alkoholkonsum hatten Personen, die ausschließlich Spirituosen tranken, das höchste Risiko für eine Erkrankung mit AAF>0. Unter Personen mit riskantem Alkoholkonsum hatten diejenigen mit ARHE ein besonders problematisches Trinkverhalten, welches eine subklinische Diagnose vermuten lässt. Um eine adäquate Intervention bereitstellen zu können, sollte zukünftig die klinische Praxis zwischen AR, HE und ARHE unterscheiden. Alkoholkurzinterventionen sollten nach dem persönlichen

Veränderungsmotivationsstadium und der Art problematischen Alkoholkonsums individualisiert werden. Die Effektivität solcher Maßnahmen muss allerdings weiter geklärt werden.

1 Introduction

1.1 Alcohol problem drinking: Definitions

Two types of *alcohol problem drinking* can be distinguished: alcohol use disorders and drinking above recommended levels. The first type, alcohol use disorders, comprises alcohol dependence and alcohol abuse. They are characterized by different sets of criteria according to diagnostic manuals, for example the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, American Psychiatric Association, 1995). To confirm a diagnosis of *alcohol dependence*, individuals have to fulfill three or more of the following seven criteria, occurring at any time in the same 12-month period: (1) alcohol tolerance, (2) alcohol withdrawal symptoms, (3) alcohol use more or longer than intended, (4) unsuccessful attempt or the desire to cut down alcohol use, (5) excessive time related to alcohol (e.g., obtaining, hangover), (6) impaired social or work activities due to alcohol use, or (7) alcohol use despite physical or psychological consequences. The diagnosis *alcohol abuse* is assigned if the criteria for alcohol dependence are never met and one or more of the following four criteria occur within a 12-month period: (1) recurrent role impairment (e.g., at work or home), (2) recurrent hazardous use (e.g., driving while intoxicated), (3) recurrent alcohol-related legal problems, or (4) persistent or recurrent social or interpersonal problems due to alcohol use.

The second type of alcohol problem drinking, drinking above recommended levels, is identified solely by the quantity and frequency of alcohol consumption and comprises three subtypes: at-risk drinking only, heavy episodic drinking only, and the combination of at-risk and heavy episodic drinking. *At-risk drinkers* exceed certain thresholds of daily average alcohol consumption that imply a higher risk for alcohol-related consequences. In general, these thresholds only apply for healthy adults as long as no other reasons, such as medication, pregnancy, or alcohol dependence in remission, indicate alcohol abstinence.

Over the last decades these thresholds have been continuously reduced (Bühringer et al., 2000). For example, according to the World Health Organization (Anderson, 1990), at-risk drinkers are described as men who drink 40g or more of pure alcohol and women who drink 20g or more of pure alcohol on average per day. However, according to the British Medical Association (1995), at-risk drinkers are characterized by a daily average consumption of 30g or more of pure alcohol for men and 20g or more for women. Recent research results indicate that men who drink 20-24g or more and women who drink 10-12g or more of pure alcohol on average per day should be considered at-risk drinkers (Burger, Bronstrup & Pietrzik, 2004). This recent threshold is also recommended by the German Centre for

Addiction (Seitz, Bühringer & Mann, 2008). However, results of the following analyses are based on the definition of at-risk drinking according to the British Medical Association, as the more recent recommendation just discussed did not exist at the time the following study was implemented.

Heavy episodic drinkers are individuals with irregular excessive alcohol consumption. Definitions vary widely in their thresholds of heavy episodic drinking (see Gill, 2002; Gmel, Rehm & Kuntsche, 2003). Until now, no clear-cut threshold could be affirmed that predicts various alcohol-related consequences (Jackson, 2008). For example, a widely used definition in the USA indicates heavy episodic drinking if men drink five or more and women four or more standard drinks in a row at least once in a two-week period (Wechsler & Nelson, 2001). The 4+/ 5+ definition is largely criticized due to its lack of clinical relevance (Dejong, 2003) and nonspecific intoxication level (Gmel et al., 2003; Perkins, Linkenbach & Dejong, 2001). As the size of standard drinks varies across countries (Turner, 1990), the usage of this definition is problematic as it implies different pure alcohol quantities across countries. Instead, definitions that are based on specific quantities of gram pure alcohol can provide comparable study results. For example, according to the recommendation of the World Health Organization (Babor & Grant, 1992), men who consume 100g or more of pure alcohol and women who consume 60g or more of pure alcohol on one occasion at least twice a month are considered to be heavy episodic drinkers.

1.2 Alcohol-related morbidity and mortality

Alcohol problem drinking causes major health problems that lead to an increased risk for mortality (Bühringer et al., 2000). As described above, even low thresholds of daily average consumption imply an increased risk for various diseases. More than 200 diseases and 80 accidents and injuries are related to alcohol consumption (Table 1). This relationship can be depicted in alcohol-attributable fractions (AAF). AAFs have been defined as the proportion by which disease cases, injury events, or deaths would be reduced if alcohol use and misuse were eliminated among the population (Shultz et al., 1991). Diseases 100% attributable to alcohol by definition are assigned an alcohol-attributable fraction of 1 (AAF=1). Diseases partially attributable to alcohol are assigned an alcohol-attributable fraction of less than 1 (AAF<1).

In Germany 42,000 deaths per year can be related to alcohol (Bühringer et al., 2000). In Germany, the highest proportion of alcohol-related mortality was found among those between 35 and 64 years old (21.0%) (John & Hanke, 2002). In addition, most often other

individuals are affected by the consequences of problem drinking, such as premature birth, miscarriage, traffic and workplace accidents, sex offenses and other crimes (Anderson & Baumberg, 2006).

Table 1 Examples of alcohol-related diseases and injuries

	AAF = 1	AAF < 1
Malignant neoplasms	-	Laryngeal, mouth and oropharynx, esophageal, liver cancers
Neuro-psychiatric conditions	Alcohol dependence, alcohol abuse	Depression, epilepsy
Cardiovascular diseases	Alcoholic cardiomyopathy	Esophageal varices, cardiac arrhythmias, hypertensive disease
Digestive diseases	Alcoholic gastritis, chronic pancreatitis (alcohol-induced)	Cirrhosis of the liver, acute and chronic pancreatitis
Skin diseases	-	Psoriasis
Conditions arising during the perinatal period	Fetal alcohol syndrome	Low birth weight
Injuries	Accidental and intentional (self-) poisoning and exposure to alcohol	Motor vehicle accidents, poisonings, falls, fires, drowning, self-inflicted injuries, homicide

Notes: According to Rehm, Patra and Popova (2006).

To quantify morbidity and mortality, the disability adjusted life years (DALY) measure is used. This measure combines years of life lost due to premature death with years of life lived in disability into a summary measure. In 2002, alcohol consumption in Europe has caused more than 10 million years of life lost (Rehm, Taylor & Patra, 2006). Years of life lived in disability were estimated to be about 6 million years of life lost. In 2002, 10.7% of all DALYs in Europe were due to alcohol consumption. Of all DALYs due to health risk behaviors, only the proportion of DALYs due to tobacco smoking was higher.

1.3 Proportions of individuals with alcohol problem drinking

General hospital inpatient treatment may serve as one proxy to alcohol-attributable morbidity. Reported proportions of general hospital inpatients with current (past 12 months) alcohol use disorders were 7.4% in the USA (Smothers, Yahr & Sinclair, 2003), 16.0% in France

(Reynaud, Malet, Facy & Glanddier, 2000), and 16.5% in Taiwan (Chen, Chen & Cheng, 2004). In one German hospital, 18.3% of the internal medicine and surgical inpatients had alcohol use disorders during the past 12 months (John, Rumpf & Hapke, 1999).

Individuals who drink above recommended levels have a higher risk for somatic problems (for an overview see Rehm, Room, Graham & Frick, 2003). In particular, heavy episodic drinkers experience a higher rate of injuries and accidents (e.g., Gmel et al., 2003). Individuals who drink above recommended levels also have a higher risk of being admitted to general hospitals than individuals who drink at the recommended level (Bischof, Rumpf, Meyer, Hapke & John, 2004; Poikolainen, Paljarvi & Makela, 2007). Hence, in addition to individuals with alcohol use disorders, individuals who drink above recommended levels are expected to constitute a substantial portion of general hospital inpatients. However, little is known about proportions of inpatients who drink above recommended levels.

We lack sufficient information on proportions of problem drinking of inpatients for an entire region to analyze regional differences (e.g., to compare urban and rural areas), as only two studies so far have included more than one general hospital (Reynaud et al., 2000; Smothers et al., 2003). Moreover, only a few studies have used standardized diagnostic interviews based on DSM-IV (American Psychiatric Association, 1995) or International Classification of Diseases, 10th version, ICD-10 (World Health Organization, 1992) criteria for alcohol use disorders (Arolt & Driessen, 1996; Chen et al., 2004; John et al., 1999; Smothers et al., 2003; Wu, Liu, Fang, Hsu & Sun, 2006). Proportions have been reported for one general hospital only (e.g. John et al., 1999) or for one specific ward such as the emergency room (e.g. Vitale, Van De Mheen, Van De Wiel & Garretsen, 2006), or for AUDs only (e.g. Wu et al., 2006). Previous studies reporting proportions of problem drinking among general hospital inpatients focused on small study samples or were conducted over a short period of time (except John et al., 1999). Hence, these designs might have resulted in biased data due to seasonal effects (John et al., 1999).

1.4 Reported beverage consumed and alcohol-related diseases

Alcohol-related somatic disorders are highly prevalent among general hospital inpatients (Gerke, Hapke, Rumpf & John, 1997): 52.5% of all internal medicine and surgical inpatients in a German municipal general hospital had diseases that were definitely or possibly alcohol-related. This is not unexpected as a variety of serious diseases are at least to some extent attributable to alcohol (e.g., alcohol dependence and liver cirrhosis) and require inpatient treatment (Rehm, Room, Graham, Monteiro et al., 2003; Rehm, Patra et al., 2006). Most

often, a dose-response relationship between the drinking volume and the risk of alcohol-related diseases has been found (for reviews and meta-analyses, see Anderson, Cremona, Paton, Turner & Wallace, 1993; Corrao, Bagnardi, Zambon & Arico, 1999; Corrao, Bagnardi, Zambon & La Vecchia, 2004), indicating a risk for regular drinkers, such as individuals with alcohol use disorders or at-risk drinking. Heavy episodic drinking is predictive for coronary heart disease and injuries (Rehm, Room, Graham, Monteiro et al., 2003). Little evidence exists about the relationship of beverage preference (i.e., *which kind of* alcoholic beverage somebody drinks) and alcohol-related diseases. In order to detect beverage-specific risks, it is necessary to analyze individuals with different beverage consumption patterns within "… a homogenous setting and homogenous drinking patterns" (Gronbaek et al., 2000, p. 417). One way to investigate beverage differences is to use a sample of general hospital inpatients with alcohol problem drinking, assuming that these individuals consume different beverages.

Previous research on beverage type-related diseases has focused on *protective effects of wine* in populations of non-problem drinkers. For example, wine drinkers showed a lower risk of mortality due to coronary heart disease compared to those who consumed other beverages (Wannamethee & Shaper, 1999). Spirits are suspected to be more harmful than beer or wine due to their toxic effects (Anderson et al., 1993). Only a few studies have investigated the *beverage-specific risk* of alcohol-related diseases. Compared with beer or wine drinkers, spirits drinkers have a higher risk of developing esophageal cancer (Castellsague et al., 1999) and for coronary artery disease mortality (Klatsky & Armstrong, 1993). Findings of ecological studies on beverage-specific effects on mortality are inconclusive. Two studies found that (a) increased sale of spirits nationwide was followed by an increase in liver disease mortality (Stokkeland, Brandt, Ekbom, Osby & Hultcrantz, 2006) and (b) the consumption of spirits explained cirrhosis mortality nearly as well as average alcohol consumption (Kerr, Fillmore & Marvy, 2000). However, in a European study, increased beer sales were related to all-cause mortality (Her & Rehm, 1998). Although more findings indicate a more harmful effect of spirits compared to other beverages, the relationship of spirits to alcohol-related diseases remains unclear.

1.5 Three subtypes of drinking above recommended levels

Among individuals who drink above recommended levels, heavy episodic drinkers appear to have a higher risk for mortality and morbidity, even when the effects of total alcohol intake are controlled for (Jarvenpaa, Rinne, Koskenvuo, Raiha & Kaprio, 2005; Kauhanen, Kaplan, Goldberg & Salonen, 1997). In a Finnish prospective population-based study, Kauhanen et al.

(1997) found a fourfold greater risk of all-cause mortality and a fivefold greater risk of death due to external causes for men with heavy episodic drinking as opposed to men without heavy episodic drinking. In another Finnish prospective population-based cohort study, heavy episodic drinkers had an approximately sixfold greater risk of dementia twenty-five years after baseline compared with non-heavy episodic drinkers (Jarvenpaa et al., 2005). Moreover, in a Canadian general population study, heavy episodic drinkers had a higher risk of reporting two or more alcohol-related problems (e.g., regarding partnership, friendships, work situation) or of being assaulted by another drinker while controlling for total alcohol intake (Room, Bondy & Ferris, 1995). Finally, in a Spanish representative population-based study, all individuals who drank above recommended levels revealed higher odds of risky health behaviors, namely inadequate seat-belt use and alcohol-impaired driving compared with non-drinkers (Valencia-Martin, Galan & Rodriguez-Artalejo, 2008). However, in contrast to groups with solely at-risk or heavy episodic drinking, at-risk drinkers with heavy episodic drinking had the highest risk. This was also the only group that had a higher risk for traffic crashes compared with non-drinkers. Thus, among individuals with drinking above recommended levels, the following three drinking groups should be distinguished: (1) at-risk drinking only (AR), (2) heavy episodic drinking only (HE), and (3) a combined pattern of individuals who engage in both at-risk and heavy episodic drinking (ARHE).

So far, these groups have not been well-characterized regarding demographic and alcohol-related variables. For example, although evidence from the general population suggests that heavy episodic drinkers have limited social resources (e.g., less education and higher rates of unemployment) compared with individuals without heavy episodic drinking (see Kuntsche, Rehm & Gmel, 2004), differences regarding demographics among individuals who drink above recommended levels have not been reported.

To be efficacious, health behavior interventions should be tailored to the individuals' needs and characteristics (Noar, Benac & Harris, 2007). For example, among primary care patients, brief alcohol interventions were differently effective depending on the motivation to change drinking habits (Maisto et al., 2001). Previous studies on the association between alcohol drinking and motivation to change drinking habits have focused on (a) individuals with major alcohol problems, namely alcohol dependence (e.g., Demmel, Beck, Richter & Reker, 2004; Rumpf, Hapke & John, 1998), or (b) special subgroups, i.e., students (e.g., Barnett, Goldstein, Murphy, Colby & Monti, 2006; Shealy, Murphy, Borsari & Correia, 2007). In these studies, results about the association between motivation and alcohol drinking were mixed (e.g., Barnett et al., 2006; Williams et al., 2006).

Among the three groups of individuals drinking above recommended levels, ARHE seems to be the most problematic pattern as it is associated with a higher risk of health-related problems than individuals with AR or HE. However, the risk of the development of alcohol dependence for the three groups of drinking above recommended levels is largely unknown. One prospective study demonstrated that (a) non-dependent individuals with an average alcohol consumption of 38g or more of pure alcohol per day and (b) those who were daily drinkers had an increased risk to develop alcohol dependence during the next 25 years compared to individuals who drank less or less frequently (Flensborg-Madsen, Knop, Mortensen, Becker & Gronbaek, 2007). Heavy episodic drinking was not considered in this study. Most other studies on the relationship of alcohol consumption and alcohol dependence have used a cross-sectional design (e.g., Caetano, Tam, Greenfield, Cherpitel & Midanik, 1997; Dawson & Archer, 1993; Dawson, Grant & Li, 2005; Midanik, Tam, Greenfield & Caetano, 1996). These studies found a positive relationship of average alcohol consumption or heavy episodic drinking and alcohol dependence. For example, in a US general population study, individuals with heavy episodic drinking in the past 12 months had higher odds of having alcohol dependence during the same period while controlling for average alcohol consumption (Caetano et al., 1997). As drinking more or longer than intended is one criterion of alcohol dependence (see section 1.1), these results were to be expected. However, cross-sectional studies give no information on the role of alcohol consumption or of drinking above recommended levels for the future development of alcohol dependence.

1.6   Aims

From the background presented above three aims of this dissertation emerged. For each aim one study was conducted. These three studies included several research questions.

Aim 1: To provide data on proportions of individuals with alcohol problem drinking among general hospital inpatients. In detail, research questions of *study 1* were: (a) What is the proportion of alcohol problem drinking among 18- to 64-year-old general hospital inpatients in a defined region in northeastern Germany? (b) Do individuals who drink above recommended levels constitute a substantial portion of individuals with alcohol problem drinking in general hospitals? (c) Are there any differences in the proportions of alcohol problem drinking between general hospitals in rural and urban areas?

These questions were answered in the following scientific paper:

Coder, B., Freyer-Adam, J., Bischof, G., Pockrandt, C., Hartmann, B., Rumpf, H. J., John, U. & Hapke, U. (2008). Alcohol problem drinking among general hospital inpatients in northeastern Germany. *Gen Hosp Psychiatry, 30*(2), 147-154.

Aim 2: To analyze the relationship of beverage preference and having any alcohol-related disease among general hospital inpatients with problem drinking. The main research question of *study 2* was: Among inpatients with problem drinking, are those who drink spirits at a greater risk of suffering from any alcohol-related disease in comparison to those who prefer other beverages?

This question was answered in the following scientific paper:

Coder, B., Freyer-Adam, J., Lau, K., Riedel, J., Rumpf, H. J., Meyer, C., John, U. & Hapke, U. (2009). Reported beverage consumption and alcohol-related diseases among male hospital inpatients with problem drinking. *Alcohol Alcohol, 44*(2), 216-221.

Aim 3: To analyze three subtypes of drinking above recommended levels and in order to determine whether individuals with ARHE have a more problematic drinking pattern than individuals with AR or HE. In detail, research questions of *study 3* were: (a) Do individuals with ARHE have a more problematic drinking pattern regarding demographic and alcohol related variables compared to inpatients with AR or HE, e.g. do they have fewer social resources and do they more often have diseases with AAF=1? (b) Do individuals with ARHE have a higher motivation to change their drinking patterns than those with AR or HE? (c) Are individuals with ARHE at a higher risk of developing alcohol dependence 12 months after hospitalization compared to inpatients with AR or HE?

These questions were answered in the following scientific papers:

Coder, B., Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H. J., John, U. & Hapke, U. (2008). Male at-risk drinkers with heavy episodic drinking: a subclinical diagnosis? *J Stud Alcohol Drugs, 69*(1), 85-90.

Coder, B., Freyer-Adam, J., Rumpf, H. J., John, U. & Hapke, U. (submitted). Risky drinking, motivation to change, and the development of alcohol dependence.

2 Methods

Data presented in this dissertation are based on the randomized controlled trial "Early Intervention at General Hospitals". The purpose of the project was to test the effectiveness of alcohol brief intervention among general hospital inpatients with alcohol problem drinking. As part of the Research Collaboration in Early Substance Use Intervention (EARLINT), the project was funded by the German Federal Ministry of Education and Research (01EB0120, 01EB0420) and the Social Ministry of the State of Mecklenburg-Western Pomerania (IX 311a 406.68.43.05).

2.1 Sample

The sample included inpatients from four general hospitals in northeastern Germany, mainly from the wards of internal and surgical medicine and the ear, nose and throat unit. Sites 1 and 2 were considered urban areas (Stralsund and Greifswald, with 59,140 and 52,869 residents, respectively) (Statistisches Landesamt, 2004). Sites 3 and 4 were located in rural areas (Demmin and Malchin/ Dargun with 12,754 and 8,383 residents, respectively). The whole study area is part of the Federal State of Mecklenburg-Western Pomerania, which has the lowest population density among all states of Germany. These four hospitals provide medical care for the 198,745 inhabitants (including residents from each administrative district of the rural hospitals) of the defined geographical region (Statistisches Landesamt, 2005).

Between April 28, 2002 and June 30, 2004, all consecutive hospital admissions were asked to consent to an alcohol screening assessment, with the provision that individuals were between 18 and 64 years old and staying for at least 24 hours (n=17,272) (Figure 1). Patients not cognitively and physically capable of participating in the study, patients already recruited for the study during an earlier hospital stay, patients with language barriers, and patients employed at the hospital were excluded from the study. The sampling approach included two stages: (a) screening and (b) ascertainment of alcohol problem drinking. A total of 14,332 participants were screened for problem drinking during any time in their life. For 2,924 of these individuals, a positive screening result was obtained. Of those, 2,337 agreed to participate in a diagnostic interview. For 1,281 of these individuals, alcohol problem drinking was ascertained. Of those, 1,166 individuals gave informed written consent for further participation in the study. This included participation in further baseline assessments, participation in an intervention study and permission for the researchers to receive routine diagnoses provided by the hospitals.

Figure 1 Sampling procedure
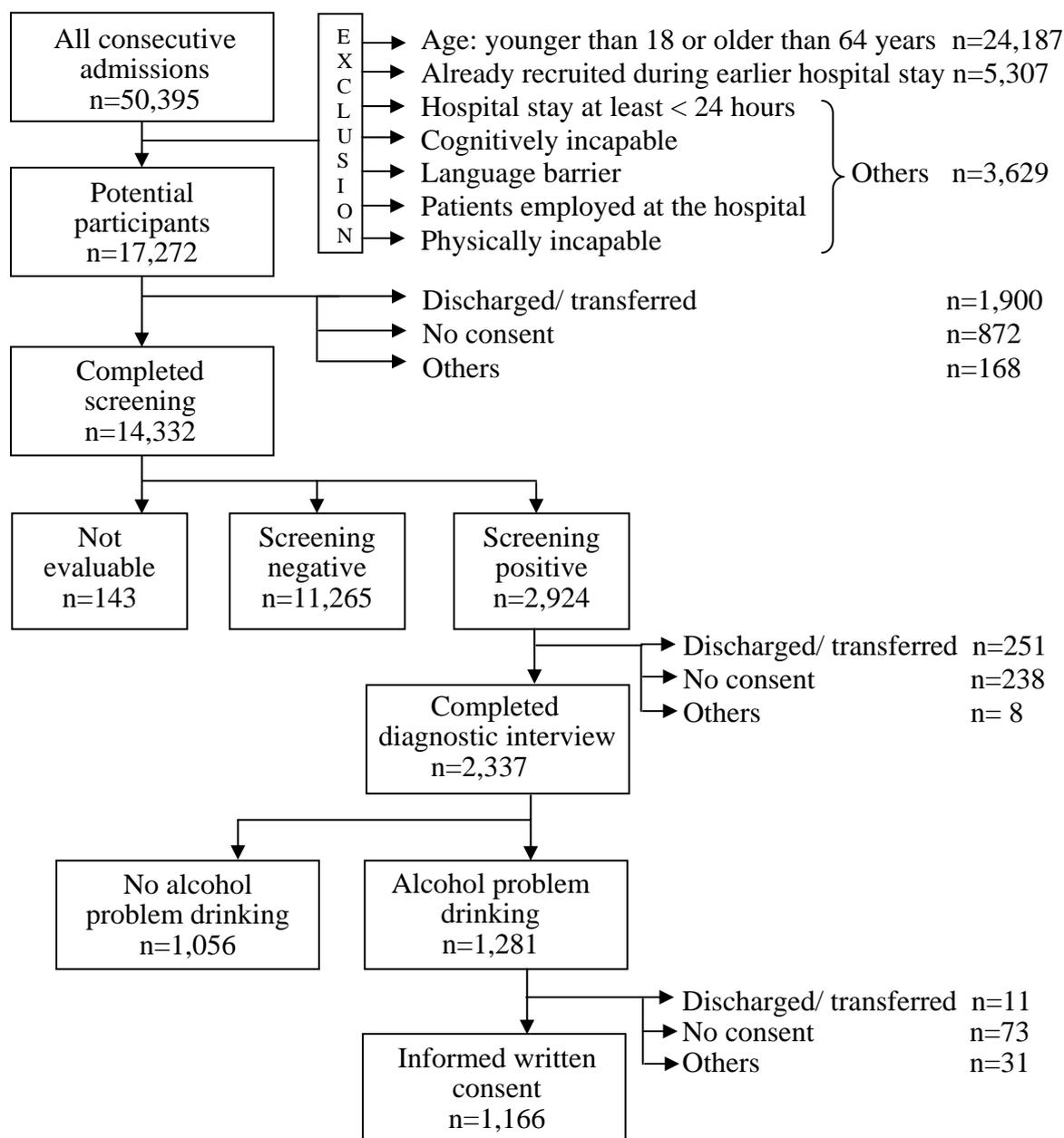
In all sampling stages, the patients were informed that the results would be used for research purposes only and that the results were not released to the staff of the general hospital. Screening and diagnostic procedures were conducted by the study staff, who were present on the wards on weekdays. Patients admitted on weekends were approached on Mondays. Sample recruitment, intervention, and follow-up are described in more detail elsewhere (Freyer-Adam, Coder, Baumeister et al., 2008). The ethics committee of the University of Greifswald approved the study procedures. As depicted in Figure 2, different samples were used for studies 1, 2 and 3.

Figure 2 Overview of samples used in study 1, study 2 and study 3
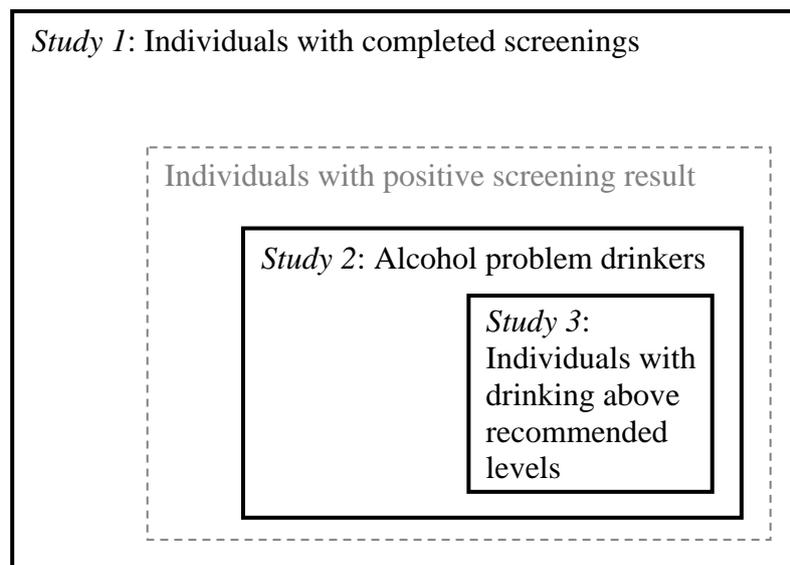
2.2 Measures

A more detailed description of the measures used is given in the scientific papers relevant to this dissertation.

Demographic variables (age, having an intimate partner, school education, current employment status) and current smoking status were included in the self-administered screening questionnaire.

The *alcohol screening* included the Alcohol Use Disorder Identification Test (AUDIT, Saunders, Aasland, Babor, De La Fuente & Grant, 1993) and the Lübeck Alcohol Dependence and Abuse Screening Test (LAST, Rumpf, Hapke, Hill & John, 1997). Patients with scores of eight or higher in the AUDIT or two or higher in the LAST were considered to have tested "positive". Patients with lower scores on both measures were defined as "negative".

Patients with a positive screening result in at least one of the two measures were asked to participate in a *diagnostic interview* using the German adaptation of the Composite International Diagnostic Interview (M-CIDI, Lachner et al., 1998; Wittchen & Pfister, 1997). The M-CIDI is a standardized software program based on DSM-IV criteria (American Psychiatric Association, 1995). Its alcohol section isolates current (past 12 months) alcohol dependence and alcohol abuse from alcohol dependence and abuse in remission. At-risk drinking, according to the guidelines of the British Medical Association (1995), was defined by a quantity-frequency index obtained from the M-CIDI. When criteria for alcohol dependence, abuse, and at-risk drinking were not met, heavy episodic drinking in the past 12 months was assessed. In accordance with Babor and Grant (1992), an additional item screened

men for the consumption of at least eight drinks (100g of pure alcohol) and women for the consumption of at least five drinks (60g) on one occasion at least twice a month. Participants were assigned diagnoses in the following descending hierarchical order: alcohol dependence, alcohol abuse, drinking above recommended levels and alcohol dependence in remission. Individuals drinking above recommended levels were differentiated in mutually exclusive groups: AR, HE and ARHE. Individuals who screened positive and did not participate in the diagnostic interview were classified as under suspicion of problem drinking. Individuals who screened positive but did not meet any of the above criteria were assumed to be false-positive.

In addition, daily alcohol consumption, beverage preference and severity of the alcohol problem were derived from the M-CIDI. *Daily alcohol consumption* was assessed using a quantity-frequency index. An open question, "What and how much did you drink on a typical drinking day within the past 12 months", assessed *beverage consumption.* The *severity of the alcohol problem* was quantified by the numbers of fulfilled lifetime diagnostic criteria for alcohol dependence and alcohol abuse.

Further baseline assessment included the *utilization of formal help*, asking the participants if they had had any lifetime contact with any kind of alcohol treatment (e.g., attendance in self-help groups, detoxification, outpatient therapy group) (Rumpf et al., 1998).

Two aspects of *motivation* were assessed: (a) motivation to change according to the Readiness to Change Questionnaire (RCQ, Rollnick, Heather, Gold & Hall, 1992) and (b) motivation to seek formal help according to the Treatment Readiness Tool (TReaT, Freyer et al., 2004). Both measures are based on the stages of change of the transtheoretical model of intentional behavior change (TTM, Prochaska & DiClemente, 1984; Prochaska & Velicer, 1997). The RCQ differentiates three stages of behavior change: Precontemplation (i.e., not thinking about change), Contemplation (i.e., being ambivalent about change), and Action (i.e., beginning to implement change). The TReaT (Freyer et al., 2004) consists of three subscales representing three stages of help-seeking: Precontemplation (i.e., not thinking about seeking help), Contemplation (i.e., being ambivalent about seeking help), and Preparation (i.e., determined to seek help).

To determine if the *participants' diseases were attributable to alcohol*, the International Classification of Diseases, 10th Revision (ICD-10), diagnostic codes (World Health Organization, 1992) provided by the hospitals were evaluated. We used one principal and one secondary ICD-10 diagnostic code. Classification of the diagnostic codes was performed according to their relationship to alcohol consumption following the approach of

Rehm et al. (2006). Alcohol-attributable fractions have been defined as the proportion by which disease cases, injury events, or deaths would be reduced if alcohol use and misuse were eliminated among the population (Shultz et al., 1991). Participants with ICD-10 codes indicating diseases 100% attributable to alcohol by definition (e.g., alcohol dependence, alcoholic gastritis) were assigned an alcohol-attributable fraction of 1 (AAF=1). Participants with ICD-10 diagnostic code diseases partially attributable to alcohol (e.g., liver cirrhosis, esophageal cancer) were assigned an alcohol-attributable fraction of less than 1 (AAF<1). Contrary to Rehm et al. (2006), ICD-10 codes starting with X, Y or Z, representing injuries, did not appear in the database. Instead, injuries received codes starting with S and T, which were not classified by Rehm et al. (2006). All S-codes and those T-codes that represented injuries were assigned AAF<1 (e.g., fractures, burns). Diseases with no empirical relationship to alcohol or with a possibly protective effect associated with alcohol (e.g., diabetes mellitus, ischemic heart disease) were assigned AAF=0. T-codes that did not represent injuries were also assigned AAF=0 (e.g., complications of surgical and medical care). If two different alcohol-attributable fractions were ascertained for the principal and the secondary ICD-10 diagnostic codes, the highest alcohol-attributable fraction was chosen.

Alcohol dependence at follow-up was assessed using the 12 month version of the M-CIDI's alcohol section (Lachner et al., 1998; Wittchen & Pfister, 1997). Alcohol dependence was indicated when sufficient criteria were met in the 12 months prior to the follow-up interview.

2.3 Data analysis

Statistical data analyses were performed using SPSS 14.0 and Intercooled STATA 9.2 (StataCorp, 2005). To take into account clustering within wards, STATA's sample survey methods were applied, which adjust the standard errors using svyset commands. Clinical wards (n=29) were chosen as the primary sampling unit. Subjects with missing values were deleted list-wise.

2.3.1 Study 1: Proportions of alcohol problem drinking

Descriptives are reported with their 95% confidence intervals (CIs), which were calculated using CIA 2.0 software (Altman, Machin, Bryant & Gardner, 2000). In post hoc analyses, differences between rural and urban sites were further analyzed using multivariate logistic regressions predicting (a) alcohol dependence and (b) ARHE.

2.3.2 Study 2: Reported beverage consumed and alcohol-related diseases

Multinomial logistic regression analyses were performed to predict the three different levels of alcohol-attributable diseases with beverage consumption as a predictor. AAF=0 was used as the reference group. Two multinomial regression models were tested. The first model included the beverage variable only. The second model additionally adjusted for alcohol-associated characteristics (grams of alcohol per day and heavy episodic drinking), demographics and smoking. Odds ratios (ORs) and CIs are presented. To identify differences between all three groups, all analyses were conducted twice with exchanged reference groups.

2.3.3 Study 3: Three subtypes of drinking above recommended levels

Baseline group differences between AR, HE and ARHE were analyzed using separate multinomial regression analyses for each predictor. To control for confounding age effects, age was included as a covariate in the regression models. ORs and CIs are presented. To identify differences between individuals with HE and ARHE, analyses were redone using HE as the reference group. Finally, one logistic regression was computed to predict alcohol dependence at follow-up (1=yes, 0=no), with the three groups as the predictors and controlling for possible intervention effects.

3 Results

3.1 Study 1: Proportions of alcohol problem drinking (Coder, Freyer-Adam, Bischof et al., 2008)

Of all eligible patients, 14,332 (83.0%) individuals were screened for problem drinking. Of those, 20.4% (n=2,924) tested positive. Of all patients screened, 8.9% showed alcohol problem drinking: 5.3% exhibited alcohol use disorders and 3.6% drinking above recommended levels (Table 2). Proportions of problem drinking differed significantly among men and women (14.4% vs. 1.5%, respectively). Higher proportions of problem drinking were found at rural sites compared to urban sites (13.7% vs. 7.5%, respectively).

Table 2 Proportions of problem drinking in general hospitals and at urban and rural sites

Diagnosis	Total (n=14,332)		Urban sites (n=11,027)		Rural sites (n=3,305)	
	%	(CI)	%	(CI)	%	(CI)
Alcohol use disorders						
Alcohol dependence	4.2	(3.9-4.5)	3.1	(2.8-3.5)	7.6	(6.8-8.9)
Alcohol abuse	1.1	(1.0-1.3)	1.1	(0.9-1.3)	1.3	(1.0-1.8)
Alcohol dependence in remission	3.1	(2.9-3.4)	3.1	(2.8-3.5)	3.2	(2.6-3.8)
Drinking above recommended levels						
AR	1.4	(1.2-1.6)	1.4	(1.2-1.6)	1.5	(1.1-2.0)
HE	0.8	(0.7-1.0)	0.8	(0.6-1.0)	0.9	(0.6-1.3)
ARHE	1.4	(1.2-1.6)	1.1	(0.9-1.3)	2.4	(1.9-3.0)
False positive	4.3	(3.9-4.6)	4.7	(4.3-5.1)	2.6	(2.1-3.2)
Under suspicion[a]	4.1	(3.8-4.4)	4.2	(3.9-4.6)	3.7	(3.1-4.4)
Total screening positive	20.4	(19.8-21.1)	19.5	(18.8-20.3)	23.2	(21.8-24.7)

Notes: [a]persons who screened positive, but did not complete diagnostic on grounds of giving no consent, being discharged/ transferred or other reasons; AR = at-risk drinking only, HE = heavy episodic drinking only, ARHE = at-risk and heavy episodic drinking; CI=95% confidence interval.

Two post hoc multivariate logistic regressions revealed that when controlling for age, sex, having an intimate partner, education, employment status, and ward, individuals from rural sites had significantly higher odds of having alcohol dependence (OR=2.08, CI: 1.71-2.53) and of having ARHE (OR=2.04, CI: 1.48-2.80) compared to those from urban sites.

3.2 Study 2: Reported beverage consumed and alcohol-related diseases (Coder et al., 2009)

Because of the low proportion of women with alcohol problem drinking, analyses in the following sections were restricted to males. For 1,011 males, routine diagnoses could be obtained, and beverage preference was reported. Of those, 53.0% of the participants were identified as exclusively beer drinkers, 14.1% exclusively spirits drinkers, 26.0% mixed beer and spirits drinkers and 6.9% individuals drinking wine exclusively or in combination with one or two other beverages (mixed wine drinkers).

Two multinomial regression models that predicted the three groups of alcohol-attributable diseases were tested (Table 3). In both models, beer drinkers, mixed beer and spirits drinkers and mixed wine drinkers showed lower odds of having AAF=1 compared to spirits drinkers. Beer drinkers and mixed wine drinkers also showed lower odds of having AAF<1 compared to spirits drinkers. After adjusting for possible confounders, significance remained and the odds ratios for all but mixed beer and spirits drinkers increased. To identify differences between individuals with AAF<1 and AAF=1, analyses were repeated with AAF<1 used as the reference group. Significant differences between AAF<1 vs. AAF=1 were found in the unadjusted models for one comparison (beer drinkers vs. spirits drinkers OR = 0.532, CI: 0.319-0.887). This difference disappeared in the adjusted model.

Table 3 Multinomial logistic regression analyses predicting AAFs[a]

	AAF=0 (n=392)	AAF<1 (n=377)		AAF=1 (n=242)	
Categorical preference variable					
Model I (n=1011)					
Spirits	ref	ref	-	ref	-
Beer	ref	0.536	(0.348-0.823)	0.285	(0.170-0.478)
Mixed beer and spirits	ref	0.702	(0.416-1.187)	0.547	(0.341-0.876)
Mixed wine	ref	0.342	(0.190-0.614)	0.186	(0.102-0.338)
Model III[b] (n=919)					
Spirits	ref	ref	-	ref	-
Beer	ref	0.615	(0.383-0.986)	0.422	(0.247-0.721)
Mixed beer and spirits	ref	0.742	(0.413-1.332)	0.452	(0.255-0.802)
Mixed wine	ref	0.363	(0.182-0.724)	0.279	(0.137-0.567)

Notes: [a]using svyset commands (primary sampling unit = clinical wards), [b]Model I + grams alcohol per day, heavy episodic drinking, age, intimate partner, level of education, employment status and smoking; ref = reference group, OR=odds ratio, CI=95% confidence interval.

3.3 Study 3: Three subtypes of drinking above recommended levels (Coder, Freyer-Adam, Lau et al., 2008), (Coder, Freyer-Adam, Rumpf, John & Hapke, submitted)

At baseline, a total of 492 men were deemed as drinking above recommended levels without currently meeting full criteria for alcohol dependence or alcohol abuse. Of those, 425 participants gave informed consent for further study participation. Of those, 42.1% were identified with ARHE, 35.3% with AR, and 22.6% with HE. One year later, 68.9% (n=293) of these participants were followed up, 5.4% (n=23) had died, and the rest were lost due to refusal of further study participation (16.3%; n=69) or for other reasons (9.4%; n=40).

3.3.1 Baseline

Separate multinomial regression analyses for each predictor, while controlling for confounding age effects, were calculated. The following predictors were considered: (a) demographics (school education, having an intimate partner, employment), (b) alcohol-associated variables (fulfilling at least one criterion of alcohol dependence, total number of fulfilled alcohol dependence criteria, having alcohol dependence in remission, total number of fulfilled alcohol abuse criteria, having alcohol abuse in remission, having an ICD-10 routine diagnostic code with AAF=1, having utilized formal help, motivation to change, motivation to seek formal help), and (c) being a smoker.

Differences between ARHE and AR: Individuals with ARHE had significantly higher odds of: having fewer years of school education (>11 years vs. <10 years: OR=2.89, CI: 1.41-5.96), having no intimate partner (OR=1.64, CI: 1.02-2.61), fulfilling at least one criterion of alcohol dependence (OR=2.06, CI: 1.23-3.45), having an ICD-10 routine diagnostic code with AAF=1 (OR=3.43, CI: 1.58-7.43), having utilized formal help (OR=2.21, CI: 1.02-4.79), being in the Action stage regarding behavior change (OR=2.11, CI: 1.15-3.86) and being a current smoker (OR=1.95, CI: 1.27-2.99) than individuals with AR.

Differences between ARHE and HE: The same analyses with HE used as the reference group revealed that individuals with ARHE had higher odds of: being prior help seekers (OR=2.80, CI: 1.27-6.15), being in the Action stage regarding behavior change (OR=2.29, CI: 1.21-4.34) and in the Preparation stage regarding help-seeking (OR=2.86, CI: 1.02-8.02).

Differences between AR and HE: Individuals with HE had higher odds of having fewer years of school education than individuals with AR (>11 years vs. <10 years: OR=3.90, CI: 1.10-13.84).

3.3.2 Follow-up

Twelve months after the baseline assessment, 8.4% (n=10) of the individuals with ARHE were identified with alcohol dependence, compared to 1.9% (n=2) of those with AR and 7.5% (n=5) of those with HE. Logistic regression revealed that when controlling for intervention effects, individuals with ARHE had significantly higher odds of having alcohol dependence compared to those with AR (OR=4.73, CI: 1.01–22.20). No significant differences were found for ARHE vs. HE and AR vs. HE.

4 Discussion

The aims of this dissertation were threefold. First, proportions of alcohol problem drinking among general hospital inpatients were determined. Second, the relationship of beverage preference and alcohol-related diseases was analyzed. Finally, differences between three groups of drinking above recommended levels were examined. In the sections below, the results are discussed and implications for practice and research will be illustrated.

4.1 General Discussion

4.1.1 Alcohol problem drinking among general hospital inpatients

Among 18- to 64-year-old general hospital inpatients, 8.9% showed alcohol problem drinking: 5.3% exhibited alcohol use disorders and 3.6% drinking above recommended levels. Hence, individuals who drink above recommended levels constitute a substantial portion of inpatients with alcohol problem drinking. However, the proportion of inpatients with alcohol use disorders was lower in comparison to other general hospital studies (Chen et al., 2004; John et al., 1999; Reynaud et al., 2000; Smothers et al., 2003; Wu et al., 2006) and partly lower in comparison to proportions of alcohol use disorders in Germany's general population, which varied between 2.5 and 8.0% (Jacobi et al., 2004; Kraus & Bauernfeind, 1998; Meyer, Rumpf, Hapke & John, 2001). This reflects results known from general population samples, reporting a high variability of proportions for alcohol use disorders between different countries, even when comparable instruments and diagnostic criteria are used throughout the studies (Rehm, Room, van den Brink & Jacobi, 2005). However, only two of these studies used DSM-IV (American Psychiatric Association, 1995) criteria (Smothers et al., 2003; Wu et al., 2006). Smothers et al. (2003) found a proportion of 7.4% for alcohol use disorders, which is comparable to the reported finding. Apart from methodological differences, there are several explanations for why other general hospital studies may have overestimated proportions of alcohol use disorders. First, other studies used populations that were at a special risk of problem drinking. For example, the study of Reynaud et al. (2000) focused on a region with particularly high alcohol-related mortality and the highest alcohol consumption rates in young individuals in France. Second, short study periods such as a single day, 14 days or a month (Chen et al., 2004; Reynaud et al., 2000; Smothers et al., 2003) do not reflect accurate proportions of hospital inpatients with problem drinking (John et al., 1999).

At rural sites, a higher overall proportion of inpatients with problem drinking was found than at urban sites. This was particularly true for alcohol dependence and ARHE, and

the difference remained significant after controlling for demographics. Several explanations for this finding may exist. First, there may be less utilization of addiction care in rural areas due to travel barriers and reduced availability of alcohol treatment facilities (Fortney, Booth, Blow & Bunn, 1995). Hence, individuals in rural areas may obtain alcohol-related treatment at general hospitals, whereas individuals in urban areas may more often receive alcohol-specific treatment in specialized or psychiatric clinics. For these reasons, individuals with problem drinking in rural areas may "wait" until alcohol-related diseases or disabilities become more severe before utilizing alcohol-specific care. This indicates an early intervention gap in rural areas. Second, individuals impaired by problem drinking or other conditions that may add to problem drinking accumulate in rural areas. For example, higher unemployment rates at rural sites may have contributed to higher proportions of problem drinking. At the rural sites, an unemployment rate of 26.3% was found, compared to 19.2% at the urban sites (see Coder, Freyer-Adam, Bischof et al., 2008).

4.1.2 Alcohol-related diseases among men who drink spirits only

General hospital inpatients with problem drinking who consumed solely spirits were at a higher risk of having a disease partially attributable to alcohol than those who consumed beer or mixed wine. Moreover, spirits drinkers were at a higher risk of having a disease that was 100% attributable to alcohol than those who consumed beer, mixed wine, or mixed beer and spirits. This finding is particularly interesting as it was controlled for average alcohol consumption among an excess risk sample (with a high level of average alcohol consumption) regarding alcohol related diseases. These results cannot be explained by spirits drinkers consuming a larger amount of ethanol than individuals with other beverage consumption styles. Quite the contrary, mixed beer and spirits drinkers had the highest average alcohol consumption of all beverage groups. However, compared to spirits drinkers they had a lower proportion of individuals with AAF>0, indicating that the consumption of spirits is associated with a higher risk of having an alcohol-related disease.

Although the result was controlled for heavy episodic drinking, it cannot be ruled out that the duration of individual drinking episodes influenced the result. To consume the same amount of ethanol, beer and wine drinkers have to consume more liquid due to the lower alcohol content of beer and wine in comparison to spirits. It is likely that a larger amount of liquid takes a longer time to drink. In contrast, spirits drinkers may consume larger quantities of alcohol in a shorter period. This may lead to greater toxic events and subsequent damage, which is likely to result in more alcohol-related diseases. However, it cannot be concluded

from this finding that the consumption of other beverages is "safe" as individuals with problem drinking who did not solely consume spirits also exhibited diseases that were at least partially attributable to alcohol.

4.1.3 At-risk and heavy episodic drinking among men: A subclinical diagnosis?

Among general hospital inpatients, individuals with ARHE were characterized by a particularly serious drinking pattern. In contrast to AR, individuals with ARHE had a higher proportion of diseases with AAF=1 and more often fulfilled at least one criterion for alcohol dependence. Hence, these individuals may have a subclinical diagnosis because they failed to meet full diagnostic criteria for alcohol dependence while hospitalized.

Diverse occurrences of subclinical diagnosis are possible (Helmchen, 2001). First, individuals with ARHE might be more often in remission of alcohol dependence. This was not found in this study. Still, the considerable proportion of former help seekers among them indicated that some individuals have had drinking problems in the past. Second, individuals with ARHE were falsely not identified as currently meeting criteria for alcohol dependence. Because the M-CIDI (Wittchen & Pfister, 1997) is highly sensitive (0.88) and specific (0.98) in detecting lifetime diagnoses of any substance disorders and conforms with the clinicians' diagnosis (Reed et al., 1998) this cannot apply to the majority of individuals with ARHE. Third, they could be on the verge of developing alcohol dependence. The development of dependence could be understood as a continuum starting with drinking above recommended levels (namely HE or AR), proceeding through subclinical diagnoses (i.e., ARHE) and on to a threshold diagnosis (i.e., alcohol dependence).

This argument is strengthened by the finding that 12 months after hospitalization and compared to individuals with AR, individuals with ARHE had a higher risk of developing alcohol dependence. This result may relate to findings on alcohol consumption and the development of alcohol dependence. In a prospective study (Flensborg-Madsen, Knop, Mortensen, Becker, & Gronbaek, 2007), males who consumed more than 38 g of pure alcohol per day had an increased risk of developing alcohol dependence compared to non-daily drinkers. Those consuming more than 70 g of pure alcohol per day showed the highest risk. Post-hoc analyses confirmed the expectation; individuals with ARHE had the highest daily average alcohol consumption compared to those with AR or HE (93 g vs. 62 g and 19 g, respectively). However, the results presented in this dissertation differed in two ways from those reported by Flensborg-Madsen and colleagues. First, only a low proportion of those with AR developed alcohol dependence in spite of their high average alcohol consumption.

This might be due to the shorter follow-up period. Second, although not significant, the results for individuals with HE indicate that heavy episodic drinking alone might also play a role in the development of alcohol dependence.

The findings of this study support those of previous studies focusing on general population samples or college students, which showed that heavy episodic drinkers tend to be young, smokers, and to have low levels of education (see Kuntsche et al., 2004). The results of this dissertation confirm that these differences also exist among different groups of drinking above recommended levels. For example, ARHE was associated with having fewer social resources. In addition, individuals with ARHE had a higher chance of being in Action to change their drinking and in Preparation to seek formal help compared to individuals with AR or HE. The higher motivation of inpatients with ARHE might be explained by mental strain caused by their more severe alcohol problem.

4.2 Limitations

This study estimated proportions of alcohol use disorders and drinking above recommended levels over a two-year period at several general hospitals that provide the medical care for an entire region. The screening response rate of 83.0% was satisfactory. These advantages of the study helped to avoid pitfalls of previous studies (e.g., drawing generalizing conclusions from one single ward). Another advantage of this study was the inclusion of more than one screening instrument to raise the sensitivity. In addition, by using the M-CIDI (Lachner et al., 1998; Wittchen & Pfister, 1997) it was possible to provide profound diagnoses based on DSM-IV criteria (American Psychiatric Association, 1995) excluding screening false positives. Regarding the analyses of the effect of beverage consumption, the sample was derived from a relatively homogenous setting with a variety of alcohol-related diseases. As all diseases attributable to alcohol could be included, this study was not limited to one specific disease. Beyond that, the results were adjusted for possible confounders such as age or smoking. However, some limitations that are inherent to the study design should be mentioned.

4.2.1 Sensitivity of screening instruments

The recommended AUDIT cut-off value of eight was used (Babor, Higgins-Biddle, Saunders & Monteiro, 2001). The low sensitivity of this cut-off value (Reinert & Allen, 2007) may have resulted in an underestimation of individuals with less severe drinking patterns. In particular, women with less severe problem drinking are likely to be underrepresented leading

to an underestimation of the overall percentage of individuals with problem drinking. However, as two screening instruments were used and a substantial part of screening positives were detected exclusively through the LAST, this problem might have been partly reduced.

4.2.2 Severity of alcohol dependence

Alcohol dependence or having a disease 100% attributable to alcohol was regarded as the most severe alcohol problem. In comparison to other subtypes of alcohol problem drinking this might be justified as a diagnosis of alcohol dependence implies that an individual has severe alcohol-related health or social problems. For example, an individual with this diagnosis may use alcohol despite physical or psychological consequences or social or work activities may be impaired due to alcohol use (see section 1.1). However, individuals who drink above recommended levels have a higher risk for somatic problems (for an overview see Rehm, Room, Graham & Frick, 2003). In particular, heavy episodic drinkers experience a higher rate of injuries and accidents (e.g., Gmel et al., 2003). In this context the ascertainment of severity of a disease could be questioned. Other criteria, such as fatality, years of life lost, disability adjusted life years or quality adjusted life years, might have been more appropriate to ascertain the severity of a disease.

4.2.3 Smoking co-occurrence and somatic multimorbidity

Among all alcohol problem drinkers, 71.5% were current and 18.7% former smokers. These findings are, for example, in line with previous studies that reported 83-88% smokers among individuals with alcohol dependence (Batel, Pessione, Maitre & Rueff, 1995; DiFranza & Guerrera, 1990). In Germany, 74% of all alcohol-attributable deaths are caused by alcohol and smoking (John & Hanke, 2002). Therefore, smoking may have played a causal role in the development of diseases attributable to alcohol in this sample. In addition, these alcohol problem drinkers could also suffer from other smoking-related diseases. To control for this effect, smoking was considered as a confounder in regression models predicting AAFs.

4.2.4 The transtheoretical model of intentional behavior change as theoretical framework

The assessment of motivation to change drinking habits and to seek formal help was based on the transtheoretical model of intentional behavior change only (TTM, Prochaska & DiClemente, 1984; Prochaska & Velicer, 1997). Theoretical aspects of the TTM have been criticized, especially its stages of change construct and the assignment by time frame

algorithm (Sutton, 2001; West, 2005). However, as the RCQ and the TReaT are valid and measures of motivation are not based on the time frame algorithm (Freyer et al., 2004; Freyer et al., 2007; Hannöver et al., 2002; Heather, Rollnick & Bell, 1993; Rollnick et al., 1992), this critique does not apply to this study.

4.2.5 Generalizability

Generalizability to all alcohol problem drinkers is affected in two ways. First, a sample selection bias is likely as hospitalized persons may experience more severe somatic consequences from drinking that require hospitalization than a sample of problem drinkers from the general population. For example, in a representative sample of at-risk drinkers in Northern Germany, only 15.1% had been hospitalized within the previous year (Bischof et al., 2004). Therefore, at-risk drinkers among general hospital inpatients are a special subgroup, and findings cannot be generalized to all at-risk drinkers. Second, due to the small number of women with alcohol problem drinking in the parent study, research questions 2 and 3 could not be tested for women. Therefore, no conclusions in reference to women can be drawn regarding the relationship of beverage consumption and alcohol-related diseases and differences between the three groups of drinking above recommended levels.

4.2.6 Power

Although individuals with ARHE had a significantly higher risk of developing alcohol dependence, the corresponding 95% confidence interval was large and the lower bound of the confidence interval was close to 1, probably due to small sample size. Hence, this result should be interpreted with caution. However, the OR was adjusted for intervention effects and it can be assumed that given a larger sample size, a similar OR might be expected.

4.3 Practical implications

To conclude, a high proportion of inpatients with alcohol problem drinking is present in general hospitals when considering all general hospitals of an entire region. As expected, not only are alcohol use disorders an issue, but drinking above recommended levels is also common among hospital inpatients. In particular, general hospital inpatients in rural areas are affected by problem drinking. Hence, general hospitals in rural areas should be aware of their unique position within addiction care, and the development of intervention strategies is particularly important in rural areas.

Systematic screening of all general hospital inpatients and documentation of problem drinking are recommended (Rumpf, Bohlmann, Hill, Hapke & John, 2001). Although barriers such as high rates of false positive cases may discourage medical staff from systematic screening, it is important for the following reasons. First, individuals who drink above recommended levels have a special risk for health related problems (e.g., Gmel et al., 2003; Rehm, Room, Graham & Frick, 2003). It can be expected that it is even more challenging for medical staff to spot these less obvious types of alcohol problem drinking. Systematic screening would lead to higher detection rates of problem drinking, particularly for drinking above recommended levels. Second, it would remind physicians to initiate subsequent brief interventions for these patients. However, the effectiveness of brief alcohol interventions among general hospital inpatients is still inconclusive (Emmen, Schippers, Bleijenberg & Wollersheim, 2004; Freyer-Adam, Coder, Lau, Bischof & John, 2008). For example, one study found no intervention effect (Saitz et al., 2007), whereas an intervention effect on motivation to change drinking behavior was found in the main study of this trial (Freyer-Adam, Coder, Baumeister et al., 2008). Interventions should be tailored to the type of problem drinking. Interventions for individuals with alcohol dependence should aim for referral to formal alcohol treatment, whereas interventions for individuals drinking above recommended levels could aim at reducing the average alcohol intake or the number of heavy drinking episodes.

Moreover, it is assumed that interventions, which are adjusted to the different groups of drinking above recommended levels, could be more effective. For example, it may not be sufficient to counsel at-risk drinkers exclusively with regard to their average alcohol consumption if they also report heavy episodic drinking. These interventions should also be tailored to the individual's motivation to change. For individuals with ARHE, an additional aim of counseling should be the prevention of alcohol dependence. Referring patients with drinking above recommended levels to alcohol-specific treatment does not seem to be appropriate as they do not yet fulfill full criteria for alcohol use disorders. Offering them brief alcohol intervention is likely to be more adequate (Freyer et al., 2006).

4.4 Outlook

Research and clinical practice should distinguish between different groups of drinking above recommended levels. Additionally, future research should address the questions of the effectiveness of pattern-specific interventions in general hospitals and to what extent at-risk drinkers in general hospitals differ from those in the general population based on

demographics, alcohol-associated measures, or alcohol-related sequels. In addition, more research is needed regarding brief alcohol interventions among general hospital inpatients with alcohol problem drinking. In particular, further research should clarify for whom interventions are effective and what the mediating factors are.

Addiction care should broaden the range of healthcare services to individuals who drink above recommended levels to prevent alcohol-related harm. As the latest recommendation for at-risk drinking lowered the threshold considerably (Seitz et al., 2008), it can be suspected that the proportion of drinking above recommended levels among general hospital inpatients is even higher than found in this study. This will also apply for the proportion of drinking above recommended levels in the general population. Therefore, there will be a growing demand for brief alcohol interventions for this target group. Currently there seems to be an intervention gap for those individuals as addiction care is mostly specialized for individuals having an alcohol use disorder.

5 References

Altman, D. G., Machin, D., Bryant, T. N. & Gardner, M. J. (Eds.). (2000). *Statistics with confidence* (2nd ed.). London: BMJ Books.

American Psychiatric Association (Ed.). (1995). *Diagnostic and statistical manual of mental disorders (DSM-IV)*. Washington, DC: American Psychological Association.

Anderson, P. (1990). *Management of drinking problems* (European Series 32). Copenhagen: WHO Regional Publications.

Anderson, P., Cremona, A., Paton, A., Turner, C. & Wallace, P. (1993). The risk of alcohol. *Addiction, 88*(11), 1493-1508.

Anderson, P. & Baumberg, B. (2006). *Alcohol in Europe: a public health perspective: a report for the European Commission*. London: Institute for Alcohol Studies UK.

Arolt, V. & Driessen, M. (1996). Alcoholism and psychiatric comorbidity in general hospital inpatients. *Gen Hosp Psychiatry, 18*(4), 271-277.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. & Monteiro, M. (2001). *AUDIT: The alcohol use disorders identification test: guidelines for use in primary health care*. Geneva: World Health Organization.

Babor, T. F. & Grant, M. (Eds.). (1992). *Programme on substance abuse: project on identification and management of alcohol-related problems. Report on phase II: A randomized clinical trial of brief interventions in primary health care*. Geneva: World Health Organization.

Barnett, N. P., Goldstein, A. L., Murphy, J. G., Colby, S. M. & Monti, P. M. (2006). "I'll never drink like that again": characteristics of alcohol-related incidents and predictors of motivation to change in college students. *J Stud Alcohol, 67*(5), 754-763.

Batel, P., Pessione, F., Maitre, C. & Rueff, B. (1995). Relationship between alcohol and tobacco dependencies among alcoholics who smoke. *Addiction, 90*(7), 977-980.

Bischof, G., Rumpf, H.-J., Meyer, C., Hapke, U. & John, U. (2004). Inanspruchnahme medizinischer Versorgung bei Rauchern und riskant Alkohol konsumierenden Personen: Ergebnisse einer repräsentativen Bevölkerungsstudie [Medical care requested by smokers and at-risk alcohol consumers: results of a representative population survey]. *Gesundheitswesen, 66*, 114-120.

British Medical Association. (1995). *Alcohol: Guidelines on sensible drinking*. London, UK: British Medical Association.

Bühringer, G., Augustin, R., Bergmann, E., Bloomfield, K., Funk, W., Junge, B., Kraus, L., Merfert-Diete, C., Rumpf, H.-J., Simon, R. & Töppich, J. (2000). *Alkoholkonsum und alkoholbezogene Störungen in Deutschland (Schriftenreihe des Bundesministerium für Gesundheit Bd. 28) [Alcohol consumption and alcohol related disorders in Germany]*. Baden-Baden: Nomos.

Burger, M., Bronstrup, A. & Pietrzik, K. (2004). Derivation of tolerable upper alcohol intake levels in Germany: a systematic review of risks and benefits of moderate alcohol consumption. *Prev Med, 39*(1), 111-127.

Caetano, R., Tam, T., Greenfield, T., Cherpitel, C. & Midanik, L. (1997). DSM-IV alcohol dependence and drinking in the U.S. population: a risk analysis. *Ann Epidemiol, 7*(8), 542-549.

Castellsague, X., Munoz, N., De Stefani, E., Victora, C. G., Castelletto, R., Rolon, P. A. & Quintana, M. J. (1999). Independent and joint effects of tobacco smoking and alcohol drinking on the risk of esophageal cancer in men and women. *Int J Cancer, 82*(5), 657-664.

Chen, C. H., Chen, W. J. & Cheng, A. T. A. (2004). Prevalence and identification of alcohol use disorders among nonpsychiatric inpatients in one general hospital. *Gen Hosp Psychiatry, 26*(3), 219-225.

Coder, B., Freyer-Adam, J., Bischof, G., Pockrandt, C., Hartmann, B., Rumpf, H. J., John, U. & Hapke, U. (2008). Alcohol problem drinking among general hospital inpatients in northeastern Germany. *Gen Hosp Psychiatry, 30*(2), 147-154.

Coder, B., Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H. J., John, U. & Hapke, U. (2008). Male at-risk drinkers with heavy episodic drinking: a subclinical diagnosis? *J Stud Alcohol Drugs, 69*(1), 85-90.

Coder, B., Freyer-Adam, J., Lau, K., Riedel, J., Rumpf, H. J., Meyer, C., John, U. & Hapke, U. (2009). Reported beverage consumed and alcohol-related diseases among male hospital inpatients with problem drinking. *Alcohol Alcohol, 44*(2), 216-221.

Coder, B., Freyer-Adam, J., Rumpf, H. J., John, U. & Hapke, U. (submitted). Risky drinking, motivation to change, and the development of alcohol dependence.

Corrao, G., Bagnardi, V., Zambon, A. & Arico, S. (1999). Exploring the dose-response relationship between alcohol consumption and the risk of several alcohol-related conditions: a meta-analysis. *Addiction, 94*(10), 1551-1573.

Corrao, G., Bagnardi, V., Zambon, A. & La Vecchia, C. (2004). A meta-analysis of alcohol consumption and the risk of 15 diseases. *Prev Med, 38*(5), 613-619.

Dawson, D. A. & Archer, L. D. (1993). Relative frequency of heavy drinking and the risk of alcohol dependence. *Addiction, 88*(11), 1509-1518.

Dawson, D. A., Grant, B. F. & Li, T. K. (2005). Quantifying the risks associated with exceeding recommended drinking limits. *Alcohol Clin Exp Res, 29*(5), 902-908.

Dejong, W. (2003). Definitions of binge drinking. *JAMA, 289*(13), 1635; author reply 1636.

Demmel, R., Beck, B., Richter, D. & Reker, T. (2004). Readiness to change in a clinical sample of problem drinkers: relation to alcohol use, self-efficacy, and treatment outcome. *Eur Addict Res, 10*(3), 133-138.

DiFranza, J. R. & Guerrera, M. P. (1990). Alcoholism and smoking. *J Stud Alcohol, 51*(2), 130-135.

Emmen, M. J., Schippers, G. M., Bleijenberg, G. & Wollersheim, H. (2004). Effectiveness of opportunistic brief interventions for problem drinking in a general hospital setting: systematic review. *BMJ, 328*(7435), 318.

Flensborg-Madsen, T., Knop, J., Mortensen, E. L., Becker, U. & Gronbaek, M. (2007). Amount of alcohol consumption and risk of developing alcoholism in men and women. *Alcohol Alcohol, 42*(5), 442-447.

Fortney, J. C., Booth, B. M., Blow, F. C. & Bunn, J. Y. (1995). The effects of travel barriers and age on the utilization of alcoholism treatment aftercare. *Am J Drug Alcohol Abuse, 21*(3), 391-406.

Freyer, J., Tonigan, J. S., Keller, S., John, U., Rumpf, H. J. & Hapke, U. (2004). Readiness to change versus readiness to seek help for alcohol problems: the development of the Treatment Readiness Tool (TReaT). *J Stud Alcohol, 65*(6), 801-809.

Freyer, J., Coder, B., Pockrandt, C., Hartmann, B., Rumpf, H. J., John, U. & Hapke, U. (2006). Krankenhauspatienten mit riskantem Alkoholkonsum sind offen für Beratung [General hospital patients with alcohol problems welcome counselling]. *Gesundheitswesen, 68*(7), 429-435.

Freyer, J., Coder, B., Bischof, G., Baumeister, S. E., Rumpf, H. J., John, U. & Hapke, U. (2007). Intention to utilize formal help in a sample with alcohol problems: a prospective study. *Drug Alcohol Depend, 87*(2-3), 210-216.

Freyer-Adam, J., Coder, B., Baumeister, S. E., Bischof, G., Riedel, J., Paatsch, K., Wedler, B., Rumpf, H.-J., John, U. & Hapke, U. (2008). Brief alcohol intervention for general hospital inpatients: a randomized controlled trial. *Drug Alcohol Depend, 93*, 233-243.

Freyer-Adam, J., Coder, B., Lau, K., Bischof, G. & John, U. (2008). Kurzintervention bei Alkoholproblemen im Allgemeinkrankenhaus: Eine Übersicht über Kontrollgruppenstudien [Brief alcohol interventions in general hospitals: A review of clinical controlled trials]. *Psychosomatik und Konsiliarpsychiatrie, 2*, 8-14.

Gerke, P., Hapke, U., Rumpf, H. J. & John, U. (1997). Alcohol-related diseases in general hospital patients. *Alcohol Alcohol, 32*(2), 179-184.

Gill, J. S. (2002). Reported levels of alcohol consumption and binge drinking within the UK undergraduate student population over the last 25 years. *Alcohol Alcohol, 37*(2), 109-120.

Gmel, G., Rehm, J. & Kuntsche, E. (2003). Binge drinking in Europe: definitions, epidemiology, and consequences. *Sucht, 49*(2), 105-116.

Gronbaek, M., Becker, U., Johansen, D., Gottschau, A., Schnohr, P., Hein, H. O., Jensen, G. & Sorensen, T. I. (2000). Type of alcohol consumed and mortality from all causes, coronary heart disease, and cancer. *Ann Intern Med, 133*(6), 411-419.

Hannöver, W., Thyrian, J. R., Hapke, U., Rumpf, H. J., Meyer, C. & John, U. (2002). The readiness to change questionnaire in subjects with hazardous alcohol consumption, alcohol misuse and dependence in a general population survey. *Alcohol Alcohol, 37*(4), 362-369.

Heather, N., Rollnick, S. & Bell, A. (1993). Predictive validity of the Readiness to Change Questionnaire. *Addiction, 88*(12), 1667-1677.

Helmchen, H. (2001). Unterschwellige psychische Störungen [Subthreshold psychological disorders]. *Nervenarzt, 72*(3), 181-189.

Her, M. & Rehm, J. (1998). Alcohol and all-cause mortality in Europe 1982-1990: a pooled cross-section time-series analysis. *Addiction, 93*(9), 1335-1340.

Jackson, K. M. (2008). Heavy episodic drinking: determining the predictive utility of five or more drinks. *Psychol Addict Behav, 22*(1), 68-77.

Jacobi, F., Wittchen, H. U., Holting, C., Hofler, M., Pfister, H., Muller, N. & Lieb, R. (2004). Prevalence, co-morbidity and correlates of mental disorders in the general population: results from the German Health Interview and Examination Survey (GHS). *Psychol Med, 34*(4), 597-611.

John, U., Rumpf, H. J. & Hapke, U. (1999). Estimating prevalence of alcohol abuse and dependence in one general hospital: an approach to reduce sample selection bias. *Alcohol Alcohol, 34*(5), 786-794.

John, U. & Hanke, M. (2002). Alcohol-attributable mortality in a high per capita consumption country - Germany. *Alcohol Alcohol, 37*(6), 581-585.

Kauhanen, J., Kaplan, G. A., Goldberg, D. E. & Salonen, J. T. (1997). Beer binging and mortality: results from the Kuopio ischaemic heart disease risk factor study, a prospective population based study. *BMJ, 315*(7112), 846-851.

Kerr, W. C., Fillmore, K. M. & Marvy, P. (2000). Beverage-specific alcohol consumption and cirrhosis mortality in a group of English-speaking beer-drinking countries. *Addiction, 95*(3), 339-346.

Klatsky, A. L. & Armstrong, M. A. (1993). Alcoholic beverage choice and risk of coronary artery disease mortality: do red wine drinkers fare best? *Am J Cardiol, 71*(5), 467-469.

Kraus, L. & Bauernfeind, R. (1998). Repräsentativerhebung zum Gebrauch psychoaktiver Substanzen bei Erwachsenen in Deutschland 1997 [Population survey on the consumption of psychoactive substances in the German adult population 1997]. *Sucht, 44*(Sonderheft 1), 3-82.

Kuntsche, E., Rehm, J. & Gmel, G. (2004). Characteristics of binge drinkers in Europe. *Soc Sci Med, 59*(1), 113-127.

Lachner, G., Wittchen, H. U., Perkonigg, A., Holly, A., Schuster, P., Wunderlich, U., Turk, D., Garczynski, E. & Pfister, H. (1998). Structure, content and reliability of the Munich-Composite International Diagnostic Interview (M-CIDI) substance use sections. *Eur Addict Res, 4*(1-2), 28-41.

Maisto, S. A., Conigliaro, J., McNeil, M., Kraemer, K., Conigliaro, R. L. & Kelley, M. E. (2001). Effects of two types of brief intervention and readiness to change on alcohol use in hazardous drinkers. *J Stud Alcohol, 62*(5), 605-614.

Meyer, C., Rumpf, H. J., Hapke, U. & John, U. (2001). Prevalence of DSM-IV psychiatric disorders including nicotine dependence in the general population: results from the Northern German TACOS study. *Neurol Psychiatr Brain Res, 9*, 75-80.

Midanik, L. T., Tam, T. W., Greenfield, T. K. & Caetano, R. (1996). Risk functions for alcohol-related problems in a 1988 US national sample. *Addiction, 91*(10), 1427-1437; discussion 1439-1456.

Noar, S. M., Benac, C. N. & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health Behavior change interventions. *Psychological Bulletin, 133*(4), 673-693.

Perkins, H. W., Linkenbach, J. & Dejong, W. (2001). Estimated blood alcohol levels reached by "binge" and "nonbinge" drinkers: a survey of young adults in Montana. *Psychol Addict Behav, 15*(4), 317-320.

Poikolainen, K., Paljarvi, T. & Makela, P. (2007). Alcohol and the preventive paradox: serious harms and drinking patterns. *Addiction, 102*(4), 571-578.

Prochaska, J. O. & DiClemente, C. C. (1984). *The transtheoretical approach. Crossing traditional boundaries of therapy*. Homewood, IL: Irwin.

Prochaska, J. O. & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *Am J Health Promot, 12*(1), 38-48.

Reed, V., Gander, F., Pfister, H., Steiger, A., Sonntag, H., Trenkwalder, C., Sonntag, A., Hundt, W. & Wittchen, H. U. (1998). To what degree does the composite international diagnostic interview (CIDI) correctly identify DSM-IV disorders? Testing validity issues in a clinical sample. *IJMPR, 7*(3), 142-155.

Rehm, J., Room, R., Graham, K. & Frick, U. (2003). Trinkmenge, Trinkmuster und ihre Beziehung zu Morbidität und Mortalität [Quantity and patterns of drinking and their relation to morbidity and mortality]. *Sucht, 49*(2), 87-94.

Rehm, J., Room, R., Graham, K., Monteiro, M., Gmel, G. & Sempos, C. T. (2003). The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. *Addiction, 98*(9), 1209-1228.

Rehm, J., Room, R., van den Brink, W. & Jacobi, F. (2005). Alcohol use disorders in EU countries and Norway: an overview of the epidemiology. *Eur Neuropsychopharmacol, 15*(4), 377-388.

Rehm, J., Patra, J. & Popova, S. (2006). Alcohol-attributable mortality and potential years of life lost in Canada 2001: implications for prevention and policy. *Addiction, 101*(3), 373-384.

Rehm, J., Taylor, B. & Patra, J. (2006). Volume of alcohol consumption, patterns of drinking and burden of disease in the European region 2002. *Addiction, 101*(8), 1086-1095.

Reinert, D. F. & Allen, J. P. (2007). The alcohol use disorders identification test: an update of research findings. *Alcohol Clin Exp Res, 31*(2), 185-199.

Reynaud, M., Malet, L., Facy, F. & Glanddier, P. (2000). Hospital morbidity of alcohol use disorders in the center of France. *Alcohol Clin Exp Res, 24*(7), 1057-1062.

Rollnick, S., Heather, N., Gold, R. & Hall, W. (1992). Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict, 87*(5), 743-754.

Room, R., Bondy, S. J. & Ferris, J. (1995). The risk of harm to oneself from drinking, Canada 1989. *Addiction, 90*(4), 499-513.

Rumpf, H. J., Hapke, U., Hill, A. & John, U. (1997). Development of a screening questionnaire for the general hospital and general practices. *Alcohol Clin Exp Res, 21*(5), 894-898.

Rumpf, H. J., Hapke, U. & John, U. (1998). Previous help seeking and motivation to change drinking behavior in alcohol-dependent general hospital patients. *Gen Hosp Psychiatry, 20*(2), 115-119.

Rumpf, H. J., Bohlmann, J., Hill, A., Hapke, U. & John, U. (2001). Physicians' low detection rates of alcohol dependence or abuse: a matter of methodological shortcomings? *Gen Hosp Psychiatry, 23*(3), 133-137.

Saitz, R., Palfai, T. P., Cheng, D. M., Horton, N. J., Freedner, N., Dukes, K., Kraemer, K. L., Roberts, M. S., Guerriero, R. T. & Samet, J. H. (2007). Brief intervention for medical inpatients with unhealthy alcohol use: a randomized, controlled trial. *Ann Intern Med, 146*(3), 167-176.

Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R. & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption Part II. *Addiction, 88*, 617-629.

Seitz, H. K., Bühringer, G. & Mann, K. (2008). Grenzwerte für den Konsum alkoholischer Getränke: Empfehlungen des wissenschaftlichen Kuratoriums der DHS [Guidelines on drinking at recommended levels: Recommendations by the German Centre for Addiction]. In Deutsche Hauptstelle für Suchtfragen e.V. [German Centre for Addiction] (Ed.), *Jahrbuch Sucht 08 [Yearbook Addiction 2008]* (pp. 205-209). Geesthacht: Neuland.

Shealy, A. E., Murphy, J. G., Borsari, B. & Correia, C. J. (2007). Predictors of motivation to change alcohol use among referred college students. *Addictive Behaviors, 32*(10), 2358-2364.

Shultz, J. M., Rice, D. P., Parker, D. L., Goodman, R. A., Stroh, G., Jr. & Chalmers, N. (1991). Quantifying the disease impact of alcohol with ARDI software. *Public Health Rep, 106*(4), 443-450.

Smothers, B. A., Yahr, H. T. & Sinclair, M. D. (2003). Prevalence of current DSM-IV alcohol use disorders in short-stay, general hospital admissions, United States, 1994. *Arch Intern Med, 163*(6), 713-719.

StataCorp. (2005). Stata User's Guide Release 9.2. Stata Corporation: College Station TX.

Statistisches Landesamt, M.-V. (2004). *Statistisches Jahrbuch Mecklenburg-Vorpommern 2004 [Statistical yearbook Mecklenburg Western-Pomerania 2004]*. Schwerin: Statistisches Landesamt Mecklenburg-Vorpommern [Statistical office Mecklenburg-Western Pomerania].

Statistisches Landesamt, M.-V. (2005). *Statistisches Jahrbuch Mecklenburg-Vorpommern 2005 [Statistical yearbook Mecklenburg-Western Pomerania 2005]*. Schwerin: Statistisches Landesamt Mecklenburg-Vorpommern [Statistical office Mecklenburg-Western Pomerania].

Stokkeland, K., Brandt, L., Ekbom, A., Osby, U. & Hultcrantz, R. (2006). Morbidity and mortality in liver diseases in Sweden 1969-2001 in relation to alcohol consumption. *Scand J Gastroenterol, 41*(4), 463-468.

Sutton, S. (2001). Back to the drawing board? A review of applications of the transtheoretical model to substance use. *Addiction, 96*(1), 175-186.

Turner, C. (1990). How much alcohol is in a 'standard drink'? An analysis of 125 studies. *Br J Addict, 85*(9), 1171-1175.

Valencia-Martin, J. L., Galan, I. & Rodriguez-Artalejo, F. (2008). The joint association of average volume of alcohol and binge drinking with hazardous driving behaviour and traffic crashes. *Addiction, 103*(5), 749-757.

Vitale, S. G., Van De Mheen, D., Van De Wiel, A. & Garretsen, H. F. (2006). Alcohol and illicit drug use among emergency room patients in the Netherlands. *Alcohol Alcohol, 41*(5), 553-559.

Wannamethee, S. G. & Shaper, A. G. (1999). Type of alcoholic drink and risk of major coronary heart disease events and all-cause mortality. *Am J Public Health, 89*(5), 685-690.

Wechsler, H. & Nelson, T. F. (2001). Binge drinking and the American college student: what's five drinks? *Psychol Addict Behav, 15*(4), 287-291.

West, R. (2005). Time for a change: putting the Transtheoretical (Stages of Change) Model to rest. *Addiction, 100*(8), 1036-1039.

Williams, E. C., Kivlaban, D. R., Saitz, R., Merrill, J. O., Achtmeyer, C. E., McCormick, K. A. & Bradley, K. A. (2006). Readiness to change in primary care patients who screened positive for alcohol misuse. *Ann Fam Med, 4*(3), 213-220.

Wittchen, H. U. & Pfister, H. (1997). *DIA-X-Interviews: Manual für Screening-Verfahren und Interview [DIA-X-Interviews: Manual for Screening and Interview]*. Frankfurt, Germany: Swets & Zeitlinger.

World Health Organization. (1992). *The ICD-10 Classification of mental and behavioral disorders: clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization (WHO).

Wu, S. I., Liu, S. I., Fang, C. K., Hsu, C. C. & Sun, Y. W. (2006). Prevalence and detection of alcohol use disorders among general hospital inpatients in eastern Taiwan. *Genl Hosp Psychiatry, 28*(1), 48-54.

6 Scientific papers

This dissertation is based upon the following four scientific papers that are reprinted in this section. In addition, an overview of the author's contribution to these publications is given.

(1) <u>Coder, B.</u>, Freyer-Adam, J., Bischof, G., Pockrandt, C., Hartmann, B., Rumpf, H. J., John, U. & Hapke, U. (2008). Alcohol problem drinking among general hospital inpatients in northeastern Germany. *Gen Hosp Psychiatry, 30*(2), 147-154

(2) <u>Coder, B.</u>, Freyer-Adam, J., Lau, K., Riedel, J., Rumpf, H. J., Meyer, C., John, U. & Hapke, U. (2009). Reported beverage consumed and alcohol-related diseases among male hospital inpatients with problem drinking. *Alcohol Alcohol, 44*(2), 216-221

(3) <u>Coder, B.</u>, Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H. J., John, U. & Hapke, U. (2008). Male at-risk drinkers with heavy episodic drinking: a subclinical diagnosis? *J Stud Alcohol Drugs, 69*(1), 85-90

(4) <u>Coder, B.</u>, Freyer-Adam, J., Rumpf, H. J., John, U. & Hapke, U. (submitted). Risky drinking, motivation to change, and the development of alcohol dependence.

Table 4 Overview of the author's contribution to the scientific papers

Scientific paper	Conception and design	Acquisition of the data[1]	Data analysis	Interpret-ation of data	a) Writing draft b) Revision	Approval of final manuscript
(1) Coder, Freyer-Adam, Bischof et al. (2008)	xx	n.a.	xxx	xxx	a) xxx b) xxx	yes
(2) Coder et al. (2009)	xxx	n.a.	xxx	xxx	a) xxx b) xxx	yes
(3) Coder, Freyer-Adam, Lau et al. (2008)	xxx	n.a.	xxx	xxx	a) xxx b) xxx	yes
(4) Coder, Freyer-Adam, Rumpf et al. (submitted)	xxx	x	xxx	xxx	a) xxx b) xxx	yes

Notes: xxx=own responsibility, xx=conducted together with co-authors, x=collaboration, n.a.=not applicable; [1]My duties within this study were data management and data cleansing.

6.1 Coder, B., Freyer-Adam, J., Bischof, G., Pockrandt, C., Hartmann, B., Rumpf, H. J., John, U. & Hapke, U. (2008)

Alcohol problem drinking among general hospital inpatients in northeastern Germany

Alcohol problem drinking among general hospital inpatients in northeastern Germany

Beate Coder, Dipl.-Psych.[a],[*], Jennis Freyer-Adam, Ph.D.[a], Gallus Bischof, Ph.D.[b],
Christine Pockrandt, Dipl.-Pflegew. (FH)[a], Birgit Hartmann, Dipl.-Soz.-Päd. (FH)[a],
Hans-Jürgen Rumpf, Ph.D.[b], Ulrich John, Ph.D.[a], Ulfert Hapke, Ph.D.[c]

[a]Ernst-Moritz-Arndt-University of Greifswald, Institute of Epidemiology and Social Medicine, Walther-Rathenau-Str. 48, 17487 Greifswald, Germany
[b]University of Luebeck, Department of Psychiatry and Psychotherapy, Ratzeburger Allee 160, 23538 Luebeck, Germany
[c]Robert Koch-Institut, FG 22, Seestaße 10, 13353 Berlin, Germany

Abstract

Objective: To estimate proportions of alcohol problem drinking: alcohol use disorders (AUDs) and drinking above recommended levels among general hospital inpatients in northeastern Germany.
Method: The sample includes consecutively admitted inpatients (n=14,332) between 18 and 64 years old. This study adopted a two-stage-sampling approach including screening and ascertainment of diagnosis based on *DSM-IV* criteria and a quantity-frequency index.
Results: In total, 20.4% of all inpatients screened positive. Nine percent of the total sample were identified with current problem drinking in the following descending order: 5.3% AUD and 3.6% drinking above recommended levels. In addition, 3.1% of persons were diagnosed with alcohol dependence in remission. Proportions differed significantly among men and women (P<.001). Higher proportions of problem drinking were found at rural sites compared to urban sites (13.7% vs. 7.5%, P<.001).
Conclusions: In addition to AUDs, drinking above recommended levels is a common problem among general hospital inpatients. Thus, the implementation of systematic alcohol screening and brief interventions should be considered.
© 2008 Elsevier Inc. All rights reserved.

Keywords: General hospital; Alcohol problem drinking; At-risk drinking; Heavy episodic drinking; Alcohol use disorders

1. Introduction

Alcohol-related somatic disorders are highly prevalent among general hospital inpatients [1]. Proportions of inpatients with current alcohol use disorders (AUDs: alcohol dependence and alcohol abuse) range between 7.4% and 18.3% (e.g. [2–5]). While data on proportions of inpatients with AUDs have been provided, little is known about proportions of inpatients who drink above recommended levels, namely, proportions of at-risk and heavy episodic drinking. According to the British Medical Association [6], at-risk drinkers are characterized by a daily average consumption of 30 g or more of pure alcohol for men and 20 g or more for women. Heavy episodic drinkers are persons with irregular excessive alcohol consumption. Both drinking

groups have a higher risk for somatic problems; in particular heavy episodic drinkers experience a higher rate of injuries and accidents [6,7]. They have a higher risk of being admitted to general hospitals [8,9]. Therefore, in addition to persons with AUDs, persons who drink above recommended levels are expected to constitute a substantial part among hospital inpatients. AUDs and drinking above recommended levels may be summarized as problem drinking.

Previous studies reporting proportions of problem drinking among general hospital inpatients include several limitations: Firstly, proportions have been reported for one general hospital only (e.g., Ref. [3]) or for one specific ward such as the emergency room (e.g., Ref. [10]), or for AUDs only (e.g., Ref. [11]). Secondly, proportions of problem drinking have rarely been reported for an entire region [4,5]. Thirdly, the majority of evidence is based on screening data (see Ref. [12]). Only a few studies used standardized diagnostic interviews based on *DSM-IV* [13] or ICD-10 [14] criteria for AUDs [2,3,5,11,15].

* Corresponding author. Tel.: +49 3834/867733; fax: +49 3834/867701.
E-mail address: coder@uni-greifswald.de (B. Coder).

Fourthly, studies using *DSM-IV* or ICD-10 criteria focused on small study samples and were conducted over a short period of time (e.g., Refs. [2,11]), which can be biased by seasonal effects. In summary, proportions of problem drinking including AUDs and drinking above recommended levels among inpatients in a variety of general hospitals of an entire geographical region are still unknown.

To our knowledge, there is no study that comprises all of the following conditions to get a more complete picture of the distribution and extent of problem drinking: (a) the inclusion of more than one general hospital of an entire geographical region; (b) the focus on all types of problem drinking; and (c) the use of *DSM-IV* criteria to identify AUDs. However, such a study is needed to estimate the demand of (special) medical care due to alcohol-related problems in general hospitals and in a larger geographical region. A study meeting these conditions would have the additional advantage of comparing rural and urban areas.

The aim of the present study was to provide data on proportions of 18- to 64-year-old inpatients with problem drinking in the general hospitals of a defined region.

2. Methods

2.1. Sample

The sample described in this paper is part of the project "Early Intervention at General Hospitals" (conducted by the

Research Collaboration Early Substance Use Intervention, EARLINT). It included 14,332 inpatients from four general hospitals in northeastern Germany, mainly from the wards of internal and surgical medicine, and ear–nose–throat unit. Sites 1 and 2 were considered urban areas (Stralsund and Greifswald with 59,140 and 52,869 residents, respectively) [16]. Sites 3 and 4 were located in rural areas (Demmin and Malchin/Dargun with 12,754 and 8383 residents, respectively). The whole study area is part of the Federal State of Mecklenburg-Western Pomerania that has the lowest population density among all states of Germany. These four hospitals provide medical care for the 198,745 inhabitants (including residents from each administrative district of the rural hospitals) in the defined geographical region [17]. Between April 28, 2002, and June 30, 2004, all consecutive hospital admissions were asked to consent to an alcohol screening assessment, with the provision that individuals were between 18 and 64 years old and staying for at least 24 h (n=17,272) (Fig. 1). Patients not cognitively and physically capable, patients already recruited for the study during an earlier hospital stay, patients with language barriers and patients employed at the hospital were excluded from the study. Individuals who screened positive and verbally agreed to further participation were then assessed to identify AUDs and drinking above recommended levels. In all sampling stages, the patients were informed that the results were used for research purposes only and that the results were not released to the staff of the general hospital.
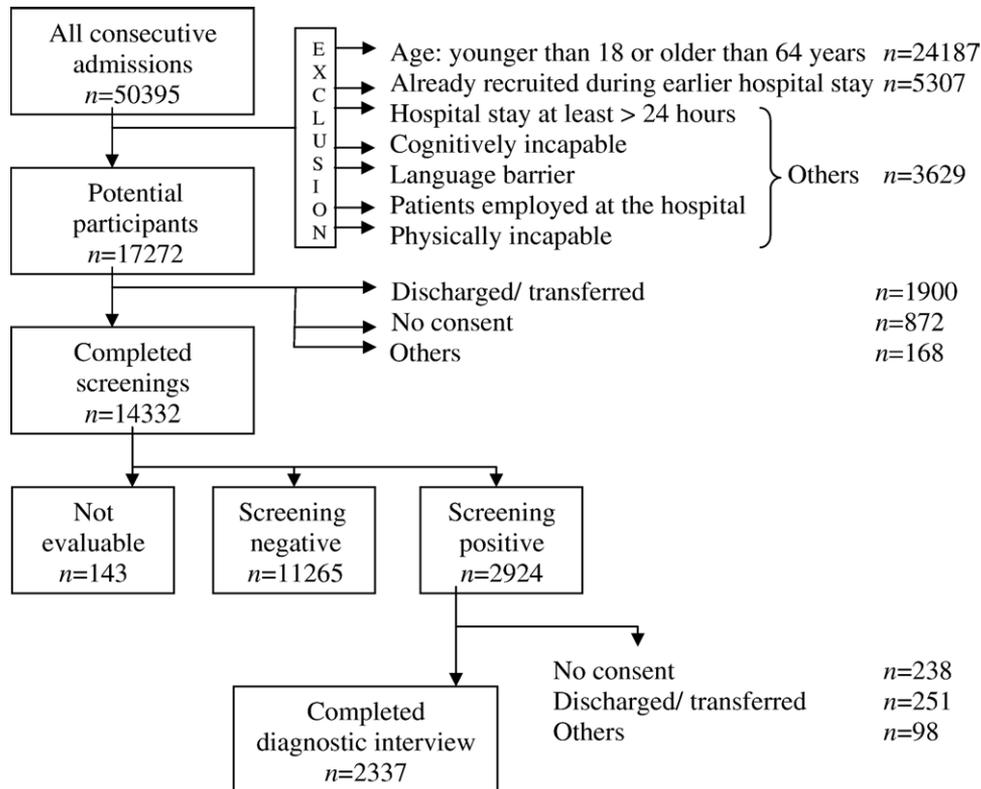

Fig. 1. Sampling procedure.

Screening and diagnostic were conducted by the study staff who were present on the wards on weekdays. Patients admitted on weekends were approached on Mondays. The study design is described in more detail elsewhere [18]. The ethics committee of the University of Greifswald has approved the procedures of the study.

2.2. Measures

The screening included the Alcohol Use Disorder Identification Test (AUDIT [19]) and the Luebeck Alcohol Dependence and Abuse Screening Test (LAST [20]). The LAST was derived from the CAGE [21] and the Michigan Alcoholism Screening Test [22]; it refers to the lifetime occurrence of AUDs [20]. Patients with values of 8 or higher in the AUDIT (sensitivity: 0.71, specificity: 0.97) or 2 or higher in the LAST (sensitivity: 0.81, specificity: 0.91) were considered "positive" [20,23]. Patients with lower scores on both measures were defined as "negative." Patients with a positive screening result in at least one of the two measures were asked to participate in a diagnostic interview using the German adaptation of the Composite International Diagnostic Interview (M-CIDI [24,25]). The M-CIDI is a standardized software program based on *DSM-IV* criteria [13]. Its alcohol section isolates current *alcohol dependence and abuse* (past 12 months) from alcohol dependence and abuse in remission. Alcohol dependence criteria are rated independently of whether alcohol abuse is present or not. *At-risk drinking* according to the guidelines of the BMA [6] was defined by a quantity-frequency index obtained from the M-CIDI. When criteria for alcohol dependence, abuse and at-risk drinking were not met, we assessed *heavy episodic drinking* in the past 12 months. According to Babor and Grant [26], an additional item asked men for the consumption of at least eight drinks (100 g of pure alcohol) and women for the consumption of at least five drinks (60 g) on one occasion at least twice a month. Participants were assigned diagnoses in the following descending hierarchical order: alcohol dependence, alcohol abuse, drinking above recommended levels and alcohol dependence in remission. No hierarchical order was applied to persons drinking above recommended levels; we differentiated between the following mutually exclusive groups: at-risk drinking (but no heavy episodic drinking), heavy episodic drinking (but no at-risk drinking) and at-risk+heavy episodic drinking. Persons who screened positive and did not participate in the diagnostic interview were classified as *under suspicion* of problem drinking. Individuals who screened positive but did not meet any of the above criteria were assumed to be *false positive*.

2.3. Data analysis

Statistical data analyses were performed using SPSS 14.0. In the first stage, descriptives (mean, standard deviation, absolute number, percent) and bivariate analyses (ANOVAs, χ^2 statistics) were conducted. For the effect size estimate we used Cramer's w or Cramer's Φ' for categorical variables and f for continuous variables [27]. Descriptives are reported with their 95% confidence intervals (CI) which were calculated using CIA 2.0 software [28]. Most analyses included data from all participating wards. In addition, as internal and surgical medicine wards constitute 62.7% of all inpatient beds in German general hospitals [29], proportions of inpatients with problem drinking were calculated separately for these two wards.

In the second stage of the analysis, post hoc analyses were conducted. Differences among rural and urban sites were further analyzed, and true- and false-positive screens were compared using multivariate logistic regressions. Cases with missing values were deleted listwise.

3. Results

3.1. Sample

Of all eligible patients, 14,332 (83.0%) individuals were screened for problem drinking. A total of 872 individuals refused participation, and 2068 individuals could not be recruited for reasons of discharge, transfer or other reasons. The mean age of the participants was 45.0 years, the majority were male (57.8%) and 77.4% of the sample had an intimate partner (Table 1). Thirty-five percent had 9 or less years of school education, and 20.9% were job seeking. Among the sample were internal medicine (38.4%) and surgical (38.8%) patients. Differences between the four sites were analyzed. As described in Table 1, all χ^2 statistics were significant. Looking at effect sizes, hospital sites differed regarding years of school education and employment status. In comparison to the urban sites, more persons from rural areas had less than 9 years of education and were job seekers.

Of those participating in the screening, 20.4% (*n*=2924) were screening positive. Of these, 45.3% had both a positive AUDIT and a positive LAST score, and 54.7% screened positive on one measure only (LAST: 35.9%, AUDIT: 18.8%). A total of 2337 persons agreed to participate in further diagnostic.

3.2. Proportions of problem drinking

Of all patients screened, 5.3% had AUDs, 3.6% were drinking above recommended levels and 3.1% had alcohol dependence in remission (Table 2). Furthermore, 4.3% were false-positive cases and 4.1% under suspicion of problem drinking. Men and women differed significantly in their proportions of problem drinking (χ^2=1558.9, *df*=8, *P*<.001, *w*=.33). The distribution of problem drinking differed between age groups (χ^2=456.8, *df*=24, *P*<.001, Φ'=.10) (Table 3). The highest proportions of AUDs and drinking above recommended levels were found among the 30- to 49-year-old patients (7.5–7.6% and 4.0–4.8%, respectively). The lowest proportions of persons with AUDs and drinking above recommended levels were found among those between 50 and 64 years old (2.4% and 2.9%, respectively).

Table 1
Description of sample

| | n | Total | | Urban sites | | | | Rural sites | | | | $\chi^{2 a}/F^{b}$ (df) | P | Φ'^{a}/f^{b} |
| | | | | Site 1 | | Site 2 | | Site 3 | | Site 4 | | | | |
		n^{a}/M^{b}	%^{a}/S.D.^{b}	n^{a}/M^{b}	%^{a}/S.D.^{b}	n^{a}/M^{b}	%^{a}/S.D.^{b}	n^{a}/M^{b}	%^{a}/S.D.^{b}	n^{a}/M^{b}	%^{a}/S.D.^{b}			
Male	14,332	8282	57.8	3824	57.1	2564	59.2	1393	58.3	501	54.6	8.6 (3)	.04	.02
Age ^{c}	14,298	45.04	13.5	44.4	13.8	46.4	13.2	44.2	13.2	45.3	12.6	22.2 (3)	<.001	.07
Intimate partner	13,729	10625	77.4	5045	77.3	3158	79.1	1735	75.0	687	76.5	14.6 (3)	.002	.03
Education (years)	13,708											156.0 (9)	<.001	.06
≤9		4795	35.0	2158	33.1	1331	34.0	956	40.6	350	38.5			
10–11		6142	44.8	2882	44.2	1726	44.1	1100	46.7	434	47.7			
≥12		2703	19.7	1458	22.3	839	21.4	285	10.5	121	13.3			
Still in school		68	0.5	28	0.4	19	0.5	16	0.7	5	0.5			
Employment	13,314											94.4 (6)	<.001	.06
Full-/half-time		6463	48.5	3109	49.2	1931	50.9	998	45.3	425	47.4			
Retired/others		4068	30.6	2033	32.1	1098	29.0	672	29.2	265	29.6			
Job-seeking		2783	20.9	1182	18.7	761	20.1	634	27.5	206	23.0			
Wards	14,331											1487.7 (6)	<.001	.23
Internal medicine ^{d}		5508	38.4	2143	32.0	1905	44.0	982	41.1	478	52.1			
Surgical		5564	38.8	2241	33.5	1670	38.5	1406	58.9	247	26.9			
Others ^{e}		3259	22.8	2308	34.5	759	17.5	–	–	192	20.9			

M=mean, n=number of observations, Φ'>.058 small effect, f>.10 small effect.

[a] Categorical variables.
[b] Continuous variables.
[c] Post hoc analyses with Scheffé test show Site 2>Site 1, Site 3.
[d] Site 2: 406 persons who were assigned to internal medicine belonged either to pneumology or to neurology combined into one ward.

Internal and surgical medicine wards differed regarding the distribution of problem drinking (χ^{2}=127.9, df=8, P<.001, w=.11) (Table 4). Compared to surgical wards, individuals with AUDs were more often found on internal medicine wards (4.1% vs. 7.5%).

Rural and urban sites differed significantly in proportions of problem drinking (χ^{2}=189.4, df=8, P<.001, w=.12), with higher proportions of inpatients with AUDs and drinking above recommended levels at rural sites compared to urban

sites (AUDs: 8.8% vs. 4.2%; drinking above recommended levels: 4.8% vs. 3.3%) (Table 5). These differences were largely due to higher proportions of alcohol dependence and at-risk+heavy episodic drinking at rural sites compared to urban sites.

3.3. Post hoc analyses

Multivariate logistic regressions were conducted to further analyze the differences between rural and urban

Table 2
Proportions of problem drinking in general hospitals

| Diagnosis | Total (n=14,332) | | Males (n=8282) | | Females (n=6050) | |
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Alcohol use disorders						
Alcohol dependence	599	4.2 (3.9–4.5)	549	6.6 (6.1–7.2)	50	0.8 (0.6–1.1)
Alcohol abuse	159	1.1 (1.0–1.3)	150	1.8 (1.5–2.1)	9	0.2 (0.1–0.3)
Alcohol dependence in remission	448	3.1 (2.9–3.4)	398	4.8 (4.4–5.3)	50	0.8 (0.6–1.1)
Drinking above recommended levels						
At-risk drinking ^{a}	205	1.4 (1.2–1.6)	196	2.4 (2.1–2.7)	9	0.1 (0.1–0.3)
Heavy episodic drinking ^{b}	118	0.8 (0.7–1.0)	108	1.3 (1.1–1.6)	10	0.2 (0.1–0.3)
At-risk+heavy episodic drinking	200	1.4 (1.2–1.6)	188	2.3 (2.0–2.6)	12	0.2 (0.1–0.3)
False positive	608	4.3 (3.9–4.6)	534	6.4 (5.9–7.0)	74	1.2 (1.0–1.5)
Under suspicion ^{c}	587	4.1 (3.8–4.4)	504	6.1 (5.6–6.6)	83	1.4 (1.1–1.7)
Total screening positive	2924	20.4 (19.8–21.1)	2627	31.7 (30.7–32.7)	297	4.9 (4.4–5.5)
Total screening negative	11,408	79.6 (78.9–80.2)	5655	68.3 (67.3–69.3)	5753	95.1 (94.5–95.6)

n=Number of observations.

[a] But no heavy episodic drinking.
[b] But no at-risk drinking.
[c] Persons who screened positive, but did not complete diagnostic on grounds of giving no consent, being discharged/transferred or other reasons.

Table 3
Proportions of problem drinking in different age groups

Diagnosis	18–29 years (n=2406)		30–39 years (n=2136)		40–49 years (n=3680)		50–64 years (n=6076)	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Alcohol use disorders								
Alcohol dependence	115	4.8 (4.0–5.7)	132	6.2 (5.2–7.3)	236	6.4 (5.7–7.3)	116	1.9 (1.6–2.3)
Alcohol abuse	59	2.4 (1.9–3.2)	29	1.4 (0.9–1.9)	42	1.1 (0.8–1.5)	29	0.5 (0.3–0.7)
Alcohol dependence in remission	19	0.8 (0.5–1.2)	52	2.4 (1.9–3.2)	183	5.0 (4.3–5.7)	194	3.2 (2.8–3.7)
Drinking above recommended levels								
At-risk drinking [a]	11	0.5 (0.3–0.8)	23	1.1 (0.7–1.6)	72	2.0 (1.6–2.5)	99	1.6 (1.3–2.0)
Heavy episodic drinking [b]	48	2.0 (1.5–2.6)	18	0.9 (0.5–1.3)	31	0.8 (0.6–1.2)	21	0.3 (0.2–0.5)
At-risk+heavy episodic drinking	22	0.9 (0.6–1.4)	43	2.0 (1.5–2.7)	74	2.0 (1.6–2.5)	61	1.0 (0.8–1.3)
False positive	129	5.4 (4.5–6.3)	105	4.9 (4.1–5.9)	146	4.0 (3.4–4.6)	228	3.8 (3.3–4.3)
Under suspicion [c]	89	3.7 (3.0–4.5)	84	3.9 (3.2–4.8)	188	5.1 (4.4–5.9)	226	3.7 (3.3–4.2)
Total screening positive	492	20.5 (18.9–22.1)	486	22.8 (21.0–24.6)	972	26.4 (25.0–27.9)	974	16.0 (15.1–17.0)
Total screening negative	1914	79.5 (77.9–81.1)	1650	77.2 (75.4–79.0)	2708	73.6 (72.1–75.0)	5102	84.0 (93.0–84.9)

n=number of observations.
[a] But no heavy episodic drinking.
[b] But no at-risk drinking.
[c] Persons who screened positive, but did not complete diagnostic on grounds of giving no consent, being discharged/transferred or other reasons.

sites and to compare false-positive screens to true-positive screens.

In the first step, two multivariate logistic regressions were conducted to predict (a) alcohol dependence and (b) at-risk +heavy episodic drinking (1=yes, 0=no) with site (rural vs. urban) as predictor. The analyses revealed that when controlling for age, sex, having an intimate partner, education, employment status and wards, individuals from

rural sites had significantly higher odds of having alcohol dependence or of being an at-risk+heavy episodic drinker than those from urban sites (Table 6). In the second step, to test specific interactions, these analyses were redone including the following interaction terms: (a) age and sex and (b) sites and wards. No significant interactions were found for at-risk+heavy episodic drinking. For alcohol dependence, only the interaction between sites and wards

Table 4
Proportions of problem drinking in internal medicine and surgical wards

Diagnosis	Internal medicine wards (n=5508)		Surgical wards (n=5564)	
	n	% (95% CI)	n	% (95% CI)
Alcohol use disorders				
Alcohol dependence	357	6.5 (6.0–7.3)	162	2.9 (2.5–3.4)
Alcohol abuse	56	1.0 (0.8–1.3)	69	1.2 (1.0–1.6)
Alcohol dependence in remission	207	3.8 (3.3–4.3)	120	2.2 (1.8–2.6)
Drinking above recommended levels				
At-risk drinking [a]	74	1.3 (1.1–1.7)	83	1.5 (1.2–1.8)
Heavy episodic drinking [b]	34	0.6 (0.4–0.9)	55	1.0 (0.8–1.3)
At-risk+heavy episodic drinking	91	1.7 (1.3–2.0)	72	1.3 (1.0–1.6)
False positive	230	4.2 (3.7–4.7)	218	3.9 (3.4–4.5)
Under suspicion [c]	272	4.9 (4.4–5.5)	212	3.8 (3.3–4.3)
Total screening positive	1321	24.0 (22.9–25.1)	991	17.8 (16.8–18.8)
Total screening negative	4187	76.0 (74.9–77.1)	4573	82.2 (81.2–83.2)

n=number of observations.
[a] But no heavy episodic drinking.
[b] But no at-risk drinking.
[c] Persons who screened positive, but did not complete diagnostic on grounds of giving no consent, being discharged/transferred or other reasons.

Table 5
Proportions of problem drinking at urban and rural sites

Diagnosis	Urban sites (n=11,027)		Rural sites (n=3305)	
	n	% (95% CI)	n	% (95% CI)
Alcohol use disorders				
Alcohol dependence	347	3.1 (2.8–3.5)	252	7.6 (6.8–8.9)
Alcohol abuse	115	1.1 (0.9–1.3)	44	1.3 (1.0–1.8)
Alcohol dependence in remission	344	3.1 (2.8–3.5)	104	3.2 (2.6–3.8)
Drinking above recommended levels				
At-risk drinking [a]	155	1.4 (1.2–1.6)	50	1.5 (1.1–2.0)
Heavy episodic drinking [b]	88	0.8 (0.6–1.0)	30	0.9 (0.6–1.3)
At-risk+heavy episodic drinking	120	1.1 (0.9–1.3)	80	2.4 (1.9–3.0)
False positive	521	4.7 (4.3–5.1)	87	2.6 (2.1–3.2)
Under suspicion [c]	466	4.2 (3.9–4.6)	121	3.7 (3.1–4.4)
Total screening positive	2156	19.5 (18.8–20.3)	768	23.2 (21.8–24.7)
Total screening negative	8871	80.5 (79.7–81.2)	2537	76.8 (75.3–78.2)

n=number of observations.
[a] But no heavy episodic drinking.
[b] But no at-risk drinking.
[c] Persons who screened positive, but did not complete diagnostic on grounds of giving no consent, being discharged/transferred and other reasons.

Table 6
Multivariate logistic regression predicting alcohol dependence and at-risk drinking (1=yes, 0=no)

	Alcohol dependence (*n*=12,842)		At-risk+heavy episodic drinking (*n*=12,842)	
	OR	95% CI	OR	95% CI
Site				
Urban	Ref	–	Ref	–
Rural	2.08	1.71–2.53	2.04	1.48–2.80
Age	0.97	0.96–0.98	1.00	0.99–1.01
Sex				
Female	Ref	–	Ref	–
Male	7.37	5.44–9.99	11.57	6.10–21.95
Intimate partner				
Yes	Ref	–	Ref	–
No	2.45	2.02–2.97	1.87	1.35–2.59
Education (years)				
≤9	Ref	–	Ref	–
10–11	0.89	0.72–1.09	0.70	0.50–0.98
≥12	0.80	0.59–1.08	0.60	0.37–0.98
Still in school	0.42	0.10–1.81	1.08	0.14–8.39
Employment				
Full-/halftime	Ref	–	Ref	–
Retired/others	1.68	1.28–2.19	0.73	0.48–1.12
Job-seeking	4.29	3.41–5.39	1.53	1.08–2.18
Wards				
Internal medicine	Ref	–	Ref	–
Surgical	0.36	0.29–0.44	0.89	0.63–1.24
Others [a]	0.38	0.28–0.50	1.02	0.66–1.57

n=number of observations, OR=odds ratio, Ref=reference category.

[a] Ear–nose–throat unit, dermatology and orthopedic ward.

was significant. Compared to urban sites and to internal medicine wards, inpatients with alcohol dependence at rural sites had lower odds of being at surgical wards (OR=0.39, CI 0.25–0.60) and of being at other wards, namely, orthopedic ward (OR=0.09, CI 0.01–0.70).

Similarly, a multivariate logistic regression analysis was conducted to predict false-positive screens (1=yes, 0=no) with age, sex, having an intimate partner, school education, employment status, wards and site as predictor. Men had lower odds of being false-positive screens compared to women (OR=0.68, CI 0.49–0.94). Persons without an intimate partner had lower odds of being false-positive screens compared to persons with an intimate partner (OR=0.52, CI 0.41–0.66). Compared to persons with 9 or less years of school education, persons with at least 12 years of school education and persons still in school had higher odds of being false-positive screens (OR=1.64, CI 1.23–2.20; OR=3.35, CI 1.04–10.82). In comparison to persons with full-/half-time employment, job-seekers and persons in retirement had lower odds of being a false-positive screen (OR=0.73, CI 0.57–0.95; OR=0.43, CI 0.33–0.56). Persons at rural sites had lower odds of being false-positive screens than persons from urban sites (OR=0.40, CI 0.31–0.53). No significant differences between false- and true-positive screens were found for age and wards.

4. Discussion

The main finding of our study is that 12.0% of the 18- to 64-year-old general hospital inpatients showed problem drinking (AUDs or drinking above recommended levels) or alcohol dependence in remission. There was a large gender gap with 14.4% of all men and 1.5% of all women being affected by problem drinking.

Our study estimated alcohol proportions of AUDs and drinking above recommended levels over a 2-year period at several general hospitals that provide medical care for an entire region. The screening response rate of 83.0% was satisfactory. As the patients were informed that data will be used for research purposes only, we assume that the participating patients answered all questions honestly. These advantages of the study helped to avoid pitfalls of previous studies (e.g., to draw generalizing conclusions from one single ward). Another advantage of our study was the inclusion of more than one screening instrument to raise the sensitivity. In addition, by using the M-CIDI [24,25] we were able to provide profound diagnoses based on *DSM-IV* criteria [13] excluding screening false positives.

At rural sites a higher overall proportion of inpatients with problem drinking was found than at urban sites. This was particularly true for alcohol dependence and at-risk+heavy episodic drinking, and the difference remained significant after controlling for demographics. Persons with alcohol dependence on internal medicine wards were more common at rural sites than at urban sites. Several reasons may be responsible for this finding. Firstly, there may be less utilization of addiction care in rural areas due to travel barriers and reduced availability of alcohol treatment facilities [30]. Hence, individuals in rural areas may get alcohol-related treatment at general hospitals, whereas individuals in urban areas may more often receive alcohol-specific treatment in specialized or psychiatric clinics. For these reasons, persons with problem drinking in rural areas may "wait" until alcohol-related diseases or disabilities become more severe before utilizing medical care. This indicates an early intervention gap in rural areas. Secondly, individuals impaired by problem drinking or other conditions that may add to problem drinking accumulate in rural areas. For example, higher unemployment rates at our rural sites have contributed to higher proportions of problem drinking. Therefore, the development of intervention strategies is particularly important in rural areas. In addition, general hospitals in rural areas should be aware of their unique position within addiction care. They should extend their offer of addiction treatment and counseling.

In our study, 5.3% of the inpatients had AUDs: this proportion is lower in comparison to other general hospital studies [2–5,11] and partly lower in comparison to proportions of AUDs in Germany's general population that vary between 2.5% and 8.0% [31–33]. Compared to Germany's general population, persons in northeastern Germany have a slightly higher intake of pure alcohol,

resulting from less abstainers and a higher consumption of spirits [34]. This reflects results known from general population samples, reporting a high variability of proportions for AUDs between different countries, even when comparable instruments and diagnostic criteria are used throughout the studies [35]. However, only two of these studies used *DSM-IV* [13] criteria [5,11]. Smothers et al. [5] found a proportion of 7.4% for AUDs, which is comparable to our finding. Apart from methodological differences, there are several explanations for why other general hospital studies may have overestimated the proportions of AUDs. Firstly, other studies used populations that are at special risk of problem drinking. For example, the study of Reynaud et al. [4] focused on a region with a particular high alcohol-related mortality and the highest alcohol consumption rates in young persons in France. Secondly, short study periods such as a single day, 14 days or a month [2,4,5] do not reflect accurate proportions of hospital inpatients with problem drinking [3].

Some limitations which are inherent to our study design should be mentioned. We used the recommended AUDIT cut-off value of 8 for men and women [36]. This probably resulted in an underestimation of women screening positive due to the low sensitivity for this cut-off value [37]. In particular, women with less severe problem drinking are likely to be underrepresented leading to an underestimation of the overall percentage of persons with problem drinking. According to Reinert and Allen [37], a cut-off value of 5 for women and men would have been more adequate. However, as we used two screening instruments, we might have partly reduced this problem as we detected a substantial part of screening positives exclusively through the LAST. Another issue concerns screening negatives. Due to limited resources, it was not possible to control for alcohol-specific diagnosis in a random sample of screening negatives. However, the utilization of two screening instruments increased the chance of being screened positive, which also explains the high percentage of persons with false-positive results. Additional analyses showed that 31.5% of the persons who were detected exclusively through the LAST were false-positive cases compared to 11.5% of those detected through both screening measurements and 22.8% of those detected exclusively through the AUDIT. As 20.1% of all persons screening positive did not participate in the alcohol-specific diagnostic, we may have missed a certain proportion of persons with problem drinking. Particularly, persons who refused further study participation may have done so because of their own awareness of their problem drinking. Persons who screened positive and did not participate in the diagnostic interview were classified as under suspicion of problem drinking. This might not be well justified for all of these persons as some persons did not participate due to discharge. Finally, we did not use a continuum measurement of AUD. The validity of the diagnostic distinction between alcohol abuse and dependence is increasingly questioned [38,39].

We conclude that high proportions of inpatients with alcohol problem drinking are present in general hospitals, also when considering all general hospitals of an entire region. In particular, general hospital inpatients in rural areas are affected by problem drinking. As expected, not only AUDs are an issue, but also drinking above recommended levels is also common among hospital inpatients. Systematic screening of all general hospital inpatients and documentation of problem drinking are recommended [40]. Although barriers such as high rates of false-positive cases may refrain medical staff from systematic screening, it is important for the following reasons. Persons who drink above recommended levels have a special risk for health-related problems [6,7]. It can be expected that it is even more challenging for medical staff to spot these less obvious types of problem drinking. Systematic screening would lead to higher detection rates of problem drinking, particularly for drinking above recommended levels. In addition, it would remind physicians to initiate subsequent counseling or brief interventions for these patients. Interventions should also consider persons with alcohol dependence in remission to prevent relapse, in particular if they drink above recommended levels. The effectiveness of brief alcohol interventions among general hospital inpatients is inconclusive still [41]. For example, one recent study found no intervention effect [42], whereas we found an intervention effect on motivation to change drinking behavior [43]. Interventions should be tailored to the type of problem drinking. Interventions for persons drinking above recommended levels could aim at reducing the average alcohol intake or the number of heavy drinking episodes. Interventions for persons with alcohol dependence should aim for referral to formal alcohol treatment.

Acknowledgments

References

[1] Gerke P, Hapke U, Rumpf HJ, John U. Alcohol-related diseases in general hospital patients. Alcohol Alcohol 1997;32:179–84.

[2] Chen CH, Chen WJ, Cheng ATA. Prevalence and identification of alcohol use disorders among nonpsychiatric inpatients in one general hospital. Gen Hosp Psychiatry 2004;26:219–25.

[3] John U, Rumpf HJ, Hapke U. Estimating prevalence of alcohol abuse and dependence in one general hospital: an approach to reduce sample selection bias. Alcohol Alcohol 1999;34:786–94.

[4] Reynaud M, Malet L, Facy F, Glanddier P. Hospital morbidity of alcohol use disorders in the center of France. Alcohol Clin Exp Res 2000;24:1057–62.

[5] Smothers BA, Yahr HT, Sinclair MD. Prevalence of current DSM-IV alcohol use disorders in short-stay, general hospital admissions, United States, 1994. Arch Intern Med 2003;163:713–9.

[6] BMA. Alcohol: guidelines on sensible drinking. London (UK): British Medical Association; 1995.

[7] Gmel G, Rehm J, Kuntsche E. Binge drinking in Europe: definitions, epidemiology, and consequences. Sucht 2003;49:105–16.

[8] Bischof G, Rumpf H-J, Meyer C, Hapke U, John U. Medical care requested by smokers and at-risk alcohol consumers: results of a representative population survey. Gesundheitswesen 2004;66:114–20.

[9] Poikolainen K, Paljarvi T, Makela P. Alcohol and the preventive paradox: serious harms and drinking patterns. Addiction 2007;102: 571–8.

[10] Vitale SG, Van De Mheen D, Van De Wiel A, Garretsen HF. Alcohol and illicit drug use among emergency room patients in the Netherlands. Alcohol Alcohol 2006;41:553–9.

[11] Wu SI, Liu SI, Fang CK, Hsu CC, Sun YW. Prevalence and detection of alcohol use disorders among general hospital inpatients in eastern Taiwan. Gen Hosp Psychiatry 2006;28:48–54.

[12] Roche AM, Freeman T, Skinner N. From data to evidence, to action: findings from a systematic review of hospital screening studies for high risk alcohol consumption. Drug Alcohol Depend 2006;83:1–14.

[13] American Psychiatric Association, editor. Diagnostic and statistical manual of mental disorders (DSM-IV). Washington (DC): American Psychological Association; 1995.

[14] World Health Organization. The ICD-10 Classification of mental and behavioral disorders: clinical descriptions and diagnostic guidelines. Geneva: World Health Organization (WHO); 1992.

[15] Arolt V, Driessen M. Alcoholism and psychiatric comorbidity in general hospital inpatients. Gen Hosp Psychiatry 1996;18:271–7.

[16] Statistisches Landesamt M-V. Statistical yearbook Mecklenburg Western-Pomerania 2004. Schwerin: Statistical Office Mecklenburg-Western Pomerania; 2004.

[17] Statistisches Landesamt M-V. Statistical yearbook Mecklenburg-Western Pomerania 2005. Schwerin: Statistical Office Mecklenburg-Western Pomerania; 2005.

[18] Freyer J, Coder B, Bischof G, et al. Intention to utilize formal help in a sample with alcohol problems: a prospective study. Drug Alcohol Depend 2007;87:210–6.

[19] Saunders JB, Aasland OG, Babor TF, De La Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption Part II. Addiction 1993;88: 617–29.

[20] Rumpf HJ, Hapke U, Hill A, John U. Development of a screening questionnaire for the general hospital and general practices. Alcohol Clin Exp Res 1997;21:894–8.

[21] Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism screening instrument. Am J Psychiatry 1974;131: 1121–3.

[22] Selzer ML. The Michigan Alcoholism Screening Test: the quest for a diagnostic instrument. Am J Psychiatry 1971;127:1653–8.

[23] Dybek I, Bischof G, Grothues J, et al. The reliability and validity of the Alcohol Use Disorders Identification Test (AUDIT) in a German general practice population sample. J Stud Alcohol 2006;67:473–81.

[24] Lachner G, Wittchen HU, Perkonigg A, et al. Structure, content and reliability of the Munich-Composite International Diagnostic Interview (M-CIDI) substance use sections. Eur Addict Res 1998;4:28–41.

[25] Wittchen HU, Pfister H. DIA-X-Interviews: Manual for Screening and Interview. Frankfurt (Germany): Swets & Zeitlinger; 1997.

[26] Babor TF, Grant M, editors. Programme on substance abuse: project on identification and management of alcohol-related problems. Report on phase II: a randomized clinical trial of brief interventions in primary health care. Geneva: World Health Organization; 1992. p. 15–56.

[27] Cohen J. Statistical power analysis. Hillsdale: Lawrence Erlbaum; 1988.

[28] Altman DG, Machin D, Bryant TN, Gardner MJ, editors. Statistics with confidence. 2nd ed. London: BMJ Books; 2000.

[29] Statistisches Bundesamt. Statistical yearbook 2005: For the Federal Republic of Germany. Wiesbaden: Federal Statistical Office; 2005.

[30] Fortney JC, Booth BM, Blow FC, Bunn JY. The effects of travel barriers and age on the utilization of alcoholism treatment aftercare. Am J Drug Alcohol Abuse 1995;21:391–406.

[31] Kraus L, Bauernfeind R. Population survey on the consumption of psychoactive substances in the German adult population 1997. Sucht 1998;44:3–82.

[32] Meyer C, Rumpf HJ, Hapke U, John U. Prevalence of DSM-IV psychiatric disorders including nicotine dependence in the general population: results from the Northern German TACOS study. Neurol Psychiatry Brain Res 2001;9:75–80.

[33] Jacobi F, Wittchen HU, Holting C, et al. Prevalence, co-morbidity and correlates of mental disorders in the general population: results from the German Health Interview and Examination Survey (GHS). Psychol Med 2004;34:597–611.

[34] Baumeister SE, Alte D, Meyer C, John U. Health risk drinking and problematic consumption of alcohol in Pomerania: comparative analysis of the Study of Health in Pomerania (SHIP) compared with the Federal German Health and Examination Survey in 1998. Gesundheitswesen 2005;67:39–47.

[35] Rehm J, Room R, van den Brink W, Jacobi F. Alcohol use disorders in EU countries and Norway: an overview of the epidemiology. Eur Neuropsychopharmacol 2005;15:377–88.

[36] Babor TF, Higgins-Biddle JC, Saunders J, Monteiro M. AUDIT: the alcohol use disorders identification test: guidelines for use in primary health care. Geneva: World Health Organization; 2001.

[37] Reinert DF, Allen JP. The alcohol use disorders identification test: an update of research findings. Alcohol Clin Exp Res 2007;31:185–99.

[38] Li TK, Hewitt BG, Grant BF. The Alcohol Dependence Syndrome, 30 years later: a commentary. the 2006 H. David Archibald lecture. Addiction 2007;102:1522–30.

[39] Saha TD, Chou SP, Grant BF. Toward an alcohol use disorder continuum using item response theory: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Psychol Med 2006;36:931–41.

[40] Rumpf HJ, Bohlmann J, Hill A, Hapke U, John U. Physicians' low detection rates of alcohol dependence or abuse: a matter of methodological shortcomings? Gen Hosp Psychiatry 2001;23:133–7.

[41] Emmen MJ, Schippers GM, Bleijenberg G, Wollersheim H. Effectiveness of opportunistic brief interventions for problem drinking in a general hospital setting: systematic review. BMJ 2004;328:318.

[42] Saitz R, Palfai TP, Cheng DM, et al. Brief intervention for medical inpatients with unhealthy alcohol use: a randomized, controlled trial. Ann Intern Med 2007;146:167–76.

[43] Freyer-Adam J, Coder B, Baumeister SE, et al. Brief alcohol intervention for general hospital inpatients: a randomized controlled trial. Drug Alcohol Depend [in press].

6.2 Coder, B., Freyer-Adam, J., Lau, K., Riedel, J., Rumpf, H. J., Meyer, C., John, U. & Hapke, U. (2009)

Reported beverage consumed and alcohol-related diseases among male hospital inpatients with problem drinking

OTHER CLINICAL STUDIES

Reported Beverage Consumed and Alcohol-Related Diseases among Male Hospital Inpatients with Problem Drinking

Beate Coder[1,*], Jennis Freyer-Adam[1], Katharina Lau[1], Jeannette Riedel[2], Hans-Jürgen Rumpf[3], Christian Meyer[1], Ulrich John[1] and Ulfert Hapke[4]

[1]Institute of Epidemiology and Social Medicine, Ernst-Moritz-Arndt-University, Greifswald, Germany, [2]Institute for Medical Psychology, Ernst-Moritz-Arndt-University, Greifswald, Germany, [3]Department of Psychiatry and Psychotherapy, University of Lübeck, Lübeck, Germany, [4]Department of Epidemiology and Health Monitoring, Robert Koch-Institute, Berlin, Germany

*Corresponding author: Institute of Epidemiology and Social Medicine, Ernst-Moritz-Arndt-University of Greifswald, Walther-Rathenau-Str. 48, D-17487 Greifswald, Germany. Tel: +49-3834/867733; Fax: +49-3834/867701; E-mail: coder@uni-greifswald.de.

Abstract — Aims: The aim of this study was to examine if problem drinkers have varying risks of having alcohol-related diseases according to their reported beverage consumed. **Methods:** In a cross-sectional study all consecutive inpatients aged 18–64 years from four general hospitals of one catchment area were systematically screened for alcohol use. A total of 1011 men with problem drinking were used for this study. Routine treatment diagnoses for all participants were provided by hospital physicians and were classified into three categories according to their alcohol-attributable fractions (AAF; AAF = 0; AAF < 1; AAF = 1). **Results:** According to their reported beverage consumed, 53.0% of the participants were identified as exclusively beer drinkers, 14.1% exclusively spirits drinkers, 26.0% mixed beer and spirits drinkers and 6.9% individuals drinking wine exclusively or in combination with one or two other beverages (mixed wine drinkers). Compared to spirits drinkers and controlling for possible confounders (i.e. alcohol-associated characteristics, demographic variables), multinomial regressions revealed that beer drinkers, mixed beer and spirits drinkers, and mixed wine drinkers had lower odds of having diseases with AAF = 1 than spirits drinkers (e.g. for AAF = 1: beer versus spirits drinkers: OR = 0.42, CI: 0.25–0.72). Beer drinkers and mixed wine drinkers also had lower odds of having diseases with AAF < 1 than spirits drinkers (e.g. mixed wine versus spirits drinkers: OR = 0.36, CI: 0.18–0.72). **Conclusions:** These data suggest an association between the reported beverage consumed and alcohol-related diseases. Among hospitalized problem drinkers, spirits drinkers had the greatest risk of having diseases with AAF < 1 and with AAF = 1.

INTRODUCTION

Previous research on beverage type-related diseases focused on the protective effects of wine in populations of non-problem drinkers. For example, wine drinkers showed a lower risk of mortality due to coronary heart disease compared to those who consumed other beverages (Wannamethee and Shaper, 1999). Spirits are suspected to be more harmful than beer or wine due to their toxic effects (Anderson *et al*., 1993). Only few studies have investigated a beverage-specific risk of having alcohol-related diseases. Compared with beer or wine drinkers, spirits drinkers had a higher risk of developing oesophageal cancer (Castellsague *et al*., 1999) and coronary artery disease mortality (Klatsky and Armstrong, 1993). Findings of ecological studies on beverage-specific effects on mortality are inconclusive. Two studies found that (a) an increased sale of spirits nationwide was followed by an increase in liver disease mortality (Stokkeland *et al*., 2006) and (b) the consumption of spirits explained cirrhosis mortality nearly as well as average alcohol consumption (Kerr *et al*., 2000). However, in a European study, particularly an increased beer sale was related to all-cause mortality (Her and Rehm, 1998). Although more findings indicate a more harmful effect of spirits compared to other beverages, the relation of spirits and alcohol-related diseases remains unclear.

Previous studies reporting varying risks for morbidity and mortality among different beverage groups had several limitations: First, only a few studies controlled for heavy episodic drinking (Castellsague *et al*., 1999; Laatikainen *et al*., 2003). Second, ecological studies adjusted only for average alcohol consumption on an aggregated level (Klatsky and Armstrong,

1993; Stokkeland *et al*., 2006), inhibiting conclusive findings on an individual level. Third, previous studies focused on one specific alcohol-related disease, such as stomach cancer or cirrhosis of the liver (e.g. Nomura *et al*., 1990; Gronbaek *et al*., 2004), as opposed to any other alcohol-related morbidity risks.

Beyond these studies, beverage-specific research is limited in countries with national beverage preferences. For example, until the mid-1990s, Scandinavians mainly consumed spirits, whereas individuals in wine-producing countries such as France and Italy preferred wine (Leifman, 2002). However, in order to detect beverage-specific risks, it is necessary to study individuals with different beverage consumption styles. Additionally, it is important to study beverage-specific differences within '. . . a homogenous setting and homogenous drinking patterns' (Gronbaek *et al*., 2000, p. 417). Thus, one way to study beverage differences is to use a sample of general hospital inpatients with problem drinking, assuming that these individuals consume different beverages (especially beverages that are not typically consumed in the region) in large amounts.

To our knowledge, there is no study that comprises all of the following conditions to identify beverage-specific health risks (a) in one homogenous setting (e.g. all general hospitals of one region), (b) in individuals with problem drinking, and (c) with regard to a variety of alcohol-related diseases. The aim of this study was to provide data on the beverage-specific risks of having any alcohol-related disease among general hospital inpatients with problem drinking. We assume that differences found in general population samples also apply to this excess risk sample. We hypothesized that those who drink spirits are at a greater risk of suffering from an alcohol-related disease in

comparison to problem-drinking inpatients who consume other beverages.

METHOD

Sample

The sample described in this study was recruited as part of the Early Intervention at General Hospitals project (NCT00423904, conducted by the Research Collaboration Early Substance Use Intervention, EARLINT). The study was performed at all four general hospitals in one area in northeastern Germany, predominantly in the internal medicine and surgery wards.

In Germany, the per capita consumption of pure alcohol divides into 55% beer, 26% (sparkling) wine and 19% spirits (Meyer and John, 2008). Compared to Germany's general population, men in northeastern Germany have a slightly higher intake of pure alcohol, resulting from a higher consumption of spirits and fewer abstainers (Baumeister *et al.*, 2005). In addition, less wine is consumed among men compared to the rest of Germany.

From 28 April 2002 through 30 June 2004, all consecutively admitted hospital inpatients were asked to participate in an alcohol screening assessment with the provision that individuals were between ages 18 and 64 years and stayed for at least 24 h. The sampling approach included two stages: (a) screening and (b) ascertainment of alcohol problem drinking. A total of 14,332 participants were screened for problem drinking using the German adaptation of the Alcohol Use Disorder Identification Test (AUDIT, Saunders *et al.*, 1993) and the Lübeck Alcohol Dependence and Abuse Screening Test (LAST, Rumpf *et al.*, 1997), with cutoff values of 8 and 2, respectively. For 20.4% ($n = 2924$) of these individuals, a positive screening result was obtained. Of those participants, 79.9% ($n = 2337$) agreed to participate in a diagnostic interview using the Munich Composite International Interview (M-CIDI, Wittchen and Pfister, 1997; Lachner *et al.*, 1998), a standardized software program based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria (American Psychiatric Association, 1995). Individuals who fulfilled criteria solely for alcohol dependence in remission but showed no problem drinking in the past 12 months ($n = 448$) were not included further in the study. A total of 1281 individuals received the diagnosis of alcohol dependence or abuse or were deemed as either at-risk or heavy episodic drinkers in the past 12 months. At-risk drinkers were characterized by a daily average consumption of 30 g or more of pure alcohol for men and 20 g or more for women (British Medical Association, 1995). Men who consumed 100 g or more of pure alcohol and women who consumed 60 g or more of pure alcohol on one occasion at least twice a month were considered to be heavy episodic drinkers (Babor and Grant, 1992). Individuals in those categories of 'problem drinking' were asked to participate in an intervention study. Because of the low proportion of women with problem drinking (7.0%, $n = 90$), analyses were restricted to males ($n = 1191$). Of these, 90.8% ($n = 1081$) gave informed consent for further participation in the study. Seventy more individuals were excluded for the following reasons: no routine diagnoses could be obtained for 55 individuals and 15 individuals did not report their beverage consumption. The final sample consisted of 1011 males.

On average, these individuals stayed for 8.4 days (SD = 7.3) at the hospital. Sample recruitment is described in more detail elsewhere (Freyer-Adam *et al.*, 2008). The ethics committee of the University of Greifswald approved the study procedures.

Measures

Beverage consumption. Beverage consumption was assessed with an open question by the M-CIDI, 'What and how much did you drink on a typically drinking day within the past 12 months'. On the basis of this free text information, we generated different beverage variables. First, to analyse each beverage type separately, three continuous variables (% beer, % spirits, % wine) were calculated to indicate proportions of beer, spirits or wine in the total alcohol consumption (0–100%). Second, to create mutually exclusive categories, we classified all individuals into four groups: (a) individuals drinking beer exclusively and no other beverages (beer drinkers), (b) individuals drinking spirits exclusively and no other beverages including liqueur, long drinks and cocktails (spirits drinkers), (c) individuals drinking spirits and beer without any wine consumption (mixed beer and spirits drinkers) and (d) individuals drinking wine exclusively or in combination with beer and/or spirits (mixed wine drinkers).

Pattern and quantity of alcohol consumption. The pattern and quantity of alcohol consumption was assessed using the quantity–frequency index derived from the M-CIDI. Frequency was assessed using five categories: almost daily, three to four times a week, one to two times a week, one to three times a month and less than once a month. We did not use standard drinks to assess the quantity of alcohol consumed. Instead, an open question assessed the quantity of alcohol consumed on a typical drinking day, which was then converted (beverage specific) into index units (one index unit corresponded to 9 g of pure alcohol). The quantity–frequency index was computed using the mean of the frequency categories. Outliers regarding daily alcohol consumption were determined using the mean plus three times standard deviation. Under this criterion, 18 cases above the threshold value of 487.2 g were assigned this score as maximum consumption. Heavy episodic drinking was assessed using the question, 'How often within the past 12 months did you drink eight drinks on one occasion?' (one standard drink corresponded to 12 g of pure alcohol). Individuals who reported at least two instances of drinking per month above this criterion were considered to be heavy episodic drinkers (Babor and Grant, 1992). A dichotomous variable for heavy episodic drinking (yes versus no) was then calculated.

Outcome. To determine if the participants' diseases were attributable to alcohol, the International Classification of Diseases, 10th Revision (ICD-10), diagnostic codes (World Health Organization, 1992) provided by the hospitals were evaluated. We used one principal and one secondary ICD-10 diagnostic code. Classification of the diagnostic codes was performed according to their relation to alcohol consumption following the approach of Rehm *et al.* (2006). Alcohol-attributable fractions (AAFs) have been defined as the proportion by which disease cases, injury events or deaths would be reduced if alcohol use and misuse were eliminated among the population (Shultz *et al.*, 1991). Participants with ICD-10 codes indicating diseases 100% attributable to alcohol by definition (e.g. alcohol dependence, alcohol abuse, alcohol-induced chronic

Table 1. Demographics and alcohol-associated characteristics for beverage-specific groups[a]

	Total (n = 1011)	Beer (n = 536)	Spirits (n = 142)	Mixed beer and spirits (n = 263)	Mixed wine (n = 70)	Design based F (df)	P	$f^{2\,b}/\Phi'^{c}$
Age—M (SD)	40.8 (12.0)	40.8 (12.0)	40.2 (11.5)	41.3 (12.4)	40.4 (11.4)	0.03 (1, 28)	0.854	0.001
Intimate partner—n (% yes)	544 (56.1)	307 (59.3)	65 (47.5)	132 (53.2)	40 (59.7)	2.86 (2.46, 69.01)	0.053	0.088
Level of education, years—n (%)						3.12 (4.11, 114.96)	0.017	0.104
<10	408 (41.0)	208 (39.4)	58 (41.4)	116 (44.8)	26 (38.8)			
10–11[d]	462 (46.5)	249 (47.2)	73 (52.2)	117 (45.2)	23 (34.3)			
>11	124 (12.5)	71 (13.4)	9 (6.4)	26 (10.0)	18 (26.9)			
Employment—n (%)						2.64 (4.91, 137.36)	0.027	0.078
Full/halftime	340 (34.9)	194 (37.5)	37 (27.2)	78 (31.0)	31 (44.9)			
Job-seeking	418 (42.9)	208 (40.2)	70 (51.5)	117 (46.4)	23 (33.3)			
Retired/others[e]	216 (22.2)	115 (22.3)	29 (21.3)	57 (22.6)	15 (21.8)			
Smoker—n (%)						7.40 (5.22, 146.16)	<0.001	0.129
Never	98 (9.8)	62 (11.6)	10 (7.0)	19 (7.3)	7 (10.1)			
Current	717 (71.5)	350 (65.7)	119 (83.8)	206 (79.6)	42 (60.9)			
Former	188 (18.7)	121 (22.7)	13 (9.2)	34 (13.1)	20 (29.0)			
Heavy episodic drinking—n (% yes)	730 (72.2)	348 (64.9)	125 (88.0)	216 (82.1)	41 (58.6)	17.42 (2.69, 75.27)	<0.001	0.225
Gram alcohol per day—M (SD)	99.9 (103.0)	80.8 (73.0)	115.1 (117.9)	135.4 (133.3)	83.6 (97.6)	7.15 (1, 28)	0.012	0.026
AAF—n (%)						5.07 (3.90, 109.15)	0.001	0.137
=0	392 (38.8)	232 (43.3)	34 (24.0)	88 (33.5)	38 (54.3)			
<1	377 (37.3)	201 (37.5)	55 (38.7)	100 (38.0)	21 (30.0)			
=1	242 (23.9)	103 (19.2)	53 (37.3)	75 (28.5)	11 (15.7)			

[a]Using svyset commands (primary sampling unit = clinical wards), [b]continuous variables, [c]categorical variables, [d]including five persons still in school, [e]e.g. housewives; M = mean, n = number of observations, SD = standard deviation, $\Phi' > 0.058$ small effect, $\Phi' > 0.173$ medium effect, $\Phi' > 0.289$ large effect, $f^2 > 0.02$ small effect, $f^2 > 0.15$ medium effect, $f^2 > 0.35$ large effect.

pancreatitis, alcoholic gastritis) were assigned an AAF of 1. Participants with ICD-10 diagnostic code diseases partially attributable to alcohol (e.g. liver cirrhosis, oesophageal cancer, epilepsy, hypertensive disease) were assigned an AAF of <1. Contrary to Rehm *et al.* (2006), ICD-10 codes starting with X, Y or Z representing injuries did not appear in our database. Instead, injuries received codes starting with S and T, which were not classified by Rehm *et al.* (2006). All S-codes and those T-codes that represent injuries were assigned AAF <1 (e.g. fractures, burns, open wounds, contusions). Diseases with no empirical relation to alcohol or with a possibly protective effect associated with alcohol (e.g. diabetes mellitus, ischaemic heart disease, ischaemic stroke, cholelithiasis) were assigned AAF = 0. T-codes that did not represent injuries were also assigned AAF = 0 (e.g. complications of surgical and medical care). If two different AAFs were ascertained for the principal and the secondary ICD-10 diagnostic codes, the highest AAF was chosen.

The screening questionnaire also included demographic variables such as age, level of education, current employment status, having an intimate partner and current smoking status.

Data analysis

Statistical analyses were performed using Intercooled STATA 9.2 (StataCorp, 2005). To take into account clustering within wards, we applied sample survey methods that adjust the standard errors using svyset commands. Clinical wards (n = 29) were chosen as the primary sampling unit. First, descriptives (means, standard deviations, absolute numbers, percentages) and bivariate analyses (linear regressions, χ^2 statistics) were conducted. We used Cramer's Φ' for categorical variables and f^2 for continuous variables to estimate the effect size (Cohen, 1988).

Second, multinomial logistic regression analyses were calculated to predict the three different levels of alcohol-attributable diseases with all beverage consumption variables as predictors (categorical variable, proportion of each beverage). AAF = 0 was used as the reference group. Odds ratios (ORs) and 95% confidence intervals (CIs) are presented. To identify differences between all three groups of alcohol-attributable diseases, all analyses were conducted twice with exchanged reference groups. Two models were calculated to estimate the beverage-specific effect with and without adjustment for possible confounders. The first model included one beverage variable only. The second model additionally adjusted for demographics and alcohol-associated characteristics that were significant in predicting the three groups of alcohol-attributable diseases. Subjects with missing values were deleted list-wise.

RESULTS

Sample

In Table 1, demographic data are shown for the total sample and the four beverage groups according to the categorized beverage variable. In our sample, 53.0% of the participants were identified as beer drinkers, 14.1% as spirits drinkers, 26.0% as mixed beer and spirits drinkers and 6.9% as mixed wine drinkers. The mean age of the sample was 40.8 years, and 56.1% had a partner (Table 1). Forty-one percent had <10 years of education, 42.9% were job-seeking and 71.5% were current smokers.

Differences regarding demographics and alcohol-associated characteristics among the four beverage groups were analysed. With the exception of age, all bivariate comparisons between the four groups were significant or showed at least small effects. Compared to all other groups, spirits drinkers less often had an intimate partner and more often were current smokers and job seekers. Mixed beer and spirits drinkers had the highest proportion of individuals with <10 years of education. Mixed wine drinkers comprised the highest proportion of

Table 2. Demographics and alcohol-associated characteristics for groups with different alcohol-attributable fractions[a]

	AAF = 0 (n = 392)	AAF < 1 (n = 377)	AAF = 1 (n = 242)	Design based F (df)	P	f^{2b}/ Φ'^{c}
Age—M (SD)	41.0 (13.1)	39.9 (12.9)	41.9 (8.1)	0.21 (1, 28)	0.648	0.006
Intimate partner—n (% yes)	240 (63.2)	204 (56.4)	100 (43.9)	7.31 (1.74, 48.74)	0.003	0.149
Level of education, years—n (%)				3.38 (2.61, 73.15)	0.028	0.090
<10	143 (37.2)	147 (39.7)	118 (49.4)			
10–11[d]	183 (47.5)	173 (46.8)	106 (44.3)			
>11	59 (15.3)	50 (13.5)	15 (6.3)			
Employment—n (%)				12.5 (3.10, 86.75)	<0.001	0.173
Full/halftime	155 (40.8)	137 (38.1)	48 (20.5)			
Job-seeking	121 (31.8)	151 (41.9)	146 (62.4)			
Retired/others[e]	104 (27.4)	72 (20.0)	40 (17.1)			
Smoker—n (%)				8.37 (3.04, 85.25)	<0.001	0.132
Never	32 (8.2)	40 (10.7)	26 (10.9)			
Current	257 (65.9)	264 (70.6)	196 (82.0)			
Former	101 (25.9)	70 (18.7)	17 (7.1)			
Heavy episodic drinking—n (% yes)	255 (65.1)	264 (70.0)	211 (87.2)	10.65 (1.57, 43.88)	<0.001	0.194
Gram alcohol per day—M (SD)	78.9 (84.2)	86.7 (94.8)	155.6 (121.9)	13.57 (1, 28)	0.001	0.076

[a]Using svyset commands (primary sampling unit = clinical wards), [b]continuous variables, [c]categorical variables, [d]including five persons still in school, [e]e.g. housewives; M = mean, n = number of observations, SD = standard deviation, $\Phi' > 0.058$ small effect, $\Phi' > 0.173$ medium effect, $\Phi' > 0.289$ large effect, $f^2 > 0.02$ small effect, $f^2 > 0.15$ medium effect, $f^2 > 0.35$ large effect.

Table 3. Multinomial logistic regression analyses predicting AAFs[a]

		OR (CI)	
	AAF = 0 (n = 392)	AAF < 1 (n = 377)	AAF = 1 (n = 242)
Categorical beverage variable			
Model I (n = 1011)			
Spirits	ref	ref	ref
Beer	ref	0.536 (0.348–0.823)	0.285 (0.170–0.478)
Mixed beer and spirits	ref	0.702 (0.416–1.187)	0.547 (0.341–0.876)
Mixed wine	ref	0.342 (0.190–0.614)	0.186 (0.102–0.338)
Model II[b] (n = 919)			
Spirits	ref	ref	ref
Beer	ref	0.615 (0.383–0.986)	0.422 (0.247–0.721)
Mixed beer and spirits	ref	0.742 (0.413–1.332)	0.452 (0.255–0.802)
Mixed wine	ref	0.363 (0.182–0.724)	0.279 (0.137–0.567)
Proportion of each beverage			
% Spirits			
Model I (n = 1005)	ref	1.007 (1.003–1.011)	1.014 (1.009–1.019)
Model II[b] (n = 917)	ref	1.006 (1.001–1.010)	1.009 (1.004–1.014)
% Beer			
Model I (n = 1005)	ref	0.995 (0.991–0.999)	0.989 (0.984–0.994)
Model II[b] (n = 917)	ref	0.996 (0.992–1.001)	0.993 (0.988–0.998)
% Wine			
Model I (n = 1005)	ref	0.994 (0.986–1.001)	0.985 (0.971–0.999)
Model II[b] (n = 917)	ref	0.993 (0.985–1.002)	0.991 (0.976–1.007)

[a]Using svyset commands (primary sampling unit = clinical wards), [b]Model I + gram alcohol per day, heavy episodic drinking, intimate partner, level of education, employment status and smoking; ref = reference group, OR = odds ratio, CI = 95% confidence interval.

individuals with >11 years of education in comparison to the other groups. Spirits drinkers and individuals with mixed beer and spirits consumption had the highest proportion of individuals with heavy episodic drinking. Mixed beer and spirits drinkers had the highest average alcohol consumption per day. The highest proportion of individuals with AAF = 0 was found among mixed wine drinkers, whereas the highest proportion of individuals with AAF = 1 was found among spirits drinkers.

Multinomial logistic regression

To identify possible confounders, differences in demographics and alcohol-associated characteristics among the three groups of alcohol-attributable diseases were analysed (Table 2). With the exception of age, all tested variables showed significant differences or at least small effects and were therefore considered confounders.

Two multinomial regression models that predicted the three groups of alcohol-attributable diseases were tested for different beverage variables. First, the categorized beverage variable was used. In both models, beer drinkers, mixed beer and spirits drinkers, and mixed wine drinkers showed lower odds of having AAF = 1 compared to spirits drinkers (Table 3). Beer drinkers and mixed wine drinkers also showed lower odds of having AAF < 1 compared to spirits drinkers. After adjusting for possible confounders, significance remained and the ORs for all but mixed beer and spirits drinkers increased.

Next, to investigate the effects of spirits, beer and wine consumption separately, their contributions to total alcohol consumption were used as separate predictors in subsequent multinomial regressions. The same two models as above were tested for each beverage. Both models showed that %spirits consumption had slightly higher odds for having a disease with AAF < 1 or AAF = 1 and %beer consumption had slightly lower odds for having a disease with AAF = 1. No significant relationship was found for %wine consumption when controlling for possible confounders.

To identify differences between individuals with AAF < 1 and AAF = 1, analyses were repeated with AAF < 1 used as the reference group. Significant differences between AAF < 1 versus AAF = 1 were found in the unadjusted models for one comparison of the categorical beverage variable (beer drinkers versus spirits drinkers OR = 0.532, CI: 0.319–0.887), %spirits consumption (OR = 1.007, CI: 1.002–1.012) and %beer consumption (OR = 0.994, CI: 0.989–0.999). These differences disappeared in the adjusted models.

DISCUSSION

The main finding of our study was that general hospital inpatients with problem drinking who consumed solely spirits were at a higher risk of having a disease partially attributable to alcohol than those who consumed beer or mixed wine. Moreover, spirits drinkers were at a higher risk of having a disease that was 100% attributable to alcohol than those who consumed beer, mixed wine, or mixed beer and spirits. This finding is particularly interesting as we controlled for average alcohol consumption among an excess-risk sample (with a high level of average alcohol consumption) regarding alcohol-related diseases. Our results cannot be explained by spirits drinkers consuming a larger amount of ethanol than individuals with other beverage consumption styles. Quite contrarily, mixed beer and spirits drinkers had the highest average alcohol consumption of all beverage groups. However, compared to spirits drinkers, they had a lower proportion of individuals with AAF > 0 indicating that the consumption of spirits is associated with a higher risk of having an alcohol-related disease.

Our results are in line with previous studies that reported a more harmful effect of spirits compared to other beverages (Klatsky and Armstrong, 1993; Castellsague *et al.*, 1999; Kerr *et al.*, 2000; Stokkeland *et al.*, 2006). Moreover, our results are consistent with a recent study that found spirits to be less protective than beer or wine (Athyros *et al.*, 2007). In contrast to previous studies, we were able to study a sample from a relatively homogenous setting with a variety of alcohol-related diseases. Because we included all diseases attributable to alcohol, our study was not limited to one specific disease. Beyond that, our results were adjusted for possible confounders such as smoking. Although the confidence intervals were large, which was probably due to the small sample size, we still found significant effects.

In addition, individuals consuming a higher proportion of spirits relative to total alcohol consumption showed a slightly higher risk for having diseases with AAF > 0, even after adjusting for possible confounders. As this was not true for three of the four adjusted models regarding the other continuous beverage variables, the increased harmfulness of spirits consumption

was confirmed by the second set of analyses. Although our results were controlled for heavy episodic drinking, we cannot rule out that the duration of individual drinking episodes influenced the results. To consume the same amount of ethanol, beer and wine drinkers have to consume more liquid due to the lower alcohol content of beer and wine in comparison to spirits. It is likely that a larger amount of liquid takes a longer time to drink. In contrast, spirits drinkers may consume larger quantities of alcohol in a single period. This may lead to greater toxic events and subsequent damage, which is likely to result in more alcohol-related diseases.

Some limitations of this study should be noted. The first concerns our four categories of beverage groups. The mixed wine drinkers formed the smallest group and largely consisted of individuals with mixed beverage consumption. Due to the protective effect of wine (e.g. Athyros *et al.*, 2007), individuals who consume solely wine might have shown a lower risk of alcohol-attributable diseases compared to mixed wine drinkers. We compensated for this by repeating the analyses with continuous beverage variables. In accordance with the current literature, our mixed wine drinkers had a higher level of education and were less often smokers than the other groups of drinkers (e.g. Klatsky *et al.*, 1990). Second, we were not able to control for other confounders such as diet, physical activity or body mass index, all of which might be correlated with beverage consumption (Tjonneland *et al.*, 1999; Wannamethee and Shaper, 1999) and which have a substantial impact on the individual's health. Therefore, differences between beverage groups might be smaller than implied by our analyses. We compensated for this problem by controlling for level of education, employment and smoking status, which we assumed to be approximate estimations of other health behaviours (e.g. Johansson *et al.*, 1999; Schumann *et al.*, 2001; Qi *et al.*, 2006; Duvigneaud *et al.*, 2007). Third, the beverage consumption used in this study reflects current consumption. We do not know if the reported beverage consumption is stable over the course of a lifetime. Some alcohol-related diseases might have been caused by consumption styles at earlier drinking stages. Fourth, we may have underestimated the proportions of AAF < 1 and AAF = 1. As not all hospitals supplied more than one secondary diagnosis, we were not able to consider several secondary diagnoses. However, additional secondary diagnoses could have included diagnoses with AAF = 1 or AAF < 1. Fifth, we were not able to control for the onset of excessive drinking. As groups did not differ in age and as age is often correlated with the duration of excessive drinking, this might not have been a problem in this sample. Finally, generalibility is affected in two ways as we cannot draw any conclusions in reference to women or the general population. More precisely, our sample was composed of general hospital inpatients with problem drinking in north-eastern Germany. A sample selection bias is likely because hospitalized individuals may experience more severe somatic consequences from drinking that require hospitalization than a sample of problem drinkers from the general population. Further research should verify if our results also apply to other regions and countries. Finally, cross-sectional data do not allow conclusions on causality.

In a large sample of adults in a general hospital setting, we demonstrated that individuals with problem drinking who solely consumed spirits were at a higher risk of having diseases 100% attributable to alcohol than problem drinkers who

consumed other beverages or who reported a mixed beverage preference. However, it cannot be concluded from this finding that the consumption of other beverages is 'safe' as individuals with problem drinking who did not solely consume spirits also showed diseases that were at least partially attributable to alcohol.

REFERENCES

American Psychiatric Association ed. (1995) *Diagnostic and statistical manual of mental disorders (DSM-IV)*. Washington, DC: American Psychological Association.

Anderson P, Cremona A, Paton A *et al.* (1993) The risk of alcohol. *Addiction* **88**:1493–508.

Athyros VG, Liberopoulos EN, Mikhailidis DP *et al.* (2007) Association of drinking pattern and alcohol beverage type with the prevalence of metabolic syndrome, diabetes, coronary heart disease, stroke, and peripheral arterial disease in a Mediterranean cohort. *Angiology* **58**:689–97.

Babor TF, Grant M. eds (1992) *Programme on Substance Abuse: Project on Identification and Management of Alcohol-Related Problems. Report on Phase II: A Randomized Clinical Trial of Brief Interventions in Primary Health Care*. Geneva: World Health Organization.

Baumeister SE, Alte D, Meyer C *et al.* (2005) Riskanter Alkoholkonsum und alkoholbezogenen Störungen in Vorpommern: Die Studie 'Leben und Gesundheit in Vorpommern' (SHIP) und der Bundesgesundheitssurvey 1998 im Vergleich [Health risk drinking and problematic consumption of alcohol in Pomerania: comparative analysis of the Study of Health in Pomerania (SHIP) compared with the Federal German Health and Examination Survey in 1998]. *Gesundheitswesen* **67**:39–47.

British Medical Association. (1995) *Alcohol: Guidelines on Sensible Drinking*. London: British Medical Association.

Castellsague X, Munoz N, De Stefani E *et al.* (1999) Independent and joint effects of tobacco smoking and alcohol drinking on the risk of esophageal cancer in men and women. *Int J Cancer* **82**:657–64.

Cohen J. (1988) *Statistical Power Analysis*. Hillsdale, NJ: Lawrence Erlbaum.

Duvigneaud N, Wijndaele K, Matton L *et al.* (2007) Socio-economic and lifestyle factors associated with overweight in Flemish adult men and women. *BMC Public Health* **7**:23.

Freyer-Adam J, Coder B, Baumeister SE *et al.* (2008) Brief alcohol intervention for general hospital inpatients: a randomized controlled trial. *Drug Alcohol Depend* **93**:233–43.

Gronbaek M, Becker U, Johansen D *et al.* (2000) Type of alcohol consumed and mortality from all causes, coronary heart disease, and cancer. *Ann Intern Med* **133**:411–9.

Gronbaek M, Jensen MK, Johansen D *et al.* (2004) Intake of beer, wine and spirits and risk of heavy drinking and alcoholic cirrhosis. *Biol Res* **37**:195–200.

Her M, Rehm J. (1998) Alcohol and all-cause mortality in Europe 1982–1990: a pooled cross-section time-series analysis. *Addiction* **93**:1335–40.

Johansson L, Thelle DS, Solvoll K *et al.* (1999) Healthy dietary habits in relation to social determinants and lifestyle factors. *Br J Nutr* **81**:211–20.

Kerr WC, Fillmore KM, Marvy P. (2000) Beverage-specific alcohol consumption and cirrhosis mortality in a group of English-speaking beer-drinking countries. *Addiction* **95**:339–46.

Klatsky AL, Armstrong MA. (1993) Alcoholic beverage choice and risk of coronary artery disease mortality: do red wine drinkers fare best? *Am J Cardiol* **71**:467–9.

Klatsky AL, Armstrong MA, Kipp H. (1990) Correlates of alcoholic beverage preference: traits of persons who choose wine, liquor or beer. *Br J Addict* **85**:1279–89.

Laatikainen T, Manninen L, Poikolainen K *et al.* (2003) Increased mortality related to heavy alcohol intake pattern. *J Epidemiol Community Health* **57**:379–84.

Lachner G, Wittchen HU, Perkonigg A *et al.* (1998) Structure, content and reliability of the Munich-Composite International Diagnostic Interview (M-CIDI) substance use sections. *Eur Addict Res* **4**:28–41.

Leifman H. (2002) Trends in population drinking. In Norstrom T (ed.). *Alcohol in Postwar Europe: Consumption, Drinking Patterns, Consequences and Policy Responses in 15 European Countries*. Stockholm: Almqvist & Wiksell International, 49–81.

Meyer C, John U. (2008) Alkohol—Zahlen und Fakten zum Konsum [Alcohol—data and facts on the consumption]. In Deutsche Hauptstelle für Suchtfragen e.V. [German Centre for Addiction] (ed.). *Jahrbuch Sucht 2008 [Yearbook Addiction 2008]*. Geesthacht: Neuland, 23–53.

Nomura A, Grove JS, Stemmermann GN *et al.* (1990) A prospective study of stomach cancer and its relation to diet, cigarettes, and alcohol consumption. *Cancer Res* **50**:627–31.

Qi V, Phillips SP, Hopman WM. (2006) Determinants of a healthy lifestyle and use of preventive screening in Canada. *BMC Public Health* **6**:275.

Rehm J, Patra J, Popova S. (2006) Alcohol-attributable mortality and potential years of life lost in Canada 2001: implications for prevention and policy. *Addiction* **101**:373–84.

Rumpf HJ, Hapke U, Hill A *et al.* (1997) Development of a screening questionnaire for the general hospital and general practices. *Alcohol Clin Exp Res* **21**:894–8.

Saunders JB, Aasland OG, Babor TF *et al.* (1993) Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption part II. *Addiction* **88**:617–29.

Schumann A, Hapke U, Rumpf HJ *et al.* (2001) The association between degree of nicotine dependence and other health behaviours. Findings from a German general population study. *Eur J Public Health* **11**:450–2.

Shultz JM, Rice DP, Parker DL *et al.* (1991) Quantifying the disease impact of alcohol with ARDI software. *Public Health Rep* **106**:443–50.

StataCorp. (2005) *Stata User's Guide Release 9.2*. College Station, TX, Stata Corporation.

Stokkeland K, Brandt L, Ekbom A *et al.* (2006) Morbidity and mortality in liver diseases in Sweden 1969–2001 in relation to alcohol consumption. *Scand J Gastroenterol* **41**:463–8.

Tjonneland A, Gronbaek M, Stripp C *et al.* (1999) Wine intake and diet in a random sample of 48763 Danish men and women. *Am J Clin Nutr* **69**:49–54.

Wannamethee SG, Shaper AG. (1999) Type of alcoholic drink and risk of major coronary heart disease events and all-cause mortality. *Am J Public Health* **89**:685–90.

Wittchen HU, Pfister H. (1997) *DIA-X-Interviews: Manual für Screening-Verfahren und Interview (DIA-X-Interviews: Manual for Screening and Interview)*. Frankfurt, Germany: Swets & Zeitlinger.

World Health Organization. (1992) *The ICD-10 Classification of Mental and Behavioral Disorders: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organization (WHO).

6.3 Coder, B., Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H. J., John, U. & Hapke, U. (2008)

Male at-risk drinkers with heavy episodic drinking: a subclinical diagnosis?

Male At-Risk Drinkers With Heavy Episodic Drinking: A Subclinical Diagnosis?*

BEATE CODER, DIPL.-PSYCH.,[†] JENNIS FREYER-ADAM, PH.D., KATHARINA LAU, DIPL.-PSYCH., GALLUS BISCHOF, PH.D.,[†] JEANNETTE RIEDEL, PH.D.,[†] HANS-JÜRGEN RUMPF, PH.D.,[†] ULRICH JOHN, PH.D., AND ULFERT HAPKE, PH.D.

Ernst-Moritz-Arndt-University of Greifswald, Institute of Epidemiology and Social Medicine, Walther-Rathenau-Str. 48, 17487 Greifswald, Germany

ABSTRACT. **Objective:** The aim of this study was to examine to what extent general hospital inpatients with risky drinking patterns differ regarding alcohol-associated characteristics. In particular, we tested whether persons with at-risk and heavy episodic drinking (ARHE) differ from those persons with at-risk drinking only (AR) and heavy episodic drinking only (HE). **Method:** The participants were recruited using a two-stage sampling process: (1) screening and (2) diagnostic. All inpatients from four general hospitals, ages 18-64 years (N = 14,332), were systematically screened for alcohol use. For this study, men with AR, HE, or ARHE (n = 425) were used, and men with current alcohol dependence or alcohol abuse were excluded. The severity of the alcohol problem was assessed by the number of lifetime Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, diagnostic criteria met. Among the participants' diseases, those that were 100% attributable to alcohol (assigned an alcohol-attributable fraction of 1 [AAF = 1]) were analyzed. **Results:** Of the sample, 35.3% of the persons were identified with AR, 22.6% with HE, and 42.1% with ARHE. Multinomial logistic regression revealed that, when controlling for age, ARHE was associated with increased odds of having a more severe alcohol problem (odds ratio [OR] = 2.06, confidence interval [CI]: 1.23-3.45), using formal help (OR = 2.21, CI: 1.02-4.79), and having diseases with AAF = 1 (OR = 3.43, CI: 1.58-7.43), compared with AR. **Conclusions:** Among at-risk drinkers, persons with ARHE are a special subgroup because there appears to be an indication of a subclinical diagnosis. To provide adequate intervention, future research and clinical practice should distinguish between different risky drinking patterns. (*J. Stud. Alcohol Drugs* **69:** 85-90, 2008)

A LCOHOL-RELATED PROBLEMS ARE MAINLY caused by persons with a risky drinking pattern without alcohol dependence or abuse (Babor et al., 2005). There are two risky drinking patterns: (1) at-risk drinking and (2) heavy episodic drinking. According to the British Medical Association (1995), at-risk drinkers are characterized by a daily average consumption of 30 g or more of pure alcohol for men and 20 g or more for women. Heavy episodic drinkers are persons with irregular excessive alcohol consumption. Both drinking groups have a higher risk for somatic problems; in particular, heavy episodic drinkers experience a higher rate of injuries and accidents (British Medical Association, 1995; Gmel et al., 2003). They have a higher risk of being admitted to general hospitals (Bischof et al., 2004; Poikolainen et al., 2007). Therefore, at-risk or heavy episodic drinkers are expected to constitute a substantial proportion of general hospital inpatients.

Heavy episodic drinking appears to hold a special health and mortality risk for individuals, even when the effects of total alcohol intake are controlled for (Jarvenpaa et al., 2005; Kauhanen et al., 1997; Rehm et al., 2001). Thus, it is interesting to distinguish between the following three risky drinking patterns: (1) at-risk drinking only (AR), (2) heavy episodic drinking only (HE), and (3) a combined pattern of persons who conduct both at-risk and heavy episodic drinking (ARHE).

We lack knowledge about the distribution of these groups among general hospital inpatients and how they are characterized. Current research has shown that these groups (without further characterization of these groups) are at a different risk for mortality and morbidity (e.g., Jarvenpaa et al., 2005; Kauhanen et al., 1997). Knowing more about these groups would help to adjust brief interventions to different risky drinking patterns. For example, it is not sufficient to suggest that at-risk drinking persons who also drink excessively on weekends should reduce their daily consumption, because heavy episodic drinking is still associated with health-related consequences. Because research on heavy episodic drinking has predominantly focused on younger persons (e.g., college students; Wechsler et al., 1994), heavy episodic drinking appears to be associated with younger age groups, and, generally, counselors will not expect heavy

episodic drinking in persons older than age 29. Although heavy episodic drinking is not limited to young persons (Yang et al., 2007), currently, little is known about heavy episodic drinking among middle-aged persons. Moreover, although evidence from the general population suggests that heavy episodic drinkers have limited social resources (e.g., less education and higher rates of unemployment) in comparison with persons without heavy episodic drinking (Kuntsche et al., 2004), differences regarding demographics among risky drinkers have not been well investigated.

To our knowledge, there is no study focusing on the investigation of differences between general hospital inpatients with AR, HE, and ARHE. Therefore, the aim of this study is to provide data on the distribution of these groups among general hospital inpatients and to determine whether these three groups vary in demographic and alcohol-related characteristics. We assume that (1) there are considerable proportions of general hospital inpatients with AR, HE, and ARHE and that (2) persons with ARHE have a more problematic drinking pattern owing to their cumulative risky behavior of practicing two risky drinking patterns.

Method

Sample

The sample described in this study was recruited as part of the Early Intervention at General Hospitals project (NCT00423904; conducted by the Research Collaboration Early substance use Intervention [EARLINT]). The study was performed at four general hospitals in northeastern Germany, predominantly on the internal medicine and surgery wards. From April 28, 2002, through June 30, 2004, all consecutively admitted hospital inpatients were asked to participate in an alcohol screening assessment, with the provision that individuals were between ages 18-64 and stayed for at least 24 hours. The sampling approach included two stages: (1) screening and (2) ascertainment of diagnosis. A total of 14,332 participants were screened for alcohol problem behavior. For 20.4% (n = 2,924) of these persons, a positive screening result was identified. Of those participants, 79.9% (n = 2,337) of them agreed to participate in a diagnostic interview. Individuals who solely fulfilled criteria for alcohol dependence in remission, but who showed no alcohol problem behavior in the past 12 months (n = 448), were not included further in the study. A total of 1,281 individuals received the diagnosis of alcohol dependence or alcohol abuse or were at-risk or heavy episodic drinkers in the past 12 months. They were asked to participate in an intervention study. Of those individuals, 1,166 participants gave informed consent. Persons who currently (past 12 months) met Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), criteria for alcohol dependence (46.8%, n = 599) or alcohol abuse (12.4%, n = 159) were

excluded from further analyses, leaving 453 participants with AR, HE, and ARHE. Because of the low proportion of women with risky drinking patterns (6.2%, n = 28), the final sample for this study included men only (n = 425). The recruitment of the sample is described in more detail elsewhere (Freyer et al., 2007).

Measures

The self-administered screening for alcohol problem behavior comprised the German adaptation of the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) and the Luebeck Alcohol Dependence and Abuse Screening Test (LAST; Rumpf et al., 1997), with cutoff values of 8 and 2, respectively. For further analyses, the total scores of both screening instruments and the total score of the short version of the AUDIT (AUDIT-consumption [AUDIT-C]) were applied (Gual et al., 2002). The AUDIT-C consists of the first three items concerning alcohol consumption.

Ascertainment of diagnosis was conducted using the Munich-Composite International Diagnostic Interview (M-CIDI; Lachner et al., 1998; Wittchen and Pfister, 1997), a standardized software program based on DSM-IV criteria (American Psychiatric Association, 1994). The alcohol section isolates current (past 12 months) alcohol dependence and alcohol abuse from alcohol dependence and abuse in remission. At-risk drinking was defined according to the guidelines of the British Medical Association (1995) using a quantity-frequency index derived from the M-CIDI. Frequency was assessed using five categories: (1) almost daily, (2) three to four times a week, (3) one to two times a week, (4) one to three times a month, and (5) less than once a month. An open question assessed the quantity of alcohol consumed on a typical drinking day, which was then converted (beverage specific) into an index (one index unit corresponded to 9 g of pure alcohol). Heavy episodic drinking was assessed with the question, "How often within the past 12 months did you drink five (for women) or eight (for men) drinks on one occasion?" (One standard drink corresponded to 12 g of pure alcohol.) Individuals who reported at least two instances of drinking per month above this criterion were considered to be heavy episodic drinkers (Babor and Grant, 1992). For the following analyses, we differentiated between the following mutually exclusive groups: AR, HE, and ARHE.

The severity of the alcohol problem in terms of diagnostic criteria was assessed using the M-CIDI. The numbers of fulfilled lifetime DSM-IV criteria for alcohol dependence (maximum = 7; e.g., agreement to alcohol tolerance or withdrawal symptoms) and alcohol abuse (maximum = 4; e.g., recurrent substance-related legal problems) were determined separately (total score). A dichotomous measure (≥1 criteria: yes vs no) differentiated between those individuals who had met at least one criterion for alcohol dependence and

those individuals who at no stage met the criteria for alcohol dependence.

To determine if the participants' diseases were attributable to alcohol, the International Classification of Diseases, 10th Revision (ICD-10), diagnostic codes (World Health Organization, 1992) provided by the hospitals were evaluated. We used one principal and one secondary ICD-10 diagnostic code. These codes were missing for 22 study participants. According to Rehm et al. (2006), participants with ICD-10 diagnostic codes indicating diseases 100% attributable to alcohol by definition (e.g., alcoholic gastritis) were assigned an alcohol-attributable fraction of 1 (AAF = 1).

Utilization of formal help was assessed using 10 items (Rumpf et al., 1998) asking the participants if they had had any lifetime contact with any kind of alcohol treatment (e.g., attendance in self-help groups, detoxification, outpatient therapy group). As a general measure for utilization of help, persons reporting to have utilized at least one of these types of help were classified as help seekers, and those persons reporting to have not utilized any of these types of help were classified as nonseekers.

Demographic variables—such as age, having an intimate partner, education, current employment status, and current smoking status—were included in the self-administered screening questionnaire.

Data analysis

Statistical analyses were performed using STATA Version 9.2 (StataCorp LP, College Station, TX). Because the complex sampling strategy in this study required adjustments in calculating the standard errors, all analyses were calculated using svyset commands. Clinical wards ($n = 29$) were chosen as the primary sampling unit. First, descriptives (means, percentages, absolute numbers, standard deviations) were calculated to describe the distribution of demographic and alcohol-associated variables of the three drinking groups.

Second, group differences were analyzed using multinomial regression analyses for each variable, with AR used as the reference group. To control for confounding age effects, age was included as a covariate in the regression models. Odds ratios (ORs) and 95% confidence intervals (CIs) are presented. To identify differences between persons with HE and ARHE, analyses were redone with HE used as the reference group.

Results

Sample

In Table 1, demographic data and alcohol-associated characteristics are shown for the total sample and the three

TABLE 1. Demographics and alcohol associated characteristics for different drinking patterns

Variable	n	Total ($N = 425$) M[a]/n[b]	Total ($N = 425$) SD[a]/%[b]	AR ($n = 150$) M[a]/n[b]	AR ($n = 150$) SD[a]/%[b]	HE ($n = 96$) M[a]/n[b]	HE ($n = 96$) SD[a]/%[b]	ARHE ($n = 179$) M[a]/n[b]	ARHE ($n = 179$) SD[a]/%[b]
Age	425	43.5	12.2	48.8	9.4	34.4	13.4	44.0	10.6
Age groups	425								
18-29 years		67	15.8	7	4.7	41	42.7	19	10.6
30-39 years		71	16.7	17	11.3	17	17.7	37	20.7
40-49 years		139	32.7	50	33.3	22	22.9	67	37.4
50-64 years		148	34.8	76	50.7	16	16.7	56	31.3
Intimate partner	417	268	64.3	109	73.2	56	58.9	103	59.5
Education, years	414								
<10		162	39.1	46	31.1	33	34.7	83	48.5
10-11[c]		195	47.1	71	48.0	56	59.0	68	39.8
>11		57	13.8	31	20.9	6	6.3	20	11.7
Employment	407								
Full time/half time		187	45.9	64	44.7	52	55.3	71	41.8
Job seekers		128	31.5	38	26.6	25	26.6	65	38.2
Retired/others[d]		92	22.6	41	28.7	17	18.1	34	20.0
Current smoker	421	259	61.5	72	48.0	66	70.2	121	68.4
AUDIT score	414	11.5	5.0	10.3	4.0	10.9	4.8	12.9	5.6
AUDIT-C score	421	7.0	2.0	6.5	1.5	6.6	1.7	7.7	2.4
LAST score	415	2.2	1.5	2.2	1.5	1.8	1.5	2.4	1.5
M-CIDI dependence									
Total score	399	1.4	1.5	1.2	1.4	1.3	1.3	1.5	1.5
Agreement to ≥1 criteria	413	295	71.4	91	63.2	67	71.3	137	78.3
In remission	425	38	8.9	13	8.7	5	5.2	20	11.2
M-CIDI abuse									
Total score	423	0.4	0.8	0.3	0.7	0.3	0.7	0.5	0.9
In remission	425	117	27.5	32	21.3	29	30.2	56	31.3
AAF = 1	403	46	11.4	9	6.1	6	7.0	31	18.3
Prior help seeking	424	85	20.0	24	16.1	9	9.4	52	29.1

Notes: AR = at-risk drinking only; HE = heavy episodic drinking only; ARHE = at-risk and heavy episodic drinking; M = mean; n = number of observations; AUDIT = Alcohol Use Disorders Identification Test; AUDIT-C = AUDIT-consumption; LAST = Luebeck Alcohol Dependence and Abuse Screening Test; M-CIDI = Munich-Composite International Diagnostic Interview; AAF = alcohol-attributable fraction. [a]Continuous variables; [b]categorical variables; [c]including two persons still in school; [d]e.g., housewives.

drinking groups. Of the sample, 35.3% of the individuals were identified with AR, 22.6% with HE, and 42.1% with ARHE. The mean age of the sample was 43.5 years, and 64.3% had a partner. Thirty-nine percent of the individuals had less than 10 years of education, and 31.5% were job seekers. Persons with HE were the youngest, those with AR the oldest. Compared with both HE groups, individuals with AR had the highest proportion of persons with an intimate partner and the lowest proportion of current smokers. Individuals with ARHE had the highest proportion of persons with less than 10 years of education and the highest proportion of job seekers compared with those with AR or HE.

In contrast to individuals with AR or HE, persons with ARHE had the highest average score in the AUDIT (total and consumption) and the highest proportions of individuals fulfilling at least one criteria for alcohol dependence, of individuals with AAF = 1, and of prior help seekers. Both HE groups showed higher proportions of persons with alcohol abuse in remission, in contrast to persons with AR. Individuals with HE showed the lowest proportion of persons with alcohol dependence in remission, compared with persons with AR and ARHE. On average, the three groups showed similar average LAST scores and total numbers of met M-CIDI criteria for alcohol dependence and alcohol abuse.

Multinomial regression

Separate multinomial regression analyses for each variable revealed that persons with HE and ARHE were more likely to have fewer years of education (Table 2). Persons

TABLE 2.   Separate multinomial regression analyses[a]

	OR (CI)		
Variable	AR ($n = 150$)	HE ($n = 96$)	ARHE ($n = 179$)
Intimate partner			
Yes	ref.	ref.	
No		1.34 (0.69-2.61)	1.64 (1.02-2.61)
Education, years			
<10	ref.	3.90 (1.10-13.84)	2.89 (1.41-5.96)
10-11[b]	ref.	2.65 (0.93-7.53)	1.16 (0.61-2.21)
>11		ref.	
Employment			
Full time/half time		ref.	
Job seeker	ref.	0.88 (0.39-1.99)	1.55 (0.93-2.57)
Retired/others[c]	ref.	0.89 (0.35-2.25)	1.04 (0.55-1.95)
Current smoker			
Yes	ref.	1.48 (0.75-2.88)	1.95 (1.27-2.99)
No		ref.	
AUDIT score	ref.	1.02 (0.99-1.05)	1.11 (1.03-1.20)
AUDIT-C score	ref.	0.99 (0.88-1.10)	1.36 (1.06-1.74)
LAST score	ref.	0.99 (0.79-1.25)	1.11 (0.89-1.38)
M-CIDI dependence			
Total score	ref.	1.12 (0.90-1.39)	1.20 (0.97-1.49)
Agreement to ≥1 criteria			
Yes	ref.	1.35 (0.69-2.65)	2.06 (1.23-3.45)
No		ref.	
In remission			
Yes	ref.	0.58 (0.17-2.04)	1.31 (0.61-2.84)
No		ref.	
M-CIDI abuse			
Total score	ref.	1.05 (0.63-1.74)	1.32 (0.89-1.96)
In remission			
Yes	ref.	1.31 (0.60-2.86)	1.53 (0.79-2.96)
No		ref.	
AAF = 1			
Yes	ref.	1.44 (0.36-5.78)	3.43 (1.58-7.43)
No		ref.	
Prior help seeking			
Yes	ref.	0.72 (0.28-1.88)	2.21 (1.02-4.79)
No		ref.	

Notes: OR = odds ratio; CI = 95% confidence interval; AR = at-risk drinking only; HE = heavy episodic drinking only; ARHE = at-risk and heavy episodic drinking; ref. = reference category; AUDIT = Alcohol Use Disorders Identification Test; AUDIT-C = AUDIT-consumption; LAST = Luebeck Alcohol Dependence and Abuse Screening Test; M-CIDI = Munich-Composite International Diagnostic Interview; AAF = alcohol-attributable fraction. [a]Adjusted for age and using svyset commands (primary sampling unit = clinical wards); [b]including two persons still in school; [c]e.g., housewives.

with ARHE had significantly higher odds of having no intimate partner, of having a higher AUDIT score (total and consumption), of agreeing to at least one criteria of alcohol dependence, of having an ICD-10 diagnostic code with AAF = 1, of having utilized formal help, and of being a current smoker than those persons with AR. They showed a nonsignificant trend of having increased odds of being job seekers and of having higher LAST scores and total alcohol dependence scores, compared with persons with AR.

The same analyses with HE used as the reference group revealed that those individuals with ARHE had increased odds of having a higher AUDIT-C score (OR = 1.38, CI: 1.02-1.86) and of being prior help seekers (OR = 2.80, CI: 1.27-6.15). Individuals with ARHE showed a nonsignificant trend of increased odds of having a higher total AUDIT score (OR = 1.08, CI: 0.98-1.19) and ICD-10 diagnostic codes with AAF = 1, in contrast to persons with HE (OR = 2.38, CI: 0.89-6.38). No significant differences between ARHE and HE were found for having an intimate partner, years of education, employment, LAST, M-CIDI abuse or dependence variables, and smoking status.

Discussion

The main finding of the study is that persons with ARHE are characterized by a serious drinking style. In contrast to AR, persons with ARHE have a higher proportion of diseases with AAF = 1 and more often fulfill at least one criterion for alcohol dependence. We conclude that these persons may have a subclinical diagnosis because they fail to meet full diagnostic criteria for alcohol dependence.

Diverse occurrences of subclinical diagnosis are possible (Helmchen, 2001). First, persons with ARHE might be more often in remission of alcohol dependence. This was not found in our study. Still, the considerable proportion of former help seekers among them indicates that some persons have had drinking problems in the past. Second, persons with ARHE were falsely not identified as currently meeting criteria for alcohol dependence. Because the M-CIDI (Wittchen and Pfister, 1997) is highly sensitive (0.88) and specific (0.98) in detecting lifetime diagnoses of any substance disorders and conforms with the clinicians' diagnosis (Reed et al., 1998), this cannot apply to the majority of persons with ARHE. Third, they could be on the verge of developing alcohol dependence. The development of dependence could be understood as a continuum starting with risky drinking patterns (such as HE or AR), proceeding through subclinical diagnoses (e.g., ARHE) and on to a threshold diagnosis (i.e., alcohol dependence). However, further research has to evaluate how far ARHE is a diagnosable condition rather than a behavior pattern that is associated with a diagnosable condition.

Our findings support those of previous studies focusing on general population samples or college students, which showed that heavy episodic drinkers tend to be young, smokers, and more often unemployed and to have low levels of education (Kuntsche et al., 2004). Our results confirm that these differences also exist among persons with different risky drinking patterns. For example, ARHE was associated with having fewer social resources.

Clinical implications of our findings will need to be evaluated in further studies. We assume that alcohol-related counseling, which is adjusted to different risky drinking patterns, could be more effective. For example, it may not be sufficient to counsel at-risk drinkers exclusively with regard to their average alcohol consumption if they also report heavy episodic drinking. In addition, the presented differences among risky drinking patterns could help to detect problematic drinking. Because persons with ARHE had higher odds of having an increased AUDIT-C score than persons with AR or HE, the AUDIT-C can provide a first impression of a person's drinking pattern. This finding is not surprising, because the first two items of the AUDIT-C assess average alcohol consumption, and the third item relates to heavy episodic drinking. Consequently, persons with ARHE score higher on all three items. Further assessment of the drinking pattern will still be necessary. For instance, Item 3 of the AUDIT-C is not gender specific and does not exactly correspond to the definition of heavy episodic drinking that is widely used.

Some limitations of this study should be noted. Because of the low number of women with a risky drinking pattern recruited within the parent study, this study focused exclusively on men. Our sample included at-risk drinkers from general hospitals. As in a representative sample of at-risk drinkers in Northern Germany, 15.1% had been hospitalized within the previous year (Bischof et al., 2004). At-risk drinkers among general hospital inpatients are a special subgroup, and our findings cannot be generalized to all at-risk drinkers. A sample selection bias is likely, because a hospital sample may experience more severe somatic consequences from drinking that require hospitalization. By investigating daily average consumption, rather than average consumption on a drinking day, we may have overlooked persons with a risky drinking pattern who did not fulfill our definition of at-risk drinking. Men who drink heavily less often than twice a month, or who drink less than eight standard drinks on one occasion, are not included in our study. Another limitation of our study concerns the sensitivity of the screening instruments. We used the recommended AUDIT cutoff value of 8 (Babor et al., 2001). The low sensitivity of this cutoff value (Reinert and Allen, 2007) may have resulted in an underestimation of persons with less severe drinking patterns. However, because we used two screening instruments, we may have partly reduced this problem. Additional analyses showed that 13.9% of all persons with a risky drinking pattern were detected exclusively through the LAST. An AUDIT cutoff value of

5, as proposed by Reinert and Allen, would have identified 98.1% of the persons with risky drinking in our study. Most group differences were found between persons with AR and ARHE but not between persons with HE and ARHE. This might be because of the low numbers of persons with HE. Still, it seems important to distinguish between HE and ARHE, because persons with HE are younger, which indicates different implications for counseling.

In a large adult general hospital sample of men, we showed that subgroups of risky drinking patterns are affected differently by alcohol-related (health) problems. Research and clinical practice should distinguish between these groups. Additionally, future research should address the questions of the effectiveness of pattern-specific counseling in general hospitals and to what extent at-risk drinkers in general hospitals differ from those in the general population based on demographics, alcohol-associated measures, or alcohol-related sequels.

References

AMERICAN PSYCHIATRIC ASSOCIATION. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), Washington, DC, 1994.

BABOR, T., CAETANO, R., CASSWELL, S., EDWARDS, G., GIESBRECHT, N., GRAHAM, K., GRUBE, J., GRUENEWALD, P., HILL, L., HOLDER, H., HOMEL, R., ÖSTERBERG, E., REHM, J., ROOM, R., AND ROSSOW, I. Alkohol - Kein gewöhnliches Konsumgut [Originally published: Alcohol: No Ordinary Commodity. Research and Public Policy; New York, Oxford Univ. Press, 2003], Göttingen: Hogrefe, 2005.

BABOR, T.F. AND GRANT, M. (Eds.) Project on Identification and Management of Alcohol-Related Problems. Report on Phase II: A Randomized Clinical Trial of Brief Interventions in Primary Health Care, Geneva, Switzerland: World Health Organization, 1992.

BABOR, T.F., HIGGINS-BIDDLE, J.C., SAUNDERS, J.B., AND MONTEIRO, M.G. AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care, 2nd Edition, WHO Document No. WHO/MSD/MSB/01.6a, Geneva, Switzerland: World Health Organization, 2001.

BISCHOF, G., RUMPF, H.-J., MEYER, C., HAPKE, U., AND JOHN, U. Inanspruchnahme medizinischer Versorgung bei Rauchern und riskant Alkohol konsumierenden Personen: Ergebnisse einer repräsentativen Bevölkerungsstudie (Medical care requested by smokers and at-risk alcohol consumers: Results of a representative population survey). Gesundheitswesen 66: 114-120, 2004.

BRITISH MEDICAL ASSOCIATION. Alcohol: Guidelines on Sensible Drinking, London, England: British Medical Association, 1995.

FREYER, J., CODER, B., BISCHOF, G., BAUMEISTER, S.E., RUMPF, H.-J., JOHN, U., AND HAPKE, U. Intention to utilize formal help in a sample with alcohol problems: A prospective study. Drug Alcohol Depend. 87: 210-216, 2007.

GMEL, G., REHM, J., AND KUNTSCHE, E. Binge drinking in Europe: Definitions, epidemiology, and consequences. Sucht 49: 105-116, 2003.

GUAL, A., SEGURA, L., CONTEL, M., HEATHER, N., AND COLOM, J. AUDIT-3 and AUDIT-4: Effectiveness of two short forms of the Alcohol Use Disorders Identification Test. Alcohol Alcsm 37: 591-596, 2002.

HELMCHEN, H. Unterschwellige psychische Störungen (Subthreshold psychological disorders). Nervenarzt 72: 181-189, 2001.

JARVENPAA, T., RINNE, J.O., KOSKENVUO, M., RAIHA, I., AND KAPRIO, J. Binge drinking in midlife and dementia risk. Epidemiology 16: 766-771, 2005.

KAUHANEN, J., KAPLAN, G.A., GOLDBERG, D.E., AND SALONEN, J.T. Beer binging and mortality: Results from the Kuopio Ischaemic Heart Disease Risk Factor Study, a prospective population based study. Brit. Med. J. 315: 846-851, 1997.

KUNTSCHE, E., REHM, J., AND GMEL, G. Characteristics of binge drinkers in Europe. Social Sci. Med. 59: 113-127, 2004.

LACHNER, G., WITTCHEN, H.-U., PERKONIGG, A., HOLLY, A., SCHUSTER, P., WUNDERLICH, U., TURK, D., GARCZYNSKI, E., AND PFISTER, H. Structure, content and reliability of the Munich-Composite International Diagnostic Interview (M-CIDI) substance use sections. Europ. Addict. Res. 4: 28-41, 1998.

POIKOLAINEN, K., PALJARVI, T., AND MAKELA, P. Alcohol and the preventive paradox: Serious harms and drinking patterns. Addiction 102: 571-578, 2007.

REED, V., GANDER, F., PFISTER, H., STEIGER, A., SONNTAG, H., TRENKWALDER, C., SONNTAG, A., HUNDT, W., AND WITTCHEN, H.-U. To what degree does the Composite International Diagnostic Interview (CIDI) correctly identify DSM-IV disorders? Testing validity issues in a clinical sample. Int. J. Meth. Psychiat. Res. 7: 142-155, 1998.

REHM, J., GREENFIELD, T.K., AND ROGERS, J.D. Average volume of alcohol consumption, patterns of drinking, and all-cause mortality: Results from the US National Alcohol Survey. Amer. J. Epidemiol. 153: 64-71, 2001.

REHM, J., PATRA, J., AND POPOVA, S. Alcohol-attributable mortality and potential years of life lost in Canada 2001: Implications for prevention and policy. Addiction 101: 373-384, 2006.

REINERT, D.F. AND ALLEN, J.P. The Alcohol Use Disorders Identification Test: An update of research findings. Alcsm Clin. Exp. Res. 31: 185-199, 2007.

RUMPF, H.-J., HAPKE, U., HILL, A., AND JOHN, U. Development of a screening questionnaire for the general hospital and general practices. Alcsm Clin. Exp. Res. 21: 894-898, 1997.

RUMPF, H.-J., HAPKE, U., AND JOHN, U. Previous help seeking and motivation to change drinking behavior in alcohol-dependent general hospital patients. Gen. Hosp. Psychiat. 20: 115-119, 1998.

SAUNDERS, J.B., AASLAND, O.G., BABOR, T.F., DE LA FUENTE, J.R., AND GRANT, M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption-II. Addiction 88: 791-804, 1993.

WECHSLER, H., DAVENPORT, A., DOWDALL, G., MOEYKENS, B., AND CASTILLO, S. Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. JAMA 272: 1672-1677, 1994.

WITTCHEN, H.-U. AND PFISTER, H. DIA-X-Interviews: Manual für Screening-Verfahren und Interview (DIA-X-Interviews: Manual for Screening and Interview), Frankfurt, Germany: Swets & Zeitlinger, 1997.

WORLD HEALTH ORGANIZATION. The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines, Geneva, Switzerland: World Health Organization, 1992.

YANG, S., LYNCH, J.W., RAGHUNATHAN, T.E., KAUHANEN, J., SALONEN, J.T., AND KAPLAN, G.A. Socioeconomic and psychosocial exposures across the life course and binge drinking in adulthood: Population-based study. Amer. J. Epidemiol. 165: 184-193, 2007.

6.4 Coder, B., Freyer-Adam, J., Rumpf, H. J., John, U. & Hapke, U. (submitted)

Risky drinking, motivation to change, and the development of alcohol dependence

2 tables

Risky drinking, motivation to change, and the development of alcohol dependence

Beate Coder[1], Jennis Freyer-Adam, Ph.D.[1], Hans-Jürgen Rumpf, Ph.D.[2], Ulrich John, Ph.D.[1],

Ulfert Hapke, Ph.D.[3]

[1]Ernst-Moritz-Arndt-University of Greifswald, Institute of Epidemiology and Social

Medicine, Walther-Rathenau-Str. 48, 17487 Greifswald, Germany

[2]University of Luebeck, Department of Psychiatry and Psychotherapy, Ratzeburger Allee 160,

23538 Luebeck, Germany

[3]Department of Epidemiology and Health Monitoring, Robert Koch-Institute, Seestaße 10,

13353 Berlin, Germany

Correspondence to: Beate Coder, Dipl.-Psych., Ernst-Moritz-Arndt-University of Greifswald,

Institute of Epidemiology and Social Medicine, Walther-Rathenau-Str. 48, D-17487

Greifswald, Germany, phone +49 3834/867733, fax +49 3834/867701, **coder@uni-

greifswald.de**.

Abstract

Objective: To analyze whether individuals with at-risk and heavy episodic drinking (ARHE) have a higher motivation to change drinking habits and a higher risk of developing alcohol dependence than individuals with at-risk drinking only (AR) or heavy episodic drinking only (HE). Methods: A proactively recruited sample of 425 male general hospital inpatients with AR, HE, or ARHE was used. Men with current alcohol dependence or abuse were excluded. Participants were followed up 12 months later. Results: At baseline, multinomial regressions revealed that individuals with ARHE had higher odds of taking action to change drinking habits than individuals with HE (OR=2.29, CI: 1.21-4.34) or AR (OR=2.11, CI: 1.15-3.86). At follow-up, individuals with ARHE had higher odds of having alcohol dependence according to the DSM-IV (OR=4.73, CI: 1.01–22.20) compared to individuals with AR. Conclusions: Inpatients with ARHE intended to change their risky drinking pattern more than those with AR or HE and had higher odds for short-term development of alcohol dependence. Brief alcohol intervention should be tailored to the individual's motivation to change and to the risky drinking pattern.

Keywords: at-risk drinking, heavy episodic drinking, general hospital, motivation, alcohol counseling

1. Introduction

Two risky drinking patterns have become particularly well-known: (1) at-risk drinking and (2) heavy episodic drinking. At-risk drinking is characterized by a daily average consumption of 30 g or more of pure alcohol for men and 20 g or more for women according to the British Medical Association (1995). Heavy episodic drinking is irregular excessive alcohol consumption (e.g., Babor & Grant, 1992). In a previous study among general hospital inpatients (Coder et al., 2008; Valencia-Martin et al., 2008), we demonstrated the significance of distinguishing between three risky drinking patterns: (1) at-risk drinking only (AR), (2) heavy episodic drinking only (HE), and (3) a combined pattern of both at-risk and heavy episodic drinking (ARHE). Among these three patterns, ARHE is the most problematic as it is associated with a higher proportion of diseases that are 100% attributable to alcohol (Coder et al., 2008). In addition, it was found to be associated with a higher risk of fulfilling at least one criterion for life-time alcohol dependence. ARHE might be a subclinical diagnosis of alcohol dependence. Hence, individuals with ARHE could be more prone to becoming alcohol dependent than individuals with AR or HE.

Individuals with ARHE might, furthermore, be more motivated to change drinking habits due to having experienced more severe symptoms than individuals with AR or HE. However, we lack knowledge on motivation to change drinking habits, motivation to seek formal help, and openness to counseling among individuals with AR, HE, or ARHE. Previous studies on the association between alcohol drinking and motivation to change drinking habits focused on (a) individuals with a severe alcohol problem, namely alcohol dependence (e.g., Demmel, Beck, Richter, & Reker, 2004; Rumpf, Hapke, & John, 1998), or (b) special subgroups, i.e., students (e.g., Barnett, Goldstein, Murphy, Colby, & Monti, 2006; Shealy, Murphy, Borsari, & Correia, 2007). In these studies, results about the association between motivation and alcohol drinking were mixed (e.g., Barnett et al., 2006; Williams et al., 2006).

According to our assumption of ARHE being a subclinical diagnosis, we suspected individuals with ARHE to be at a higher risk of developing alcohol dependence 12 months after hospitalization. Furthermore, we hypothesized that individuals with ARHE have a higher motivation to change their drinking habits and to seek formal help and that they are more open for counseling than individuals with AR or HE.

2. Method

2.1. Sample

The sample was recruited as part of the Early Intervention at General Hospitals project (NCT00423904, conducted by the Research Collaboration Early Substance Use Intervention, EARLINT). The study was performed at all four general hospitals in one area in northeastern Germany, predominantly in the internal medicine and surgery wards. From April 28, 2002 through June 30, 2004, all consecutively admitted hospital inpatients were asked to participate in an alcohol screening assessment with the provision that individuals were between ages 18-64 years and stayed for at least 24 hours. The sampling approach included two stages: (a) screening and (b) ascertainment of alcohol diagnosis. A total of 14 332 participants were screened for problem drinking during any time in their life. For 20.4% (n = 2 924) of these individuals, a positive screening result was obtained. Of those, 79.9% (n = 2 337) agreed to participate in a diagnostic interview. Individuals who (a) received a diagnosis of alcohol dependence or alcohol abuse in the past 12 months (n = 758), (b) fulfilled criteria for alcohol dependence in remission, but showed no problem drinking in the past 12 months (n = 448), or (c) were false-positive cases (n = 608) were not included further in the study. A total of 523 individuals were deemed as either at-risk or heavy episodic drinkers in the past 12 months. They were asked to participate in an intervention study. Of those individuals, 453 participants gave informed consent. Because of the low proportion of women with risky drinking patterns (6.2%, n = 28), the final sample for this study included men only (n = 425). One year later,

68.9% (n = 293) of the participants were followed up, 5.4% (n = 23) had died, and the rest were lost due to refusal of further study participation (16.3%; n = 69) or other reasons (9.4%; n = 40). Sample recruitment, intervention, and follow-up are described in more detail elsewhere (Freyer-Adam et al., 2008). The ethics committee of the University of Greifswald has approved the study procedures.

2.2. Measures

The self-administered screening for problem drinking was comprised of the German adaptation of the Alcohol Use Disorder Identification Test (AUDIT, Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) and the Lübeck Alcohol Dependence and Abuse Screening Test (LAST, Rumpf, Hapke, Hill, & John, 1997), with cutoff values of eight and two, respectively.

Ascertainment of alcohol dependence and alcohol abuse was conducted using the Munich-Composite International Diagnostic Interview (M-CIDI, Lachner et al., 1998; Wittchen & Pfister, 1997), a standardized software program based on Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria (DSM-IV, American Psychiatric Association, 1995). The alcohol section isolates current (past 12 months) alcohol dependence and alcohol abuse from alcohol dependence and abuse in remission. At-risk drinking was defined according to the guidelines of the British Medical Association (1995), using a quantity-frequency index derived from the M-CIDI. Frequency was assessed using five categories: almost daily, three to four times a week, one to two times a week, one to three times a month, and less than once a month. An open question assessed the quantity of alcohol consumed on a typical drinking day, which was then converted (beverage specific) into index units. The quantity-frequency index was computed using the mean of the frequency categories. According to Babor and Grant (1992), heavy episodic drinking was assessed using the question, "How often within the past 12 months did you drink eight drinks on one occasion?" (one standard drink corresponded to approximately 12 g of pure alcohol). Individuals who reported at least two

instances of drinking above this criterion per month were considered to be heavy episodic drinkers. For the following analyses, we differentiated between the following mutually exclusive groups: AR, HE, and ARHE.

Motivational measures included the Readiness to Change Questionnaire (RCQ, Rollnick, Heather, Gold, & Hall, 1992) and the Treatment Readiness Tool (TReaT, Freyer et al., 2004). Both measures are based on the stages of change of the transtheoretical model of intentional behavior change (TTM, Prochaska & DiClemente, 1984; Prochaska & Velicer, 1997) and assess different aspects of motivation. The RCQ measures motivation for behavior change. It consists of 12 items and three subscales representing the stages of change: Precontemplation (i.e., not thinking about change), Contemplation (i.e., being ambivalent about change), and Action (i.e., beginning to implement change). The quick-method allocates individuals to stages based on highest scale scores. In the case of between-scale ties, subjects are allocated to the one further along on the motivational process. The TReaT (Freyer et al., 2004) was used to assess motivation to seek formal help. It is a short, reliable, and valid measure. It has 12 items and three subscales representing three stages of change: Precontemplation (i.e., not thinking about seeking help), Contemplation (i.e., being ambivalent about seeking help), and Preparation (i.e., planning to seek help). In conformity with the quick-method of the RCQ (Rollnick et al., 1992), subjects are allocated to stages based on their highest scale score. In the case of zero-scores on all three scales, subjects are assigned to Precontemplation.

Openness towards counseling and/or information was assessed using two items ("I'm open to learn more about help" and "I want to find out how to help myself"). A dichotomous scale was used for each item (true/ not true). Participants agreeing to at least one item were considered as open for counseling.

The screening questionnaire also included demographic variables such as age, school education, current employment status, and having a partner.

Alcohol dependence at follow-up was assessed using the 12 month version of the M-CIDI's alcohol section (Lachner et al., 1998; Wittchen & Pfister, 1997). Alcohol dependence was assigned when sufficient criteria were met in the 12 months prior to the interview.

2.3. Data Analysis

Statistical analyses were performed using STATA Version 9.2 (StataCorp, 2005). First, descriptive statistics (means, standard deviations, absolute numbers, and percentages) were conducted. Second, group differences between AR, HE, and ARHE were analyzed using multinomial regression analyses, with each motivational variable and openness for counseling as predictors. HE was used as the reference group. To control for confounding age effects, age was included as a covariate in these regression models. Third, one logistic regression was computed to predict alcohol dependence at follow-up (1 = yes, 0 = no) with risky drinking patterns as the predictor and controlling for the intervention effect.

To take into account clustering within wards, we applied sample survey methods for all regression analyses that adjust the standard errors using STATA svyset commands. Clinical wards (n = 29) were chosen as the primary sampling unit. Odds ratios (ORs) and 95% confidence intervals (CIs) are presented. Subjects with missing values were deleted list-wise.

3. Results

3.1. Sample

The mean age of the sample was 43.5 years (SD = 12.2), 64.3% (n = 268) had a partner, 39.1% (n = 162) had less than 10 years of school, and 31.5% (n = 128) were job-seeking. Among the participants, 35.3% (n = 150) were identified with AR, 22.6% (n = 96) with HE, and 42.1% (n = 179) with ARHE.

Table 1 presents motivation to change, motivation to seek help, and openness for counseling for the total sample and the three risky drinking patterns.

Please insert Table 1

3.2. Motivation to change at baseline

Separate multinomial regression analyses revealed that individuals with ARHE had higher odds of being in Action regarding behavior change and in Preparation regarding help-seeking compared to individuals with HE (Table 2). No significant differences were found among individuals with AR and HE.

To identify differences between individuals with AR and ARHE, analyses were repeated with AR used as the reference group. Individuals with ARHE had higher odds of being in Action regarding behavior change than individuals with AR (OR = 2.11, CI: 1.15-3.86). Individuals with AR and ARHE did not differ significantly regarding help-seeking.

No significant group differences were found regarding openness for counseling.

Please insert Table2 about here

3.3. Alcohol dependence at follow-up

Twelve months after baseline, 8.4% (n = 10) of the individuals with ARHE were identified with alcohol dependence compared to 7.5% (n = 5) of those with HE and 1.9% (n = 2) of those with AR. Logistic regression revealed that when controlling for intervention effects, individuals with ARHE had significantly higher odds of having alcohol dependence compared to those with AR (OR = 4.73, CI: 1.01 – 22.20). No significant difference was found between individuals with AR and HE. To compare individuals with HE and ARHE, the analysis was repeated with HE as the reference category. No significant difference between individuals with HE and ARHE was found.

Baseline differences between the follow-up sample (n = 293) and the sample not followed-up (n = 132) were analysed using a multivariate logistic regression (1 = follow-up sample, 0 = sample not followed up). Participants in the follow-up sample had higher odds of having more years of school education (> 11 years vs. < 10 years: OR = 2.98, CI = 1.62 – 5.45). No significant differences were found for age, partner, or employment status. Controlling for the intervention effect, one logistic regression analysis predicting alcohol dependence at follow-up confirmed that, in our sample, school education was not significantly associated with alcohol dependence at follow-up. Therefore, we did not consider school education as a confounder.

4. Discussion

Among the non-dependent general hospital inpatients with risky drinking patterns, 54.1% were in Contemplation or Action to change their drinking habits, 37.1% were in Contemplation or Preparation to seek formal help, and 53.1% were open for receiving alcohol counseling. In accordance with our hypotheses, individuals with ARHE had a higher chance of being in Action to change their drinking habits and in Preparation to seek formal help compared to individuals with AR or HE.

After 12 months and compared to individuals with AR, individuals with ARHE had a higher risk of developing alcohol dependence. Probably due to the small sample size, the 95% confidence interval was large and the lower bound of the confidence interval was close to 1. Hence, this result should be interpreted with caution. However, the OR was adjusted for intervention effects and we assume that given a larger sample size, a similar OR might be expected. This result may relate to findings on alcohol consumption and the development of alcohol dependence. In a prospective study (Flensborg-Madsen, Knop, Mortensen, Becker, & Gronbaek, 2007), males who consumed more than 38 g of pure alcohol per day had an increased risk of developing alcohol dependence compared to non-daily-drinkers. Those

consuming more than 70 g of pure alcohol per day showed the highest risk. Post-hoc analyses of our data confirmed our expectation; individuals with ARHE had the highest daily average alcohol consumption compared to those with AR or HE (93 g vs. 62 g and 19 g, respectively). However, our results differed in two ways from those reported by Flensborg-Madsen et al.. First, only a low proportion of those with AR developed alcohol dependence in spite of their high average alcohol consumption. This might be due to our shorter follow-up period. Second, although not significant, the results for individuals with HE indicate that heavy episodic drinking alone might also play a role in the development of alcohol dependence.

The higher motivation of inpatients with ARHE compared to individuals with AR or HE might be explained by mental strain caused by their more severe alcohol problem (Coder et al., 2008). However, individuals with AR or HE should also be considered for brief alcohol interventions as they have a higher risk for somatic problems, injuries, or accidents than individuals without risky drinking (British Medical Association, 1995; Gmel, Rehm, & Kuntsche, 2003). The provision of alcohol counseling for individuals with any risky drinking patterns while hospitalized is one way to enhance their motivation to change (Freyer-Adam et al., 2008) or their ability to transfer their motivation into actual behavior change (Heather, Rollnick, Bell, & Richmond, 1996). These counseling sessions should be tailored to the individual's motivation to change and to the risky drinking pattern. For example, for individuals with ARHE an additional aim of counseling should be the prevention of alcohol dependence. Referring patients with risky drinking patterns to alcohol-specific treatment does not seem to be appropriate as they do not yet fulfill criteria for alcohol use disorders. Offering them alcohol counseling is likely to be more adequate, especially as the majority of individuals with risky drinking patterns (62.9%) were not ready to utilize formal help, but 53.1% of these individuals welcomed alcohol counseling.

In our study, 45.9% of the inpatients were in Precontemplation to change their drinking habits. This proportion is high in comparison to other general hospital studies that

found proportions between 24.1 and 27.5% of inpatients in Precontemplation (Hapke, Rumpf, & John, 1998; Heather, Rollnick, & Bell, 1993). This difference may largely be explained by the severity of the alcohol problem. In contrast to our study, both studies included individuals with more severe alcohol problems, namely alcohol dependence, which is positively related to motivation (Carpenter, Miele, & Hasin, 2002). Still, compared to the proportion of 73.8% of individuals in Precontemplation among a representative sample of at-risk drinkers in northern Germany (Hannöver et al., 2002), inpatients with risky drinking patterns were more ready to change their drinking habits. This result is in line with previous findings about individuals with alcohol dependence in the general population and in general hospitals (Rumpf, Hapke, Meyer, & John, 1999). Therefore, our results indicate that for individuals with risky drinking patterns, hospitalization is a teachable moment to support drinking behavior change that should be used to prevent more harm.

4.1. Limitations

Some limitations of this study should be noted. First, because of the low number of women with a risky drinking pattern recruited within the parent study, this study focused exclusively on men. Second, although we found that individuals with ARHE have a significantly increased risk of developing alcohol dependence, the corresponding 95% confidence interval was very large due to small sample size, as has been discussed. Finally, our assessment of motivation to change drinking habits and to seek formal help was based on the TTM only (Prochaska & DiClemente, 1984; Prochaska & Velicer, 1997). The TTM has been criticized in theoretical aspects, especially its stages of change construct and the assignment by time frame algorithm (Sutton, 2001; West, 2005). However, as the RCQ and the TReaT are valid and continuous measures of motivation (Freyer et al., 2007; Freyer et al., 2004; Hannöver et al., 2002; Heather et al., 1993; Rollnick et al., 1992), this critique does not apply to our study.

4.2. Conclusions

We conclude that in this general hospital inpatient sample, individuals with ARHE intended to change their risky drinking pattern more than inpatients with AR or HE. Moreover, individuals with ARHE seem to have higher odds for short-term development of alcohol dependence after hospital discharge. Hospitalization offers an opportunity to provide adequate brief alcohol interventions according to the individual's motivation to change and to the risky drinking patterns requiring different counseling aims.

References

American Psychiatric Association (Ed.). (1995). *Diagnostic and statistical manual of mental disorders (DSM-IV)*. Washington, DC: American Psychological Association.

Babor, T. F., & Grant, M. (Eds.). (1992). *Programme on substance abuse: Project on identification and management of alcohol-related problems. Report on phase II: A randomized clinical trial of brief interventions in primary health care*. Geneva: World Health Organization.

Barnett, N. P., Goldstein, A. L., Murphy, J. G., Colby, S. M., & Monti, P. M. (2006). "I'll never drink like that again": Characteristics of alcohol-related incidents and predictors of motivation to change in college students. *Journal of Studies on Alcohol, 67*(5), 754-763.

British Medical Association. (1995). *Alcohol: Guidelines on sensible drinking*. London, UK: British Medical Association.

Carpenter, K. M., Miele, G. M., & Hasin, D. S. (2002). Does motivation to change mediate the effect of DSM-IV substance use disorders on treatment utilization and substance use? *Addictive Behaviors, 27*(2), 207-225.

Coder, B., Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H. J., et al. (2008). Male at-risk drinkers with heavy episodic drinking: a subclinical diagnosis? *J Stud Alcohol Drugs, 69*(1), 85-90.

Demmel, R., Beck, B., Richter, D., & Reker, T. (2004). Readiness to change in a clinical sample of problem drinkers: Relation to alcohol use, self-efficacy, and treatment outcome. *European Addiction Research, 10*(3), 133-138.

Flensborg-Madsen, T., Knop, J., Mortensen, E. L., Becker, U., & Gronbaek, M. (2007). Amount of alcohol consumption and risk of developing alcoholism in men and women. *Alcohol Alcohol, 42*(5), 442-447.

Freyer-Adam, J., Coder, B., Baumeister, S. E., Bischof, G., Riedel, J., Paatsch, K., et al. (2008). Brief alcohol intervention for general hospital inpatients: A randomized controlled trial. *Drug and Alcohol Dependence, 93*, 233-243.

Freyer, J., Coder, B., Bischof, G., Baumeister, S. E., Rumpf, H. J., John, U., et al. (2007). Intention to utilize formal help in a sample with alcohol problems: A prospective study. *Drug Alcohol Depend, 87*(2-3), 210-216.

Freyer, J., Tonigan, J. S., Keller, S., John, U., Rumpf, H. J., & Hapke, U. (2004). Readiness to change versus readiness to seek help for alcohol problems: the development of the Treatment Readiness Tool (TReaT). *J Stud Alcohol, 65*(6), 801-809.

Gmel, G., Rehm, J., & Kuntsche, E. (2003). Binge drinking in Europe: Definitions, Epidemiology, and consequences. *Sucht, 49*(2), 105-116.

Hannöver, W., Thyrian, J. R., Hapke, U., Rumpf, H. J., Meyer, C., & John, U. (2002). The readiness to change questionnaire in subjects with hazardous alcohol consumption, alcohol misuse and dependence in a general population survey. *Alcohol and Alcoholism, 37*(4), 362-369.

Hapke, U., Rumpf, H. J., & John, U. (1998). Differences between hospital patients with alcohol problems referred for counselling by physicians' routine clinical practice versus screening questionnaires. *Addiction, 93*(12), 1777-1785.

Heather, N., Rollnick, S., & Bell, A. (1993). Predictive validity of the Readiness to Change Questionnaire. *Addiction, 88*(12), 1667-1677.

Heather, N., Rollnick, S., Bell, A., & Richmond, R. (1996). Effects of brief counselling among male heavy drinkers identified on general hospital wards. *Drug Alcohol Rev, 15*(1), 29-38.

Lachner, G., Wittchen, H. U., Perkonigg, A., Holly, A., Schuster, P., Wunderlich, U., et al. (1998). Structure, content and reliability of the Munich-Composite International Diagnostic Interview (M-CIDI) substance use sections. *Eur Addict Res, 4*(1-2), 28-41.

Prochaska, J. O., & DiClemente, C. C. (1984). *The transtheoretical approach. Crossing traditional boundaries of therapy*. Homewood, IL: Irwin.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *Am J Health Promot, 12*(1), 38-48.

Rollnick, S., Heather, N., Gold, R., & Hall, W. (1992). Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict, 87*(5), 743-754.

Rumpf, H. J., Hapke, U., Hill, A., & John, U. (1997). Development of a screening questionnaire for the general hospital and general practices. *Alcohol Clin Exp Res, 21*(5), 894-898.

Rumpf, H. J., Hapke, U., & John, U. (1998). Previous help seeking and motivation to change drinking behavior in alcohol-dependent general hospital patients. *Gen Hosp Psychiatry, 20*(2), 115-119.

Rumpf, H. J., Hapke, U., Meyer, C., & John, U. (1999). Motivation to change drinking behavior: comparison of alcohol-dependent individuals in a general hospital and a general population sample. *Gen Hosp Psychiatry, 21*(5), 348-353.

Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption Part II. *Addiction, 88*, 617-629.

Shealy, A. E., Murphy, J. G., Borsari, B., & Correia, C. J. (2007). Predictors of motivation to change alcohol use among referred college students. *Addictive Behaviors, 32*(10), 2358-2364.

StataCorp. (2005). Stata User's Guide Release 9.2. Stata Corporation: College Station TX.

Sutton, S. (2001). Back to the drawing board? A review of applications of the transtheoretical model to substance use. *Addiction, 96*(1), 175-186.

Valencia-Martin, J. L., Galan, I., & Rodriguez-Artalejo, F. The joint association of average volume of alcohol and binge drinking with hazardous driving behaviour and traffic crashes. Addiction 103: 749-57, 2008. the

West, R. (2005). Time for a change: putting Transtheoretical (Stages of Change) Model to rest. *Addiction, 100*(8), 1036-1039.

Williams, E. C., Kivlaban, D. R., Saitz, R., Merrill, J. O., Achtmeyer, C. E., McCormick, K. A., et al. (2006). Readiness to change in primary care patients who screened positive for alcohol misuse. *Annals of Family Medicine, 4*(3), 213-220.

Wittchen, H.-U., & Pfister, H. (1997). *DIA-X-Interviews: Manual für Screening-Verfahren und Interview [German] (DIA-X-Interviews: Manual for Screening and Interview).* Frankfurt, Germany: Swets & Zeitlinger.

Table 1: Motivation and openness for counseling for different risky drinking patterns

Variables	Total		AR		HE		ARHE	
	n	(%)	n	(%)	n	(%)	n	(%)
Motivation to change								
Precontemplation	194	(45.9)	75	(50.0)	56	(58.3)	63	(35.8)
Contemplation	118	(28.0)	39	(26.0)	23	(24.0)	56	(31.8)
Action	110	(26.1)	36	(24.0)	17	(17.7)	57	(32.4)
Motivation to seek help								
Precontemplation	263	(62.9)	99	(67.4)	61	(64.9)	103	(58.2)
Contemplation	108	(25.8)	34	(23.1)	28	(29.8)	46	(26.0)
Preparation	47	(11.3)	14	(9.5)	5	(5.3)	28	(15.8)
Open for counseling								
No	196	(46.9)	75	(51.0)	40	(42.6)	81	(45.8)
Yes	222	(53.1)	72	(49.0)	54	(57.4)	96	(54.2)

Notes: AR = at-risk drinking only, HE = heavy episodic drinking only, ARHE = at-risk and heavy episodic drinking, n = number of observations.

Table 2: Separate multinomial regression analyses for motivation and openness for counseling[a]

Variables	OR (CI)		
	HE	AR	ARHE
Motivation to change			
Precontemplation	Ref.	Ref.	Ref.
Contemplation	Ref.	1.12 (0.57-2.19)	1.96 (0.88-4.34)
Action	Ref.	1.08 (0.53-2.22)	2.29 (1.21-4.34)
Motivation to seek help			
Precontemplation	Ref.	Ref.	Ref.
Contemplation	Ref.	0.86 (0.41-1.80)	1.02 (0.59-1.77)
Preparation	Ref.	1.51 (0.56-4.05)	2.86 (1.02-8.02)
Open for counseling			
No	Ref.	Ref.	Ref.
Yes	Ref.	0.88 (0.48-1.59)	0.99 (0.55-1.76)

Notes: HE = heavy episodic drinking only, AR = at-risk drinking only, ARHE = at-risk and heavy episodic drinking, OR = odds ratio, CI = 95% confidence interval, Ref. = reference category, [a]Adjusted for age and using svyset commands (primary sampling unit = clinical wards).

Appendices

Appendix A - Eidesstattliche Erklärung

Appendix B – Curriculum Vitae

Appendix C – List of publications

Appendix A – Eidesstattliche Erklärung

Hiermit erkläre ich, dass ich die vorliegende Dissertation selbständig verfasst und keine anderen als die angegebenen Hilfsmittel benutzt habe. Die Dissertation ist bisher keiner anderen Fakultät vorgelegt worden. Ich erkläre, dass ich bisher kein Promotionsverfahren erfolglos beendet habe und dass eine Aberkennung eines bereits erworbenen Doktorgrades nicht vorliegt.

Greifswald, den 21.01.2009   _____

Beate Coder

Appendix B – Curriculum Vitae

Personal Details

Name: Beate Coder

Address: Stephanstr. 59, 10559 Berlin

E-mail address: beatecoder@web.de

Date of birth: May 31, 1978

Place of birth: Zwickau

Citizenship: German

Education

1984-1996   Elementary and Secondary school education in Aue (Saxony)

1997 – 2004   Free University of Berlin: education in psychology

2000 – 2001   Bath University: visiting student

2004   Free University of Berlin: Diploma in Psychology

Professional experience

Since 2004   Research Fellow at the University of Greifswald,

                    Institute of Epidemiology and Social Medicine (Prof. U. John)

Others

1996-1997   Voluntary year of social service in Aue (Saxony)

Greifswald, January 21, 2009   _____

                                                        Beate Coder

Appendix C – List of scientific papers

Articles in peer reviewed journals

<u>Coder, B.</u>, Freyer-Adam, J., Bischof, G., Pockrandt, C., Hartmann, B., Rumpf, H.-J., John, U. & Hapke, U. (2008). Alcohol problem drinking among general hospital inpatients in North-eastern Germany. *Gen Hosp Psychiatry,* 30(2), 147-154.

<u>Coder, B.</u>, Freyer-Adam, J., Lau, K., Bischof, G., Riedel, J., Rumpf, H.-J., John, U. & Hapke, U. (2008). Male at-risk drinkers with heavy episodic drinking: A subthreshold diagnosis? *J Stud Alcohol Drugs*, 69(1), 85-90.

<u>Coder, B.</u>, Freyer-Adam, J., Lau, K., Riedel, J., Rumpf, H.-J., Meyer, C., John, U. & Hapke, U. (2009). Reported beverage consumed and alcohol-related diseases among male hospital inpatients with problem drinking. *Alcohol Alcohol,* 44(2), 216-221.

<u>Coder, B.</u>, Freyer-Adam, J., Rumpf, H.-J., John, U. & Hapke, U. (2008). Tabakrauchen und Alkoholrisikokonsum unter Allgemeinkrankenhauspatienten [Tobacco smoking and alcohol problem drinking among general hospital inpatients]. *Prävention Gesundheitsförderung, 3*(1), 37-42.

<u>Coder, B.</u>, Röske, K., Ulbricht, S., Doese, D., John, U., Meyer, C. & Hapke, U. (2007). Die Kooperation niedergelassener Ärzte mit den Schwerpunktpraxen „Sucht" in Mecklenburg-Vorpommern [Cooperation of general practitioners with priority practices for addiction in Mecklenburg-Western Pommerania]. *Psychiatrische Praxis,* 34, 283-288.

Freyer, J., <u>Coder, B.</u>, Bischof, G., Baumeister, S., Rumpf, H.-J., John, U. & Hapke, U. (2007). Intention to utilize formal help in a sample with alcohol problems: A prospective study. *Drug Alcohol Depend*, 87 (2-3), 210-216.

Freyer, J., <u>Coder, B.</u>, Pockrandt, C., Hartmann, B., Rumpf, H.-J., John, U. & Hapke, U. (2006). Krankenhauspatienten mit riskantem Alkoholkonsum sind offen für Beratung [General hospital patients with alcohol problems welcome counselling]. *Gesundheitswesen,* 68, 429-435.

Freyer-Adam, J., <u>Coder, B.</u>, Baumeister, S. E., Bischof, G., Riedel, J., Paatsch, K., Wedler, B., Rumpf, H.-J., John, U. & Hapke, U. (2008). Brief Alcohol Intervention for General Hospital Inpatients: A Randomized Controlled Trial. *Drug Alcohol Depend, 88* (3), 233-243.

Freyer-Adam, J., <u>Coder, B.</u>, Bischof, G., Baumeister, S. E., Rumpf, H.-J., John, U. & Hapke, U. (2008). Utilization of formal and informal help among general hospital inpatients with alcohol use disorders, *IJMPR*, 17(2), S70-S73.

Freyer-Adam, J., <u>Coder, B.</u>, Lau, K. & John, U. (2008). Kurzinterventionen bei Alkoholproblemen im Allgemeinkrankenhaus: eine Übersicht [Brief Alcohol Interventions in General Hospitals: A Review of Controlled Clinical Trials]. *Psychosomatik Konsiliarpsychiatrie*, 2, 8-14.

Freyer-Adam, J., <u>Coder, B.</u>, Ottersbach, C., Tonigan, J.S., Rumpf, H.-J., John, U. & Hapke, U. (2009). The performance of two motivation measures and outcome after alcohol detoxification. *Alcohol Alcohol*, 44(1), 77-83.

John, U., Meyer, C., Rumpf, H.-J., Hapke, U., Bischof, G., Schumann, A., Freyer-Adam, J., Ulbricht, S., Grothues, J., Reinhardt, S., <u>Coder, B.</u>, Haug, S., Schorr, G. & Thyrian, J. R. (2008). Leistungen, mediierende Faktoren und Outcome der Prävention tabakrauch- oder alkoholbezogener Erkrankungen [Provisions and outcome in the prevention of

tobacco- and alcohol-attributable disease]. *Prävention Gesundheitsförderung, 3*(1), 7-11.

Lau, K., Freyer-Adam, J., <u>Coder, B.</u>, Riedel, J., Rumpf, H.-J., John, U. & Hapke, U. (2008). Dose-response relation between volume of drinking and alcohol-related diseases in male inpatients. *Alcohol Alcohol*, 43(1), 34-38.

Pockrandt, C., <u>Coder, B.</u>, Lau, K., Hartmann, B., John, U. & Freyer-Adam, J. (2007). Gesundheits- und Risikoverhalten unter Arbeitsuchenden: Ein Screening am Arbeitsamt [Health behaviour and health-risk behaviour among job-seekers: a screening at an employment agency]. *Gesundheitswesen*, 69(11), 628-634.

Röske, K., <u>Coder, B.</u>, John, U., Hannich, H.-J., Ulbricht, S. (2006). The role of general practitioners in the care for patients with addiction problems in a rural area of Germany. *Family medicine & primary care review, 8* (4), 1223-1227.

Ulbricht, S., <u>Coder, B.</u>, Röske, K., Meyer, C., Rumpf, H. J., Hapke, U. & John, U. (2007). Die Überweisung von Patienten mit Abhängigkeitserkrankungen in die ambulante und stationäre professionelle Suchtkrankenhilfe – Ergebnisse einer repräsentativen Befragung unter Hausärzten in Mecklenburg-Vorpommern [Referral behaviour of general practitioners to professionals in outpatient care and in addiction treatment sites in Mecklenburg-West Pommerania]. *Gesundheitswesen, 69* (5), 306-310.

Submitted peer reviewed articles

<u>Coder, B.</u>, Freyer-Adam, J., Riedel, J., Rumpf, H.-J., John, U. & Hapke, U. (submitted). Risky drinking, motivation to change, and the development of alcohol dependence.

Book chapters

<u>Coder, B.</u>, Meyer, C., Freyer-Adam, J. & John, U. (2009). Alkohol - Zahlen und Fakten zum Konsum [Alcohol - Data and facts on the consumption]. In Deutsche Hauptstelle für Suchtfragen e.V. [German Centre for Addiction] (Eds.), *Jahrbuch Sucht 2009 [Yearbook Addiction 2009]* (pp. 21-50). Geesthacht: Neuland.

Oral presentations (first author)

<u>Coder, B.</u>, Freyer-Adam, J., Bischof, G., Rumpf, H.-J., John, U. & Hapke, U. (2008). Drinking patterns among general hospital inpatients. 1st German Addiction Reseach Congress, Mannheim, June, 11.-14.

<u>Coder, B.</u>, Freyer-Adam, J., Rumpf, H.-J., John, U. & Hapke, U. (2008). Male at-risk and heavy episodic drinkers and their motivation to change drinking. XXIX International Congress of Psychology, Berlin, July, 20-25.

<u>Coder, B.</u>, Freyer-Adam, J., Bischof, G., Rumpf, H.-J., John, U. & Hapke, U. (2007). Häufigkeit problematischen Alkoholkonsums unter Allgemeinkrankenhauspatienten [Proportions of alcohol problem drinking among general hospital inpatients]. Augsburg: Kongress Medizin und Gesellschaft, September 17-21.

<u>Coder, B.</u>, Pockrandt, C., Lau, K., Hartmann, B., John, U. & Freyer-Adam, J. (2007). Eine Gesundheitsstudie am Arbeitsamt: Gesundheits- und Risikoverhalten sowie Bereitschaft zur Studienteilnahme unter Arbeitssuchenden [Health behaviors and health risk behaviors among job-seekers: Testing the suitability of employment

agencies for prevention]. Augsburg: Kongress Medizin und Gesellschaft, September 17-21.

Coder, B. (2006). Male at-risk drinkers with heavy episodic drinking: A subthreshold diagnosis? NAD - Research course on drinking and drug taking practices. Tvärminne, Finland, September 24-30.

Poster presentations (first author)

Coder, B., Freyer-Adam, J., Bischof, G., Rumpf, H.-J., John, U. & Hapke, U. (2008). Drinking patterns among general hospital inpatients. 1st German Addiction Reseach Congress, Mannheim, June, 11.-14.

Coder, B., Freyer-Adam, J., Lau, K., Rumpf, H.-J., Meyer, C., John, U. & Hapke, U. (2008). Präferenz für alkoholische Getränke und alcohol-attributable Erkrankungen [Beverage preference and alcohol-related diseases]. Jahrestagung der Deutschen Gesellschaft für Sozialmedizin und Prävention, Hannover, 17.-19. September.

Coder, B., Freyer-Adam, J., Meyer, C., Rumpf, H.-J., John, U. & Hapke, U. (2008). Tabakrauchen und problematischer Alkoholkonsum unter Allgemeinkrankenhauspatienten [Tobacco smoking and alcohol problem drinking among general hospital inpatients]. Jahrestagung der Deutschen Gesellschaft für Epidemiologie, Bielefeld, 24.-27. September.

Coder, B., Hapke, U., Riedel, J., Rumpf, H.-J., John, U. & Freyer-Adam, J. (2007). Motivation to change and motivation to seek help among treatment-seeking and non-treatment-seeking persons with alcohol dependence. 3. Tagung der Suchtforschungsverbünde des Bundesministeriums für Bildung und Forschung, Greifswald, July 05-06.

Coder, B., Freyer, J., Pockrandt, C., Hartmann, B, Bischof, G., John, U. & Hapke, U. (2006). Alkoholrisikokonsumenten in Allgemeinkrankenhäusern: Ein Vergleich unterschiedlicher Subgruppen [Inpatients with risky drinking: Comparision of different subgroups]. Jahrestagung der Deutschen Gesellschaft für Sozialmedizin und Prävention, Frankfurt, September 27-29.

Coder, B., Freyer, J., Pockrandt, C., Hartmann, B, Bischof, G., John, U. & Hapke, U. (2006). Alkoholrisikokonsumenten in Allgemeinkrankenhäusern: Ein Vergleich unterschiedlicher Subgruppen [Inpatients with risky drinking: Comparision of different subgroups]. Jahrestagung der Deutschen Gesellschaft für Epidemiologie, Greifswald, September 21-23.

Coder, B., Röske, K., Hapke, U. & John, U. (2006). Die Kooperation niedergelassener Ärzte mit den Schwerpunktpraxen Sucht in Mecklenburg-Vorpommern [Cooperation of general practitioners with priority practices for addiction in Mecklenburg-Western Pommerania]. Jahrestagung der Deutschen Gesellschaft für Epidemiologie, Greifswald, September 21-23.

Coder, B., Freyer, J., Pockrandt, C., Hartmann, B, Bischof, G., John, U. & Hapke, U. (2006). Alkoholrisikokonsumenten in Allgemeinkrankenhäusern: Ein Vergleich unterschiedlicher Subgruppen [Inpatients with risky drinking: Comparision of different subgroups]. Jahrestagung der Deutschen Gesellschaft für Medizinische Psychologie, Leipzig, September 21-23.

Coder, B., Röske, K., Hapke, U. & John, U. (2005). Die Kooperation niedergelassener Ärzte mit den Schwerpunktpraxen Sucht in Mecklenburg-Vorpommern [Cooperation of

general practitioners with priority practices for addiction in Mecklenburg-Western Pommerania]. 4. Deutscher Kongress für Versorgungsforschung, Berlin, September 21-24.

Coder, B., Scholz, U., & Sniehotta, F.F. (2004). Effektivität von Planung bei Handlungs- und Lageorientierung in Bezug auf körperliche Aktivität [Effectivty of planing physical activity among action and state orientated individuals]. 44. Kongress der Deutschen Gesellschaft für Psychologie, Göttingen, September 26-30.

Awards

Röske, K., Coder, B., John, U., Hannich, H.-J. & Ulbricht, S.: 2nd degree prize for the best publication 2006 "The role of general practitioners in the care for patients with addiction problems in a rural area of Germany", Family Medicine & Primary Care Review, Wroclaw, Polen, September 13, 2007

Acknowledgement/ Danksagung