

# Patterns of alcohol use, their correlates, and impact in male drinkers: a population-based survey from Goa, India

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## Abstract

**Purpose** Associations between low socio-economic class and alcohol use disorders are relatively well established in developed countries; however, there is comparably little research in India and other developing countries on the associations between socio-economic class, drinking patterns, and alcohol-related problems. We sought to assess drinking patterns and adverse outcomes among male drinkers and examine whether the association between drinking patterns and adverse outcomes differ by socioeconomic class.

**Methods** Population survey of 732 male drinkers screened from 1,899 men, aged 18 to 49 years, randomly selected from rural and urban communities in northern Goa, India.

**Results** Usual quantity of alcohol consumed by 14.8 % (rural 16.8 %; urban 13.6 %) current drinkers is at high-risk level. About 28.6 % (rural 31 %; urban 27.2 %) and

33.7 % (rural 30.5 %; urban 35.5 %) of current drinkers reported monthly or more frequent heavy episodic drinking and drunkenness, respectively. Lower education and lower standard of living (SLI) were associated with higher usual quantity of alcohol consumption. More frequent heavy episodic drinking was associated with older age, being separated, lower education, and lower standard of living; weekly or more frequent drunkenness was associated only with rural residence. All three risky drinking patterns were associated with common mental disorders, sexual risk, intimate partner violence, acute alcohol-related consequences, and alcohol dependence. Significant interactions between SLI and risky alcohol use patterns suggested an increased risk of intimate partner violence among men with risky drinking and lower SLI.

**Conclusions** Risky drinking patterns are common among male drinkers in Goa and associated with lower socio-economic class. A range of adverse health and social outcomes were associated with risky drinking across all socio-economic classes. Alcohol policy should target risky drinking patterns, particularly among poorer men, to reduce the health and social burden of alcohol use in India.

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## Introduction

Alcohol use disorders (AUDs) represent a spectrum of health conditions ranging from drinking alcohol at hazardous levels (which pose a risk to health and social outcomes) to alcohol dependence. The burden of disease attributable to AUDs is estimated to be greater in low- and middle-income countries than in high-income countries.

Although lifetime alcohol abstinence rate is high in India (79.2 %) compared with average abstinence rates in World Health and Organization's [1] African (57.3 %), American (21.5 %), and European (18.9 %) regions, [2] the rates of AUD amongst those who drink are relatively high [3]. The epidemiological picture in India is characterized by predominantly male drinking; frequent, heavy drinking; preference for spirits with high alcohol content; [4, 5, 6], and high rates of alcohol-attributable mortality (15–20 % of all deaths and 25 % of deaths among men 15–44 year age group) [7] and alcohol dependence (17–26 % among current drinkers) [3] relative to the volume of alcohol.

Research suggests specific patterns of alcohol consumption increase the risk of morbidity and mortality [8]. For example, heavy episodic drinking (HED, sometimes called “binge” drinking) or the consumption of the equivalent of more than 60 g of pure ethanol in a day, increases the risk for diverse alcohol-related harms [9]. Several of these harms, including drunk driving, interpersonal violence, and injury have implications beyond the drinker by generating harm to others [10]. Heavy episodic drinking is reported to be more common among drinkers in poorer drinking populations, within countries as well as globally [11]. Risky drinking patterns may underlie the emergence of AUDs as a public health crisis in India [12, 13].

In addition to the average amount of alcohol consumed, there are several ways that alcohol consumption patterns have been measured [14]. Patterns of consumption examined in this study include usual quantity of alcohol consumed on a drinking day (sometimes referred to as drinks per drinking day), HED, and frequency of drunkenness (i.e., the number of days drank “enough to feel drunk”). These alcohol consumption patterns have been shown to indicate acute and chronic alcohol-related problems [14], alcohol dependence [15], and mortality [16] in developed countries like the US. However, little is known in the Indian context about the prevalence of each specific drinking pattern indicator and its association with alcohol-related problems. In addition, while associations between low socio-economic class and AUDs are relatively well established in developed countries [17], there is comparably little research in India on the associations between socio-economic class, drinking patterns, and alcohol-related problems.

The aims of this study were to (1) describe the prevalence of three specific patterns of alcohol use in a population sample of male drinkers in Goa; (2) describe the associations of these alcohol use patterns with socio-demographic factors and with adverse health and social outcomes; and (3) assess whether associations between drinking patterns and adverse outcomes differ by socio-economic class.

## Methods

### Sample

The study was set in Goa, a small state on the west coast of India, with a population of 1.4 million [18]. Goa is a transitional state with a highly urbanized population and relatively high levels of economic and social development comparable to other southern states and urban settings [19]. Previous studies in Goa with specific populations (e.g., male industrial workers and primary care attendees) estimate hazardous alcohol use in at least 30 % of all male drinkers [20, 21, 22].

Data from a population-based survey of respondents, aged 18 to 49 years and randomly selected from rural and urban communities in northern Goa, were used. A two-staged probability sampling procedure, based on 2004 and 2006 electoral rolls, was used to select respondents. From a randomly selected household the study subject was selected at random from those of eligible ages within the households. A house was deemed unavailable when no respondents were found at the randomly selected household after three attempts at recruitment. The first house on the right-hand side of the one deemed unavailable was selected as the replacement household ( $n = 546$ ; 28.8 %). Refusal rates for randomly selected households were 1.5 % and replacement households were 0.75 %.

### Procedure

A two-stage methodology was adopted. The first stage comprised a screening interview, which included demographic and socio-economic information, current drinking status, sexual risk behavior, and intimate partner violence. In the second stage, a sub-sample, comprising of (a) all men who reported alcohol use (at least one whole drink containing 10 g of alcohol) in the past year and (b) non drinkers randomly selected in a 1:4 ratio, were invited to participate in a longer interview which assessed alcohol use patterns, problems, and adverse outcomes. All interviews were administered by male interviewers, in private, in the respondents' homes. First-stage interviews took about 15 min and second-stage interviews just over 60 min to complete. Both interviews were completed on the same day for the large majority of respondents (98.8 %).

### Measures

#### *Demographic and Socioeconomic variables*

Demographic factors assessed were age, area of residence (urban/rural), ethnicity (Goan nativity or not), and marital status.

Socio-economic factors assessed were education and standard of living. A standard of living index (SLI) was

created based on household assets and was consistent with prior work on both international and Indian survey data [23, 24]. Principal component analysis of seven selected household assets suggested a single factor, accounting for 32.4 % of the variance (eigenvalue  $\lambda_1 = 4.22$ ). A composite asset score was computed by summing items weighted by their factor loadings. Asset-based indices have been associated with mean alcohol consumption, economic development and health indices in India [24], and we found strong associations ( $P < 0.0001$ ) with urban residence, education, and experiencing hunger due to lack of money, supporting its use as a valid indicator of SES. The asset score was categorized into two categories of SLI: upper three quintiles and lower two quintiles. The use of dichotomous SLI is consistent with other studies in India, which have shown poorer health outcomes for the respondents who fall in the poorest 40 % grouping for SLI compared with the remaining 60 % of the population [23].

#### *Alcohol use variables*

Systematically assessed beverage-specific drink-size information was used to define a drink [25] and the reported numbers of drinks were converted to grams of pure ethanol (one drink = 10 g of alcohol). The following three risky drinking patterns were defined.

Usual quantity of consumption was assessed by asking about the usual number of drinks consumed per drinking day in the past 12 months. Current drinkers were categorized into three groups: low risk (<40 g), medium risk (40–60 g), and high risk (>60 g). This risk categorization of quantity used by WHO allows international comparisons of drinking levels, pattern, and related problems [26].

Heavy episodic drinking was assessed by asking the frequency of consumption of drinks equivalent to 60 or more grams of pure ethanol in a single occasion during the past 12 months.

Drunkenness was elicited by the question “how often in the last 12 months did you drink enough to feel drunk?” The response was categorized as less than monthly, at least monthly (but less than weekly), and at least weekly during the past 12 months. Previous studies in the US have suggested that subjective self-report of intoxication may be a better predictor of alcohol-related harm [27], compared with heavy drinking, morning drinking, or total volume of intake [28]. This measure implicitly adjusts for factors like body water and metabolism rates and has been validated against qualitative data [29].

#### *Health and social outcomes*

Five adverse health and social outcomes were assessed.

Common mental disorders (CMD) were assessed by the general health questionnaire (GHQ). The GHQ [30] is a

widely used screening tool used internationally [31] for the measurement of anxiety and depressive symptoms. The Konkani version of the GHQ has been demonstrated to be superior to several other primary care questionnaires for detection of probable cases of CMD in Goa [32]. A cut-off score of five, recommended for case detection in primary care samples to denote probable CMDs, was used [33].

*Sexual risk behaviors* Respondents were asked if they had ever engaged in any of the following ‘risky’ sexual acts: sex with a commercial sex worker; sex for money or gifts; sex with other men; or had two or more sexual partners. Those who answered any of these questions in the affirmative were then asked about these same behaviors during the past 12 months. Due to the low count for specific sexual risk behaviors reported during the previous 12 months, a composite variable of any sexual risk behavior in the previous 12 months was computed.

*Intimate partner violence (IPV)* Two questions separately assessed self-reported perpetration of physical and sexual violence: “In the past 12 months have you slapped, hit, kicked, punched your partner or done something else that did or could have hurt your partner physically?” and “In the past 12 months, have you had sex with your partner when your partner was unwilling or forced your partner to do sexual things or to have sex?” These questions were based on the conflict tactic scale, a widely used measure of interpersonal violence [34] used in prior studies on IPV with men in India [35, 36]. Men reporting either type of violence were coded as positive for IPV.

Acute alcohol-related consequences measured the overall prevalence of 15 adverse events directly related to alcohol use during the past 12 months. Adverse events included getting into fights after drinking; problems at place of work due to drinking; and health consequences, legal issues, and any other tangible problems that have resulted from alcohol use. The number of alcohol-related events answered in the affirmative were summed and then categorized into two groups defined as those reporting less than two events and those reporting two or more events. Prior research in the US using this standardized measure used two or more tangible consequences as indicative of alcohol-related problems [37, 38].

*Alcohol dependence* The alcohol dependence measure from the US national alcohol surveys that reflect DSM-IV defined seven symptom domains [39] or criteria for alcohol dependence was adapted [40, 41]. Respondents reporting at least one positive item from each of three or more symptom domains were identified as alcohol dependent. However, this measure, while standardized for surveys [41], is not a formal clinical diagnosis.

#### *Analysis*

Weights were applied to the data to account for the sampling design, age distribution information from the

electoral rolls, number of adults aged 18–49 years in the household, under-sampling of non-drinkers in the second-stage interviews, and non-response. Weights were also rescaled to separately represent rural and urban sample sizes. All analyses were a-priori adjusted for age and area of residence (rural/urban) to account for rural/urban and age-related differences in alcohol use. First, frequencies of alcohol use patterns were analyzed and demographic and socioeconomic factors associated with each pattern among male drinkers were identified. Then, the association between the three drinking patterns and each of the five adverse health and social outcomes mentioned above: probable CMD, IPV, sexual risk, acute alcohol-related consequences and alcohol dependence, were examined. A relatively low number of men of high SLI reported adverse health and social outcomes. Hence to ensure adequate power in logistic regression models run, the drinking pattern variables were reported as continuous measures and change in risk associated with unit change in drinking pattern was reported (e.g., for each drink of alcohol consumed the average increase in odds for psychological distress; for each additional day of HED the average increase in odds for psychological distress). The moderating effect of SLI on the association between drinking patterns and adverse health and social outcomes was tested by including an interaction term between SLI and each drinking pattern variable in separate logistic regression models. When this interaction term was significant, stratified effect sizes in the group of men in lower two quintiles versus upper three quintiles of SLI were calculated.

## Results

One thousand eight hundred and ninety-nine men completed the screening interview; the majority of respondents were from randomly selected households (71.3 %,  $n = 1,353$ ). Although replacement houses were more likely to be in urban areas (59.4 vs. 36.9 %,  $P < 0.001$ ), have a lower standard of living score (mean score 0.95 vs. 1.00;  $P < 0.01$ ) and be of non-Goan ethnicity (22.8 vs. 14 %,  $P < 0.001$ ), they were comparable to randomly selected households on the prevalence of AUD and other study measures. Of the 766 current drinkers (39 %; 95 % CI 36–42) identified by the screening interview, 742 (97 %) completed the second-stage interview.

### Prevalence of alcohol use patterns (Table 1)

Among current male drinkers who completed the second stage interview ( $n = 742$ ), 26 % drank less than once a month, while 21 % reported four or more drinking episodes per week. The majority of drinkers (72 %) consumed less

**Table 1** Patterns of alcohol use among current drinkers

Pattern	<i>N</i>	Weighted % (95 % CI)
Usual quantity ( $n = 742$ )		
Low risk (<40 g)	534	71.6 (67.7–75.4)
Moderate risk (40–60 g)	97	13.6 (10.6–16.7)
High risk (>60 g)	111	14.8 (11.8–17.8)
Frequency of HED (>60 g) ( $N = 741$ )		
Never	420	57 (52.9–61.2)
Less than monthly	107	14.3 (11.5–17.2)
Monthly or more	214	28.6 (24.8–32.4)
Frequency-drunkenness ( $n = 737$ )		
Never	501	66.3 (62.3–70.3)
At least monthly but not weekly	185	26.7 (22.9–30.4)
Weekly or more	51	7 (4.8–9.3)

than four drinks (40 g) on a typical drinking day, while 14.8 % had six drinks or more ( $\geq 60$  g). Over one-fourth of male drinkers (29 %) reported HED monthly or more frequently and 7 % reported getting drunk at least weekly.

### Demographic and socio economic factors associated with drinking patterns (Table 2)

Men with lower education and lower standard of living were more likely to report a risky usual quantity of alcohol ( $\geq 60$  g/drinking day). At least monthly HED was reported more often by older men, those who were separated, less educated, and those with a lower standard of living. Men from rural areas were significantly more likely to report drunkenness at least once a week than urban counterparts.

### Adverse health and social outcomes associated with drinking patterns (Table 3)

Risky drinking patterns were associated with all five adverse health and social outcome variables. After adjusting for age, area of residence, standard of living, and education, higher usual quantity of drinking, greater frequency of HED, and drunkenness were significantly associated (adjusted odds ratios  $P < 0.05$ ) with intimate partner violence, acute consequences of drinking, and alcohol dependence. Similarly, higher usual quantities of drinking and greater frequency of drunkenness were significantly associated with sexual risk behaviors. Finally, higher usual quantity of drinking and HED were significantly associated with psychological distress.

### Moderating effect of standard of living (SLI)

We did not find any interaction between SLI and risky drinking patterns in its association with CMD, sexual risk behavior, acute consequences of alcohol use, and alcohol

**Table 2** Socio-demographic factors associated with drinking pattern

	Usual quantity (%) (n = 742) <sup>a</sup>				Frequency of heavy drinking: (5+ drinks) (%) (n = 741)				Monthly frequency of drunkenness (%) (n = 737)			
	Low risk	Moderate risk	High risk	P value	Never	Less than monthly	At least once a month	P value	Less than monthly	Monthly but not weekly	At least once a week	P value
18–29	193 (72.9)	37 (15.4)	33 (11.7)	$\chi^2$ 4, P 0.4	154 (57.3)	50 (19.6)	59 (23.2)	$\chi^2$ 14.2, P 0.01	173 (63.3)	73 (31.3)	16 (5.6)	$\chi^2$ 2.4, P 0.7
30–39	210 (73.4)	31 (10.2)	47 (16.4)		160 (58.2)	39 (13.3)	38 (28.6)		194 (66.9)	71 (25.6)	21 (7.5)	
40–49	131 (67.3)	29 (16)	31 (16.8)		106 (55.1)	18 (8.6)	67 (36.3)		134 (69.8)	41 (21.6)	14 (8.7)	
Area												
Rural	245 (69.1)	45 (14.2)	60 (16.8)	$\chi^2$ 2.5, P 0.3	200 (57.1)	44 (11.9)	105 (31)	$\chi^2$ 1.9, P 0.38	245 (69.4)	71 (21.5)	33 (9.1)	$\chi^2$ 12.6, P 0.002
Urban	282 (73.1)	58 (13.3)	51 (13.6)		220 (57)	63 (15.8)	109 (27.2)		256 (64.4)	114 (29.7)	18 (5.8)	
Ethnicity												
Goan	433 (73.4)	75 (13.2)	92 (13.4)	$\chi^2$ 1.1, P 0.6	339 (58.6)	88 (14.5)	172 (27)	$\chi^2$ 0.2, P 0.92	409 (68.2)	151 (26.1)	37 (5.7)	$\chi^2$ 2.5, P 0.28
Non-Goan	101 (63.7)	22 (15.7)	19 (20.6)		81 (50.4)	19 (13.8)	42 (35.8)		92 (58.1)	34 (28.9)	14 (13)	
Marital status												
Married	318 (71.5)	56 (12.9)	69 (15.6)	Exact P 0.15	244 (55.8)	57 (12.5)	141 (31.7)	Exact P 0.01	307 (69.1)	101 (23.5)	31 (7.4)	Exact P 0.46
Separated	4 (57.1)	3 (22)	3 (20.9)		4 (57.1)	0	6 (42.9)		6 (75.7)	2 (16)	1 (8.3)	
Single	212 (72.2)	38 (14.3)	39 (13.5)		172 (58.7)	50 (17.2)	67 (24.1)		188 (62.4)	82 (31)	19 (6.6)	
Education												
High school	404 (76.7)	62 (12.0)	64 (15.5)	$\chi^2$ 22.1, P < 0.001	324 (62.2)	84 (15.9)	121 (22)	Exact P < 0.001	364 (67.5)	130 (27.4)	30 (5.2)	Exact P 0.16
Prim/middle	118 (61.7)	28 (14.8)	39 (22.8)		85 (44.7)	21 (10.8)	79 (44.5)		122 (63.7)	42 (24.6)	18 (11.7)	
No education	12 (29.2)	7 (40.6)	8 (30.2)		11 (31.1)	2 (5.6)	14 (63.3)		15 (58.6)	9 (25.1)	3 (16.2)	
SLI												
Upper three quintile	361 (73.9)	50 (11.6)	62 (14.5)	$\chi^2$ 12.7, P 0.002	285 (59.9)	72 (14.6)	115 (25.5)	$\chi^2$ 12.9, P 0.002	319 (65.1)	123 (28.2)	27 (6.7)	$\chi^2$ 3.2, P 0.205
Lowest two quintile	173 (66.3)	47 (18.3)	49 (15.4)		135 (50.3)	35 (13.9)	99 (35.8)		182 (69.2)	62 (23)	24 (7.8)	

<sup>a</sup> Weighted percentage

**Table 3** Association between drinking pattern and adverse outcomes

	Psychological distress (GHQ score)		Sexual risk		Intimate partner violence		Acute consequence of alcohol use		Alcohol dependence	
	Absent	Present	Absent	Present	Absent	Present	Absent	Present	Absent	Present
Current drinkers (%)	695 (88.9)	70 (11.1)	752 (97.9)	14 (2.1)	472 (92.1)	48 (7.9)	628 (90.9)	66 (9.1)	641 (88.9)	88 (11.1)
Usual quantity (mean number of drinks)	3.7 ± 0.1	5.7 ± 0.7	3.8 ± 0.12	5.7 ± 0.12	3.7 ± 0.14	5.3 ± 0.7	3.8 ± 0.1	6.3 ± 0.7	3.7 ± 0.1	6.4 ± 0.5
Adj OR <sup>b</sup>	1.17 (1.06–1.3) <sup>a</sup>		1.19 (1.05–1.3) <sup>a</sup>		1.12 (1.04–1.21) <sup>a</sup>		1.02 (1.011–1.029) <sup>a</sup>		1.024 (1.014–1.034) <sup>a</sup>	
Frequency of HED (days, last 12 months)	22 ± 3.2	77 ± 20.8	26 ± 3.5	70 ± 38.5	21 ± 3.9	90 ± 23.1	21 ± 3.8	99 ± 20.8	18 ± 3.1	104 ± 18.6
Adj OR <sup>b</sup>	1.004 (1.002–1.007) <sup>a,c</sup>		1.004 (1–1.009)		1.005 (1.003–1.007) <sup>a</sup>		1.006 (1.004–1.008) <sup>a</sup>		1.007 (1.005–1.01) <sup>a</sup>	
Frequency of drunkenness (days last 12 months)	13 ± 2.4	26 ± 9.2	14 ± 2.4	34 ± 16.3	14 ± 3.3	44 ± 15.6	12 ± 2.5	40 ± 10.3	21 ± 13	47 ± 8.9
Adj OR <sup>b</sup>	1.002 (0.998–1.006)		1.008 (1–1.014) <sup>a</sup>		1.004 (1.001–1.008) <sup>a</sup>		1.006 (1.002–1.009) <sup>a</sup>		1.009 (1.004–1.015) <sup>a</sup>	

<sup>a</sup>  $P < 0.05$ <sup>b</sup> Odds ratio adjusted for age, area of residence, education and standard of living index<sup>c</sup> For each additional day of heavy episodic drinking the risk for psychological distress increases by 0.4 %**Table 4** Association between risky drinking patterns and intimate partner violence stratified by SLI

	Adjusted odds ratio for intimate partner violence	
	SLI lower two quintiles OR (95 % CI)	SLI upper three quintiles OR (95 % CI)
Usual quantity of alcohol (usual number of drinks per day)	1.35 (1.16–1.56) <sup>a</sup>	0.66 (0.44–1.00)
Frequency of drunkenness (days drunk last 12 months)	1.01 (1.00–1.01)	0.99 (0.98–1.00)
Frequency of HED (days last 12 months)	1.01 (1.01–1.013) <sup>a</sup>	1 (0.99–1.00)

<sup>a</sup>  $P < 0.05$ 

dependence. Thus, the respondent's standard of living did not moderate the relationship between drinking patterns and these four adverse social and health outcomes. However, we observed significant interactions between SLI and usual quantity of alcohol use (1.08, 95 % CI 1.03–1.12), HED (1.01, 95 % CI 1.0–1.02), and frequency of drunkenness (1.02, 95 % CI 1.003–1.07) in association with intimate partner violence. Association between intimate partner violence and risky drinking patterns stratified by SLI showed that higher risk for intimate partner violence associated with higher usual quantity of alcohol and

frequent HED were significant only for men with lower SLI (Table 4).

## Discussion

The prevalence of drinking among men in our study (39 %) is lower compared with that in many western countries [2] but is consistent with other studies from Goa [20] and other parts of India [3, 4, 42]. Majority of current drinkers in this population could be considered as low-risk drinkers (72 %) based on their usual quantity of consumption; however, 43 % of drinkers reported heavy episodic drinking during the past year. One-third of current drinkers experienced drunkenness at least once a month (and up to 7 % weekly). Lower standard of living and lower education were associated with risky levels of usual quantity of alcohol and HED. In addition, HED was also associated with marital separation and older age. Finally, rural residence was associated with more frequent drunkenness. All three risky drinking patterns were associated with intimate partner violence, acute consequences of alcohol use, and alcohol dependence. Increasing usual quantity of alcohol and HED was also associated with CMD, while sexual risk behavior was associated with increasing usual quantity of alcohol and drunkenness. These associations did not differ by socio-economic class except for the association between drinking patterns and intimate partner violence.

The higher rates of alcohol dependence and risky drinking patterns amongst those who drink are consistent with findings from other parts of India. To the best of our knowledge, there have been no studies from India investigating the impact of diverse patterns of drinking on various health and social outcomes. Such evidence is important because risky drinking patterns may be more relevant in predicting adverse health as well as social outcomes [8] than overall “presence” or “absence” of alcohol use. We found that all risky drinking patterns were associated with indicators of socio-economic disadvantage. While HED and frequency of drunkenness predicted four out of five adverse outcomes we examined, usual quantity of alcohol predicted all five adverse outcomes. Previous studies from high-income countries have observed associations between drinking risky patterns and violence [43, 44], alcohol dependence [45], and mental ill-health [46]. Our study confirms that the findings from high-income countries are also observed in this population and highlights the adverse impact of risky drinking patterns in India.

Standard of living did not influence the association between risky drinking patterns and adverse outcomes among drinkers, except for IPV. Association between risky drinking patterns and IPV stratified by SLI showed that the IPV is associated with higher usual quantity of drinking and frequent heavy episodic drinking among men with lower SLI only.

#### Limitations of this study

The main limitation of our study is its cross-sectional design, which limits our ability to interpret the direction of causality for the associations observed. In particular, the association of lower standard of living with risky drinking patterns and of risky drinking patterns with CMD may be bi-directional. Furthermore, shared determinants such as personality traits may be residual confounders in the association between risky drinking patterns and adverse health and social outcomes. Purposeful underreporting of socially undesirable behaviors, such as alcohol use and perpetration of violence cannot be ruled out. However, experience with similar research efforts, including our own earlier studies in the same setting, has indicated that self-reported information from drinkers is generally reliable regardless of the sensitivity of the information sought and the type of information-gathering procedure used [47]. Although we found sexual risk behaviors associated with increasing usual quantity of alcohol and drunkenness, we do not have information on whether the sexual risk behavior occurred on the same occasions as alcohol use. Finally, although both rural and urban areas in Goa were included in the study, the generalizability to a large and

diverse country like India is limited. The strengths of our study included the high participation rate, especially considering the sensitive nature of information sought and the use of standardized and validated measures for data collection.

In summary, risky drinking patterns are common among male drinkers in India and they are at increased risk for multiple adverse outcomes. Men from socioeconomically disadvantaged situations are more likely to have risky drinking pattern. Though risky drinkers from all socio-economic groups are vulnerable to adverse health and social outcomes associated with risky drinking patterns, men with a lower SLI are at increased risk of engaging in intimate partner violence associated with risky drinking patterns compared with men with a higher SLI.

In the context of a relatively low prevalence of alcohol use, alcohol policy in India should specifically emphasize targeting harm reduction through strategies for reducing risky drinking patterns across all socioeconomic groups.

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#### References

1. World Health Organization (2008) The global burden of disease: 2004 update. World Health Organization, Geneva
2. World Health Organization (2011) Global status report on alcohol and health. World Health Organization, Geneva
3. Ray R (2004) The extent pattern and trends of drug abuse in India: National survey, Ministry of Social Justice and Empowerment, Government of India and United Nations Office on Drugs and Crime. Regional Office of South Asia, New Delhi, pp 1–140
4. Benegal V (2005) India: alcohol and public health (Miscellaneous). *Addiction* 100(8):1051–1056
5. Prasad R (2009) Alcohol use on the rise in India. *Lancet* 373(9657):17–18
6. Saxena S (1999) Country profile on alcohol in India In: Riley L, Marshall M (eds) Alcohol and public health in 8 developing countries. World Health Organisation, Geneva, pp 37–60
7. Gururaj G et al (2011) Alcohol related harm: implications for public health and policy in India. National Institute of Mental Health and Neuro Sciences, Bangalore
8. Bondy SJ (1996) Overview of studies on drinking patterns and consequences. *Addiction* 91(11):1663–1674
9. Rehm J, Sempos CT, Trevisan M (2003) Average volume of alcohol consumption, patterns of drinking and risk of coronary heart disease—a review. *J Cardiovasc Risk* 10(1):15–20
10. Nutt DJ, King LA, Phillips LD (2010) Drug harms in the UK: a multi criteria decision analysis. *Lancet* 376(9752):1558–1565
11. Anderson P, Chisholm D, Fuhr DC (2009) Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *Lancet* 373(9682):2234–2246
12. Neufeld K et al (2005) Regular use of alcohol and tobacco in India and its association with age, gender, and poverty. *Drug Alcohol Depend* 77(3):283–291

13. Bonu S et al (2005) Does use of tobacco or alcohol contribute to impoverishment from hospitalization costs in India? *Health Policy* 20(1):41–49
14. Greenfield TK, Kerr WC (2008) Alcohol measurement methodology in epidemiology: recent advances and opportunities. *Addiction* 103(7):1082–1099
15. Caetano R et al (1997) DSM-IV alcohol dependence and drinking in the US population: a risk analysis. *Ann Epidemiol* 7(8): 542–549
16. Rehm J, Greenfield TK, Kerr W (2006) Patterns of drinking and mortality from different diseases—an overview. *Contemp Drug Probl* 33:205
17. Mulia N et al (2008) Social disadvantage, stress, and alcohol use among black, Hispanic, and white Americans: findings from the 2005 US National Alcohol Survey. *J stud alcohol drugs* 69(6): 824–833
18. Government of India (2001) Census of India 2001. Government of India, New Delhi
19. Government of India (2002) National human development report 2001. Planning commission, New Delhi
20. Silva MC et al (2003) The prevalence and correlates of hazardous drinking in industrial workers: a study from Goa, India. *Alcohol Alcohol* 38(1):79–83
21. Gaunekar G, Patel V, Rane A (2005) The impact and patterns of hazardous drinking amongst male industrial workers in Goa, India. *Soc Psychiatry Psychiatr Epidemiol* 40(4):267–275
22. D’Costa G et al (2007) Harmful alcohol use in Goa, India, and its associations with violence: a study in primary care. *Alcohol Alcohol* 42(2):131–137
23. Gwatkin D et al (2007) Socio-economic differences in health, nutrition, and population, India 1992/93, 1998/99. World Bank, Washington
24. Filmer D, Pritchett LH (2001) Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. *Demography* 38(1):115–132
25. Nayak MB et al (2008) Not all drinks are created equal: implications for alcohol assessment in India. *Alcohol Alcohol* 43(6): 713–718
26. World Health Organization (2000) International guide for monitoring alcohol consumption and related harm. World Health Organization, Department of Mental Health and Substance Dependence, Noncommunicable Diseases and Mental Health Cluster, Copenhagen
27. Midanik LT (2000) Definitions of drunkenness, in measuring drinking patterns, alcohol problems, and their connection In: International research conference, Kettil Bruun Society, Skarpo, 3–7 April 2000
28. Dawson DA, Room R (2000) Toward agreement on ways to measure and report drinking patterns and alcohol-related problems in adult general population surveys: the Skarpo conference overview. *J Subst Abuse* 12:1–21
29. Midanik L (1999) Drunkenness, feeling the effects, and 5+ measures. *Addiction* 94(6):887–897
30. Goldberg DP et al (1997) The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med* 27(1):191–197
31. Maj M, Gaebel W (2002) *Psychiatric diagnosis and classification*. Wiley, Chichester
32. Patel V et al (2008) Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med* 38(2):221–228
33. Puertas G, Patel V, Marshall T (2004) Are visual measures of mood superior to questionnaire measures in non-western settings? *Soc Psychiatry Psychiatr Epidemiol* 39(8):662–666
34. Straus MA et al (1996) The revised conflict tactics scales (CTS2): development and preliminary psychometric data. *J Fam Issues* 17:283–316
35. Duvvury N, Nayak M, Allendorf K (2002) Links between masculinity and violence: aggregate analysis, in domestic violence in India: exploring strategies, promoting dialogue. In: Young M, ICRW staff (eds) *Men, masculinity and domestic violence in India*. Summary report of four studies, International Center for Research on Women, Washington, pp 52–70
36. Nayak MB, Kumar S (2004) Alcohol use patterns associated with spousal violence-related injury in India. In: Abstracts of the alcoholism: clinical and experimental research, Research Society on Alcoholism, Vancouver, 26–30 June 2004, 28(5):107A
37. Midanik L, Greenfield TK (2000) Trends in social consequences and dependence symptoms in the United States: the national alcohol surveys, 1984–1995. *Am J Public Health* 90(1):53–56
38. Cherpitel CJ (2002) Screening for alcohol problems in the US general population: comparison of the CAGE, RAPS4, and RAPS4-QF by gender, ethnicity, and services utilization. *Alcohol Clin Exp Res* 26(11):1686–1691
39. American Psychiatric Association (2000) *Diagnostic and statistical manual of mental disorders, text revision (DSM-IV-TR)*. 4th edn. American Psychiatric Association, Washington
40. Caetano R, Greenfield TK (1997) Trends in DSM-IV alcohol dependence: 1990 and 1995 US national alcohol surveys (ARG F407), Alcohol Research Group, Public Health Institute, Berkeley
41. Caetano R, Tam TW (1995) Prevalence and correlates of DSM-IV and ICD-10 alcohol dependence: 1990 US national alcohol survey. *Alcohol Alcohol* 30(2):177–186
42. International Institute for Population Sciences (2007) *Macro international, national family health survey (NFHS-3) 2005–06: India*. International Institute for Population Sciences, Mumbai
43. Caetano R et al (2000) Intimate partner violence and drinking patterns among white, black, and Hispanic couples in the US. *J Subst Abuse* 11(2):123–138
44. Lipsky S, Caetano R, Roy-Byrne P (2011) Triple jeopardy: impact of partner violence perpetration, mental health and substance use on perceived unmet need for mental health care among men. *Soc Psychiatry Psychiatr Epidemiol* 46(9):843–852
45. Hatton J et al (2009) Drinking patterns, dependency and life-time drinking history in alcohol-related liver disease. *Addiction* 104(4):587–592
46. Volk RJ et al (1997) Alcohol use disorders, consumption patterns, and health-related quality of life of primary care patients. *Alcohol Clin Exp Res* 21(5):899–905
47. McCrady BS, Paolino TJ, Longabaugh R (1978) Correspondence between reports of problem drinkers and spouses on drinking behavior and impairment. *J Stud Alcohol* 39:1252–1257