

Role of socioeconomic markers and state prohibition policy in predicting alcohol consumption among men and women in India: a multilevel statistical analysis

S.V. Subramanian,¹ Shailen Nandy,² Michelle Irving,² David Gordon,² & George Davey Smith²

Objective To investigate the independent contribution of individual socioeconomic markers and state prohibition policy on alcohol consumption among men and women in India.

Methods The study used a multilevel cross-sectional analysis of alcohol consumption from the 1998–1999 Indian national family health survey of 301 984 adult individuals in 92 447 households in 3215 villages in 440 districts in 26 states, stratified by sex.

Findings Men with no education were more likely to consume alcohol than those with a post graduate education (OR, 2.28; 95% CI, 2.08–2.50). Unlike men, women showed a U-shaped association between education and alcohol consumption. Men and women living in households at the lowest standard-of-living quintile were more likely to consume alcohol (OR, 1.92; 95% CI, 1.81–2.03, and OR, 2.72, 95% CI, 2.18–3.39), respectively, than those classified as living in the top quintile. Members of scheduled tribes and castes and other backward classes were more likely to consume alcohol than members of other caste groups. There was no difference in alcohol consumption between men from states that were not under prohibition (OR, 1.36; 95% CI 0.69–2.03) and those that were. By contrast, states not under prohibition has higher alcohol use by women (OR, 3.04, 95% CI, 1.59–4.48) than those under partial or complete prohibition.

Conclusions Caste, education and standard of living independently influence alcohol use in India. Prohibition policies appear to have little effect on alcohol use by men, but may reduce the proportion of women who consume alcohol. The socioeconomic patterning of health behaviours is likely to feed substantially into inequalities in health outcomes. Further investigation is required to understand how social and cultural factors in more localized contexts (e.g. districts) influence alcohol consumption.

Keywords Alcohol drinking/epidemiology/legislation; Public policy; Socioeconomic factors; Sex factors; Social class; Education; Living conditions; Models, Statistical, India (*source: MeSH, NLM*).

Mots clés Consommation alcool/épidémiologie/législation; Politique gouvernementale; Facteur socioéconomique; Facteur sexuel; Classe sociale; Enseignement et éducation; Conditions de vie; Modèle statistique; Inde (*source: MeSH, INSERM*).

Palabras clave Consumo de bebidas alcohólicas/epidemiología/legislación; Política social; Factores socioeconómicos; Factores sexuales; Clase social; Educación; Condiciones de vida; Modelos estadísticos; India (*fuentes: DeCS, BIREME*).

Arabic

Bulletin of the World Health Organization 2005;83:829-836.

Voir page 834 le résumé en français. En la página 835 figura un resumen en español.

Introduction

Approximately 2 billion people worldwide consume alcohol, an estimated 76 million of whom have been diagnosed with alcohol use disorders (1). Alcohol consumption is estimated to cause 1.8 million deaths per year (3.2% of all deaths) and to be responsible for 4.0% of the disability-adjusted life years lost per year worldwide (1, 2). Additionally, it is estimated that 20–30% of all motor vehicle accidents, homicides and intentional injuries are alcohol-related (3, 4). Studies have also found that high alcohol intake increases blood pressure (5, 6), and elevates the risk of stroke (7–10) and liver cirrhosis (11, 12).

It is, therefore, important to know if certain population groups are more susceptible to alcohol consumption. More-

over, health behaviours, such as alcohol consumption, tend to be influenced by the context within which they occur (13). Two individuals, despite being similar in a range of individual demographic and socioeconomic characteristics, may have differential probabilities of alcohol use that may be due to different residential environments, suggesting an underlying geography of alcohol consumption. There is currently very little research examining the socioeconomic and geographical patterns of alcohol intake in developing countries. Consequently, in this study, we assessed the independent contribution of individual socioeconomic markers and geographical contexts on alcohol consumption among men and women in India.

Developing countries are thought to be dominated by abstainers, but the minority who do drink tend to do so heavily

¹ Harvard School of Public Health, 677 Huntington Avenue, KRESGE Building, 7th Floor, Room 716, Boston, MA, USA. Correspondence should be sent to this author (email: svsubram@hsph.harvard.edu).

² University of Bristol, Bristol, England.

Ref. No. 04-019893

(Submitted: 29 November 2004 – Final revised version received: 04 March 2005 – Accepted: 16 April 2005)

(14). In the Asian subcontinent, per capita alcohol consumption increased by over 50% between 1980 and 2000 (4), while India has experienced a 115% increase in per capita alcohol consumption by adults since 1980 (15). In India, as in other developing societies, alcohol addiction has adverse health and social consequences, ranging from shifting the use of resources away from basic necessities such as food and shelter, to acute consequences for the welfare of other members of the household (especially children and women) (16, 17).

A recent review of studies on alcohol use in India concluded that existing studies had little power to draw national patterns of alcohol consumption for contemporary India (18). Sex differences in alcohol use have been recognized, but socioeconomic differences remain under-researched (19). Specifically, the extent to which education, caste and material standard of living are independently predictive of alcohol consumption is unclear. Furthermore, the role of individual states in India, as suggested by the variations in alcohol use shown in Fig. 1 (web version only, available at: <http://www.who.int/bulletin>), is likely to be important because the production and sale of alcohol are state, and not federal, responsibilities. Two main policy perspectives dominate the regulation of alcohol consumption in India (20). The first relates to prohibition, i.e. a complete or partial ban on the production, sale and consumption of alcohol by particular states of India (15). Support for prohibition goes back to the struggle for independence launched by Mahatma Gandhi, and is mentioned in the Indian Constitution, as a stated, but not universally enforced, goal (21). The second policy perspective is to regulate alcohol use with increased tax rates on alcohol production and consumption (22), or by imposing age restrictions on the purchase of alcohol (20).

The aim of this study was to investigate the different demographic and socioeconomic axes along which alcohol consumption is stratified in India. Conditional on this distribution we estimated the extent to which the prevalence of alcohol consumption varied between localities, districts and states. In particular, we tested whether prohibitionist states tended to have lower levels of alcohol use, after adjusting for their socioeconomic composition.

Methods

Sources of data

The analysis used data from the 1998–99 Indian national family health survey (INFHS). This cross-sectional survey was nationally representative, and the analytical sample comprised 301 984 adults aged 18 and older, from 92 447 households from 26 Indian states, stratified by sex (23). The household data, obtained through an interview-based structured questionnaire and answered by an adult household member, provided a range of demographic and socioeconomic markers for all the members of the household, including information on alcohol consumption (23). Face-to-face interviews were conducted with respondents in their homes in one of the 18 Indian languages. All households were coded according to the primary sampling unit, district and state to which they belonged. The primary sampling units (hereafter referred to as local areas) were villages or groups of villages in rural areas, and wards or municipal localities in urban areas. The response rate to the survey ranged from 89% to 100%, and in 24 of the 26 states it exceeded 94%. The high response rates in this survey were similar to those attained in the Demographic and Health Surveys in more than 40 countries (24).

Outcome measure

The analyses used a dichotomous outcome, based on the response to the question: “Does anyone, listed as a member of this household in this survey, drink alcohol?” The overall sample prevalence for alcohol consumption was 11.4%; 20% for men compared to 3% for women. Table 1 lists the descriptive characteristics of the outcome and predictor measures in the sample population, stratified by sex.

Predictor measures

At the individual level we considered age, marital status and educational attainment. At the household level we considered caste, religion and an asset-based standard-of-living index. Caste status was based on a mutually exclusive administrative classification as: scheduled tribe, scheduled caste, other backward class, other caste, or no caste. The scheduled tribes include around 700 tribes who tend to be geographically isolated (often in the hills, forest areas or islands) with little socioeconomic interaction with the rest of the population. Physical isolation, therefore, has been the main criterion for identifying communities as scheduled tribes (25). The scheduled castes include “untouchables” or Dalits; a group that was socially segregated (with little or no access to education, public places including drinking-water wells and other civic facilities) and economically disadvantaged by their low status in the traditional Hindu caste hierarchy (25, 26). The hierarchically interdependent nature of this group makes them distinct from the scheduled tribes (27). Since the inception of Indian Constitution in 1951, scheduled castes and tribes have been eligible for affirmative action. The other backward classes are another group of people who have been officially identified as “socially and educationally backward”. The other backward classes represent a diverse collection of “intermediate” castes that were considered low in the traditional caste hierarchy, but somewhat above the boundary of “untouchability” (28). Since 1990 the other backward classes, although they do not share the constitutional rights to affirmative action of scheduled castes and tribes, have been legally identified for affirmative actions. The “other” caste is a residual category of people who are not classified as scheduled caste or tribe, or other backward class; in general, this category is considered to have higher social status (23). Finally, “no caste” is used to classify communities for whom caste may not be applicable (e.g. Buddhists or Christians) or who did not report any caste affiliation. Table 2 (web version only, available at: <http://www.int/bulletin>) shows the percentage of alcohol users stratified by sex, for the different caste groups by Indian states. Religious affiliation was divided into four categories: Hindu, Muslim, Christian and other.

A classical test theory model was used to construct a valid and reliable asset index which measured the standard-of-living of households. Asset-based indices are increasingly being used to measure standard of living in developing countries (29, 30). Indices based on the ownership of assets are seen to reflect an underlying latent variable, wealth (31). The standard-of-living index of households was weighted by the proportion of each possession at the all-India level. The “possession weighting” method has been widely used in poverty research in many countries (32). The weights for each item were derived based on the proportion of households owning that item. Thus, for example, if 40% of households in the sample owned a radio, then a radio would be given a weight of 60 (100- 40). Weights for each item were summed into a linear index, and households

Table 1. Descriptive information on the individuals sampled stratified by sex, considered for the analytical multilevel models from the 1998–99 Indian national family health survey, showing the frequency of different predictor variables together with the counts and prevalence of alcohol consumption across different predictor variables in the sample population

Predictor variables	Males		Females	
	Participants <i>n</i> (%)	Drinking <i>n</i> (%)	Participants <i>n</i> (%)	Drinking <i>n</i> (%)
Living environment				
Large city	20271 (13.3)	3002 (14.8)	18659 (12.4)	92 (0.5)
Small city	10266 (6.8)	1408 (13.7)	9923 (6.6)	52 (0.5)
Town	21179 (13.9)	3574 (16.9)	21125 (14.1)	235 (1.1)
Village	100329 (66.0)	22125 (22.1)	100232 (66.8)	3883 (3.9)
Marital status				
Married/partnered	108680 (71.5)	25858 (23.8)	112711 (75.2)	3200 (2.8)
Single	36997 (24.3)	2794 (7.6)	16419 (11.0)	266 (1.6)
Widow	5455 (3.6)	1207 (22.1)	18666 (12.4)	719 (3.9)
Divorced/separated	913 (0.6)	250 (27.4)	2143 (1.4)	77 (3.6)
Religion				
Hindu	116752 (76.8)	23691 (20.3)	114746 (76.5)	2823 (2.5)
Muslim	17831 (11.7)	733 (4.1)	17473 (11.7)	32 (0.2)
Christian	9324 (6.1)	2684 (28.8)	9801 (6.5)	462 (4.7)
Other	7981 (5.2)	2961 (37.1)	7781 (5.2)	935 (12.0)
Missing	157 (0.1)	40 (25.5)	138 (0.1)	10 (7.2)
Social caste				
Other caste	60001 (39.5)	8140 (13.6)	58977 (39.3)	367 (0.6)
Scheduled caste	24503 (16.1)	6412 (26.2)	23847 (15.9)	450 (1.9)
Scheduled tribe	18362 (12.1)	6977 (38.0)	18373 (12.3)	2603 (14.2)
Other backward class	41984 (27.6)	7603 (18.1)	41614 (27.8)	729 (1.8)
No caste/missing	7195 (4.7)	977 (13.6)	7128 (4.8)	113 (1.6)
Education				
Illiterate	38523 (25.3)	10917 (28.3)	77181 (51.5)	3361 (4.4)
Primary	27504 (18.1)	6562 (23.9)	22952 (15.3)	428 (1.9)
Secondary	54516 (35.9)	9548 (17.5)	33133 (22.1)	387 (1.2)
Higher	14170 (9.3)	1479 (10.4)	7571 (5.0)	42 (0.6)
College	13004 (8.6)	1220 (9.4)	6948 (4.6)	34 (0.5)
Postgraduate	4328 (2.8)	383 (8.8)	2154 (1.4)	10 (0.5)
Household standard of living index				
Lowest fifth	26903 (17.7)	7670 (28.5)	28100 (18.7)	1648 (5.9)
Second fifth	28985 (19.1)	6700 (23.1)	27836 (18.6)	1091 (3.9)
Third fifth	30413 (20.0)	5909 (19.4)	29156 (19.4)	888 (3.0)
Fourth fifth	31611 (20.8)	5085 (16.1)	30798 (20.5)	414 (1.3)
Highest fifth	34133 (22.4)	4745 (13.9)	34049 (22.7)	221 (0.6)
Total	152045 (100)	30109 (19.8)	149939 (100)	4262 (2.8)

allocated a final score. The standard-of-living index readily provided by the INFHS (23), and the weighted standard-of-living indices used in this study were correlated to the order of 0.93 ($P < 0.00001$). Households were then divided into quintiles along this linear index.

Households were also characterized according to whether they were located in a large city (population ≥ 1 million), small city (population, 100 000–1 million), town (population ≤ 100 000), or villages and rural areas. The motivation to consider the above characteristics was that each would independently predict the likelihood that an individual would drink alcohol, with particular interest in attributes related to education, caste and standard of living.

Policy effects were estimated using a categorical predictor that depended on whether a particular state was under complete prohibition (no production and consumption of alcohol

within the state), partial prohibition (where certain types of liquor were prohibited, or where distribution and consumption were prohibited on certain days of the week or month), or not under prohibition in 1998–99 (15). Of the 26 Indian states considered for analysis, four were under complete prohibition in 1998–99 (Gujarat, Haryana, Manipur and Mizoram), three were under partial prohibition (Andhra Pradesh, Kerala and Tamil Nadu), and the rest were not under prohibition, with only regulatory policies in place.

Statistical approach

We applied multilevel statistical procedures (33), to model the multilevel variation in prevalence of alcohol consumption (34, 35). Specifically we estimated the effect of the demographic and socioeconomic markers on alcohol consumption and the variations in alcohol consumption in local areas, districts and

Table 3. Odds ratios with 95% confidence intervals from the fixed part of a multivariable five-level binomial logistic model, stratified by sex, that is calibrated for alcohol consumption, conditional on random effects at the level of state, district, local area and household

	Male		Female	
	Odds ratios	95% confidence intervals	Odds ratios	95% confidence intervals
Age (years)	1.01	(1.00–1.01)	1.22	(1.18–1.26)
Living environment				
Large city	1.00		1.00	
Small city	0.96	(0.84–1.11)	0.57	(0.45–0.72)
Town	0.91	(0.80–1.03)	0.69	(0.54–0.88)
Village	0.84	(0.75–0.94)	0.96	(0.82–1.13)
Marital status				
Married or cohabiting	1.00		1.00	
Single	0.27	(0.26–0.28)	0.64	(0.47–0.85)
Widow	0.72	(0.68–0.77)	0.90	(0.83–0.99)
Divorced/separated	0.99	(0.87–1.13)	0.84	(0.73–0.96)
Religion				
Hindu	1.00		1.00	
Muslim	0.25	(0.23–0.27)	0.22	(0.16–0.31)
Christian	1.07	(0.99–1.17)	1.28	(0.32–5.18)
Other	1.27	(1.17–1.37)	1.10	(0.67–1.82)
Missing	1.01	(0.69–1.49)	1.10	(0.51–2.34)
Social caste				
Other caste	1.00		1.00	
Scheduled caste	1.43	(1.37–1.49)	1.66	(1.47–1.87)
Scheduled tribe	2.04	(1.92–2.17)	3.74	(2.79–5.00)
Other backward class	1.08	(1.04–1.12)	1.55	(1.31–1.83)
No caste/missing	1.30	(1.19–1.41)	1.32	(1.10–1.59)
Education				
Postgraduate	1.00		1.00	
College	1.11	(1.01–1.22)	0.85	(0.72–1.00)
Higher	1.21	(1.10–1.33)	0.55	(0.41–0.75)
Secondary	1.75	(1.61–1.91)	0.81	(0.62–1.05)
Primary	2.13	(1.95–2.33)	1.00	(0.74–1.35)
Illiterate	2.28	(2.08–2.50)	1.31	(1.00–1.71)
Household standard of living index				
Highest fifth	1.00		1.00	
Fourth fifth	1.12	(1.07–1.18)	1.17	(0.94–1.45)
Third fifth	1.30	(1.24–1.37)	1.60	(1.23–2.09)
Second fifth	1.59	(1.51–1.68)	1.96	(1.53–2.43)
Bottom fifth	1.92	(1.81–2.03)	2.72	(2.18–3.39)

The reference category is a 40-year-old (the odds ratio for age is expressed for a difference of 10 years), postgraduate, married Hindu woman, belonging to the "other caste" group and to the highest fifth (quintile) of household standard-of-living index and who lives in a large city. For this "advantaged" group the predicted probability of alcohol consumption was 1.3%.

states that were not accounted for by individual and household demographic and socioeconomic markers. We calibrated a five-level weighted binary logistic model with a nested structure of individuals (level 1) in households (level 2) in local areas (level 3) in districts (level 4) in states (level 5) for men and women, separately. Model estimates and their standard errors were quasi-likelihood-based with Taylor series expansion (33, 36).

Findings

Table 3 presents the conditional odds ratios (ORs) together with the 95% confidence interval (CI) derived from the fixed part of a multivariable multilevel logistic regression model calibrated for alcohol consumption among men and women, separately.

Age was positively associated with the probability of consuming alcohol with the relationship being stronger for women than men. Marital status was also predictive of alcohol consumption: men and women who were single, widowed, divorced or separated were less likely to consume alcohol, although the association was not statistically significant for divorced or separated men. Religion-based differences were also evident; Muslim men and women were less likely to consume alcohol than the reference group, which was Hindu. Caste status was strongly associated with alcohol consumption. In comparison to the "other" caste (the reference category), men and women from scheduled tribes and castes were more likely to consume alcohol (OR, 2.04 and 1.43, respectively, for men and OR, 3.74 and 1.66, respectively, for women). Men and women

from other backward classes also showed a greater probability of consuming alcohol (OR, 1.08 and 1.55, respectively) than those from other castes. A strong gradient between education and alcohol consumption was observed; the odds of consuming alcohol were more than twice as high among the educationally worst-off group (illiterate men) than among those in the educationally best-off group (men with postgraduate education). For women, the educational differentials were more complex. Women with secondary schooling to college level were less likely to use alcohol than women with the highest levels of education, whereas consumption by women with primary education did not differ from that of women with the highest level of education (i.e. postgraduate), but having no education was associated with a greater risk of alcohol consumption. A gradient between standard of living and alcohol consumption was observed; for individuals in the bottom quintile the ORs were 1.92 for men and 2.72 for women, for consuming alcohol (compared to the top quintile). The prevalence of men who consumed alcohol was lower in rural areas (OR, 0.84) than in large cities. For women, however, differentials were observed between small city (OR, 0.57) and town (OR, 0.69) when compared to large cities.

Table 4 provides the variance estimates for each of our analytical levels, for men and women, before and after taking account of age, marital status, education, religion, caste, standard of living and urban or rural residential status. Socioeconomic markers at the individual and household level do not entirely explain the differences in the prevalence of alcohol consumption across local areas, districts and states. After taking into account individual or household demographic and socioeconomic markers, most of the remaining geographical variation lies at the district level for both men and women, but the variation for women was not statistically significant.

The ORs for alcohol use in states with no prohibition (OR, 1.36; 95% CI, 0.69–2.03) and partial prohibition (OR, 1.37; 95% CI, 0.45–2.28) were not statistically different from those of the states under complete prohibition, although the risk of alcohol use was higher in states with no or partial prohibition. Combining the states with partial and complete prohibition into one category (OR, 1.15; 95% CI, 0.63–1.67)

did not increase the statistical precision. However, for women, prohibition policies were statistically significant, with higher ORs for alcohol use in states with no prohibition (OR, 7.33; 95% CI, 6.27–8.47). The prevalence of alcohol use was also higher for women in states with partial prohibition (OR, 4.30; 95% CI, 2.74–5.86). Combining partial and complete prohibition into one group does not change this pattern (OR, 3.04; 95% CI, 1.59–4.48).

Conclusion

These findings suggest a distinct and systematic socioeconomic and spatial distribution of alcohol consumption in India. Firstly, strong gradients in prevalence of alcohol use according to education and standard of living are apparent. For men, higher levels of education and standards of living are inversely related to the probability of consuming alcohol. For women however, alcohol consumption showed a U-shaped association with educational level. Secondly, the caste differences in alcohol consumption show the persistent effect of caste as a key axis along which health measures including mortality (37, 38) and tobacco consumption (39), are stratified, over and above the adverse effects of low level of education and low standard of living.

Thirdly, and interestingly, the lack of a protective effect of marriage has also been observed for tobacco consumption (39). This pattern is the opposite to that reported in developed countries (40), but has been previously reported from India (41). The plausibility of single men (mostly young adults) having lower probabilities of alcohol consumption could be due to a combination of the general social norms that do not favour drinking by young adults as well as reflecting a systematic reporting bias by the respondent on the behaviour of young adults in a manner that conforms to the social norms. Furthermore, the gender inequities in marriage partnerships may also mean that female partners, unlike, presumably, their counterparts in the developed countries, have little control over the health behaviour of their male partners, and as a consequence there is no protective effect of marriage.

Finally, the association between prohibition and low levels of alcohol use was mixed; for men there was no statistically significant evidence of an association (although the effect estimates are relatively strong), but for women it appeared that prohibition did reduce consumption. Indeed, lobbying by women's groups has been important in influencing local policies (e.g. location of alcohol stores). Such anti-alcohol movements initiated by women are particularly strong in rural India reflecting, in part, the serious detrimental effects of alcohol use by men on their households. Indeed, the risk of alcohol use is lower for men in villages than in large cities.

A number of pertinent issues should be noted. The first concerns the limits to establishing causal connections between adverse health effects and the use of alcohol. The survey data used in this study did not distinguish between low, moderate and heavy alcohol consumption. Moreover, the reported socioeconomic patterns may be different at different levels of alcohol consumption. Nonetheless, if an earlier assessment which stated that in India, the "basic purpose of drinking alcohol is to get drunk as quickly as possible and to stay drunk for as long as possible" (42) is valid, then this need not be a major concern. In a sample from three districts of India, it was observed that among current drinkers, 66.7–92.9% drank heavily (defined

Table 4. Variance estimates from a five-level binomial logistic model, before and after adjusting for demographic and socioeconomic markers of individuals or households, at the level of the state, district, local areas, and household, for alcohol consumption, stratified by sex^a

	Males		Females	
	Before ^b	After ^c	Before ^b	After ^c
Level 5: States	0.381	0.356	4.412	3.397
Level 4: Districts	1.820	1.417	12.17	7.378
Level 3: Villages	0.282	0.197	1.208	0.7469
Level 2: Households	1.426	1.544	3.214	4.585
Dispersion	0.469	0.543	0.239	0.293

^a All variance parameters were significant at the 0.01 level, except those in bold type.

^b Gives the variance estimates at different levels before accounting for demographic and socioeconomic markers of individuals or households.

^c Gives the variance estimates at different levels after accounting for demographic and socioeconomic markers of individuals or households.

as those consuming 75 ml or more of absolute alcohol per day) (42). As such, the consumption of alcohol in India is seen to be characterized by a majority of abstainers and a minority of heavy drinkers (18, 42). If these studies are any indication, it would seem that most current users of alcohol (although still a minority) are likely to engage in heavy drinking, with individual health impacts as well as negative effects on households that are likely to be serious. Although data at the national level on frequency and amount of alcohol consumption are desirable, the fairly homogeneous levels of consumption among alcohol consumers means that more detailed data are unlikely to contradict the overall socioeconomic and geographical pattern reported here.

The lack of detail in the INFHS concerning the types of alcohol consumed (e.g. domestically produced liquor such as rum and gin, country liquor such as arrack, toddy, illicit liquor or beer) (18) is a critical data limitation. The consumption of country and illicit liquor is substantially greater in rural communities and among the more disadvantaged socioeconomic groups. Furthermore, prohibition-related policies have been shown to be different for different types of alcohol (15). If type of alcohol were to be included in the analysis, it is likely that the socioeconomic and geographical disparities in alcohol use, the documentation of which was the primary aim of this study, would be exacerbated rather than attenuated.

It is also not clear whether the extent to which the observed magnitude of socioeconomic differences reflected "actual" differences as opposed to "reporting" differences, because formal and informal social conventions related to alcohol consumption can influence reporting patterns. For instance, in prohibitionist states where alcohol use is illegal, respondents may be less likely to report alcohol use to surveyors. The overall prevalence observed in the INFHS, nonetheless, appears to be in general agreement with that reported in other studies (19). Finally, it should be recognized that alcohol use by different individuals within a household was ascertained indirectly, i.e.

from the respondent to the questionnaire, typically the head of the household. Consequently, the "individual responses" really reflect the perception of the respondent as to whether or not a particular household member consumed alcohol. There is likely to be sex- and age-bias as a result of this, with possible under-reporting for females and younger population members.

We believe that the study findings have two main implications. The first relates to the independent influences of caste, education and standard of living on alcohol consumption. Although all these variables tend to capture some aspect of socioeconomic position (often in an overlapping manner), the evidence for independent effects suggests differential pathways through which socioeconomic position may influence alcohol consumption. The second implication of this study is a lack of statistical evidence to support the notion that state-level prohibitionist policies are an effective means of reducing the prevalence of alcohol consumption among men, which runs contrary to earlier reports (15, 20). Our findings emphasize that, perhaps more than, or in addition to, state policies, the marked spatial heterogeneity in alcohol consumption at the level of districts, even after controlling for their demographic and socioeconomic composition, suggests that non-policy based (social and cultural) contextual factors may be stronger predictors of alcohol use. Future research is warranted to systematically examine the role of local context on alcohol consumption.

The large socioeconomic and geographical differences in alcohol consumption in India are likely to feed into substantial, and perhaps increasing, socioeconomic differentials in health. There is an urgent need for systematic documentation and monitoring of such inequalities in alcohol consumption in India, to improve understanding of their determinants, and to provide an evidence base for public health interventions that takes into account differences at the geographical level as well as between population groups. ■

Competing interests: none declared.

Résumé

Prévision de la consommation d'alcool par les hommes et les femmes en Inde en fonction des marqueurs socioéconomiques et de la politique de prohibition appliquée par les États : analyse statistique multiniveaux

Objectif Étudier les effets séparés des différents marqueurs socioéconomiques et de la politique de prohibition de l'alcool pratiquée par les États indiens sur la consommation d'alcool masculine et féminine en Inde.

Méthodes L'étude fait appel à une analyse transversale multiniveaux de la consommation d'alcool, réalisée à partir de l'enquête nationale indienne sur la santé des familles, qui a été menée de 1998 à 1999 sur 301 984 adultes de 92 447 foyers, installés dans 3215 villages de 440 districts et 26 États. Cette analyse a été stratifiée en fonction du sexe.

Résultats La probabilité de consommer de l'alcool était plus forte chez les hommes sans formation que chez ceux disposant d'une formation universitaire supérieure (OR = 2,28 ; IC à 95 % = 2,08-2,50). A la différence des hommes, les femmes présentaient une association en forme de U entre le niveau de formation et la consommation d'alcool. Les hommes et les femmes vivant dans des foyers dont le niveau de vie correspondait au quintile le plus faible présentaient une probabilité plus élevée de consommer de l'alcool (OR = 1,92, IC à 95 % = 1,81 - 2,03 et OR = 2,72, IC à 95 % = 2,18 - 3,39) que ceux relevant, par le niveau de vie, du quintile

supérieur. Il existait une plus grande probabilité que les membres des tribus et des castes défavorisées et autres castes peu considérées consomment de l'alcool que les autres groupes de castes. L'étude n'a pas mis en évidence de différence statistiquement significative entre les consommations d'alcool des hommes habitant des États non soumis à la prohibition (OR = 1,36, IC à 95 % = 0,69 - 2,03) et de ceux vivant dans des États où l'alcool n'est pas interdit. A contrario, dans les États où l'alcool n'était pas prohibé, la consommation féminine d'alcool était plus élevée.

Conclusions L'appartenance à une caste et les niveaux de formation et de vie exercent une influence indépendante sur la consommation d'alcool en Inde. Les politiques de prohibition semblent avoir peu d'effet sur la consommation masculine d'alcool, mais sont susceptibles de réduire la proportion de femmes consommatrices. Les caractéristiques socioéconomiques des comportements en matière de santé sont susceptibles d'aggraver les inégalités au niveau des résultats sanitaires. D'autres investigations sont nécessaires pour comprendre comment les facteurs socioculturels influent sur la consommation d'alcool dans des contextes plus localisés (par exemple les districts).

Resumen

Función de los marcadores socioeconómicos y del régimen de prohibición en la predicción del consumo de alcohol entre hombres y mujeres en la India: análisis estadístico multinivel

Objetivo Investigar la contribución independiente de distintos marcadores socioeconómicos y de las políticas estatales de prohibición en el consumo de alcohol entre los hombres y las mujeres en la India.

Métodos El estudio utilizó un análisis transversal multinivel del consumo de alcohol de la encuesta nacional de salud familiar de la India 1998–1999, que abarcaba a 301 984 personas adultas de 92 447 hogares de 3215 aldeas, en un total de 440 distritos de 26 estados, estratificadas por sexo.

Resultados Los hombres sin estudios presentaban más probabilidades de consumir alcohol que los que tenían estudios de posgrado (OR: 2,28; IC95%: 2,08-2,50). A diferencia de lo observado en los hombres, en las mujeres se observó una relación en forma de U entre el nivel de estudios y el consumo de alcohol. Los hombres y las mujeres pertenecientes a hogares del quintil inferior de nivel de vida tenían (OR: 1,92; IC95%: 1,81-2,03; y OR: 2,72; IC95%: 2,18-3,39, respectivamente) más probabilidades de consumir alcohol que los clasificados en el quintil superior. Los miembros de las tribus y castas registradas y de otras castas desfavorecidas tenían

más probabilidades de consumir alcohol que los miembros de otros grupos de castas. No había ninguna diferencia estadísticamente significativa en cuanto al consumo de alcohol entre los hombres de los estados sin régimen de prohibición (OR: 1,36; IC95%: 0,69-2,03) y los sometidos a prohibición. En cambio, los estados sin régimen de prohibición presentan un mayor consumo de alcohol por las mujeres (OR: 3,04; IC95%: 1,59-4,48) que los estados con una situación de prohibición completa o parcial.

Conclusión La casta, la educación y el nivel de vida influyen de forma independiente en el consumo de alcohol en la India. Las políticas prohibicionistas parecen tener poco efecto en el consumo por los hombres, pero pueden reducir la proporción de mujeres consumidoras de alcohol. El perfil socioeconómico de los comportamientos con incidencia en la salud tiende a repercutir sensiblemente en las desigualdades en materia de resultados sanitarios. Se requieren nuevas investigaciones para determinar el tipo de influencia de los factores sociales y culturales de contextos más localizados (por ejemplo los distritos) en el consumo de alcohol.

Arabic

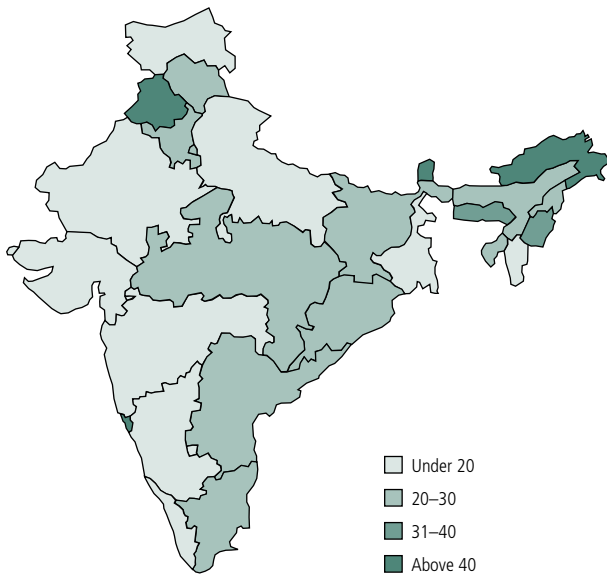
References

1. World Health Organization. Global status report: alcohol policy. Geneva: World Health Organization; 2004.
2. Rodgers A, Ezzati M, Van der Hoorn S, Lopez AD, Ruy-Bin L, Murray CJL, et al. Distribution of major health risks: findings from the Global Burden of Disease Study. *PLoS Medicine* 2004;1:44-55.
3. Edwards G. Alcohol policy and the public good. New York: Oxford University Press; 1994.
4. World Health Organization. The World Health Report: promoting healthy life. Geneva: World Health Organization; 2002.
5. Klatsky AL. Alcohol, coronary disease and hypertension. *Ann Rev Med* 1996; 47:149-60.
6. Langer RD, Criqui MH, Reed DM. Lipoproteins and blood pressure as biological pathways for effect of moderate alcohol consumption on coronary heart disease. *Circulation* 1992;85:910-15.
7. Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002;360:1903-13.

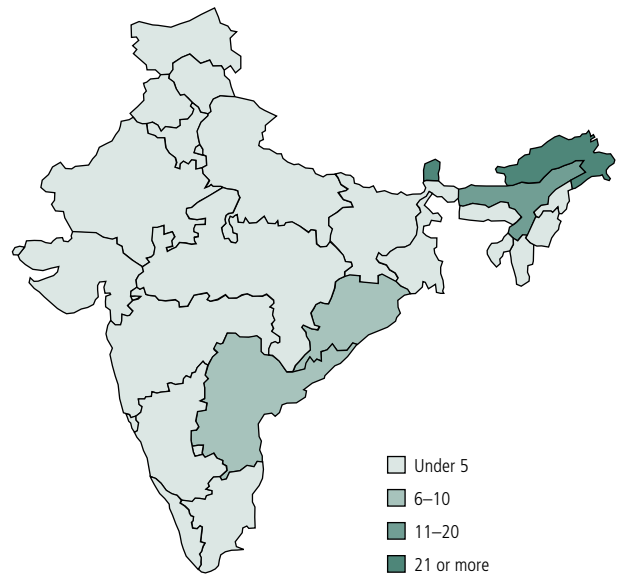
8. Gill JS, Zezulka AV, Shipley MJ, Gill SK, Beevers DG. Stroke and alcohol consumption. *New Engl J Med* 1986;315:1041-46.
9. Gill JS, Shipley MJ, Tsementzis SA, Hornby RS, Gill SK, Hitchcock ER, Beevers DG. Alcohol consumption — a risk factor for hemorrhagic and non-hemorrhagic stroke. *Am J Med* 1991;90:489-97.
10. Hart C, Davey Smith G, Hole D, Hawthorne V. Alcohol consumption and mortality from all causes, coronary heart disease, and stroke: results from a prospective cohort study of Scottish men with 21 years of follow up. *BMJ* 1999;318:1725-29.
11. Skog OJ. The risk function for liver cirrhosis from lifetime alcohol consumption. *Journal of Studies on Alcohol* 1984;45:199-208.
12. Norström T. The impact of per capita consumption on Swedish cirrhosis mortality. *Br J Addict* 1987;82:67-75.
13. Duncan C, Jones K, Moon G. Health-related behaviour in context: a multilevel modelling approach. *Soc Sci Med* 1996;42:817-30.
14. World Health Organization. Alcohol in developing societies: a public health approach. Geneva: World Health Organization; 2002.
15. Rahman L. Alcohol prohibition and addictive consumption in India. London: London School of Economics; 2002.
16. Bonu S. Household tobacco and alcohol use, and child health: an exploratory study from India. *Health Policy* 2004;70:67-83.
17. Jejeebhoy S. Associations between wife beating and fetal and infant death: impressions from a survey in rural India. *Stud Fam Plann* 1998;29:300-8.
18. Saxena S. Country profile on alcohol in India. In: Riley L, Marshall M, editors. Alcohol and public health in eight developing countries. Geneva: World Health Organization; 1999, pp.39-60.
19. Gupta PC, Saxena S, Pednekar MS, Maulik PK. Alcohol consumption among middle-aged and elderly men: a community study from Western India. *Alcohol Alcohol* 2003;38:327-31.
20. Mahal A. What works in alcohol policy? Evidence from rural India. *Econ Polit Wkly* 2000;November 2:3959-68.
21. Government of India. The Constitution of India. New Delhi: Law Ministry; 1996.
22. Saldanha IM. On drinking and drunkenness: history of liquor in Colonial India. *Econ Polit Wkly* 1995; September 16:2323-31.
23. International Institute of Population Sciences. National Family Health Survey 1998–99. Mumbai: International Institute of Population Sciences; 2000.
24. Ayad M, Barrere B, Otto J. Demographic and socio-economic characteristics of households. Calverton, Maryland: Macro International; 1997.
25. Galanter M. Competing equalities: law and the backward classes in India. Berkeley: University of California Press; 1984.
26. Chitnis S. Definition of the terms scheduled castes and scheduled tribes: a crisis of ambivalence. In: Pai Panandiker VA, editor. The politics of backwardness: reservation policy in India. New Delhi: Centre for Policy Research; 1997.
27. Dumont L. *Homo hierarchicus: the caste system and its implications*. London: Weidenfeld & Nicholson; 1966, reprinted 1970.
28. Sheth DL. Reservation policy revisited. In: Mahajan G, ed. Democracy, difference and social justice. New Delhi: Oxford University Press; 1998.
29. Filmer D, Pritchett L. Estimating wealth effects without income or expenditure data — or tears: educational enrolment in India. Washington, DC: World Bank; 1998.
30. Filmer D, Pritchett L. The effect of household wealth on educational attainment: evidence from 35 countries. *Popul Dev Rev* 1999;25:85-120.
31. Jensen J, Spittal M, Krishnan V, Sathiyandra S. New Zealand living standards: their measurement and variation, with an application to policy. *Soc Pol J N Z* 2003;20:72-97.
32. Layte R, Maitre B, Nolan B, Whelan C. Persistent and consistent poverty in the 1994 and 1995 waves of the European Community Household Panel Survey. *Rev Income Wealth* 2001;47:427-9.
33. Goldstein H. *Multilevel statistical models*. London: Arnold; 2003.
34. Subramanian SV, Jones K, Duncan C. Multilevel methods for public health research. In: Kawachi I, Berkman LF, eds. *Neighborhoods and health*. New York: Oxford University Press; 2003, pp.65-111.
35. Subramanian SV. The relevance of multilevel statistical models for identifying causal neighborhood effects. *Soc Sci Med* 2004;58:1961-7.
36. Rasbash J, Steele F, Browne W, Prosser B. *A user's guide to MLwiN, Version 2.1*. London: Multilevel Models Project, Institute of Education, University of London; 2004.
37. Subramanian SV, Nandy S, Irving M, Gordon D, Lambert H, Davey Smith G. The mortality divide in India: the differential contribution of gender, caste and standard of living across the life course. *Am J Public Health*, in press.
38. Subramanian SV, Nandy S, Irving M, Gordon D, Davey Smith G. Socioeconomic and geographic disparities in mortality: a multilevel analysis of four Indian states. In: Rajan SI, James KS, editors. *Population, health and poverty: insights from National Family Health Survey, 1998–99*. Hyderabad: Centre for Economic and Social Studies; 2004.
39. Subramanian SV, Nandy S, Kelly M, Gordon D, Davey Smith G, et al. Patterns and distribution of tobacco consumption in India: cross-sectional multilevel evidence from the 1998-99 National Family Health Survey. *BMJ* 2004; 328:801-6.
40. Miller-Tutzauer C, Leonard KE, Windle M. Marriage and alcohol use: a longitudinal study of "maturing out". *J Stud Alcohol* 1991;52:434-40.
41. Sundaram KR, Mohan D, Advani GB, Sharma HK, Bajaj JS. Alcohol abuse in a rural community in India. Part 1. Epidemiological study. *Drug Alcohol Depend* 1984;14:27-36.
42. Mohan D, Chopra A, Ray R, Sethi H. Alcohol consumption in India: a cross-sectional study. In: Room R, Demers A, et al, eds. *Surveys of drinking patterns and problems in seven developing countries*. Geneva: World Health Organization; 2001, pp.103-14.

Fig. 1. Percent adult population reporting alcohol consumption in Indian states in the 1998–99 Indian National Family Health Survey

a) Men



b) Women



WHO 05.119

Table 2. Percentage alcohol consumption stratified by state of residence and social caste for men and women in the 1998–1999 Indian national family health survey

States	Men					Women				
	OC	OBC	SC	ST	NOC	OC	OBC	SC	ST	NOC
Andhra Pradesh	14.8	31.1	38.3	58.1	12.1	1.7	9.1	10.8	25.7	0.8
Assam	14.3	27.4	21.4	61.8	9.1	3.4	4.9	3.7	35.7	3.4
Bihar	11.1	21.2	35.6	51.8	21.4	0.8	1.0	6.9	25.6	0.0
Goa	27.0	38.3	31.9	66.7	42.5	4.3	1.2	4.0	0.0	8.1
Gujarat	3.3	5.7	6.2	19.6	2.4	0.0	0.5	0.1	4.4	0.4
Haryana	20.3	23.9	30.2	0.0	0.0	0.1	0.0	0.2	0.0	0.0
Himachal Pradesh	25.6	26.4	29.6	38.1	0.0	0.2	0.2	5.7	0.0	0.0
Jammu	9.2	8.2	24.7	21.1	0.0	0.3	0.6	0.3	0.0	0.0
Karnataka	8.7	18.0	32.4	23.0	14.6	0.3	0.7	24.7	1.7	0.3
Kerala	18.3	14.3	28.1	27.9	3.3	0.2	0.1	1.1	0.0	0.0
Madhya Pradesh	7.6	14.2	24.1	40.9	9.7	0.0	1.0	3.7	9.7	0.0
Maharashtra	9.9	13.6	21.8	20.0	16.6	0.2	0.3	1.2	2.8	1.3
Manipur	38.1	20.7	38.0	27.2	38.0	0.2	2.2	1.5	4.7	0.5
Meghalaya	15.8	32.0	27.5	32.3	25.5	0.0	0.0	3.4	3.0	7.6
Mizoram	0.0	0.0	25.0	18.9	13.3	0.0	0.0	0.0	0.4	0.0
Nagaland	33.3	45.2	22.0	28.9	27.7	0.0	21.4	1.6	2.4	0.0
Orissa	8.6	11.1	23.2	54.9	3.0	1.1	1.8	7.0	27.5	0.0
Punjab	29.3	28.7	34.6	66.7	0.0	0.3	0.2	0.3	0.0	0.0
Rajasthan	8.1	12.0	17.3	23.5	7.7	0.1	0.0	1.1	1.0	0.0
Sikkim	19.4	45.9	46.0	40.3	57.1	7.0	26.2	19.9	24.6	0.0
Tamil Nadu	3.7	19.3	32.9	32.7	18.5	0.0	0.4	2.0	3.4	0.0
West Bengal	6.4	8.5	17.3	54.8	7.9	0.3	1.8	2.8	20.8	1.0
Uttar Pradesh	12.0	13.3	18.5	19.4	8.7	0.3	0.2	1.7	0.0	0.0
New Delhi	17.0	18.3	30.9	25.0	19.0	0.0	0.0	0.4	2.8	0.0
Arunachal Pradesh	55.8	48.9	52.6	76.9	36.4	17.5	32.1	17.3	63.1	12.8
Tripura	11.7	13.7	20.8	54.7	4.3	1.0	0.4	0.2	24.0	0.7
All India	13.6	18.1	26.2	38.0	13.6	0.6	1.8	3.8	14.2	1.6

OC, other caste; OBC, other backward class; SC, scheduled caste; ST, scheduled tribe; NOC, no caste.