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Does use of tobacco or alcohol contribute to impoverishment from hospitalization costs in India?

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The study investigates the association between tobacco and alcohol use, and the potential risk of impoverishment from borrowing and distress selling of assets for meeting costs of hospitalization in India. Data from the fifty-second round of the National Sample Survey, a representative survey of 120 942 households across India, were used to investigate the likelihood and the levels of borrowing and distress selling of assets to cover hospitalization expenditures among regular users of tobacco and/or alcohol, non-users from households where there was use, and non-users from households with no use. The data were analyzed by bivariate comparisons and multivariate logistic and ordinary least square regression.

The study found a higher risk of borrowing/distress selling during hospitalization for individuals who use tobacco (OR 1.35, $p < 0.05$), who were non-users but belong to households that use tobacco (OR 1.38, $p < 0.05$), and non-users from households that use both tobacco and alcohol (OR 1.51, $p < 0.05$), even after controlling for socio-economic and demographic factors. The same groups also met a higher percentage of hospitalization expenditures through borrowing/distress selling of assets. The adjusted population-attributable risk proportion of borrowing/distress selling to meet hospital expenditures for tobacco and alcohol use was 16%.

The study suggests that there is an association between use of tobacco and alcohol, and impoverishment through borrowing and distress selling of assets due to costs of hospitalization. While reduction of poverty is the overarching goal of developing countries and multilateral development organizations, very little is mentioned about control of tobacco and alcohol in the framework of development. It might be necessary to include strategies for control of tobacco and alcohol in the larger framework of poverty reduction.

Key words: tobacco, alcohol, poverty, hospitalization, cost of illness, health expenditures, medical indigence, India

Introduction

Poor nutrition, poor sanitation and crowded living conditions combined with lack of adequate access to health care make the poor in the developing world susceptible to significantly higher disease burden (Gelband and Stansfield 2001). In India, the prevalence of tuberculosis, childhood mortality and tobacco use is three times higher among the lowest-income groups than among the highest (Jha 2002). Often un-reached by public health systems and affordable risk-sharing mechanisms, the poor in India rely heavily on out-of-pocket expenditures to private providers (Peters et al. 2002). Rising out-of-pocket expenditures are driving many families into poverty–the medical poverty trap (Whitehead et al. 2001). The World Bank's *Voices of the Poor* report (Narayan et al. 2000) and other studies (Bloom and Shenglan 1999; Desmet et al. 1999; Krishna 2004) found ill health to be a frequent trigger for declining into increased poverty. More specifically, hospitalization with catastrophic economic consequences for the poor has been increasingly cited as a major determinant of poverty (Ranson 2002). The determinants of declining into poverty due to costs of hospitalization have not been extensively studied (Wagstaff and Van Doorslaer 2001, 2003).

Earlier studies have demonstrated in India and elsewhere that smoking (Jha and Chaloupka 1999, 2000; Bobak et al. 2000; Gajalakshmi et al. 2000; Peters et al. 2002) and alcohol use (IIPS 2000) are more common in the poor; and, the poor spend more of their income on tobacco (Nichter and Cartwright 1991; Shah and Vaite 2002a,b) and alcohol (Mahal 2000; Rahman 2002).

Past research on tobacco and alcohol use in India and other developing countries has mainly focused on chronic disease consequences of alcohol and tobacco use (Gupta et al. 1994, 1997; Gupta and Nandakumar 1999; Dikshit et al. 2000; Gupta and Mehta 2000; Hashibe et al. 2000; Johnson and Bain 2000; Moore et al. 2000; Padmavati 2002). The association between

poverty and tobacco and alcohol use has attracted the attention of researchers only recently (Bobak et al. 2000; Mahal 2000; Shah and Vaite 2000a,b; Peters et al. 2002; Rahman 2002). A growing body of evidence points towards higher prevalence of tobacco and alcohol use among the poor than the better-off in India and other developing countries (Jha and Chaloupka 1999, 2000; Bobak et al. 2000; Gajalakshmi et al. 2000; Peters et al. 2002), although the evidence is mixed. Preliminary evidence also shows that the poor in India spend a larger proportion of their household income on tobacco and alcohol (Nichter and Cartwright 1991; Shah and Vaite 2002a,b). Studies have shown that higher tobacco and alcohol use among the poor may be partly responsible for a widening survival gap between the poor and the rich (Jha and Chaloupka 1999, 2000).

Although, conceptually, impoverishment due to tobacco and alcohol consumption can be caused by a reduction in disposable income, increased illness, premature death, or lost wages and higher health care costs (Bobak et al. 2000; Hu 2002), few studies have tested this relationship empirically. Our study aims to fill this gap by investigating the association between individual, as well as household, use of tobacco or alcohol, and impoverishment during hospitalization, a catastrophic event known to cause impoverishment in India (Krishna 2004; Peters et al. 2002). The findings of the study may provide a basis for including control of tobacco and alcohol use as a poverty alleviation strategy in addition to being a public health intervention.

Conceptual framework and objectives of the study

The conceptual framework is partly adapted from Hu's work on smoking and poverty (Hu 2002). Figure 1 shows the various pathways between tobacco and/or alcohol use and impoverishment. Lower productivity, higher medical expenditures and reduced disposable income associated with tobacco or alcohol use may reduce the individual's as well as the household's ability to save for the future to cope with catastrophic events. When a catastrophic event such as hospitalization, famine or natural disaster strikes, the households or individuals who consume tobacco and/or alcohol are more likely to resort to distress selling of assets and borrowing. This in turn would lead to a cascade of impoverishing events such as further selling of assets (distress selling), borrowing and further impoverishment.

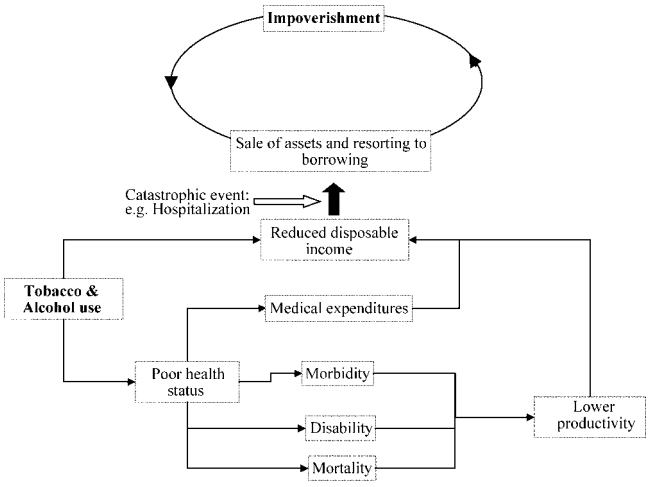

Figure 1. Association between tobacco and alcohol use, and impoverishment

Krishna's (2004) interesting work on intergenerational well-being has highlighted the impoverishing consequences of catastrophic health care costs, and concluded that health care costs and high interest rates on private loans are two of the most important reasons for intergenerational loss of well-being and entrapment into poverty. Hence, modelling the likelihood of borrowing or distress selling of assets, and the levels of health care costs incurred during hospitalization that are financed through borrowing and distress selling of assets, can be one of the useful ways to investigate the impoverishing effects of tobacco and alcohol use.

In the absence of empirical evidence, it is unclear if tobacco or alcohol use result in impoverishment during hospitalization. Using a nationally representative, large cross-sectional data set from India, the study explores the association between tobacco and alcohol use and impoverishment during hospitalization. The hypotheses investigated by the study are that individuals who use tobacco, alcohol or both, as well as individuals who do not use tobacco or alcohol but come from households that use tobacco, alcohol or both, are more likely to: (a) resort to borrowing or distress selling – proxy measures for impoverishment – to meet the costs of hospitalization; and (b) have a larger proportion of hospitalization costs met through distress selling and borrowing.

Data and methods

Data

The study uses data from the fifty-second round of the National Sample Survey (NSS) conducted in June 1995 to June 1996 in India by the National Sample Survey Organization (NSSO) of the Government of India. This was a special survey to assess the morbidity and private health expenditures in India. The NSS followed a stratified two-stage design: in the first stage, census villages in the rural areas and the NSSO urban frame survey blocks in the urban areas were sampled, followed by sampling of households in the second stage (NSSO 1995). The fifty-second round of the NSS collected information on current regular smoking and chewing of tobacco, and current regular alcohol drinking for all individuals 10 years and above. However, no data were available on the duration and quantity of consumption of tobacco and alcohol. Detailed data were elicited for total household expenditures (a proxy measure for income), and levels and source of medical expenses (current income, past savings, sale of draught animals, sale of ornaments, sale of physical assets, borrowing, and reimbursement by employers) incurred for household members treated as inpatients in a hospital during the last 365 days.

The survey covered 120 942 households, which yielded a sample of 629 888 individuals. 24 223 individuals from the sampled households experienced 26 363 episodes of hospitalization, with some individuals reporting multiple episodes. Of these, 1538 individuals who were not alive at the time of

survey were excluded from the analysis, as no tobacco and alcohol use information was available for them. The remaining 22 685 hospitalized individuals from 21 138 households constituted the sample for this study.

Outcome variables

Two outcome variables were used to model the association between tobacco and alcohol use and impoverishment during hospitalization: (a) a dichotomous variable indicating borrowing and/or distress selling of assets (draught animals, ornaments and physical assets) to meet medical expenses during the hospitalization (no = 0; yes = 1); and (b) a continuous variable for the proportion of the total hospitalization expenditure that was met through borrowing and/or distress selling of assets.

Explanatory characteristics

The main explanatory variable of interest, i.e. tobacco and alcohol use by hospitalized individual or by other household members (in cases where the hospitalized individual him/herself did not use either tobacco or alcohol, or was less than 10 years of age), was modelled with the help of the categorical variables described in Table 1. Tobacco use includes either smoking or chewing. Characteristics of the individuals or households that can also be associated with borrowing/asset sales during hospitalization and hence can potentially confound the relationship with tobacco and alcohol use were included as explanatory control variables (Kawabata et al. 2002). State (province) of residence, type of residence (urban/rural), caste, expenditure quintiles and number of household members were used as household-level control variables. Being head of the household, age, sex, level of schooling and marital status were used as individual-level control variables (Table 1). The number of days of hospitalization was used to partly control for the severity of the illness.

Statistical methods

We first ran univariate analysis to assess the distribution of the sample. The bivariate analyses were done to find the unadjusted association of various independent variables with the likelihood of borrowing and/or distress selling during hospitalization; and borrowing and/or distress selling as a proportion of total hospitalization expenditure. For multivariate analyses, two different types of models were used. The first set was a logistic regression for the dichotomous outcome variable for predicting likelihood of borrowing/distress selling during hospitalization. Ordinary least square (OLS) regression was used to model the proportion of total hospital expenditures met through borrowing and distress selling of assets.

All the estimates and the standard errors were adjusted for the multistage sampling design and clustering at the village level, and were weighted at national level to give results that are unbiased and representative of the population (White 1980, 1982). The adjusted population attributable fraction for likelihood of borrowing/distress selling during hospitalization for tobacco and alcohol use was obtained using an approach based on unconditional logistic regression using 'aflogit procedure' in Stata 8 (Bruzzi et al. 1985; Benichou and Gail 1990; Greenland and Drescher 1993; StataCorp 2002).

Results

Tobacco and alcohol use in the 22 685 people who were hospitalized was different from tobacco and alcohol use in the overall sample of 629 888. Hospitalized people were more likely to use tobacco (21% versus 17% in the overall sample).

Table 1 shows the bivariate relationship of the two outcome variables with the main explanatory variables. Individuals from different categories of tobacco/alcohol use resorted to distress sale of assets and borrowing during hospitalization as follows:

- individuals who used both tobacco and alcohol: 47%;
- individuals who used only tobacco: 44%;
- non-users who belonged to households that used both tobacco and alcohol: 42%;
- and individuals who did not use either alcohol or tobacco and who came from non-using households: 32%.

The likelihood of borrowing or selling assets during hospitalization was higher if the hospitalized individual was rural, male, currently married, aged 25–39 years, scheduled caste/tribe (the disadvantaged social group), head of the household, had no education, and was from the poorer expenditure quintile.

The percentage of total hospitalization expenditure financed through borrowing/distress selling was highest among individuals who used both alcohol and tobacco (28%) and individuals who used only tobacco (28%), and was lowest in individuals who did not use either tobacco or alcohol and came from non-using households (19%). The percentage of total hospitalization expenditure met through borrowing or distress selling was also higher if the hospitalized individual was rural, male, 25–39 years old, head of the household, scheduled caste/tribe and uneducated.

Multivariate analysis

Table 2 provides the logistic regression results – unadjusted as well as adjusted – for likelihood of borrowing/distress selling during hospitalization. Table 3 provides results of the OLS regression for borrowing/distress selling as a percentage of total hospitalization expenditure. Compared with individuals who did not consume either tobacco or alcohol themselves or came from non-using households, a higher likelihood of borrowing or distress selling was observed among individuals who used tobacco (odds ratio (OR) = 1.35, $p < 0.01$), non-using individuals who belonged to households that used both alcohol and tobacco (OR = 1.51, $p < 0.01$) and those non-users who lived in households that used only tobacco (OR = 1.38, $p < 0.01$) (Table 2). The differences between adjusted and unadjusted odds ratios for tobacco and alcohol use were small, except for individual tobacco and alcohol use, which was significant ($p < 0.01$) in the unadjusted model. This difference may be mainly due to the small sample of individuals who used both tobacco and alcohol in the sample of those hospitalized.

Table 1. Description of the variables and sample characteristics of individuals who were hospitalized during one year before survey

Variable	Definition	Mean (n = 22 685) (%)	% resorting to borrowing/distress selling during hospitalization	Borrowing/distress selling as a % of total hospitalization expenditure
Lifestyle habits	Combination of individual and household (for individuals without alcohol or tobacco use) tobacco and/or alcohol use. All hospitalized individuals < 10 years are treated as not using alcohol or tobacco and were classified according to household tobacco and alcohol use			
None	Neither the hospitalized individual nor any of the household members use alcohol or tobacco (reference)	33.4	31.8	19.0
Individual–Alcohol & tobacco	Hospitalized individual uses both alcohol and tobacco (yes = 1, others = 0)	3.2	47.2	27.8
Individual–Tobacco	Hospitalized individual uses only tobacco (yes = 1, others = 0)	20.9	43.9	27.9
Individual–Alcohol	Hospitalized individual uses only alcohol (yes = 1, others = 0)	0.5	34.9	20.0
Household–Alcohol & tobacco	Hospitalized individual does not use alcohol or tobacco but belongs to household that uses both alcohol and tobacco (yes = 1, others = 0)	6.6	41.8	26.4
Household–Tobacco	Hospitalized individual does not use alcohol or tobacco but belongs to household that uses only tobacco (yes = 1, others = 0)	34.6	40.3	26.2
Household–Alcohol	Individual does not use alcohol or tobacco but belongs to household that uses only alcohol (yes = 1, others = 0)	0.9	32.9	22.3
Residence				
Rural	Residence (rural = 0, urban = 1)	67.2	45.2	28.8
Urban		32.8	24.8	15.0
Caste				
Others	Other castes (reference)	75.8	35.6	21.7
Scheduled tribes	Scheduled tribes (yes = 1, others = 0)	5.4	45.0	31.4
Scheduled castes	Scheduled castes (yes = 1, others = 0)	18.8	48.0	32.8
Expenditure quintile	Expenditure quintiles based on household per capita annual expenditure			
Poorest	Poorest quintile (1 = yes, 0 = others)	7.7	42.8	29.7
2nd poorest	2^{nd} poorest quintile (1 = yes, 0 = others)	12.1	44.7	30.9
Middle	Middle quintile (1 = yes, 0 = others)	16.0	41.5	26.9
2nd richest	2^{nd} richest quintile (1 = yes, 0 = others)	24.8	42.0	26.8
Richest	Richest quintile (reference)	39.5	32.2	18.6
Household members	Belongs to household with < 7 or ≥ 7 members			
< 7 members	Size of the household (< 7 = 0)	70.8	38.5	24.2
≥ 7 members	Size of the household (≥ 7 = 1)	29.2	38.3	24.4
Duration of hospitalization				
< 7 days	Total days of hospitalization < 7 (reference)	46.9	29.8	19.6
7–30 days	Days hospitalized between 7 to 30 (1 = yes, 0 = no)	46.8	44.5	27.2
> 30 days	Days hospitalized more than 30 (1 = yes, 0 = no)	6.4	57.5	35.8
Relation to the head of the household				
Head	Head himself (reference)	32.5	41.2	25.7
Spouse	Spouse (1 = yes, 0 = others)	23.3	38.5	24.0
Married child	Married child (1 = yes, 0 = others)	3.6	39.4	25.0
Spouse of the head's child	Spouse of child (1 = yes, 0 = others)	4.0	34.4	19.8
Unmarried children	Unmarried child (1 = yes, 0 = others)	23.3	40.1	26.6
Grandchildren	Grandchildren (1 = yes, 0 = others)	4.9	26.7	16.8
Others	Others (1 = yes, 0 = others)	8.4	31.5	19.5
Sex of the individual				
Female	Sex of the individual (female = 0, male = 1)	47.3	35.7	22.7
Male		52.8	41.0	25.7
Age category	Age category of the individual			
1–9 years	1–9 years (1 = yes, 0 = others)	14.7	37.2	25.2
10–24 years	10–24 years (1 = yes, 0 = others)	19.8	38.6	24.8
25–39 years	25–39 years (1 = yes, 0 = others)	23.7	43.2	27.5
40–59 years	40–59 years (1 = yes, 0 = others)	26.9	39.0	23.6
≥ 60 years	≥ 60 years (reference)	15.0	31.1	18.9
Marital status	Marital status of hospitalized individual			
Never married	Never married = reference	30.1	37.5	24.6

Table 1. (*continued*)

Variable	Definition	Mean (n = 22 685) (%)	% resorting to borrowing/distress selling during hospitalization	Borrowing/distress selling as a % of total hospitalization expenditure
Married	Married (1 = yes, 0 = others)	60.8	39.8	24.7
Others	Others (1 = yes, 0 = others)	9.1	33.2	20.3
Education	Education status of hospitalized individual			
None	None (reference)	43.1	44.0	28.9
Primary	Primary (1 = yes, 0 = others)	29.1	39.6	24.7
Middle/secondary	Middle/secondary (1 = yes, 0 = others)	13.2	35.4	21.9
Senior secondary +	Senior secondary + (1 = yes, 0 = others)	14.6	22.7	12.0
State	Province or state to which the hospitalized individual belongs Uttar Pradesh is the reference state, in addition to 31 dummy states and union territories of India			

Hospitalized individuals who regularly consumed tobacco, and non-using hospitalized individuals from households that used tobacco only or from households that used both tobacco and alcohol, financed a greater proportion of hospitalization expenditures through borrowing or distress selling of assets. For example, hospitalized individuals who consumed tobacco were likely to finance an additional 4.3% ($p < 0.05$) of total hospitalization expenses on average by borrowing/asset sales compared with non-consuming individuals from non-consuming households. Similarly, the figures for non-consuming individuals from households consuming both tobacco and alcohol, and from households consuming only tobacco, are 4.6% and 4.7%, respectively (Table 3).

The other associations observed in the bivariate analysis with socio-demographic characteristics of the individuals persisted in the multivariate analysis. The likelihood of borrowing/distress asset selling was significantly higher for male, rural, scheduled caste/tribe, uneducated and younger individuals. Being head of the household and having longer duration of hospitalization also increased the risk of borrowing and asset selling. Similar characteristics were also associated with financing a significantly greater proportion of hospitalization expenditure through borrowing and distress selling. Individuals from Uttar Pradesh – the most populous state in India – were more likely to borrow and resort to distress selling during hospitalization compared with residents of other states, except for Tamil Nadu, and met a significantly greater proportion of hospital expenses through borrowing and distress selling of assets (results not shown in the Tables). The overall, adjusted attributable risk of borrowing/distress selling of assets due to individual/household tobacco use was about 16%, i.e. 16% of all borrowing/distress asset selling in cases of catastrophic events such as hospitalization at the population level can be attributed to tobacco/alcohol use.

Discussion

The key findings of the study are: (a) the likelihood of borrowing/distress selling, and the proportion of total expenditure met through borrowing/distress selling, during hospitalization is greater among individuals who use tobacco or non-users from households that use alcohol and tobacco, or tobacco alone; and (b) almost 16% of the total borrowing/distress asset selling during hospitalization can be attributed to tobacco or alcohol use at the population level. The findings from both logistic regression for likelihood of borrowing and linear regression for proportion of total hospitalization expenditure met through borrowing/distress selling are consistent, indicating robustness of the results.

However, the above findings should be interpreted within a few study limitations. First, if the probability of being hospitalized is associated with individual/household characteristics that may also be associated with tobacco/alcohol use, a selection bias may be introduced by use of a hospitalized sample. For example, the sample of hospitalized individuals was slightly more educated (15% had 10 years or more of schooling versus 12% in the overall sample), wealthier (40% from the richest quintile compared with 20% in the overall sample), married (61% versus 45% in the overall sample) and urban (33% versus 24% in overall sample). Some of these characteristics are also associated with tobacco/alcohol use (e.g. poor, uneducated, rural individuals are more likely to use tobacco). Exclusion of these individuals from the sample (as these individuals may be too poor to obtain hospital treatment, and some of this poverty might have been contributed by tobacco/alcohol use) may *dilute* the observed association.

Secondly, the observed association may be further *diluted* due to potential underreporting of use of tobacco and alcohol by the respondent of the household questionnaire, for other members of the households, whose use of tobacco and alcohol might be not known to the respondent. Social stigma attached to the use of tobacco and alcohol may also lead to possible underreporting (IIPS 2000). Though a recent study conducted in Delhi comparing the prevalence rates of tobacco use based on self-reporting and proxy reporting by the head of the household did not find significant differences (Mohan et al. 2003), another study from India that used national-level data found underreporting to the extent of 5–10% (Rani et al. 2003). Lack of information on quantity and frequency of use of tobacco and alcohol might have further *diluted* the observed association. To conclude, though the study suffers from some

Table 2. Results of logistic regression for likelihood of borrowing/distress selling during hospitalization

	Unadjusted		Adjusted[a]	
	OR	95% CI	OR	95% CI
Lifestyle habits (None)[b]				
Individual–Alcohol & tobacco	1.81**	[1.32 – 2.49]	1.33	[0.95 – 1.87]
Individual–Tobacco	1.59**	[1.37 – 1.84]	1.35**	[1.11 – 1.63]
Individual–Alcohol	1.06	[0.65 – 1.71]	1.10	[0.64 – 1.86]
Household–Alcohol & tobacco	1.49**	[1.15 – 1.95]	1.51**	[1.16 – 1.96]
Household–Tobacco	1.38**	[1.21 – 1.50]	1.38**	[1.19 – 1.60]
Household–Alcohol	1.24	[0.80 – 1.92]	1.51	[0.90 – 2.53]
Urban (Rural)	0.40**	[0.35 – 0.45]	0.49**	[0.42 – 0.57]
Caste (Others)				
Scheduled tribes	1.48**	[1.13 – 1.93]	1.39**	[1.13 – 1.71]
Scheduled castes	1.68**	[1.41 – 2.00]	1.51*	[1.13 – 2.01]
Expenditure quintile (Richest)				
Poorest	1.57**	[1.23 – 2.00]	0.90	[0.69 – 1.18]
2nd poorest	1.67**	[1.38 – 2.01]	1.13	[0.91 – 1.40]
Middle	1.50**	[1.25 – 1.79]	1.03	[0.84 – 1.27]
2nd richest	1.53**	[1.32 – 1.77]	1.21*	[1.03 – 1.42]
≥7 household members (7 members)	0.99	[0.85 – 1.14]	1.09	[0.94 – 1.25]
Duration of hospitalization (<7 days)				
7–30 days	1.86**	[1.64 – 2.11]	2.03**	[1.80 – 2.30]
> 30 days	2.85**	[2.18 – 3.71]	3.35**	[2.59 – 4.33]
Relation to the head of the household (Head)				
Spouse	0.89	[0.78 – 1.03]	0.91	[0.72 – 1.16]
Married child	0.91	[0.70 – 1.18]	0.66*	[0.49 – 0.90]
Spouse of child	0.75	[0.55 – 1.01]	0.67*	[0.47 – 0.97]
Unmarried children	0.96	[0.83 – 1.11]	0.90	[0.61 – 1.35]
Grandchildren	0.52**	[0.38 – 0.71]	0.39**	[0.24 – 0.64]
Others	0.65**	[0.51 – 0.82]	0.75*	[0.58 – 0.97]
Male (Female)	1.25**	[1.13 – 1.38]	1.38**	[1.16 – 1.64]
Age category (≥60)				
1–9 years	1.32**	[1.07 – 1.62]	2.16**	[1.43 – 3.26]
10–24 years	1.39**	[1.16 – 1.66]	2.37**	[1.72 – 3.27]
25–39 years	1.68**	[1.41 – 2.02]	2.41**	[1.93 – 3.00]
40–59 years	1.41**	[1.17 – 1.71]	1.60**	[1.30 – 1.99]
Marital status (Never married)				
Married	0.07	[0.98 – 1.25]	1.13	[0.77 – 1.66]
Others	0.84	[0.69 – 1.02]	1.23	[0.79 – 1.92]
Education (None)				
Primary	0.83**	[0.74 – 0.94]	0.85*	[0.74 – 0.98]
Middle/secondary	0.70**	[0.59 – 0.82]	0.73**	[0.60 – 0.89]
Senior secondary +	0.37**	[0.31 – 0.46]	0.43**	[0.33 – 0.56]
Number of observations			22 652	
Log-Likelihood: Intercept			− 15 095	
Log-Likelihood: Full Model			− 13 383	
LR(63):			3 425	
Prob > LR:			0	

OR = odds ratio, 95% CI = 95% confidence interval; *p < 0.05, **p < 0.01.
[a] In addition, the model is also adjusted for 31 States (provinces) and Union Territories of India.
[b] The p-value was <0.001 for the whole exposure variable – lifestyle habits (obtained via log likelihood test).

limitations, none of them invalidate the results, and might have led to dilution of the observed associations. The actual association might have been *stronger* than the study suggests.

Some of the factors – household socio-economic status, gender/age of the hospitalized individual – that may confound the association of tobacco and alcohol with borrowing/distress selling have been controlled for in the analysis. However, there may be some unmeasured factors, such as preferences/inclination of the households to save for the future, that could not be controlled for in the analysis. This may affect the direction of association in a way that is difficult to predict in advance.

In India, the poor have limited access to collateral credit from formal financial institutions (Binswanger and Khandker 1992). Hence, they resort to informal moneylenders who charge higher interest rates (Kochar 1997), which in many ways trap the household in a vicious cycle of poverty led by high debt servicing. Our study, by providing evidence linking tobacco and alcohol use with higher likelihood of borrowing/distress selling during hospitalization, links tobacco

Table 3. Results of OLS regression for borrowing/distress selling as a percentage of total hospitalization expenditure

	Unadjusted		Adjusted[a]	
	Coefficient	95% CI	Coefficient	95% CI
Lifestyle habits (None)				
Individual–Alcohol & tobacco	8.45**	[3.72 – 13.17]	2.40	[−2.31 – 7.12]
Individual–Tobacco	8.05**	[5.59 – 10.51]	4.30**	[1.54 – 7.06]
Individual–Alcohol	−0.61	[−7.35 – 6.12]	−0.61	[−7.36 – 6.15]
Household–Alcohol & tobacco	5.80*	[1.51 – 10.08]	4.65*	[0.84 – 8.45]
Household–Tobacco	6.20**	[3.95 – 8.46]	4.72**	[2.52 – 6.92]
Household–Alcohol	5.67	[−2.06 – 13.39]	7.88	[−0.01 – 15.77]
Urban (rural)	−13.98**	[−15.95 – −12.01]	−8.90**	[−10.94 – −6.85]
Caste (Others)				
Scheduled tribes	9.50**	[3.60 – 15.40]	6.82**	[3.53 – 10.11]
Scheduled castes	11.22**	[7.93 – 14.51]	7.45*	[1.99 – 12.91]
Expenditure quintile (Richest)				
Poorest	11.01**	[6.21 – 15.82]	1.80	[−2.62 – 6.21]
2nd poorest	11.85**	[8.29 – 15.40]	4.65*	[1.12 – 8.17]
Middle	7.95**	[5.22 – 10.68]	1.64	[−1.27 – 4.56]
2nd richest	7.97**	[5.44 – 10.49]	3.61**	[1.13 – 6.08]
≥7 household members (<7 members)	−0.03	[−2.59 – 2.53]	0.27	[−1.81 – 2.36]
Duration of hospitalization (<7 days)				
7–30 days	7.67**	[5.55 – 9.79]	8.35**	[6.60 – 10.11]
> 30 days	16.79**	[12.18 – 21.39]	17.15**	[13.05 – 21.26]
Relation to the head of the household (Head)				
Spouse	−1.69	[−4.00 – 0.61]	−2.90	[−6.27 – 0.46]
Married child	−0.42	[−4.86 – 4.03]	−5.02*	[−9.66 – −0.39]
Spouse of child	−5.72*	[−9.81 – −1.64]	−7.91**	[−12.87 – −2.94]
Unmarried children	0.82	[−1.71 – 3.35]	−2.31	[−8.35 – 3.72]
Grandchildren	−9.27**	[−13.32 – −5.22]	−14.28**	[−21.84 – −6.72]
Others	−6.67**	[−10.30 – −3.04]	−5.07*	[−8.69 – −1.45]
Male (Female)	3.14**	[1.38 – 4.90]	3.02*	[0.45 – 5.58]
Age category (≥60)				
1–9 years	5.76**	[2.19 – 9.33]	10.36**	[4.04 – 16.68]
10–24 years	5.35**	[2.43 – 8.26]	11.47**	[6.56 – 16.39]
25–39 years	8.06**	[5.20 – 10.93]	11.43**	[8.17 – 14.7]
40–59 years	4.21**	[1.44 – 6.98]	5.11**	[2.21 – 8.02]
Marital status (Never married)				
Married	0.24	[−1.94 – 2.42]	0.77	[−5.11 – 6.64]
Others	−4.03*	[−7.21 – −0.86]	1.00	[−5.49 – 7.49]
Education (None)				
Primary	−4.22**	[−6.26 – −2.17]	−2.99*	[−5.17 – −0.81]
Middle/secondary	−7.09**	[−9.77 – −4.41]	−5.11**	[−8.17 – −2.05]
Senior secondary +	−16.48**	[−19.14 – −13.82]	−11.59**	[−14.88 – −8.29]
Constant			24.02**	[15.08 – 32.95]
Number of observations			22 652	
Log-Likelihood: Intercept			−112 428	
Log-Likelihood: Full Model			−110 881	
LR(63):			3094	
Prob > LR:			0	

95% CI = 95% confidence interval; *p < 0.05, **p < 0.01.
[a] In addition, the model is also adjusted for 31 States (provinces) and Union Territories of India.

and alcohol use to the likelihood of impoverishment during catastrophic events such as hospitalization.

The reasons why tobacco/alcohol users tend towards borrowing or selling of assets to meet the costs of hospitalization may be many-fold, and can be a topic for future research. Maybe the users of addictive goods are more inclined to risk-taking and less concerned about the future, thus having no savings set aside for emergencies. Maybe the money spent to purchase alcohol and tobacco slices into the family budget to the extent that there is insufficient money left for hospital costs. Maybe the tobacco/alcohol users have a higher likelihood of episodes of hospitalization that increases their vulnerability to borrow or sell assets to meet the costs.

Poverty alleviation is the overarching goal of developing country governments, strongly advocated by the United Nations, World Bank, Asian Development Bank, etc. through the Millennium Development Goals. The findings of this study suggest that policies and programmes that address overall development of the poor cannot ignore the potential impoverishment associated with tobacco and alcohol use.

The high level of borrowing and distress selling to pay for hospitalization underscores the need to develop health insurance schemes to combat the poverty trap. Consumers of alcohol and tobacco are not only more likely to need hospitalization, both the consuming individuals and non-consuming members of their families are more likely to need insurance, and more of it if they are to avoid having to sell assets or borrow money and fall into poverty when hospitalized. However, such individuals may have to pay higher premiums to health insurance companies, placing additional economic burden on these families or discouraging them from seeking health insurance policies.

The impoverishing consequences of tobacco and alcohol use may also reduce the capacity of households to deal with communicable diseases by increasing their financial vulnerability to external shocks. This raises another question: what is the impact of alcohol and tobacco use, and impoverishment due to their use, on the speed of the epidemiological transition? Does alcohol or tobacco use reduce the capacity of individuals and households to deal effectively with communicable diseases and prolong the epidemiological transition, and thus further increase the likelihood of a 'dual burden' of diseases among the poor? To answer this question requires further research.

Effective measures to control tobacco (Jha and Chaloupka 1999, 2000) and alcohol (WHO 1999) use are known, and need to be an integral part of strategies adopted for enhancing the economic development and overall quality of life of the poor. Some of these measures include a ban on advertisements, educating consumers about the adverse health consequences, taxation, etc. In the past, control of tobacco and alcohol use were advocated mainly due to adverse health consequences for the consuming individuals, and adverse economic consequences for governments due to health expenditures associated with tobacco/alcohol related sickness.

In fact, policy makers in several developing countries are hesitant to take steps against tobacco production and selling, citing loss of jobs and adverse impact on the economy. Therefore, it is not surprising to see differences between the anti-tobacco and anti-alcohol rhetoric and actual measures in place. It is common to see indirect advertisements for tobacco and alcohol (that is, advertisements that mention the brand name of the product, but do not specifically mention that the product is alcohol or tobacco, though this is of course widely known), which are still allowed, despite laws banning direct advertisements for both products.

To summarize, the study findings provide critical evidence to support the higher risk of impoverishment during hospitalization among tobacco and alcohol users or non-users who are from tobacco and alcohol using households. Reducing poverty in developing countries has been an important and overarching goal of donors and multilateral development banks, which has been forcefully articulated in the Millennium Development Goals. Many measures to control tobacco and alcohol are in place, primarily because of the public health consequences of their use. Yet, there is more that can be done to control tobacco and alcohol (Jha and Chaloupka 1999, 2000). Our study findings suggest that anti-poverty measures, country poverty reduction strategies and frameworks for development of the poor in developing countries may need to include tobacco and alcohol control.

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