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Social capital and peer influence of tobacco consumption: a cross-sectional study among household heads in rural Uttar Pradesh, India

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ABSTRACT

Objective Having the world's second-largest tobacco-consuming population, tobacco control is a priority agenda of the Indian Government. Yet, there is no evidence of how peer influence and nature of social relationships—defined as social capital—affect tobacco use. This study aimed to explore the role of social capital and peer influence on tobacco consumption among household heads in rural Uttar Pradesh (UP), India.

Design and setting This study was embedded within the baseline evaluation of Project Samuday. A cross-sectional multistage cluster survey was implemented in six census blocks of Hardoi and Sitapur districts of UP from June to August 2017. Self-reported tobacco consumption status of randomly selected 6218 household heads (≥18 years; men vs women=5312 vs 906) was assessed from 346 rural communities. Peer influence of tobacco use was measured by the non-self cluster proportion of tobacco consumption among respondents. Community engagement, social support, trust and social cohesion were separately measured as unique facets of social capital both at individual and community levels using the Shortened Adapted Social Capital Assessment Tool in India (SASCAT-I). The explanatory power of covariates was assessed using gender-stratified generalised estimating equations (GEE) with robust-variance estimator.

Result Tobacco consumption patterns were starkly different for men and women (71% vs 14%). The peer influence only affected men (adjusted odds ratio (AOR)=1.10, 95% CI: 1.05 to 1.16, p<0.01), whereas women were more likely to consume tobacco if they were more engaged with community organisations (AOR=1.33, 95% CI=1.07 to 1.66, p<0.01).

Conclusion Gender alters the way social engagement affects tobacco use in rural India. Countering peer influence on Indian men should be prioritised as a tobacco control strategy. Moreover, as gender mainstreaming is a critical egalitarian agenda in India, further research is needed to understand how social engagement affects tobacco consumption behaviours among women.

Strengths and limitations of this study

► This study is first of its kind to integrate two established theoretical frameworks of social science, social cognitive theory and social capital theory, to explore the role of social capital, and peer influence on tobacco use among household heads in rural Uttar Pradesh, India.

► A large randomised sample of respondents, a holistic conceptual framework, use of a validated social capital measurement tool and implementation of multilevel confirmatory factor analysis are few of the significant strengths of this study.

► Self-reported behaviour and actual tobacco consumption pattern can be different for the respondents.

► Due to limited data availability, some known predictors of tobacco use have not been accounted for in the analysis, such as substance abuse, existing comorbidity (eg, diabetes, hypertension), psychological stressors (eg, depression, anxiety) and tobacco control programmes at the community level.

INTRODUCTION

According to the WHO, in 2016, globally, more than 1.1 billion people smoked tobacco, and 80% of them are living in low and middle-income countries.[1] Having 266 million current tobacco users (21.4% smokeless and 10.7% smoked tobacco), India ranks second in tobacco consumption in the world.[2] Among the northern states, Uttar Pradesh (UP) has one of the highest prevalence of tobacco use (35.5%; men vs women=52.1% vs 17.7%). Sixteen years since India signed WHO's Framework Convention on Tobacco Control and 7 years after adopting a national action plan and monitoring framework for the prevention and control of non-communicable diseases (NCDs), progress at reducing tobacco use in UP is still slow.[3 4] While a national goal of a 15% relative reduction was set by 2020, UP observed a 1.5% increase in tobacco use in the 6 years since 2010.[5]

Determinants of tobacco consumption exist at the individual, community and societal

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levels. At the individual level—being men, unmarried, belonging to older age groups, with lower education and wealth independently predicts higher tobacco use.[6–8] Besides these sociodemographic factors, personality attributes can influence the self-efficacy of consuming tobacco.[9 10] Self-efficacy—the perceived ability to execute any behaviour—regulates motivation, direct control over behavioural patterns and the ability to cope with stressors,[11] thus affecting tobacco consumption.

Furthermore, the community's norm related to tobacco use can reciprocally influence an individual's behaviour.[12 13] It is possible that conformity with the collective social norm related to tobacco consumption—also known as the peer influence[14]—affects an individual's behaviour toward tobacco use.[15 16] However, the diffusion of this influence requires exposure of an individual to interpersonal or social cues. Depending on the characteristics of social networks and relationships—defined as the social capital[17]—the social norm around tobacco use may also differ.[18 19]

In the context of UP, tobacco consumption is historically and culturally normalised.[20] However, to date, there is no evidence on how social capital and/or peer influence affect an individual's tobacco consumption in northern India, where one in every three adults currently using any form of tobacco product.[2 21 22] Though current population-based surveys on tobacco—such as Global Adult Tobacco Survey (GATS),[23] Global Youth Tobacco Survey[24] or WHO's STEPwise approach to surveillance[25]— collect some information on peer influence, no specific data is collected on social capital's role on tobacco use.

Addressing these existing research gaps, this study aimed to explore social capital and peer influence as critical determinants of tobacco use among household heads in rural UP, India.

Social capital and peer influence as determinants of tobacco consumption in rural UP, India

To conceptualise social capital and peer influence as determinants of tobacco consumption and empirically investigate their influence on tobacco use, this study adopted a conceptual framework from social cognitive theory (SCT) and social capital theory (figure 1). Proposed by Albert Bandura, SCT explains the process of acquiring and sustaining any behavioural pattern based on a triadic relationship among a person's behaviour, his/her personality attributes and the social environment.[26] While deconstructing these relationships, Bandura[11] explored four critical concepts: observational learning, self-efficacy, outcome expectations and reciprocal causation. In our study, we have theorised the first two concepts of SCT to explore the role of peer influence and social capital on tobacco consumption.

The causal relationship between health behaviour and the social environment is well established.[26 27] Social environment affects individual behaviour by '…shaping norms, enforcing social control, enabling or not enabling people to participate in particular behaviors'.[18] Above and beyond the addictive nature of tobacco, peer influence within a community, where tobacco use is normalised, may model an individual's tobacco consumption through observational learning.[28–30]
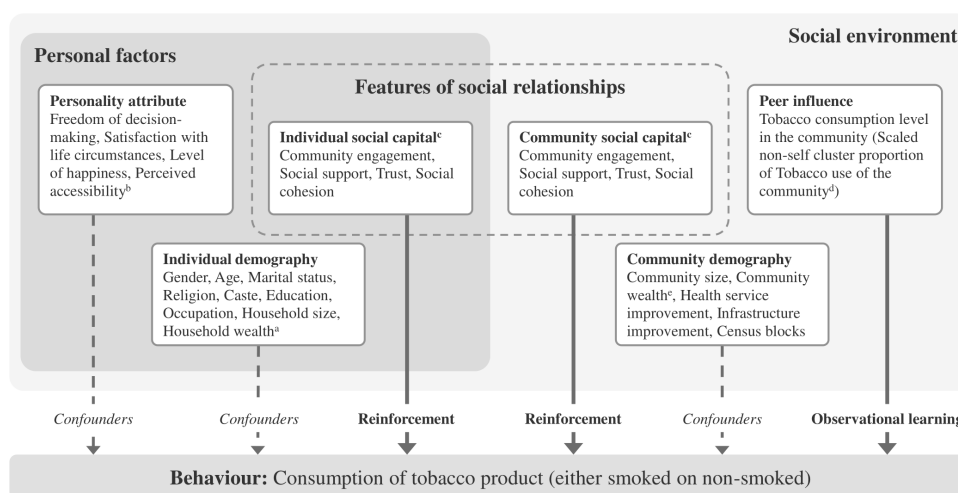

Figure 1 Conceptual framework derived from social cognitive theory to examine the role of social capital and peer influence on tobacco consumption. [a]Household wealth is measured by the quintile of a standardised linear index derived from principal component analysis using 27 binary indicators related to household's asset. [b]Perceived accessibility was measured by household head's perception of improvement of village infrastructure service (eg, roads, electricity and water supply). [c]Social capital was measured by Shortened Adapted Social Capital Assessment Tool in India (SASCAT-I). Standardised factor scores as the measure of individual and community level social capital were generated by multilevel confirmatory factor analysis. [d]Scaled 'no-self' cluster proportion of tobacco use was generated by calculating the proportion of the household heads in the community (primary sampling unit (PSU)) who consumed tobacco while excluding the respondent both from the numerator and denominator, and then multiplying the proportion by 10. One unit increase in this scaled indicator represents a 10% increase in non-self cluster proportion of tobacco use. [e]Community wealth is measured by the PSU average of standardised asset index of the households.

This study also considered social capital as an intersectional determinant between an individual and his/her social environment. It signifies the characteristics of an individual's or a group's social network and relationship.[17 22] Social capital is a multidimensional and multilevel concept that can act as both individual and community level constructs, and acknowledged as a cross-cutting social determinant of health.[21 22 31] It is classified into structural and cognitive components.[32] Structural social capital signified the associational link between individuals and groups. It is represented by engagement with social organisation and exchange of social support. Structural social capital plays a critical role by directly reinforcing an individual's behaviour. This can happen when a person tries to access informational or instrumental resources through his or her social network.[33 34] It was shown in a cluster randomised controlled trial in Dutch schools where the social network was used to alter smoking behaviour.[35]

On the other hand, the cognitive component of social capital embodies more subjective constructs—such as trust, social cohesion, reciprocity.[22] A person with high cognitive social capital often tries to align himself or herself with the existing social norms, leading to either promotive or coercive health-related practices.[36] A study from southern Sweden that has shown a higher level of individual trust was negatively correlated with tobacco use.[37] Similar findings were reported by Brown and colleagues,[38] where higher community social capital related to the religious group has a significant and negative correlation with the number of cigarettes consumed by smokers.

Based on the conceptual framework (figure 1), we evaluated two potential pathways through which social capital and peer influence may affect individual tobacco consumption. First, peer influence could be positively associated with tobacco consumption because the high level of tobacco use in the community may provide enabling social cues (observational learning) to other members believing tobacco use a social norm. Second, individual and community level social capital might be positively associated with tobacco consumption due to the reinforcing effect of the social relations on self-efficacy. While exploring these two pathways, we considered personality attributes, individual and community level demographics and socioeconomic variables as confounders in the analysis.

METHODS
Study design and population
This study was embedded within the baseline evaluation of Project Samuday—a multisectoral rural development initiative in UP, India.[39 40] The study area, Hardoi and Sitapur districts, is a rural region, and the health and human development indicators of these areas are below the state average.[41] A community-level cross-sectional household survey was conducted from June to August 2017 in the six census blocks of Hardoi and Sitapur. Using stratified random sampling, 17–18 households were selected from each of the 346 primary sampling units (PSUs), also known as gram panchayats (GPs). Due to the high level of illiteracy in the study area (61%),[42] obtaining written informed consent was not feasible. Instead, oral informed consent was received from the participants following the standard research practice in India.[43] In total, 6218 households were surveyed with a response rate of >99%. The details of the survey design, sampling procedure and strategies to ensure sample attrition were reported in the online supplementary materials of this paper. During the survey, trained data collectors interviewed 6218 household heads (≥18 years) using a multi-topic questionnaire. Information on tobacco use, along with demographic, socioeconomic, psychosocial factors, and social capital were collected using a computer-assisted personal interviewing system.

Measurement and variables
The dependent variable, tobacco consumption, was measured by asking each household heads, 'Do you currently use any tobacco products?' and the response categories included cigarettes, bidis or hookah, chewing tobacco or gutkha, and multiple responses were possible.

Covariates of this study were operationalised and classified as the peer influence of tobacco use, social capital measures, personality attributes, individual and community level demographics and socioeconomic factors. Detailed descriptions of the covariates are provided in the online supplementary materials of this paper.

Peer influence of tobacco use
Aggregating individual data at the PSU level, the measure of peer influence was constructed by calculating the 'non-self' cluster proportion of tobacco use among household heads to understand the endogenous social effect.[44–46] This indicator was calculated as—the number of other household heads (excluding the respondent) residing in the community who also consumed tobacco, divided by the total number of other household heads in the same community (see online supplementary materials for details of the calculation). To make the indicator more interpretable, we scaled it by multiplying the indicator by 10.

Social capital
We used the Shortened Adapted Social Capital Assessment Tool in India (SASCAT-I) to measure individual social capital,[47] with 13 questions exploring—group membership (2 questions), collective action (2 questions), social support (3 questions), trust (3 questions) and social cohesion (3 questions). Multilevel confirmatory factor analysis (MCFA) was used to generate standardised factor scores of social capital measures. At both individual and community levels, four unique social capital factors emerged from MCFA, which were defined as community engagement, social support, trust and social cohesion.

Personality attributes

To account for the unique personality of each household head, we included freedom of decision-making, satisfaction with life circumstances, level of happiness and perceived accessibility as categorical explanatory variables.[48–51] Detailed descriptions of how each of these variables were constructed are provided in the online supplementary materials of this paper.

Individual demography

To account for the individual characteristics, we considered self-reported gender, age, marital status, educational attainment, occupation, religion, caste, household size as demographic covariates.[6 52 53] There were eight observations where self-reported age was missing, which is less than 1% of the data. These missing values were replaced by the mean age of the participants for the ease of the analysis. Furthermore, age was stratified into five categories, such as ≤30 years, 31–40 years, 41–50 years, 51–60 years and >60 years. A household was considered 'large' if more than five members were living in the house and 'small' otherwise. Household wealth was measured as a linear index generated using PCA of 27 binary indicators related to asset ownership.[54] Each household was assigned to a wealth quintile based on the asset index considering quintile five as wealthiest.

Community demography

Community wealth was derived by averaging the standardised asset index scores of all households within a PSU. Any recent improvement of the community's health service and infrastructure (eg, roads, electricity and water supply) were measured by averaging individual household head's response. Also, each community was categorised into small, medium and large based on the population of GP reported in the 2011 Census of India.[55] Lastly, we included the census blocks to account for the geographic variability in the analysis.

Statistical analyses

Data management and analysis were performed using Stata 15.1.[56] Mplus 8.1 was used to perform the MCFA and generate individual and community level factor scores of social capital.[57] As a descriptive analysis, first, the pattern of tobacco product use was reported. Next, we assessed the explanatory power of each covariate by calculating unadjusted odds ratios (ORs) using generalised estimating equations (GEEs) with robust standard errors (SEs) (Huber/White/sandwich estimator). Lastly, multiple GEE logistic regressions were implemented to estimate the adjusted ORs by simultaneously incorporating those covariates, which represented a p-value ≤0.2 in the unadjusted models.[58] Wald tests were performed after running the regression models to estimate the overall significance of categorical variables. Multicollinearity of the explanatory variables was assessed using the variance inflation factor. The goodness of fit of the models was evaluated using the Hosmer-Lemeshow goodness-of-fit test.

Patient and public involvement

No patients and the public were involved in the design or planning of the study.

RESULTS

The detailed description of the sample, including the respondents' tobacco consumption pattern, is provided in table 1.

Among all the household heads, 62% (n=3884) reported using any type of tobacco products, 31% (n=1913) were smoker and 43% (n=2669) chewed tobacco products. On average, 71% (n=3753) men and 14% (n=131) women household heads consumed any type of tobacco products. Across product types, a significantly higher proportion of men used tobacco, compared with woman household heads (p<0.01). Due to the noticeable difference across gender—moving forward—a gender-stratified descriptive and regression analysis was implemented. Among the respondents, a higher proportion of the women household heads were illiterate and belonged to lower wealth quintiles. While the average standardised factor scores of community engagement and social support were significantly higher among men compared with women (p<0.05), women had a significantly higher score of Trust (p<0.05). However, considering only those participant who consumed tobacco products (table 2), the mean standardised factor scores of all four individual social capital covariates were higher among women household heads compared with men. However, none of them are statistically significant (see online supplementary materials for details). Table 2 presents the distribution of household heads who consumed tobacco across the covariates disaggregated by gender. At the community level, the average peer influence of tobacco use was 64%, which ranged from 12.6% to 100%. Community-level social capital constructs presented minimal correlation with the measure of peer influence. (Data are not shown. See online supplementary materials for details.)

Tables 3 and 4 present the results of the bivariate and multivariate GEE logistic regression models for men and women accordingly. When accounting for all covariates, peer influence presented a significantly positive association with tobacco consumption only for men. If the peer influence in the community increased by 10%, the likelihood of a man would consume tobacco increased by 10% points (adjusted OR (AOR)=1.10, 95% CI=1.05 to 1.16, p<0.01). Among other covariates, age, educational attainment and level of happiness of men presented a negative and almost dose–response relationship pattern with tobacco use. On the other hand, with higher perceived accessibility, the odds of a man's tobacco consumption were significantly increased.

While we did not observe any association between peer influence on woman's tobacco consumption behaviour, only one social capital construct—individual-level community engagement—was significantly associated with woman household head's tobacco use. Adjusting

Table 1 Respondent characteristics disaggregated by gender in rural Uttar Pradesh, India (N=6218)

| | Gender of the respondent | | | | | | Total (N=6218) | | |
| | Men (n=5312) | | | Women (n=906) | | | | | |
	n	Col %	Row %	n	Col %	Row %	N	Col %	Row %
Smoking tobacco products									
No	3430	64.57	79.67	875	96.58	20.33	4305	69.23	100.00
Yes	1882	35.43	98.38	31	3.42	1.62	1913	30.77	100.00
Chewing tobacco products									
No	2748	51.73	77.43	801	88.41	22.57	3549	57.08	100.00
Yes	2564	48.27	96.07	105	11.59	3.93	2669	42.92	100.00
Using any tobacco product									
No	1559	29.35	66.80	775	85.54	33.20	2334	37.54	100.00
Yes	3753	70.65	96.63	131	14.46	3.37	3884	62.46	100.00
Age categories*									
≤30 years	979	18.45	85.65	164	18.12	14.35	1143	18.41	100.00
31–40 years	1377	25.96	87.04	205	22.65	12.96	1582	25.48	100.00
41–50 years	1317	24.83	86.02	214	23.75	13.98	1531	24.65	100.00
51–60 years	914	17.23	82.71	191	21.10	17.29	1105	17.79	100.00
>60 years	718	13.53	84.57	131	14.48	15.43	849	13.67	100.00
Marital status									
Never married/not stated	155	2.92	95.09	8	0.88	4.91	163	2.62	100.00
Married	4876	91.79	88.51	633	69.87	11.49	5509	88.60	100.00
Widow/separated	281	5.29	51.47	265	29.25	48.53	546	8.78	100.00
Religion									
Hindu	4767	89.74	85.68	797	87.97	14.32	5564	89.48	100.00
Muslim and others	545	10.26	83.33	109	12.03	16.67	654	10.52	100.00
Caste									
General	920	17.32	84.10	174	19.21	15.90	1094	17.59	100.00
ST or SC	2519	47.42	85.74	419	46.25	14.26	2938	47.25	100.00
OBC and others	1873	35.26	85.68	313	34.55	14.32	2186	35.16	100.00
Education									
Illiterate	1762	33.17	73.60	632	69.76	26.40	2394	38.50	100.00
Up to primary	1389	26.15	89.67	160	17.66	10.33	1549	24.91	100.00
Up to secondary	1587	29.88	95.09	82	9.05	4.91	1669	26.84	100.00
Above secondary	574	10.81	94.72	32	3.53	5.28	606	9.75	100.00
Occupation									
Cultivator	2879	54.20	97.43	76	8.39	2.57	2955	47.52	100.00
Wage labourer	1603	30.18	93.80	106	11.70	6.20	1709	27.48	100.00
Self-employed and others	443	8.34	95.89	19	2.10	4.11	462	7.43	100.00
Salaried worker	164	3.09	85.86	27	2.98	14.14	191	3.07	100.00
Housewife				611	67.44	100.00	611	9.83	100.00
Unemployed	223	4.20	76.90	67	7.40	23.10	290	4.66	100.00
Household wealth									
Quintile 1	990	18.64	79.45	256	28.26	20.55	1246	20.04	100.00
Quintile 2	1076	20.26	86.50	168	18.54	13.50	1244	20.01	100.00
Quintile 3	1084	20.41	87.35	157	17.33	12.65	1241	19.96	100.00
Quintile 4	1078	20.29	86.66	166	18.32	13.34	1244	20.01	100.00
Quintile 5	1084	20.41	87.21	159	17.55	12.79	1243	19.99	100.00
Freedom decision-making									

Table 1 Continued

	Gender of the respondent								
	Men (n=5312)			Women (n=906)			Total (N=6218)		
	n	Col %	Row %	n	Col %	Row %	N	Col %	Row %
Low	522	9.83	77.33	153	16.89	22.67	675	10.86	100.00
High	4790	90.17	86.42	753	83.11	13.58	5543	89.14	100.00
Satisfaction with life circumstances									
Low	1733	32.62	83.56	341	37.64	16.44	2074	33.35	100.00
Medium	1784	33.58	86.06	289	31.90	13.94	2073	33.34	100.00
High	1795	33.79	86.67	276	30.46	13.33	2071	33.31	100.00
Level of happiness									
Unhappy	1359	25.58	84.04	258	28.48	15.96	1617	26.01	100.00
Neither happy nor unhappy	1400	26.36	86.74	214	23.62	13.26	1614	25.96	100.00
Happy	2553	48.06	85.47	434	47.90	14.53	2987	48.04	100.00
Perceived accessibility									
Infrastructure worsened	1053	19.82	85.47	179	19.76	14.53	1232	19.81	100.00
Stayed the same	2601	48.96	84.42	480	52.98	15.58	3081	49.55	100.00
Improved	1658	31.21	87.03	247	27.26	12.97	1905	30.64	100.00
GP size									
Small	1829	34.43	87.68	257	28.37	12.32	2086	33.55	100.00
Medium	1753	33.00	84.65	318	35.10	15.35	2071	33.31	100.00
Large	1730	32.57	83.94	331	36.53	16.06	2061	33.15	100.00
Census blocks									
Behadar	1070	20.14	85.81	177	19.54	14.19	1247	20.05	100.00
Kachhauna	624	11.75	86.19	100	11.04	13.81	724	11.64	100.00
Kotwan	997	18.77	88.07	135	14.90	11.93	1132	18.21	100.00
Kasmanda	799	15.04	85.36	137	15.12	14.64	936	15.05	100.00
Machhrehta	802	15.10	83.89	154	17.00	16.11	956	15.37	100.00
Sidhauli	1020	19.20	83.40	203	22.41	16.60	1223	19.67	100.00
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Individual social capital									
Community engagement	0.01	−3.88	3.38	−0.08	−3.88	3.37	0.00	−3.88	3.38
Social support	0.02	−3.37	3.40	−0.09	−3.37	3.42	0.00	−3.37	3.42
Trust	−0.01	−2.77	3.32	0.07	−2.69	3.16	0.00	−2.77	3.32
Social cohesion	−0.01	−2.30	3.48	0.04	−2.30	3.30	0.00	−2.30	3.48

*Variable age has eight missing values.
max, maximum; min, minimum; OBC, other backward caste; ST/SC, scheduled caste and scheduled tribe.

for confounders, 1 standard deviation (SD) increase in the standardised factor score of individual community engagement was associated with a 33% increase in the odds of tobacco consumption for a woman household head (AOR=1.33, 95% CI=1.07 to 1.66, p=0.01). Besides, woman household head's tobacco consumption was significantly associated with their religion, social caste and the size of the household.

DISCUSSION
Using the data from a multi-topic survey among rural household heads, we explored the relationships of peer influence and social capital with tobacco consumption. We found that peer influence was permissive for tobacco consumption; however, this association was only observed in men. On the other hand, a higher level of community engagement by a woman presented a significant and positive association with her tobacco consumption status.

We have found that the peer influence of the community 'DOES' affect a man's tobacco consumption behaviour beyond his personal preference. Thus, our theorised pathway of observational learning from the social environment was partially supported by the result. The social environment conveys norms and culture,

Table 2 Characteristics of the respondent who consumed tobacco disaggregated by gender in rural Uttar Pradesh, India (N=3884)

	Gender of the respondents who consumed tobacco products								
	Men (n=3753)			Women (n=131)			Total (N=3884)		
	n	Col %	Row %	n	Col %	Row %	N	Col %	Row %
Age categories*									
≤30 years	667	17.80	96.95	21	16.03	3.05	688	17.74	100.00
31–40 years	1044	27.86	97.30	29	22.14	2.70	1073	27.67	100.00
41–50 years	954	25.46	97.25	27	20.61	2.75	981	25.30	100.00
51–60 years	637	17.00	95.22	32	24.43	4.78	669	17.25	100.00
>60 years	445	11.88	95.29	22	16.79	4.71	467	12.04	100.00
Marital status									
Never married/not stated	100	2.66	98.04	2	1.53	1.96	102	2.63	100.00
Married	3462	92.25	97.52	88	67.18	2.48	3550	91.40	100.00
Widow/separated	191	5.09	82.33	41	31.30	17.67	232	5.97	100.00
Religion									
Hindu	3358	89.48	97.08	101	77.10	2.92	3459	89.06	100.00
Muslim and others	395	10.52	92.94	30	22.90	7.06	425	10.94	100.00
Caste									
General	583	15.53	94.64	33	25.19	5.36	616	15.86	100.00
ST/SC	1831	48.79	97.50	47	35.88	2.50	1878	48.35	100.00
OBC	1339	35.68	96.33	51	38.93	3.67	1390	35.79	100.00
Education									
Illiterate	1375	36.64	94.11	86	65.65	5.89	1461	37.62	100.00
Up to primary	1028	27.39	97.72	24	18.32	2.28	1052	27.09	100.00
Up to secondary	1069	28.48	98.43	17	12.98	1.57	1086	27.96	100.00
Above secondary	281	7.49	98.60	4	3.05	1.40	285	7.34	100.00
Occupation									
Cultivator	2036	54.25	99.61	8	6.11	0.39	2044	52.63	100.00
Wage labourer	1175	31.31	98.08	23	17.56	1.92	1198	30.84	100.00
Self-employed and others	310	8.26	98.73	4	3.05	1.27	314	8.08	100.00
Salaried worker	93	2.48	94.90	5	3.82	5.10	98	2.52	100.00
Housewife				81	61.83	100.00	81	2.09	100.00
Unemployed	139	3.70	93.29	10	7.63	6.71	149	3.84	100.00
Household wealth									
Quintile 1	746	19.88	94.67	42	32.06	5.33	788	20.29	100.00
Quintile 2	788	21.00	96.92	25	19.08	3.08	813	20.93	100.00
Quintile 3	794	21.16	97.66	19	14.50	2.34	813	20.93	100.00
Quintile 4	750	19.98	97.78	17	12.98	2.22	767	19.75	100.00
Quintile 5	675	17.99	96.02	28	21.37	3.98	703	18.10	100.00
Freedom decision-making									
Low	358	9.54	93.47	25	19.08	6.53	383	9.86	100.00
High	3395	90.46	96.97	106	80.92	3.03	3501	90.14	100.00
Satisfaction with living condition									
Low	1260	33.57	95.67	57	43.51	4.33	1317	33.91	100.00
Medium	1285	34.24	97.42	34	25.95	2.58	1319	33.96	100.00
High	1208	32.19	96.79	40	30.53	3.21	1248	32.13	100.00
Level of happiness									
Unhappy	1029	27.42	96.80	34	25.95	3.20	1063	27.37	100.00
Neither happy nor unhappy	976	26.01	96.92	31	23.66	3.08	1007	25.93	100.00
Happy	1748	46.58	96.36	66	50.38	3.64	1814	46.70	100.00

Continued

Table 2 Continued

	Gender of the respondents who consumed tobacco products								
	Men (n=3753)			Women (n=131)			Total (N=3884)		
	n	Col %	Row %	n	Col %	Row %	N	Col %	Row %
Perceived accessibility									
Infrastructure worsened	666	17.75	95.97	28	21.37	4.03	694	17.87	100.00
Stayed the same	1886	50.25	96.67	65	49.62	3.33	1951	50.23	100.00
Improved	1201	32.00	96.93	38	29.01	3.07	1239	31.90	100.00
GP size									
Small	1311	34.93	97.47	34	25.95	2.53	1345	34.63	100.00
Medium	1215	32.37	95.52	57	43.51	4.48	1272	32.75	100.00
Large	1227	32.69	96.84	40	30.53	3.16	1267	32.62	100.00
Census blocks									
Behadar	753	20.06	96.79	25	19.08	3.21	778	20.03	100.00
Kachhauna	422	11.24	97.24	12	9.16	2.76	434	11.17	100.00
Kotwan	723	19.26	97.70	17	12.98	2.30	740	19.05	100.00
Kasmanda	606	16.15	97.74	14	10.69	2.26	620	15.96	100.00
Machhrehta	539	14.36	95.57	25	19.08	4.43	564	14.52	100.00
Sidhauli	710	18.92	94.92	38	29.01	5.08	748	19.26	100.00
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Individual social capital									
Community engagement	0.01	−3.88	3.38	0.11	−2.84	3.15	0.01	−3.88	3.38
Social support	0.01	−3.37	3.40	0.11	−2.44	3.42	0.01	−3.37	3.42
Trust	−0.01	−2.76	3.32	0.10	−2.38	3.01	−0.01	−2.76	3.32
Social cohesion	−0.01	−2.30	3.48	0.05	−2.08	3.10	−0.01	−2.30	3.48

*Variable age has six missing values among the participants who used tobacco products.
max, maximum; min, minimum; OBC, other backward caste; ST/SC, scheduled caste and scheduled tribe.

which affects our behaviour during our everyday life. While the evidence is limited in the Indian context, previous studies substantiated the impact of peer influence—also known as the social modelling effect—on tobacco use and substance abuse.[28–30 59] The contents of the social norm have intrinsic value, which can determine how it affects health—either positively or negatively. Living in a community where—on average—two-thirds of the other household heads engaged in tobacco consumption may indicate it as peer behaviour, and may compel individuals to behave similarly to consume tobacco.[60] In the context of rural northern India, the social circle of men is generally inclusive of friends, coworkers and advisors beyond the boundary of their immediate family. On the other hand, women were more likely to be associated with their relatives, kins and female neighbours.[61–63] Men are likely to be more exposed to the peer influence that emerged from the tobacco consumption habit of other men compared with the woman head of the household.

What if a woman can expand her social circle and actively participate in the community—will it affect their tobacco consumption behaviour? That was the premise of the second pathway of our conceptual framework related to social capital. We found community engagement of individual woman household head was associated with tobacco use. Lindström suggested formal or informal

social interactions in the community often promote harmful health-related norms.[18] Previous literature also indicates that higher community participation and social interaction might encourage tobacco consumption and smoking behaviour.[64 65] It is very much possible that breaking out of their immediate social circle exposes a woman to the peer influence of tobacco use which in terms affects her behaviour.

One of the null findings of our study was - no observed association of individual or community-level social support with tobacco consumption behaviour of the household heads. Several randomised controlled trials and observational studies were conducted to understand the attribution of social support on smoking cessation.[66–70] While there was no consensus among these studies, mostly a positive association was hypothesised between social support and cessation of tobacco use. Westmaas and colleagues explored several of these studies to develop a theoretical framework explaining how social support affects the motivation behind and the success of smoking cessation.[71] According to them, beyond the structural support—such as social integration and engagement with the support network—it is critical to have functional support to help individuals quitting tobacco. Functional social support may come in many forms, including empathy, emotional support and assistance to cope with

Table 3 Bivariate and multivariate ORs of tobacco use among *male* household heads estimated by generalised estimating equation logistic regression model in rural Uttar Pradesh, India (n=5312)

Explanatory variables	Unadjusted models			Adjusted model		
	COR	95% CI	P value	AOR	95% CI	P value
Individual demography						
Age categories (Ref: 18–29 years)*						
31–40 years	1.47	1.22 to 1.78	0.00	1.34	1.09 to 1.63	0.00
41–50 years	1.24	1.04 to 1.48		1.15	0.95 to 1.39	
51–60 years	1.08	0.89 to 1.32		0.96	0.77 to 1.19	
61 years and above	0.77	0.62 to 0.94		0.69	0.54 to 0.87	
Marital status (Ref: Married)						
Never married/not stated	0.75	0.52 to 1.08	0.14	0.75	0.52 to 1.09	0.23
Widow/separated	0.87	0.68 to 1.13		0.91	0.69 to 1.20	
Religion (Ref: Hindu)						
Muslim and others	1.10	0.90 to 1.35	0.34			
Caste (Ref: General)						
ST/SC	1.54	1.31 to 1.80	0.00	1.12	0.95 to 1.33	0.38
OBC and others	1.45	1.23 to 1.71		1.06	0.90 to 1.26	
Education (Ref: Illiterate)						
Up to primary	0.81	0.69 to 0.95	0.00	0.80	0.68 to 0.95	0.00
Secondary	0.59	0.50 to 0.69		0.57	0.47 to 0.68	
Above secondary	0.27	0.22 to 0.34		0.30	0.24 to 0.38	
Occupation (Ref: Cultivator)						
Wage labourer	1.14	0.99 to 1.31	0.00	0.92	0.79 to 1.08	0.36
Self-employed and others	0.97	0.79 to 1.19		0.98	0.78 to 1.23	
Salaried worker	0.55	0.41 to 0.74		0.78	0.56 to 1.08	
Unemployed	0.69	0.52 to 0.92		0.80	0.58 to 1.09	
Household wealth (Ref: Quintile 1)						
Quintile 2	0.90	0.74 to 1.10	0.00	0.98	0.79 to 1.20	0.73
Quintile 3	0.90	0.73 to 1.11		1.02	0.81 to 1.26	
Quintile 4	0.75	0.62 to 0.92		0.99	0.78 to 1.23	
Quintile 5	0.54	0.45 to 0.65		0.89	0.69 to 1.13	
Household size (Ref: Small: up to 5 members)						
Large (>5 members)	1.09	0.96 to 1.24	0.17	1.02	0.88 to 1.16	0.85
Individual personality attributes						
Freedom decision-making (Ref: Low)						
High	1.11	0.90 to 1.38	0.31			
Satisfaction with life circumstances (Ref: Low)						
Medium	0.97	0.82 to 1.15	0.00	1.02	0.86 to 1.21	0.70
High	0.78	0.67 to 0.91		0.95	0.80 to 1.14	
Level of happiness (Ref: Unhappy)						
Neither happy nor unhappy	0.74	0.62 to 0.88	0.00	0.78	0.65 to 0.94	0.02
Happy	0.70	0.60 to 0.82		0.82	0.69 to 0.97	
Perceived accessibility (Ref: Worsened)						
Stayed the same	1.54	1.30 to 1.82	0.00	1.57	1.32 to 1.88	0.00
Improved	1.53	1.26 to 1.86		1.66	1.35 to 2.04	
Individual social capital						
Community engagement	0.99	0.93 to 1.05	0.67			
Social support	0.98	0.92 to 1.05	0.59			

Continued

Table 3 Continued

Explanatory variables	Unadjusted models			Adjusted model		
	COR	95% CI	P value	AOR	95% CI	P value
Trust	1.00	0.93 to 1.07	0.96			
Social cohesion	1.00	0.92 to 1.06	0.98			
Community social capital						
Community engagement	0.98	0.91 to 1.05	0.50			
Social support	1.07	0.99 to 1.15	0.08	1.02	0.95 to 1.08	0.63
Trust	1.05	0.98 to 1.11	0.16	1.03	0.97 to 1.09	0.38
Social cohesion	1.02	0.95 to 1.09	0.64			
Peer influence						
Tobacco consumption in the community	1.15	1.09 to 1.20	0.00	1.10	1.05 to 1.16	0.00
Community demography						
Community size (Ref: Small)						
Medium	0.90	0.76 to 1.06	0.40			
Large	0.97	0.82 to 1.15				
Community wealth	0.88	0.82 to 0.94	0.00	0.99	0.92 to 1.07	0.84
Community health service improvement	1.02	0.77 to 1.31	0.93			
Community infrastructure improvement	1.06	0.87 to 1.29	0.57			
Census blocks (Ref: Behadar)						
Kachhauna	0.88	0.70 to 1.11	0.01	0.96	0.77 to 1.18	0.09
Kotwan	1.11	0.88 to 1.40		1.08	0.88 to 1.31	
Kasmanda	1.32	1.05 to 1.67		1.21	0.96 to 1.51	
Machhrehta	0.86	0.68 to 1.09		0.91	0.74 to 1.12	
Sidhauli	0.96	0.77 to 1.20		0.91	0.75 to 1.10	
Observations			5312			

*The missing values of age (n=7) were replaced by the average age of the participants.
AOR, adjusted OR; COR, crude or unadjusted OR; OBC, other backward caste; Ref, reference; ST/SC, scheduled caste and scheduled tribe.

withdrawal effects. As tobacco use is not considered as a deviant social behaviour—instead accepted as a social norm in rural UP[20]—and with very few interventions to denormalise tobacco use culture, observing no association between social support and tobacco consumption was expected.

While the association was observed only among men, it is essential to acknowledge the protective effect of education observed in our study, which is consistent with the current literature.[72 73] Besides, accessibility was found to be a positively associated factor among men—but not among women, which may indicate their restricted social mobility.[62] The result also showed that religion and caste significantly correlated with tobacco consumption, particularly among women. While women are inherently vulnerable in the patriarchal society of northern India, it appeared that not belonging to the religious majority could make them more susceptible to tobacco exposure.

Strengths and limitations of the study

This is the first study to integrate two established theoretical frameworks of social science, SCT and social capital theory, in the context of tobacco use, which makes our study theoretically robust. This study was also able to include a large number of covariates beyond respondent's individual demographic and socioeconomic characteristics by including several personality attributes, social capital measures and contextual characteristics of the communities while using a large population-based sample of the household heads in rural UP.

The tobacco use status of the respondents was measured by self-reported questions in our study. Though this is the standard practice of GATS and other substance use research,[2 23] self-reported behaviour and actual tobacco consumption pattern can be different. Due to the limitation of data, we were unable to account for outcome expectations—the knowledge of the positive or negative consequences of tobacco use.[11] We believe that incorporating education as a covariate would account for outcome expectations.[53 74] Additionally, causality or temporal association cannot be established with cross-sectional data. This is linked with another essential tenet of SCT—reciprocal causation (the bidirectional influence of individual behaviour and social environment).[75] Lastly, some known predictors of tobacco use such as substance abuse, existing comorbidity (eg, diabetes, hypertension) and psychological stressors (eg,

Table 4 Bivariate and multivariate ORs of tobacco use among *women* household heads estimated by generalised estimating equation logistic regression model in rural Uttar Pradesh, India (n=906)

Explanatory variables	Unadjusted models			Adjusted model		
	COR	95% CI	P value	AOR	95% CI	P value
Individual demography						
Age categories (Ref: 18–29 years)*						
31–40 years	1.12	0.61 to 2.07	0.67			
41–50 years	0.98	0.54 to 1.77				
51–60 years	1.37	0.75 to 2.52				
61 years and above	1.37	0.71 to 2.65				
Marital status (Ref: Married)						
Never married/not stated	2.06	0.41 to 10.4	0.59			
Widow/separated	1.13	0.75 to 1.72				
Religion (Ref: Hindu)						
Muslim and others	2.62	1.58 to 4.32	0.00	2.17	1.26 to 3.72	0.01
Caste (Ref: General)						
ST/SC	0.54	0.33 to 0.89	0.03	0.53	0.31 to 0.89	0.05
OBC and others	0.83	0.50 to 1.37		0.78	0.47 to 1.30	
Education (Ref: Illiterate)						
Up to primary	1.12	0.69 to 1.83	0.31			
Secondary	1.66	0.95 to 2.89				
Above secondary	0.91	0.31 to 2.69				
Occupation (Ref: Cultivator)						
Wage labourer	2.36	0.96 to 5.78	0.29			
Self-employed and others	2.27	0.59 to 8.74				
Salaried worker	1.93	0.55 to 6.78				
Housewife	1.30	0.60 to 2.83				
Unemployed	1.49	0.53 to 4.16				
Household wealth (Ref: Quintile 1)						
Quintile 2	0.89	0.53 to 1.51	0.18	0.75	0.44 to 1.28	0.09
Quintile 3	0.70	0.39 to 1.26		0.57	0.31 to 1.05	
Quintile 4	0.58	0.33 to 1.04		0.43	0.23 to 0.82	
Quintile 5	1.09	0.64 to 1.85		0.70	0.37 to 1.31	
Household size (Ref: Small: up to 5 members)						
Large (>5 members)	1.61	1.07 to 2.42	0.02	1.60	1.03 to 2.48	0.04
Individual personality attributes						
Freedom decision-making (Ref: Low)						
High	0.84	0.53 to 1.33	0.46			
Satisfaction with life circumstances (Ref: Low)						
Medium	0.66	0.44 to 1.01	0.16	0.64	0.40 to 1.01	0.15
High	0.84	0.54 to 1.31		0.80	0.45 to 1.42	
Level of happiness (Ref: Unhappy)						
Neither happy nor unhappy	1.12	0.67 to 1.87	0.75			
Happy	1.18	0.77 to 1.82				
Perceived accessibility (Ref: Worsened)						
Stayed the same	0.84	0.54 to 1.33	0.68			
Improved	0.98	0.58 to 1.65				
Individual social capital						

Table 4 Continued

Explanatory variables	Unadjusted models			Adjusted model		
	COR	95% CI	P value	AOR	95% CI	P value
Community engagement	1.25	1.06 to 1.46	0.01	1.33	1.07 to 1.66	0.01
Social support	1.16	0.94 to 1.47	0.25			
Trust	1.03	0.88 to 1.21	0.73			
Social cohesion	1.01	0.86 to 1.19	0.90			
Community social capital						
Community engagement	1.19	0.99 to 1.43	0.05	1.18	0.93 to 1.50	0.18
Social support	1.14	0.97 to 1.34	0.12	1.12	0.86 to 1.46	0.40
Trust	1.15	0.96 to 1.38	0.12	0.95	0.75 to 1.22	0.70
Social cohesion	1.26	1.07 to 1.48	0.01	1.15	0.86 to 1.54	0.35
Peer influence						
Tobacco consumption in the community	1.00	0.87 to 1.15	0.99			
Community demography						
Community size (Ref: Small)						
Medium	1.43	0.93 to 2.21	0.09	1.20	0.75 to 1.92	0.42
Large	0.90	0.57 to 1.43		0.89	0.56 to 1.41	
Community wealth	1.13	0.93 to 1.37	0.21			
Community health service improvement	1.55	0.76 to 3.17	0.23			
Community infrastructure improvement	1.59	0.92 to 2.73	0.09			
Census blocks (Ref: Behadar)						
Kachhauna	0.83	0.38 to 1.81	0.26			
Kotwan	0.88	0.46 to 1.66				
Kasmanda	0.69	0.35 to 1.35				
Machhrehta	1.18	0.66 to 2.11				
Sidhauli	1.40	0.82 to 2.39				
Observations				906		

*The missing values of age (n=1) were replaced by the average age of the participants.

AOR, adjusted OR; COR, crude or unadjusted OR; OBC, other backward caste; Ref, reference; ST/SC, scheduled caste and scheduled tribe.

depression, anxiety) were not included in the analysis due to limited data availability.

Policy implications

Despite these limitations, we believe the study findings are still generalisable to the broader rural population of northern India, as the underlying relationship between tobacco use, social capital and peer influence can be consistent. Moreover, exploring the household head's tobacco consumption is extremely critical as they are the decision-maker in the house. Their behaviour can impact the health of the entire household by secondhand and thirdhand smoking[76 77] and by normalising this harmful behaviour to other members of the household providing some enabling social cues.[60]

Thus, changing the social norm around tobacco use is our policy recommendation. In India, the majority of tobacco control policies focus on an individual's behaviour. These include pack warnings, smoke-free zones, sin taxes on tobacco products, behavioural change communication using television/radio campaign and smoking cessation programme in a limited capacity.[78] To support these

existing interventions, the protective effect of education can be leveraged. Reorienting and adapting the traditional anti-tobacco behavioural change communication strategies into online and social media platforms can be an innovative strategy.[79] One such intervention, mCessation—a mobile phone-based anti-smoking text message service—has shown some promising results in recent years.[80] Incorporation of the information regarding the National Tobacco Quitline and mCessation programme in the pack warnings must be effectively implemented for both smoked and smokeless tobacco products.[81]

As our result suggested, tobacco use in rural UP may have an active social and cultural component. Daily social interaction among individuals and groups is often accompanied by the use of hookah, bidi or other forms of tobacco.[82] By recognising the nuance of the culture, the denormalisation of smoked and smokeless tobacco in the community by a community-based participatory approach can synergise the current tobacco control strategy in India.[83 84] Community-based participatory research (CBPR) approach showed improved

acceptability of tobacco control measures by changing social norms in other places.[85 86] Here, engaging the rural community will play a catalytic role. One approach can be formalising tobacco control peer-support groups within the existing Village Health Sanitation and Nutrition Committees (VHSNCs), including village leaders, accredited social health activists (ASHA) and health providers.[87] Leveraging VHSNCs will be a cost-effective and culturally acceptable strategy to complement the tobacco control activities led by UP's State and District Tobacco Control Cells.[88] Furthermore, systematic evaluation and scale-up of such CBPR-based tobacco control intervention can strengthen the Ayushman Bharat programme, which expanded the scope of community-level primary care by including NCD prevention and treatment.[89]

Our study was also able to provide a glimpse of the effect of gender dynamics on tobacco use. In India, active participation of women in community activities and decision-making are advocated by national and state-level governments.[90 91] Non-government organisations, academic and research institutions are also striving to organise bottom-up movements to ensure gender equity in Indian society.[92] While gender mainstreaming is a critical egalitarian agenda that needs to be pursued without interruption—we also need to acknowledge— this process will expose women to the broader social sphere, which effect is not necessarily been understood by researchers. Thus, more research is needed to understand the influence of gender mainstreaming on smoked and smokeless tobacco-related norms in conjunction with tobacco-related disparities across religious, caste and class hierarchies. Moreover, the design and implementation of any CBPR-based tobacco control intervention need to account for these sociocultural dynamics.

CONCLUSION

Independently social capital and peer influence act as determinants of tobacco use in rural UP, though not simultaneously for men and women. While the peer influence of tobacco use was permissive only for men, a woman who had higher community engagement was more susceptible to tobacco exposure. As India is moving through an epidemiological transition,[93–95] tobacco control policies should address the current social context and the intersectoral nature of the tobacco industry and political sustainability. Recent evidence shows that some progress has been made against the tobacco epidemic, and momentum exists to continue these actions in this era of sustainable development goals.[2] It is essential to ensure that national, state and local governments enforce the Cigarettes and Other Tobacco Products Act (COTPA). To confront the tobacco epidemic, a synergistic multi-sectoral, systemic and participatory approach should be adopted. As a potential solution, our study highlights some entry points for action to develop priority-setting tools and engage the community in the tobacco control strategy. We also recommend further exploration of the

effect of social participation and gender on tobacco use. Furthermore, India should intensify its current tobacco control efforts with community-level participatory interventions to counter the peer influence of the use of smoked and smokeless tobacco.

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