



## Social desirability and under-reporting of smokeless tobacco use among reproductive age women: Evidence from National Family Health Survey

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### ABSTRACT

**Introduction:** This study hypothesises that the presence of a third person during the interaction between the survey investigator and the woman respondent leads to underreporting of smokeless tobacco (SLT) use by Indian women, including pregnant and breastfeeding women.

**Methods:** Cross-sectional data from the National Family Health Survey conducted in 2015–16 was analysed for SLT use among women aged 15–49. Multivariate logistic regression examined the odds of SLT use reporting by women respondents in the presence of their husbands and other male or female adults.

**Results:** SLT use reporting by women significantly varied by the presence of someone during the interview. The analysis shows that the odds of reporting SLT use among women who were neither pregnant nor lactating was 20.6% lower when they were interviewed in the presence of their husbands than when they were interviewed alone. Similarly, compared to those interviewed alone, the odds of women reporting SLT use was 16.5% lower among pregnant and breastfeeding women interviewed in the presence of any adult female. The odds of women under-reporting SLT use were higher in Central and Western India.

**Conclusions:** This study argues that the current survey estimates misconstrue the authentic prevalence of tobacco use among women in India, including pregnant and lactating women. Due to social desirability or the presence of a third person during the survey interview, those respondents who do not report their tobacco use status are also more likely to forego essential support for successful tobacco cessation. Survey methodology must be strengthened to avert the presence of a third person during the interview to ensure better reporting and population health estimates.

### 1. Introduction

Smokeless tobacco (SLT) is a global public health concern, as nearly 356 million users across 140 countries consume it. Over 90,791 deaths were attributable to SLT use in 127 countries in 2017 (Siddiqi et al., 2020). A significant proportion of SLT use is observed in low-and-middle-income countries (LMIC), and over two-thirds of the global SLT users reside in India (Tata Institute of Social Sciences and

Ministry of Health and Family Welfare, Government of India, 2017).

In South Asian countries, such as India, smoking among women is hooked up with social disapproval and stigma. At the same time, SLT use finds cultural sanction and virtue of affluence in various societies (Shah, Dave, Shah, Mehta, & Dave, 2018). However, the context of female tobacco use is complex and is dictated by socio-cultural factors and economic independence, including autonomy, identity and social status (Amos, Greaves, Nichter, & Bloch, 2012). Previous studies have shown a

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discrepancy between self-reported rates of tobacco use and those validated by biochemical analysis (Jain et al., 2014). This is especially pronounced among women (Cowling, Johnson, Holbrook, Warnecke, & Tang, 2003; Roth, Aitsi-Selmi, Wardle, & Mindell, 2009) and particularly among pregnant women (Shipton et al., 2009). For instance, a study based on Bangladeshi women in England found that the prevalence of tobacco use was under-reported by nearly 15% (Roth et al., 2009). Further, Shipton et al. (2009) projected that more than 17% of pregnant smokers in Scotland remained unidentified due to under-reporting, and thus they were not provided vital cessation services.

Previous studies have argued that the presence of a third person or bystanders during the survey may interfere with the response process (Mneimneh, 2012). For instance, in a study assessing the reporting of contraceptive use, it was found that the presence of the husband at the time of the survey reduced the odds of reporting contraceptive use (Casterline & Chidambaram, 1984). This is also observed in collecting sensitive information, such as substance use (Aquilino, Wright, & Supple, 2000; Latkin, Edwards, Davey-Rothwell, & Tobin, 2017), including in studies assessing patterns of tobacco use (Persoskie & Nelson, 2013).

In large-scale surveys, interviewers may suggest respondents seek privacy when conducting these interviews but may not wish to antagonise the interviewees and their families, especially in cases when opposite sexes interact (Kalton & Schuman, 1982). Further, since the interview situation is asymmetrical concerning the exchange of information, the protracted uncertainty over the questions, the credibility of the interviewer, the confidentiality of the responses and the arising consequences may lead to more significant concerns in responding to sensitive issues such as substance use. Hence, responses to interviews may be guided by social desirability and threat to their current social image, wherein respondents may present their personal information and choices to maintain or enhance their image and create a chosen persona in front of others (Paulhus & Trapnell, 2008).

The inclination to provide socially desirable responses may differ across cultures, genders, and even among individuals (Lalwani, Shavitt, & Johnson, 2006); however, this behaviour may be exacerbated in the presence of another individual in addition to the interviewer, such as their spouse (Aquilino, 1993) or other members of their social network (Latkin et al., 2017). While discrepancies in self-reported tobacco smoking in the presence of another individual at the time of the survey have been examined in western settings (Moskowitz, 2004), the same phenomenon has not been explored for patterns of self-reporting of SLT use in LMIC.

This study aims to understand the self-reporting behaviours of SLT use among women in the presence of their husbands and other adults. We hypothesise that women report lower SLT use in the presence of a third person at the time of the interview. This study is vital for ongoing SLT control programmes nationally and globally, as women-centric discussions and policies tend to be neglected or less emphasised due to the lower prevalence of SLT consumption reported in nationally representative surveys compared to men in LMIC.

## 2. Methods

### 2.1. Data source

The National Family Health Survey (NFHS-4) is an adaptation of the Demographic and Health Survey (DHS) (International Institute for Population Sciences (IIPS) and ICF, 2017), which is a nationally representative, cross-sectional survey and publicly available data from this survey has been used to conduct this study. The NFHS-4 was carried out in all 36 states and union territories of India and was designed to provide population-representative estimates for all 640 districts of key indicators encompassing population, health, and nutrition information. The data was obtained from 601,509 households in 28,521 Primary Sampling Units (PSUs) between January 20, 2015, and December 4, 2016. Women

aged 15–49 years from the selected households were asked to consent to participate in the survey. The survey covered 628,900 households with a response rate of 97.6%, with an individual response rate of 96.7%. A detailed and complete description of the survey design, sample, and stratifications is available at <http://rchiips.org/nfhs/NFHS-4Report.shtml>.

### 2.2. Study population

For this study, the first analytical sample included 699,686 women aged 15–49 who provided complete information on tobacco use and other socioeconomic and demographic covariates. From this sample, 79,729 (11.4%) women were randomly selected to prevent selection bias for the domestic violence (DV) module. It was only for this sample population assigned for the DV module; the interviewer recorded the privacy status at the time of the survey; therefore, these were considered study samples. Of the total sample of women included in this study (79,729), 18,156 were pregnant or breastfeeding at the time of the survey.

### 2.3. Defining tobacco use

The DHS collects information on tobacco use from the following questions: (a) *Do you currently smoke or use any (other) type of tobacco?* (b) *In what form do you currently smoke or use tobacco?*

The ‘Current consumption’ was defined as the use of SLT products (*Gutkha/Paan masala* with tobacco/*Khaini/Paan* with tobacco/other chewing tobacco/snuff/other) in the 24 h preceding the survey. This variable was included in our analysis as a binary variable, with responses being ‘yes’ or ‘no’ during the household survey.

### 2.4. Assessing the presence of a third person during the interview

Among those respondents selected to answer questions on domestic violence and other sensitive questions, the interviewer’s observations about the privacy of the interview settings were collected. These observations included the interruption of the interview once or more than once by the husband, any adult male, and an adult female. Further, the variable consists of one category as the presence of all three, i.e., the husband, any adult male, and any adult female, was derived from the above-mentioned information.

### 2.5. Covariates

To assess the respondents’ socio-demographic characteristics, variables used in the analysis included age, place of residence, region, marital status, education, exposure to mass media, social groups, religion, occupation, and wealth quintile, which are key determinants of SLT use (Ruhil, 2019). SLT use among women has been associated with higher age, lower education, residence in rural areas (Ruhil, 2019), and consumption has been found to be highly prevalent in central, eastern and north-eastern parts of India (Krishnamoorthy & Ganesh, 2020). Further, we have provided a region-wise analysis of underreporting of SLT use as autonomy among women has also been influenced and shaped by regional and state-level effects (Arulampalam, Bhaskar, & Srivastava, 2016). Moreover, marital status, religion, occupation (Ruhil, 2019) and wealth quintile (Sreeramareddy, Pradhan, Mir, & Sin, 2014) have also been associated with SLT use. Further, the likelihood of SLT use has been estimated to be the highest among Scheduled Tribes (STs) across all social groups in India (Ruhil, 2019). We have provided analysis based on the reproductive status of women as currently pregnant or currently lactating women who are SLT users are at a greater risk of detrimental health outcomes (Ratsch & Bogossian, 2014). Concealment of SLT use by pregnant or breastfeeding women can have long-lasting effects on the mother and child, as adequate cessation support may not be made available (Ratsch & Bogossian, 2014).

2.6. Statistical analysis

Both descriptive and logistic regression analyses were conducted to understand the patterns of SLT use reporting among women. Chi-squared test of independence was used to determine association across groups. Associations between reporting of SLT use and the presence of a third person (including and separately for the presence of any adult male and adult female) at the time of the interview were determined using logistic regression models. The regression analysis was adjusted for socioeconomic factors, including age, marital status, education, exposure to mass media, social groups, religion, occupation, wealth quintile, place of residence, all six regions of the country and reproductive status. These analyses were also separately carried out among the total sample, among women who were neither pregnant nor lactating, among currently pregnant women or currently lactating women for all six regions of India. All the estimates were obtained considering the complex survey design, and the estimates were derived based on the weights assigned to the DV module. Data analyses were carried out in Stata 14 statistical software (StataCorp, 2015).

2.7. Ethical approval

The NFHS-4 (2015–16) was conducted under the scientific supervision of the International Institute for Population Studies (IIPS), Mumbai, India and the ICF Macro, Calverton, Maryland, USA. The Institutional Review Board (IRB) of IIPS and ICF approved the protocol for the NFHS-4 survey, including the content of all the survey questionnaires (International Institute for Population Sciences (IIPS) and ICF, 2017). The survey protocol was also reviewed by the U.S. Centers for Disease Control and Prevention (CDC). This study is based on the NFHS-4, an anonymous public use dataset with no personally identifiable information about the study participants.

3. Results

3.1. Sample description

Of the 79,729 women 5.7% (n = 7,499) were consuming SLT (Table 1). The presence of someone during the interview was reported in the case of 18.5% (n = 13,677) women, with the highest presence of adult females (11.6%), followed by the presence of the husband (3.7%). More than one-fourth (26.4%) of the women had no formal education, and 62.1% reported watching television almost daily.

One in every five breastfeeding women (non-pregnant and non-breastfeeding women [18.3%]; currently pregnant women [17.5%]) were reported having a third person present during the interview (Table 2). In the majority of cases, an adult woman’s presence was noted during the interview, followed by the husband’s presence. The presence of a third person during the interview was higher among illiterate women who were not exposed to mass media and belonged to poor households (Table 1).

3.2. Presence during the interview and SLT use

Among non-pregnant and non-lactating women, 6.1% (95% CI = 5.8–6.4) reported using SLT when no third person was present at the time of the interview (Table 3). Consequently, this figure was lower when interviewed in the presence of the husband (4.6%, 95% CI = 3.4–6.3), adult women (5.5%, 95% CI = 4.8–6.4) and in the presence of the husband, adult male(s) as well as adult female(s) (4.1%, 95% CI = 0.7–5.7). Similar patterns of reporting were observed among breastfeeding women. Nearly 3.8% (95% CI = 3.0–4.8) of currently pregnant women reported using SLT when interviewed alone as opposed to only 2.0% (95% CI = 0.7–5.5) when interviewed in the presence of their husband.

Across all age-groups, women reported lower SLT prevalence in the

Table 1

Sample characteristics of women aged 15–49 years, NFHS-4, India, 2015–16.

Background characteristics	%	Sample
Smokeless tobacco use		
No	94.3	72,230
Yes	5.7	7,499
Presence of a third person during the interview		
None	81.5	66,052
Husband only	3.7	2,884
Any adult male only	0.9	679
Any adult female only	11.6	8,365
All (husband, adult male & female)	2.4	1,749
Women’s reproductive status		
Non-pregnant and non-breastfeeding	80.4	61,573
Currently pregnant	3.8	3,264
Currently breastfeeding	15.8	14,892
Age groups		
15-19	17	9,649
20-24	17.5	12,528
25-29	16.4	15,242
30-34	14.1	13,972
35-39	13.1	11,568
40-44	11.2	8,802
45-49	10.6	7,968
Marital status		
Single	22.4	13,716
Married	73.3	62,716
Widowed/divorced/separated	4.3	3,297
Education		
Higher Education	13.4	9,139
Up to Secondary	47.7	37,176
Up to Primary	12.4	10,529
No Education	26.4	22,885
Exposure to television		
Not at all	21.8	19,194
Less than once a week	6.3	6,127
At least once a week	9.9	9,133
Almost every day	62.1	45,275
Exposure to radio		
Not at all	85	67,052
Less than once a week	5.1	4,633
At least once a week	5.6	4,650
Almost every day	4.4	3,394
Reading newspaper		
Not at all	58.8	49,484
Less than once a week	14.2	11,590
At least once a week	12.5	9,211
Almost every day	14.5	9,444
Social groups		
Others	27.5	20,511
Other Backward Classes	43.9	30,365
Scheduled Caste	19.6	13,974
Scheduled Tribe	9	14,879
Religion		
Hindu	80.2	58,751
Muslim	14.3	10,954
Others	5.5	10,024
Occupation		
Not in workforce/no occupation	71.1	55,330
Clerical	2.8	2,297
Sales	0.5	311
Agricultural	1.3	1,285
Services/household and domestic	14.5	12,630
Manual - skilled and unskilled	3.4	2,746
Professionals/technical/managerial	6.4	5,130
Wealth Quintile		
Richest	22.4	15,131
Richer	21.5	16,124
Middle	20.5	16,715
Poorer	19.1	16,760
Poorest	16.5	14,999
Place of Residence		
Rural	64.5	55,645
Urban	35.5	24,084
Region		
North	8.8	13,060
Central	22.1	18,217

(continued on next page)

**Table 1** (continued)

Background characteristics	%	Sample
East	21.7	13,645
West	20.5	12,191
Northeast	3.5	11,056
South	23.3	11,560
Total	100	79,729

presence of a third person. For instance, in women aged 25–29, when no other person in addition to the interviewer was present, 4.6% (95% CI = 4.1–5.1) women reported using SLT, while only 2.7% (95% CI = 1.5–4.6) in the presence of their husband. The highest reporting has been observed among women from the Northeast region; however, the patterns of reporting considerably varied in the presence of another individual. For instance, 25.2% (95% CI = 23.8–26.7) women reported SLT use when no other third person was present, while in the presence of all (husband, adult male and female), only 10.9% (95% CI = 2.9–18.0) women reported the SLT use by them (Table 3).

### 3.3. Regression analysis

Results of binary logistic regression analysis showed that the likelihood of SLT use was 18.6% lower (OR = 0.81, 95% CI = 0.71–0.93) among women who were interviewed in the presence of their husbands and 16.2% lower (OR = 0.84, 95% CI = 0.77–0.91) among women interviewed in the presence of an adult female, compared to those women who were interviewed alone (Table 4). Odds of SLT use were 40.4% (OR = 0.59, 95% CI = 0.49–0.73) lower among women interviewed in the presence of their husbands, other adult male(s) and female (s) compared to women who were interviewed alone.

Among non-pregnant and non-lactating women, SLT use reporting was 20.6% lower (OR = 0.79, 95% CI = 0.68–0.93) among women who were interviewed in the presence of their husbands, 17% lower (OR = 0.83, 95% CI = 0.75–0.92) in those women who were interviewed in the presence of an adult female, compared to women who were interviewed alone. Women were less likely to report SLT use (OR = 0.59, 95% CI = 0.46–0.74) when their husbands, adult male(s) as well as adult female(s) were present compared to those who were interviewed alone. Compared to currently pregnant or currently lactating women who were interviewed alone, those who were either pregnant or breastfeeding were 16.5% (OR = 0.83, 95% CI = 0.70–1.0) less likely to report SLT use when interviewed in the presence of an adult female. Currently pregnant or currently lactating women were also 38.8% (OR = 0.612, 95% CI = 0.41–0.92) less likely to report SLT use when their husband, adult male (s) and adult female(s) were present at the time of the interview.

Marked regional differences in reporting of SLT use by women were observed across six regions of India. Among women from Central India, when interviewed in the presence of an adult, the likelihood of reporting

SLT use was 23.9% lower (OR = 0.761, 95% CI = 0.65–0.90) compared to those interviewed alone. Similar patterns were seen in women from West (OR = 0.75, 95% CI = 0.59–0.95) and Northeast India (OR = 0.83, 95% CI = 0.74–0.93). Among women who were neither pregnant nor breastfeeding, lower odds of reporting SLT use were observed in Central, Western and Northeast regions; when interviewed in the presence of at least one adult compared to women interviewed alone. Further, women from Central India, who were either currently pregnant or lactating, were 30.6% (OR = 0.69, 95% CI = 0.49–0.98) less likely to report SLT use when interviewed in the presence of an adult compared to those interviewed alone (Table 5). Advancing age, lower education level, less exposure to mass media, and poor household wealth were positively associated with SLT use among women (Table A2 in appendix).

## 4. Discussion

This article hypothesised that the presence of a third person at the time of the survey could lead to under-reporting of SLT use among women in a nationally representative sample of adult Indian women. The presence of another individual, in addition to the interviewer at the time of the survey, may create a contextual stimulus that may influence the respondents' need to provide socially desirable responses (Paulhus, 1984). Our results indicate that SLT use reporting behaviours are invariably linked with the presence of the third person during the survey.

These results are consistent with the extant literature. For instance, parents' presence has been linked with lower reports of substance use, whereas the spouse's presence may lead to higher reporting behaviour (Aquilino, 1997). Further, the presence of another individual at the time of the survey, wherein sensitive information such as tobacco use is being collected, may instigate self-representation concerns, forcing individuals to respond in socially-desirable responses as they may be concerned with the negative consequences that may arise if social practices and norms are transgressed or not respected (Uthman, Lawoko, & Moradi, 2009). These results are inconsistent with the few studies that reported that spouse presence does not lead to higher socially desirable responses (Aquilino et al., 2000). Regional differences in reporting SLT use by women are evident, specifically in west, central and northeast India. Social norms and cultural practices regarding SLT use among women have been highlighted (Singh, Jain, Singh, Reddy, & Bhargava, 2020) and could be the main reasons influencing responses.

Higher reporting of SLT use was observed among women in the presence of adult females in certain instances. For example, a more significant proportion of currently pregnant women reported SLT consumption when interviewed in the presence of adult females as opposed to those women who were currently pregnant and interviewed alone. These women are likely to know the respondents' past and current substance use. They may often recommend the use of SLT products to

**Table 2**

Distribution of women aged 15–49 years by the presence of a third person during the interview, NFHS-4, India, 2015–16.

	Non-pregnant & non-breastfeeding	Currently pregnant	Currently breastfeeding
Any third person present at the time of the interview			
No	81.7 (81.2–82.2)	82.5 (80.1–84.6)	80 (78.7–81.2)
Yes	18.3 (17.8–18.8)	17.5 (15.4–19.9)	20 (18.8–21.3)
<i>n</i>	61573	3264	14892
A third person present at the time of the interview			
Husband only	19.6 (18.4–20.9)	18.4 (14.1–23.7)	21.5 (18.9–24.4)
Any adult male only	5.1 (4.3–6.1)	4.2 (2.2–7.8)	3.6 (2.7–4.6)
Any adult female only	62.4 (60.9–63.9)	62.4 (54.8–69.4)	62.0 (58.1–65.7)
All (husband, adult male & female)	12.9 (11.9–13.9)	15.0 (9.1–23.8)	12.9 (9.4–17.5)
<i>n</i>	10,408	559	2,710

*n* = sample size.

**Table 3**

Self-reporting of SLT use among women aged 15–49 years based on the presence of a third person during the interview, NFHS-4, India, 2015–16.

Background characteristics	Presence of third person at the time of the survey interview					p-value for difference
	None	Husband only	Any adult male only	Any adult female only	All (husband, adult male & female)	
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
<b>Women's reproductive status</b>						
Non-pregnant and non-breastfeeding	6.1 (5.8–6.4)	4.6 (3.4–6.3)	6.5 (3.5–11.7)	5.6 (4.8–6.4)	4.1 (0.7–5.7)	<0.001
Currently pregnant	3.8 (3.1–4.8)	2.0 (0.7–5.5)	na	4.4 (2.0–9.2)	4.4 (3.9–22.4)	0.638
Currently breastfeeding	5.4 (4.9–5.9)	3.0 (1.8–4.7)	5.4 (2.7–10.8)	4.3 (3.3–5.6)	5.1 (1.6–9.3)	0.027
<b>Age group</b>						
15-19	1.2 (1.0–1.5)	1.1 (0.3–4.2)	0 (0–0.1)	1.6 (0.9–2.8)	0.9 (0.6–3.6)	0.513
20-24	2.9 (2.5–3.3)	1.5 (0.7–3.2)	2.7 (0.9–7.9)	2.5 (1.7–3.5)	2.1 (0.9–4.6)	0.291
25-29	4.6 (4.1–5.1)	2.7 (1.6–4.6)	2.8 (1.3–5.9)	3.3 (2.5–4.3)	3.7 (1.1–6.6)	0.014
30-34	6.4 (5.8–7.1)	4.1 (2.7–6.1)	2 (0.7–5.8)	6.8 (4.7–9.7)	5.3 (1.8–10)	0.158
35-39	9.0 (8.1–10.1)	9.5 (4.6–18.9)	15.3 (4.8–39.5)	6.5 (4.8–8.8)	6.5 (2.2–12.5)	0.028
40-44	10.1 (9.1–11.3)	4.3 (2.7–6.8)	5.8 (1.8–17.7)	8.2 (5.9–11.2)	8.8 (2.8–16)	0.212
45-49	11.8 (10.6–13)	9.7 (6–15.1)	15.5 (7.5–29.5)	12.6 (9.8–16)	4.9 (1.9–10.2)	0.04
<b>Marital status</b>						
Single	1.5 (1.2–1.7)	0.5 (0.2–1.1)	0.3 (0.1–1.3)	1.2 (0.7–1.9)	0.1 (0.1–0.4)	0.042
Married	6.8 (6.5–7.1)	4.9 (3.6–6.6)	6.2 (4.0–9.5)	6.0 (5.2–6.9)	5.5 (0.8–7.3)	<0.001
Widowed/divorced/separated	14.9 (13–17)	9.4 (4.7–17.9)	27.5 (4.6–75)	13.3 (9.3–18.6)	4.2 (3.4–18.8)	0.002
<b>Education</b>						
Higher education	0.5 (0.4–0.7)	0.7 (0.3–2.0)	0.3 (0.1–1.8)	0.5 (0.3–0.9)	2.4 (1.6–8.5)	0.54
Up to Secondary	2.7 (2.5–2.9)	2.0 (1.4–2.9)	3.3 (1.5–7.4)	2.8 (2.2–3.6)	2.1 (0.7–3.9)	<0.001
Up to Primary	9.3 (8.5–10.3)	5.0 (3.1–8.1)	11.8 (2.6–40)	7.7 (5.7–10.3)	7.3 (2.6–14.3)	0.027
No Education	13.1 (12.4–13.9)	9.2 (6.1–13.6)	10.7 (6.2–17.9)	10.2 (8.6–12.1)	7.2 (1.4–10.4)	<0.001
<b>Exposure to television</b>						
Not at all	9.4 (8.7–10.1)	6.6 (4.6–9.4)	10.7 (5.2–20.7)	8.1 (6.8–9.7)	6.3 (1.4–9.7)	0.021
Less than once a week	9.8 (8.6–11.2)	6.9 (3.7–12.6)	10.3 (4.7–21.2)	9 (5.8–13.6)	10.3 (3.3–18.8)	0.007
At least once a week	7.5 (6.6–8.4)	5.1 (3.1–8.2)	2.7 (0.9–7.6)	4.4 (3.0–6.6)	3.7 (1.6–8.6)	<0.001
Almost every day	4.1 (3.8–4.4)	3.1 (1.8–5.1)	5.3 (2.1–12.6)	4.0 (3.2–4.9)	3.0 (0.7–4.8)	0.006
<b>Exposure to radio</b>						
Not at all	6.2 (5.9–6.5)	4.5 (3.3–6)	7.2 (4–12.6)	5.7 (4.9–6.5)	4.7 (0.7–6.3)	<0.001
Less than once a week	3.5 (2.8–4.3)	2.7 (1.2–6.1)	3 (0.9–9.4)	4.6 (2.6–8.2)	1.4 (0.8–4.3)	0.025
At least once a week	5.9 (4.6–7.6)	3.8 (2.0–7.2)	3.4 (0.8–13.3)	3.1 (2.1–4.8)	5.9 (2.8–14.6)	0.018
Almost every day	3 (2.4–3.8)	1.9 (0.8–4.4)	0.7 (0.2–2.4)	3.4 (1.8–6.5)	2.2 (1.9–11.0)	0.037
<b>Reading newspaper</b>						
Not at all	8.8 (8.4–9.2)	5.9 (4.3–8)	9.2 (5.1–16.1)	7.7 (6.7–8.8)	5.9 (0.9–8)	<0.001
Less than once a week	2.6 (2.1–3.1)	1.6 (0.8–3.1)	3 (0.9–9.4)	2.6 (1.7–3.9)	2.9 (1.6–8.3)	0.038
At least once a week	1.9 (1.6–2.3)	2.4 (1–6)	1.1 (0.5–2.7)	2.4 (1.4–4)	1.7 (1.3–7.4)	<0.001
Almost every day	1.1 (0.8–1.3)	0.8 (0.3–1.9)	0.6 (0.2–1.9)	0.5 (0.3–1)	2.1 (1.3–6.9)	0.108
<b>Social groups</b>						
Others	4.5 (3.9–5)	5 (2.2–11.1)	6.7 (1.5–25.4)	4.6 (3.3–6.5)	4.3 (1.4–8.0)	0.959
OBC	4.5 (4.2–4.8)	2.9 (2.1–4.0)	3.1 (1.3–7.4)	3.9 (3.1–4.8)	3.0 (0.7–4.7)	0.054
SC	7 (6.4–7.7)	4.8 (3.0–7.7)	7.2 (3.4–14.6)	6.8 (5.3–8.7)	1.7 (0.7–3.7)	0.002
ST	15 (13.9–16.2)	8.9 (5.9–13.3)	27.6 (17.1–41.2)	11.3 (9.3–13.8)	13.6 (3.4–21.8)	<0.001
<b>Religion</b>						
Hindu	5.9 (5.6–6.2)	4.3 (3.1–6.0)	7.4 (4.1–12.9)	5.1 (4.4–5.9)	4.3 (0.7–5.9)	<0.001
Muslim	6.2 (5.5–7.1)	2.8 (1.5–5.1)	0.6 (0.2–2.4)	6.4 (4.6–8.7)	4.3 (2.1–10.9)	0.023
Others	5.7 (5.1–6.4)	7.5 (5.2–10.7)	3.9 (1.8–8.1)	6.3 (4.6–8.5)	4.6 (2.2–11.5)	0.011
<b>Occupation</b>						
Not in workforce/no occupation	4.4 (4.2–4.7)	3.2 (2.0–5.0)	2.7 (1.4–5.0)	3.8 (3.2–4.6)	3.1 (0.6–4.6)	<0.001
Clerical	1.6 (1.1–2.2)	2.1 (0.8–5.2)	3.5 (0.5–20.9)	2.1 (0.8–5.2)	0.7 (0.6–4.1)	0.105
Sales	2.9 (1.5–5.5)	13.6 (1.8–57.7)	na	6.3 (1.4–24.7)	na	0.381
Agricultural	9.1 (6.9–12.0)	12.9 (3.3–38.9)	0.5 (0.1–3.1)	3.7 (1.7–7.6)	na	<0.001
Services/household and domestic	10.8 (10–11.7)	8.0 (5.7–11.2)	15.3 (8.3–26.5)	10.7 (8.6–13.2)	7.7 (1.8–12.1)	0.05
Manual - skilled and unskilled	9.6 (7.7–11.9)	4.8 (1.8–12.1)	41.3 (9.8–82.1)	10.6 (6.6–16.5)	13.7 (6.3–31.1)	0.277
Professionals/technical/managerial	10.3 (8.9–11.9)	5.3 (2.6–10.6)	0.5 (0.1–2.4)	9 (6.5–12.5)	12.2 (5.0–25.9)	0.565
<b>Wealth Quintile</b>						
Richest	1.4 (1.1–1.8)	0.6 (0.3–1.2)	0.5 (0.1–1.5)	1.9 (0.8–4.6)	2.6 (1.5–7.9)	0.032
Richer	3.3 (2.8–3.8)	2.8 (0.7–10.3)	2.8 (0.7–26.5)	2.4 (1.6–3.7)	3.2 (1.5–7.6)	0.009
Middle	5.2 (4.7–5.8)	4.0 (2.6–6.2)	4.4 (1.9–10)	4.6 (3.4–6.1)	3.0 (1.0–5.9)	0.01
Poorer	9.4 (8.6–10.2)	6.0 (4.3–8.5)	9.1 (4.3–18.4)	8.8 (7.1–10.9)	4.1 (1.3–7.4)	0.005
Poorest	12.7 (11.9–13.6)	7.7 (5.3–11.2)	16.9 (8.8–30)	8.9 (7.5–10.6)	8.7 (1.7–12.6)	<0.001
<b>Place of Residence</b>						
Rural	6.9 (6.6–7.2)	4.5 (3.6–5.7)	7 (4.4–11)	6.4 (5.6–7.2)	5.0 (0.7–6.6)	<0.001
Urban	4.2 (3.8–4.7)	3.6 (1.6–8.1)	4.9 (1.2–18.1)	3.2 (2.2–4.6)	3.1 (1.2–6.3)	<0.001
<b>Region</b>						
North India	0.6 (0.4–0.8)	0.7 (0.2–2.0)	2.2 (0.5–9.9)	0.7 (0.3–1.7)	0.7 (0.7–4.9)	0.223
Central India	7.5 (7.0–8.0)	5.8 (3.8–8.8)	9.3 (3.7–21.5)	6.1 (4.9–7.5)	7.4 (1.5–10.9)	0.082

(continued on next page)

**Table 3** (continued)

Background characteristics	Presence of third person at the time of the survey interview					p-value for difference
	None	Husband only	Any adult male only	Any adult female only	All (husband, adult male & female)	
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
East India	7.4 (6.7–8.2)	4.0 (2.6–6.0)	7.7 (3.8–15.2)	5.6 (4.4–7.2)	3.2 (1.0–6.0)	0.004
West India	5.5 (4.8–6.2)	4.8 (1.5–14)	12.7 (4.1–33.2)	6.7 (4.6–9.6)	3.9 (1.8–9.5)	0.102
Northeast India	25.2 (23.8–26.7)	22.6 (16.6–30.1)	27.1 (16.7–40.8)	28.9 (24.3–34)	11.0 (2.9–18.0)	<0.001
South India	2.2 (1.9–2.6)	2.6 (1.6–4.3)	0.0 (0.0–0.2)	2.2 (1.5–3.1)	3.6 (1.2–6.9)	<0.001
India	5.9 (5.7–6.2)	4.2 (3.2–5.6)	6.2 (3.6–10.5)	5.3 (4.7–6)	4.3 (0.6–5.7)	<0.001

SLT = smokeless tobacco, na = data not available, CI= 95% Confidence Interval.

**Table 4**

Results of logistic regression showing association between third person presence during the interview and self-reported SLT use among women aged 15–49 years, NFHS-4, India, 2015–16.

	All women (n = 79,729)			
	Unadjusted		Adjusted	
	OR (95%CI)	p-value	OR (95%CI)	p-value
<b>Presence during the survey interview</b>				
None	Ref.		Ref.	
Husband only	0.96 (0.85–1.09)	0.561	0.81 (0.71–0.93)	0.003
Any adult male only	1.17 (0.92–1.49)	0.210	0.99 (0.76–1.28)	0.923
Any adult female only	0.85 (0.78–0.92)	<0.001	0.84 (0.77–0.91)	<0.001
All (husband, adult male & female)	0.64 (0.52–0.77)	<0.001	0.60 (0.49–0.73)	<0.001
Non-pregnant and non-breastfeeding women (n = 61,573)				
<b>Presence during the survey interview</b>				
None	Ref.		Ref.	
Husband only	0.94 (0.81–1.08)	0.380	0.79 (0.68–0.93)	0.004
Any adult male only	1.09 (0.82–1.44)	0.546	0.98 (0.73–1.32)	0.897
Any adult female only	0.84 (0.76–0.92)	<0.001	0.83 (0.75–0.92)	<0.001
All (husband, adult male & female)	0.61 (0.49–0.76)	<0.001	0.59 (0.46–0.74)	<0.001
Currently pregnant or breastfeeding (n = 18,156)				
<b>Presence during the survey interview</b>				
None	Ref.		Ref.	
Husband only	1.06 (0.82–1.37)	0.671	0.88 (0.67–1.17)	0.387
Any adult male only	1.45 (0.90–2.32)	0.126	0.98 (0.59–1.65)	0.952
Any adult female only	0.89 (0.75–1.05)	0.153	0.84 (0.70–0.92)	0.040
All (husband, adult male & female)	0.74 (0.50–1.09)	0.128	0.61 (0.41–0.92)	0.019

Note: regression models are adjusted for age, marital status, education, exposure to mass media, social group, religion, occupation, household wealth, place of residence and region; SLT = smokeless tobacco, CI= 95% Confidence Interval.

ease common disorders such as toothache and pregnancy-associated ailments (Schensul, Begum, Nair, & Oncken, 2018). Hence, when interviewed in the presence of adult females, they may hold the respondent accountable, motivating for the impression management tendencies leading to the concealment of information. Further, the perceived benefits of SLT use may lead to a decrease in its social undesirability.

The results suggest that social desirability bias and the rationale behind giving socially desirable responses lies in attempting to avoid the negative feelings that may arise in response to reporting on a behaviour that conflicts with an individuals' sense of identity and values (Scheffer, 2000). In countries where gender-based discrimination is pervasive, like India; women have lower autonomy and freedom to take decisions (Starrs et al., 2018; Undurti, 2020). Further, women may be subjected to strong pro-natalist pressures which may affect their decision in tobacco use or disclosing tobacco use as these substances may ultimately hamper their ability in providing 'robust heirs' (Dyson & Moore, 1983).

The women have lower control and access to resources, thus, disclosing tobacco use may restrict their rights further. Hence, repercussions of disclosing socially unacceptable behaviours may include harassment or violence and thus women may present publicly palatable

responses (Tourangeau & Yan, 2007). Kandiyoti (1988) has theorised that women often bargain with patriarchy and may choose to make decisions that resist male dominance, however, by hiding their true resistance, they pretend to accommodate to this dominance. We believe that women who are underreporting tobacco use in the presence of other males, are essentially, bargaining with patriarchy, and choose to continue using tobacco in their absence and without their knowledge.

Our study has several implications. First, as we showed that in the case of the presence of a bystander, the reporting of SLT use is lowered, the current estimates of tobacco use reporting are not sufficient to gauge the scope of the tobacco use burden, particularly among women of different categories like currently pregnant and lactating women. Second, historically, the health of women has received less attention and has been neglected as women continue to report worse health outcomes across all nations, regardless of their economic development (Oksuzyan, Singh, Christensen, & Jasilionis, 2018). Hence, as lower proportion of women disclose and report their tobacco use, they are less likely to seek cessation support even when motivated to quit tobacco. Further, tobacco cessation efforts at the intersection of patient and provider may perpetuate the gender bias further and neglect the development of women-centric information, education, and communication strategies

**Table 5**

Odds of SLT use among women aged 15–49 years for any third person presence during the interview with reference to none's presence; by region, NFHS-4, India, 2015–16.

Region	Overall		Non-Pregnant and Non-breastfeeding		Currently Pregnant or Breastfeeding	
	OR (95%CI)	<i>p</i> -value	OR (95%CI)	<i>p</i> -value	OR (95%CI)	<i>p</i> -value
North	1.50 (0.83–2.70)	0.179	1.51 (0.78–2.90)	0.22	2.11 (0.4–10.98)	0.377
Central	0.76 (0.65–0.90)	<0.005	0.78 (0.65–0.94)	<0.050	0.69 (0.49–0.98)	<0.050
East	0.86 (0.72–1.03)	0.092	0.81 (0.66–0.99)	<0.050	1.06 (0.73–1.52)	0.774
West	0.75 (0.59–0.95)	<0.050	0.78 (0.60–1.01)	0.061	0.65 (0.37–1.12)	0.121
Northeast	0.83 (0.74–0.93)	<0.005	0.78 (0.68–0.89)	<0.001	0.94 (0.75–1.17)	0.573
South	0.91 (0.72–1.15)	0.426	0.88 (0.69–1.12)	0.293	1.59 (0.62–4.04)	0.332

SLT = smokeless tobacco, CI = 95% Confidence Interval.

to enable effective quitting. Third, the implications of our findings extend to the improvement of collecting sensitive data including tobacco in large scale surveys like Demographic and Health Surveys which is a primary source on health and nutrition data related to women across different age groups in LMIC.

The findings of this study recommend that response and interview effects must be accounted for when analysing data from household-based surveys wherein the privacy of the interview cannot be controlled. The survey must collect specific information on the presence of a third person such as the duration of stay and the dynamics of their interaction. As suggested by the results of the bogus-pipeline experiment (Tourangeau, Smith, & Rasinski, 1997), it is essential to design survey methodologies and data collection procedures such that they improve the motivation of the respondents to provide accurate responses and reduce misreporting. This can be enabled through biochemical analysis, inclusion of cognitively oriented tools and participatory survey tools.

#### 4.1. Limitations

This study also acknowledges a few limitations. First, since this study was based on cross-sectional data, we provide only associations and not causal interpretations. Although, this study has attempted to control for various socio-demographic characteristics, the presence of a bystander may itself be controlled by several factors such as the autonomy of the respondent which we have not addressed. Further, this study has not validated the self-reported outcomes. Second, interview privacy has been measured by the 'interruption' of the interview by a third person, thus, we cannot ascertain if the third person was present at the time when the target question was asked as time duration of the bystander has not been recorded in the survey. Third, since the NFHS or the DHS collects information on health behaviours and surrounding characteristics, the respondents may have provided responses with an overview of the health effects of tobacco use instead of its perceived hedonistic benefits. Fourth, although we have assessed the current SLT consumption as occurring in the 24 h preceding the survey, we have not been able to ascertain the respondents' frequency and level of addiction.

#### 4.2. Conclusions

Our findings show that responses of SLT use behaviours of an individual may be masked by their need to socially conform and provide socially desirable responses and thus the current tobacco use estimates may not reflect the actual burden of the substance abuse among women. This is crucial to understand the scope of tobacco use, improve interview methodology to provide privacy to report tobacco use behaviours and other sensitive information in large-scale surveys.

#### Author contributions

PKS and LS conceptualised and designed the study. NS and LS performed the data analysis. LS and PKS validated the data analysis. PKS and PJ interpreted the results and wrote the original draft. CK, AY, SVS

and SS critically reviewed the manuscript and approved the final version. SS supervised the study design and manuscript development.

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#### Patient consent for publication

Not required.

#### Patient and public involvement

This study is based on an anonymised publicly available dataset; hence, this study did not undergo any direct patient or public involvement.

#### Ethical statement

The NFHS-4 (2015–16) was conducted under the scientific supervision of the International Institute for Population Studies (IIPS), Mumbai, India and the ICF Macro, Calverton, Maryland, USA. The Institutional Review Board (IRB) of IIPS and ICF approved the protocol for the NFHS-4 survey, including the content of all the survey questionnaires (International Institute for Population Sciences (IIPS) and ICF, 2017). The survey protocol was also reviewed by the U.S. Centers for Disease Control and Prevention (CDC). This study is based on the NFHS-4, an anonymous public use dataset with no personally identifiable information about the study participants.

#### Declaration of competing interest

None declared.

#### Data availability

Data will be made available on request.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2022.101257>.

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