Community environment and its relationship with tobacco use in selected North Indian communities

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ABSTRACT

Background: Community environmental factors can influence tobacco use and their modification could be one of the ways for reduction of tobacco use. This study measured community environmental determinants of tobacco use in urban and rural Haryana and relates them to tobacco use.

Materials and Methods: Community audit was done in ten rural and urban communities of Ballabgarh, Haryana, to characterize the community, map establishments selling tobacco, and tobacco advertisements. Individual establishments were assessed for their compliance to national law. Fifteen men and 15 women were sampled from each community and interviewed for tobacco use, exposure to tobacco promotion, knowledge of tobacco laws, and attitude toward tobacco. Multilevel mixed-effects logistic regression was conducted to measure community-level determinants’ contribution to tobacco use.

Results: Overall, 218 establishments and 552 participants were assessed in these 20 communities. The median density of tobacco-selling stores expressed in terms of per square kilometer area of the community was 82.9 (75.5-110.8) for rural area and lower in urban area 34.6 (9.0-91.0). Nearly 18.5% of participants were currently using tobacco. Multilevel modeling shows that 35% of the differences in the tobacco use in the community were explained by community-level differences.

Conclusion: The higher dependency of tobacco consumption on the community environment needs to be further explored.

Keywords: Community environment, multilevel modeling, North India, tobacco use

Introduction

Currently, 70% of all deaths globally and 55% in Southeast Asia region are attributed to noncommunicable diseases (NCDs). According to an estimate by the Indian Council of Medical Research, around 50% of deaths occurring in India were due to NCDs and 3 out of top 6 causes were due to NCDs. Among the many important drivers of the increase in NCDs, burden globally is rapid urbanization and consequent changes in the people's lifestyle. A good understanding of issues related to urbanization is essential to have healthier urbanization.

Tobacco consumption is one of the most well-documented and important risk factors of NCDs. Globally, tobacco accounts for around 6 million deaths. According to the Global Adult Tobacco Survey (GATS), 34.6% of the adult population in India used tobacco in any form in 2009. Socially and culturally acceptability along with easy access and affordability of the tobacco products due to good marketing, poor knowledge of the community creates a community environment favorable to tobacco use.

Unlike in the case of communicable diseases, the role of environment in the causation of NCDs is not well studied. One of the major challenges in finding the...
relationship is the measurement of the NCD-related environment. The complexities of measurement of NCD-related environment lie in the great variability in the environment and the absence of a standard valid tool and indicators. Community or neighborhood environment studies have included various constructs including built environment (access to shops, pricing, etc.), levels of deprivation (socioeconomic status, access to key financial or health services), sociopolitical climate (marketing, capitalism, etc.), psychosocial attitudes, and weather (temperature, humidity, etc.). Community audit is one of the methods for measuring environment where the researcher walks through the community to observe the physical and social attributes.\[9\]

Very few studies have measured community tobacco environment and tried to link it with the tobacco consumption.\[6,7,8\] Some of the indicators of community environment of tobacco are tobacco store density, distance to the nearest tobacco store, and cigarette advertisement density.\[6–9\] A study by Loomis et al. found a significant relation between tobacco consumption in youth and tobacco store density.\[10\] However, there are no studies from India in this regard. This is even though many population-based interventions are aimed at modifying the community environment such as marketing of tobacco products, restriction on sale, and advertisements.

We aimed to document the community environment related to tobacco use in selected urban and rural communities of Haryana state in North India and to relate it to tobacco use of its residents. Ethical clearance obtained from the Institute Ethics Committee of All India Institute of Medical Sciences, New Delhi.

**Materials and Methods**

**Study methods**

The study was conducted in Ballabgarh block of Faridabad district from May 2013 to September 2013. According to the Census of India 2011, Ballabgarh block has a total population of 188,000 (rural and urban) with 85 villages and 67 colonies/urban settlements listed in the census.\[10,11\] Ten villages and ten urban colonies were selected by stratified sampling from Ballabgarh block. A list of urban and rural communities under subdistrict Ballabgarh was collected from the municipal corporation. Villages with the population less than 1000 were excluded from the study. From the rest, ten were selected randomly. The urban area was divided into three regions according to existing geographical boundaries, and a total of ten colonies were selected by probability proportional to size. All establishments (both permanent and temporary) in these communities were mapped, and at least 30 randomly selected establishments were planned to assess in detail for compliance to national tobacco laws.

Neighborhood Environmental Assessment Tool was developed after adaptation from Environmental Profile of Community Health and Community Health Environment Scan Survey tools.\[12,13\] It had three sections, i.e., community overview, street assessment, and establishment assessment. Community overview section collected information on type (rural/urban), access to transport and other amenities from center, and types of houses. The street assessment comprised documentation of advertisement for or against tobacco use and mapping of establishment/stores. Tobacco stores were mapped using “Here maps”. The area of the community was calculated using the “ArcGIS” software (ArcGIS, ESRI, 380, New York Street, Redlands). The establishment section assessed compliance of tobacco-selling stores to national laws.\[14\] Typically, on the 1\textsuperscript{st} day, community walk was performed, on the 2\textsuperscript{nd} day, establishments were assessed, and on the 2\textsuperscript{nd} or 3\textsuperscript{rd} day, individual participants were interviewed.

Thirty participants between 18 and 65 years’ age group and residing for at least 6 months within each community were selected by Expanded Program on Immunization method. From the center of the community, one street was selected randomly and participants were selected from the first house. One eligible participant was taken from each house. If no eligible participant was found in a house, the nearest house was selected. If multiple eligible participants were present in a household, the youngest person was selected. The individual-level tool collected information on per capita monthly income, employment status, presence of tobacco user in the family, their tobacco consumption status, media exposure to tobacco, knowledge about tobacco laws, attitude, and practices about the tobacco use. The tobacco consumption and media exposure component of the tool were based on the WHO-STEPs instrument.\[15\]

**Statistical treatment**

Data entry was done by Epi-Info 7 (CDC, US Dept of Health & Human Srvices, USA) and analysis was done using STATA-9 (StataCorp,LLC, 4905, Lakeway Drive, College Station, Texas) and Microsoft Excel 2007. Key variables were defined as under.
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Web Table: Scoring system for various determinants

| Determinants            | Definition                                                                 | Domains                                                                 | Maximum score | Minimum score |
|-------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------|---------------|
| Store score             | Score given to stores as per compliance to the Cigarettes and Other Tobacco Products Act | 1. Selling of tobacco products openly                                   | 7             | 0             |
|                         |                                                                           | 2. Openly displaying tobacco products                                   |               |               |
|                         |                                                                           | 3. Presence of school within 100 yards of school                        |               |               |
|                         |                                                                           | 4. Sign indicating selling tobacco products to minor is illegal         |               |               |
|                         |                                                                           | 5. Minor employed in shop                                               |               |               |
|                         |                                                                           | 6. No smoking sign                                                      |               |               |
|                         |                                                                           | 7. Appealing items provided free with tobacco product                  |               |               |
| Tobacco attitude        | Attitude toward tobacco use                                               | Thirteen questions related to tobacco use with each in Likert scale    | 52            | 0             |
| Media exposure score    | Exposure to tobacco-promoting media                                        | Eight questions related to tobacco-promoting media exposure in the past 30 days | 8             | 0             |
| Tobacco law knowledge   | Knowledge about tobacco laws                                              | Four questions related to the tobacco law knowledge about the presence of any tobacco law preventing | 4             | 0             |
|                         |                                                                           | 1. Smoking in public places                                             |               |               |
|                         |                                                                           | 2. Danger sign on tobacco packages                                      |               |               |
|                         |                                                                           | 3. Selling tobacco products to <18 years                                 |               |               |
|                         |                                                                           | 4. Preventing advertisement of tobacco products                          |               |               |

COPTA - Cigarettes and Other Tobacco Products Act

**Store score**

Store score was given to each tobacco store for obeying different components of Cigarette and Other Tobacco Products Act. Maximum score of 7 was given for a fully compliant store and minimum score of 0 for non complaint store [Web Table].

**Home environment**

Home environment was assessed by consumption of tobacco by family members. Data regarding this was collected from the participants. Proportion of families in community having members using tobacco was calculated from proportion of participant’s families using tobacco.

**Built environment**

Built environment was represented by density of tobacco stores. Density of the stores was calculated by dividing the number of stores with area of the community and expressed in terms of per square kilometer.

**Individual factors**

**Tobacco attitude**

Attitude toward tobacco use was assessed by a total of 13 questions with scores ranging from 0 to 4 in a likert scale. A higher score indicated an unfavorable attitude toward tobacco use.

**Exposure to tobacco-promoting media**

Tobacco-promoting media exposure was assessed from 8 questions with a maximum score of 8. Being not exposed to the tobacco-promoting media, earned one point and one point was deducted if the person was exposed [Web Table].

**Tobacco law knowledge**

Tobacco law knowledge was scored based on four questions related to banning of smoking in public spaces, ban on advertisement, warning on tobacco products, and sales to minors. It could vary from 0 to 4, and higher score would mean better knowledge [Web Table].

Thus, except for density where a higher value denoted tobacco use supporting environment, for all other community variables, higher score would mean an environment against tobacco use.

Univariate logistic regression followed by multivariate logistic regression analysis was used to measure the association between tobacco use and various environmental components. Multivariate logistic regression was performed with tobacco use as outcome. Finally, Multilevel Modelling was performed with four models. First three models used random intercept while the fourth model included the random slope model. The first model was the null model with no explanatory models, the second model was with individual-level predictors, and the third model was with individual and community-level predictors. In the final model, all predictors were used with random slope method.

**Results**

In the selected 20 communities, 278 establishments and 552 individuals were studied. We planned to study 600 establishments from the study area. However, only 278 establishments were found. None of the communities had >30 establishments. From the planned 600 individuals, only 552 can be covered indicating a nonresponse rate of
8%. Distribution of these establishments and communities were given in Table 1. The prevalence of current tobacco consumption in the communities varied from 0% to 50% with the overall prevalence being 18.5% [Table 2]. It was more in rural area (23.9%; 19.4–29.2) as compared to urban area (12.1%; 8.6–16.7). Nearly 4% (22) were past users and 77.5% (428) had never consumed tobacco. Of the current tobacco users, 87% were using smoked tobacco, 13% were smokeless tobacco users, and 5% used both.

### Community characteristics

Rural communities were generally smaller (0.16 km²) than urban ones (0.52 km²). The mean street length per community was 3.1 km in rural and that of the urban population was 6.4 km. In majority of the urban communities, there was a designated marketplace, whereas in the rural places, the designated marketplace was absent and the shops were distributed in the community within the residential places.

A total of 218 (78%) of the 278 establishments sold tobacco, 134 stores in rural and 84 stores in urban areas. The median density of tobacco-selling stores expressed in terms of per square kilometer area of the community was 82.9 (75.5–110.8) for rural area and lower in urban area 34.6 (9.0–91.0). There was very high variability in tobacco store density (ranged from 6 to 488/km²).

### Store characteristics

The median tobacco store score (maximum of 7) was 4.25 (interquartile range [IQR]: 3.8–4.6). The median tobacco store score of rural area (4.3, IQR: 3.8–4.4) was little higher than that of urban area (4.0, IQR: 3.8–4.6). About one-third (33.7%) of participants had at least one family member consuming tobacco in any form. This proportion was higher in rural communities (43.2%) than urban communities (22.6%).

### Individual characteristics

The mean age of participants was 40.8 years (standard deviation: 13.74) and about 48.9% were men and rest were women. Majority of participants were illiterate or educated up to 5th class. The median family income was 2000 INR (IQR: 1000–5000 INR). Knowledge score of participants about tobacco law was 1 (IQR: 1–3). The median tobacco attitude score was found to be 31 with IQR of 27–37. Similarly, the median exposure score to the tobacco media was 7 with IQR of 7–8 [Table 3].

### Factors affecting tobacco use

In univariate analysis, female gender (odds ratio [OR]: 0.05; 0.03–0.16), education more than 10th (OR: 0.5; 0.3–0.8), income per capita more than median (OR: 0.4; 0.2–0.6), and urban community (OR: 0.4; 0.3–0.7) were negatively associated with tobacco consumption. Age >40 years (OR: 1.7; 1.1–2.5), being self-employed (OR: 7.8; 4.9–12.5), tobacco attitude more than median (OR: 10.6; 5.7–19.5), knowledge about tobacco laws more than median (OR: 3.7; 2.3–6.1), presence of tobacco user in the family (OR: 1.4; 0.9–2.1), and tobacco density more than median (OR: 1.6; 1.1–2.5) were found to be positively associated with tobacco consumption [Table 4].

In multivariate analysis, female gender (OR: 0.1; 0.04–0.3), education more than 10th (OR: 0.5, 0.2–0.9), urban community (OR: 0.2; 0.1–0.7), and tobacco user in the family (OR: 0.3; 0.1–0.9) were found to be negatively associated with tobacco consumption, while being self-employed (OR: 3.2; 1.7–5.9), tobacco attitude more than median (OR: 5.3; 2.4–11.8), and tobacco density more than median (OR: 1.8; 1.1–3.3) were found positively associated with tobacco consumption [Table 4].

In multilevel analysis, empty model (Model 1), the variance partition coefficient (VPC) was found to be 0.281, i.e., 28.1% of the variability of tobacco consumption being explained by the community-level variance. On adding the individual-level indicators (Model 2), the VPC decreased to 0.251, and on adding the community-level factors (Model 3), it decreased further to 0.163. In the random slope model, the VPC increased to 0.350. In the final model (Model 4), female gender, education more than 10th, and staying in the urban community were negatively associated with tobacco consumption.

### Table 1: Distribution of participants and establishments

|                | Total | Rural | Urban |
|----------------|-------|-------|-------|
| Establishments | 278   | 130   | 140   |
| Establishments selling tobacco | 218   | 84    | 134   |
| Participants  | 552   | 296   | 256   |

### Table 2: Environmental determinants of tobacco use among urban and rural communities of Ballabgarh

| Domain                     | Subdomain                           | Urban       | Rural       |
|----------------------------|-------------------------------------|-------------|-------------|
| Tobacco consumption (%)    |                                     | 12.1 (95%)  | 23.9 (95%)  |
|                            | CI: 8.6–16.7                        | CI: 19.4–29.2|
| Sociocultural- legislative | Compliance to tobacco laws (as measured by store score) | 4.0 (IQR: 3.8–4.4) | 4.3 (IQR: 3.8–4.4) |
| environment                | Presence of tobacco consumer in family | 21.4 (IQR: 3.8–4.6) | 43.3 |
| Built environment          | Density of stores                   | 34.6 (IQR: 9.0–91.0) | 82.9 (IQR: 75.5–110.8) |

CI - Confidence interval, IQR - Interquartile range
while being self-employed and tobacco attitude more than median were found to be positively associated with tobacco consumption. Whereas, density of tobacco stores which was significant determinant of tobacco use in multivariate analysis became nonsignificant in multilevel analysis [Table 4].

**Table 3: Distribution of participants according to tobacco consumption**

|                | Rural        | Urban        | Total       |
|----------------|--------------|--------------|-------------|
| Total          | 296 (53.6)   | 256 (46.4)   | 552 (100)   |
| Gender         |              |              |             |
| Male           | 148 (50.0)   | 122 (47.7)   | 270 (48.9)  |
| Female         | 148 (50.0)   | 134 (52.3)   | 282 (51.1)  |
| Mean age (SD)  | 38.4 (13.5)  | 43.5 (13.5)  | 40.8 (13.7) |
| Median income (IQR) | 1166.7 | 4083.3 | 2000 |
| Tobacco user, % (95% CI) | 23.9 (19.4-29.2) | 12.1 (8.6-16.7) | 18.5 (15.4-21.9) |
| Mean tobacco attitude score (SD) (maximum - 52) | 33 (29-39) | 27 (25-35) | 31 (27-37) |
| Median score of tobacco law knowledge (IQR) (maximum - 4) | 1 (1-2) | 2 (1-3) | 1 (1-3) |
| Median media exposure score (IQR) (maximum - 8) | 7 (7-8) | 7 (7-8) | 7 (7-8) |
| Tobacco user in house (%) | 128 (68.8) | 58 (31.2) | 186 (100) |
| Currently using tobacco (%) | 71 (69.6) | 31 (30.4) | 102 (100) |

CI - Confidence interval, IQR - Interquartile range, SD - Standard deviation

**Table 4: Multilevel modeling showing determinants of tobacco consumption (n = 552)**

|                        | Logistic regression | Multilevel modeling |
|------------------------|---------------------|---------------------|
|                        | OR (95% CI)         | Fixed part          | Multivariate      | Model 1 | Model 2 | Model 3 | Model 4 |
| Female gender          | 0.05 (0.03-0.16)    | 0.1 (0.04-0.3)      | 0.1 (0.04-0.3)    | 0.1 (0.04-0.3) |
| Age >40 years          | 1.7 (1.1-2.5)       | 1.5 (0.9-2.7)       | 1.5 (0.9-2.7)     | 1.6 (0.8-2.9) |
| Self employed          | 7.8 (4.9-12.5)      | 3.2 (1.7-5.9)       | 2.9 (1.6-5.3)     | 3.2 (1.7-6.0) |
| Education >10th grade  | 0.5 (0.3-0.8)       | 0.5 (0.2-0.9)       | 0.4 (0.2-0.8)     | 0.5 (0.2-0.9) |
| Tobacco attitude more than median | 10.6 (5.7-19.5) | 5.3 (2.4-11.8) | 5.6 (2.4-12.8) | 5.6 (2.4-12.7) |
| Income per capita more than median | 0.4 (0.2-0.6) | 0.8 (0.4-1.5) | 0.7 (0.4-1.4) | 0.8 (0.4-1.6) |
| Knowledge about tobacco laws more than median | 3.7 (2.3-6.1) | 0.9 (0.5-1.9) | 0.9 (0.5-1.9) | 0.9 (0.4-1.9) |
| Media exposure more than median | 1.5 (1.0-2.3) | 0.6 (0.3-1.1) | 0.7 (0.4-1.3) | 0.6 (0.3-1.1) |
| Store score more than median | 0.7 (0.5-1.1) | 0.9 (0.5-1.8) | 0.7 (0.3-1.6) | 0.9 (0.4-1.8) |
| Tobacco user in family | 1.4 (0.9-2.1)       | 0.3 (0.1-0.9)       | 0.3 (0.1-1.0)     | 0.3 (0.1-1.1) |
| Tobacco store density more than median | 1.6 (1.1-2.5) | 1.8 (1.1-3.3) | 1.9 (0.9-3.8) | 1.8 (0.9-3.6) |
| Urban community        | 0.4 (0.3-0.7)       | 0.2 (0.1-0.7)       | 0.2 (0.06-0.7)    | 0.2 (0.07-0.8) |

**Random part**

|                        | OR (95% CI)         |
|------------------------|---------------------|
| ICC                    | 0.128               |
| Variance between community intercept | 0.695 | 0.595 | 0.347 |
| Variance between individuals | 5.450 | 43.538 | 3.725 |
| Covariance according to type of community | 0.307 |
| Variance partition coefficient | 0.281 | 0.251 | 0.163 | 0.350 |

Model 1 - Empty model, Model 2 - With Individual-level variables, Model 3 - With individual- and community-level variables, Model 4 - Random slope model with all explanatory variables, ICC - Intraclass correlation, OR - Odds ratio, CI - Confidence interval

**Discussion**

This study assessed the community-level variables of tobacco consumption and tried to find the relationship between community environment and tobacco use so that measures for changing community environment can be suggested. One-fifth of the population in the community was current tobacco user largely due to use by men. There was a high density of establishments selling tobacco, and compliance of these establishments to tobacco laws was poor. The knowledge of participants regarding laws of tobacco use was poor, but exposure to the tobacco sales promotional techniques was low. Community-level variability explains about 35% of variability in the tobacco use. Staying in urban community with the presence of stores which more likely to follow tobacco laws acts as protective factors for tobacco use.

Density of tobacco stores per square kilometer of area it came out to be 98.95 (69.84–128.06) in rural and that of urban was 97.05 (49.99–144.5). No previous literature was available for comparison from India. Studies by Loomis et al. in New York (5.1/km²) and by Hyland et al. (1.2–4 per 10 km of street length) report much lower densities.[6,16]
In this study, the current tobacco consumption was around 34% in males and 3% in females. According to the GATS survey done in 2009, the smoked tobacco use was 28.7% among males and 4.3% among females while that of smokeless tobacco product was 6.7% and 1.1%, respectively. \[^{[27]}\] According to a study conducted by Anand et al. in rural and urban slums of Ballabgarh, the prevalence of smoke-producing tobacco use was around 36.5% among males and 7% among females. \[^{[18]}\] Smokeless tobacco use was 10.2% among men and 2.9% among females which is higher than this study. According to the National Family Health Survey-3, the prevalence of tobacco use was 57% among men and 11% among women. \[^{[19]}\] The lower prevalence noted in the present study may be due to different study population studies as well as temporal trends.

In this study, we found location of the community whether rural or urban was associated with the tobacco use after adjusting for other variables. Similar results were found by Chan and Leatherdale and Palipudi et al. though others like Levin et al. have reported no association between the tobacco use and community type. \[^{[4,20,21]}\] This may be due to difference in the country where the study was conducted as well as confounders studied.

We found that tobacco store density was not associated with the tobacco consumption. Similar result was found by Han et al. found no relationship between the tobacco store density and tobacco consumption. \[^{[22]}\] A study by Johns et al. found that tobacco store density was associated with consumption of tobacco with OR 1.41. \[^{[23]}\] An another study by Reitzel et al. showed that odds of quitting tobacco in persons living closer to tobacco store were 2 times less than those living far. \[^{[8]}\] Similarly, a study by Pearce et al. in their study found that those with neighborhoods with the highest access to tobacco stores had 1.2 times higher chance of consuming tobacco than those having less access. \[^{[24]}\] Studies by Chuang et al. and Peterson et al. also found positive association between tobacco use and tobacco retailer density. \[^{[25,26]}\] Studies by Loomis et al. found a negative relationship between the tobacco consumption and retail tobacco store density. \[^{[6]}\] The difference may be explained by the less number of study areas involved.

The study, the first of its kind reported from India, has its strengths and limitations. The strengths include a comprehensive assessment of the environment and adjustment for confounders at individual level. The weaknesses are that only 20 communities were covered and only 30 individuals were covered in a community, and ad hoc scoring system was used to measure some variables. In the study area of Ballabgarh block, the density of tobacco stores per square kilometer was much higher as compared to other studies although it was not significantly associated with the prevalence of tobacco use. The lower exposure to tobacco promotion also testifies to the effectiveness of government measures to combat tobacco at population level. This study points out the need to consider laws/policies to restrict the sale of tobacco in stores, for example, by introducing a licensing system. However, before such recommendations can be firmly made, there is clearly a need for more such studies and also a more systematic approach to measuring community environment related to tobacco in specific and for NCDs in general as community environment has also been shown to determine diet and physical activity.

### Conclusion

This study clearly shows the role of environment in the tobacco consumption behavior in the community. Few other findings such as higher density of the tobacco-selling stores and poor implementation of laws in the community are also evident. This calls for stricter implementation of tobacco control laws in the community with further research to determine the specific community-level determinants of tobacco use.

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### Conflicts of interest

There are no conflicts of interest.

### References

1. WHO|Noncommunicable Diseases, WHO. Available from: http://www.who.int/mmediacentre/factsheets/fs355/en/. [Last accessed on 2017 Dec 17].
2. Causes of Death in India: Results from the Million Death Study: Registrar General 2009. Available from: http://www.goo.gl/Co1hjA. [Last accessed on 2017 Nov 24].
3. Global Status Report on Non-Communicable Diseases 2010. World Health Organization; 2010. Available from: http://www.who.int/nmh/publications/ncd_report_chapter1.pdf. [Last accessed on 2015 Jan 14].
4. Palipudi KM, Gupta PC, Sinha DN, Andes LJ, Asma S, McAfee T, et al. Social determinants of health and tobacco use in thirteen low and middle income countries: Evidence from Global Adult Tobacco Survey. PLoS One 2012;7:e33466.
5. McGuirt JT, Jilcott SB, Vu MB, Keyserling TC. Conducting community audits to evaluate community resources for healthful lifestyle behaviors: An illustration from rural eastern North Carolina. Prev Chronic Dis 2011;8:A149.
6. Loomis BR, Kim AE, Busey AH, Farrelly MC, Willett JG, Juster HR, et al. The density of tobacco retailers and its association with attitudes toward smoking, exposure to point-of-sale tobacco advertising, cigarette purchasing, and smoking among New York youth. Prev Med
7. Kite J, Rissel C, Greenaway M, Williams K. Tobacco outlet density and social disadvantage in New South Wales, Australia. Tob Control 2014;23:181-2.

8. Reitzel LR, Cromley EK, Li Y, Cao Y, Dela Mater R, Mazas CA, et al. The effect of tobacco outlet density and proximity on smoking cessation. Am J Public Health 2011;101:315-20.

9. Henriksen L, Feighery EC, Wang Y, Fortmann SP. Association of retail tobacco marketing with adolescent smoking. Am J Public Health 2004;94:2081-3.

10. Census of India: Search Details. Available from: http://www.censusindia.gov.in/pca/SearchDetails.aspx?id=71974. [Last accessed on 2016 Mar 13].

11. Rates of Land with in Tehsil Ballabgarh, Municipal Corporation Faridabad; 2013. Available from: http://www.faridabad.nic.in/crate-blb-2013-14.pdf. [Last accessed on 2016 Mar 09].

12. Corsi DJ, Subramanian SV, McKee M, Li W, Swaminathan S, Lopez-Jaramillo P, et al. Environmental profile of a community’s health (EPOCH): An ecometric assessment of measures of the community environment based on individual perception. PLoS One 2012;7:e44410.

13. Wong F, Stevens D, O’Connor-Duffany K, Siegel K, Gao Y; Community Interventions for Health (CIH) Collaboration. Community Health Environment Scan Survey (CHESS): A novel tool that captures the impact of the built environment on lifestyle factors. Glob Health Action 2011;4:5276.

14. Cigarette and Other Tobacco Products Act. Government of India; 2003. Available from: http://www.who.int/fctc/reporting/Annexthreeindia.pdf. [Last accessed on 2015 Dec 29].

15. NCDs(STEPwise Approach to Surveillance (STEPS). WHO. Available from: http://www.who.int/ncds/surveillance/steps/en/. [Last accessed on 2017 Dec 27].

16. Hyland A, Travers MJ, Cummings KM, Bauer J, Alford T, Wieczorek WF, et al. Tobacco outlet density and demographics in Erie county, New York. Am J Public Health 2003;93:1075-6.

17. Bhawna G. Burden of smoked and smokeless tobacco consumption in India – Results from the Global Adult Tobacco Survey India (GATS-India)- 2009-201. Asian Pac J Cancer Prev 2013;14:3323-9.

18. Anand K, Shah B, Yadav K, Singh R, Mathur P, Paul E, et al. Are the urban poor vulnerable to non-communicable diseases? A survey of risk factors for non-communicable diseases in urban slums of Faridabad. Natl Med J India 2007;20:115-20.

19. National Family and Health Survey (NFHS-3) International Institute of Population Sciences; 2007. Available from: http://www.dhsprogram.com/pubs/pdf/FRIND3/FRIND3-Vol1andVol2.pdf. [Last accessed on 2017 Feb 16].

20. Levin KA, Dundas R, Miller M, McCartney G. Socioeconomic and geographic inequalities in adolescent smoking: A multilevel cross-sectional study of 15 year olds in Scotland. Soc Sci Med 2014;107:162-70.

21. Chan WC, Leatherdale ST. Tobacco retailer density surrounding schools and youth smoking behaviour: A multi-level analysis. Tob Induc Dis 2011;9:9.

22. Han T, Alexander M, Niggebrugge A, Hollands GJ, Marteau TM. Impact of tobacco outlet density and proximity on smoking cessation: A longitudinal observational study in two English cities. Health Place 2014;27:45-50.

23. Johns M, Sacks R, Rane M, Kansagra SM. Exposure to tobacco retail outlets and smoking initiation among New York city adolescents. J Urban Health 2013;90:1091-101.

24. Pearce J, Hiscock R, Moon G, Barnett R. The neighbourhood effects of geographical access to tobacco retailers on individual smoking behaviour. J Epidemiol Community Health 2009;63:69-77.

25. Chuang YC, Cubbin C, Ahn D, Winkleby MA. Effects of neighbourhood socioeconomic status and convenience store concentration on individual level smoking. J Epidemiol Community Health 2005;59:568-73.

26. Peterson NA, Lowe JB, Reid RJ. Tobacco outlet density, cigarette smoking prevalence, and demographics at the county level of analysis. Subst Use Misuse 2005;40:1627-35.