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Smokefree home rules and cigarette smoking intensity among smokers in different stages of smoking cessation from 20 low-and-middle income countries

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Abstract

Smokefree environment created by smokefree policies is associated with smoking reduction; however, there is paucity of literature on the relationship between smokefree home rules and smoking intensity in low-and-middle income countries (LMICs), and how smokefree policy affects smoking behavior of smokers at different stages of smoking cessation. This study examined the relationship between smokefree home rules and average number of cigarettes smoked per day (CPD) among daily smokers at different stages of the transtheoretical model (TTM) of change. Data from 18,718 current daily cigarette smokers from the Global Adult Tobacco Survey (GATS) conducted from 2011 to 2017 in 20 LMICs were analyzed. Weighted multivariable linear regression analyses were conducted using the log of CPD as the outcome variable with smokefree home rules as the exposure variable, controlling for selected covariates. Approximately 15% of the participants were in precontemplation, 5% were in preparation, 15% lived in partial smokefree homes, and 30% lived in complete smokefree homes. The average number of CPD was 12.3, 12.0, and 10.6 among participants living in homes where smoking was allowed, partial smokefree homes, and complete smokefree homes, respectively. Compared to living in homes where smoking was allowed, living in complete smokefree homes were associated with 22.5% (95%CI = 18.4%–

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Credit authorship contribution statement

Daniel Owusu:Conceptualization, Methodology, Formal analysis, Writing original draft, Writing review & editing.Megan Quinn:Methodology, Writing review & editing.Kesheng Wang:Methodology, Writing eview & editing.Faustine Williams:Writing review & editing.Hadii M. Mamudu:Supervision, Writing review & editing.

Declaration of competing interest

The authors declare that they have no conflict of interest.

26.5%), 17.9% (95%CI = 8.4%–27.3%), and 29.3% (95% CI = 17.1%–41.5%) fewer CPD among participants in precontemplation, contemplation, and preparation stages, respectively. These findings suggest that complete smokefree home policy will benefit smokers in LMICs irrespective of their intention to quit smoking in addition to protecting non-smokers from secondhand smoke exposure.

Keywords

Smoking intensity; Smokefree home rules; Transtheoretical model; Global Adult Tobacco Survey; Low-and-middle income countries

1. Introduction

Over 80% of the world's 1.1 billion smokers reside in low-and-middle income countries (LMICs) where the tobacco epidemic is increasing (Lee et al., 2012; Bilano et al., 2015). The death toll from tobacco (WHO, 2015) and its economic implications (John et al., 2011) make tobacco a major global public health problem (U.S. NCI and WHO, 2016). Tobacco cessation can prevent millions of tobacco-related deaths (Jha and Chaloupka, 1999; USDHHS, 1990) and smokefree policies are one of the key tobacco control measures known to affect smoking behavior and promote cessation (Centre for Disease Control, 2014). The overwhelming majority of LMICs have embraced the World Health Organization Framework Convention for Tobacco Control (WHO FCTC) (WHO FCTC, 2015), the international public health treaty negotiated under the auspices of WHO. The Article 8 of the WHO FCTC requires Parties to create smokefree environments to protect nonsmokers and facilitate smoking cessation (WHO FCTC, 2005); therefore, the Parties are under obligation to develop smokefree policies. These policies are associated with smoking reduction, reduction in exposure to secondhand tobacco smoke (SHS), and improved health outcomes (Hoffman and Tan, 2015) and the current evidence indicates that there is an association between workplace smokefree policy and smokefree homes (Nazar et al., 2014). Questions, however, remain as to whether smokefree homes are associated with reduced smoking and whether this association cuts across the stages of the tobacco cessation process. The answers to these questions could inform implementation and enforcement of national smokefree policies and interventions to encourage the adoption of smokefree home rules that foster reductions in cigarette consumption and protect innocent and vulnerable populations from exposure to passive or involuntary smoking through the exposure to SHS.

Prior research has found a link between smokefree homes and smoking behavior of individuals. In high income countries such as the United States, Canada, Australia and the United Kingdom, studies have found association between smokefree homes and increased smoking cessation (Borland et al., 2006; Hyland et al., 2009; Haardörfer et al., 2018), reduced cigarette consumption among continued smokers (Haardörfer et al., 2018; Messer et al., 2008), and decreased susceptibility to smoking initiation among nonsmokers (Gregoire et al., n.d.; Edjoc, 2011). However, in LMICs, little is known about whether smokefree home rules will result in a reduced cigarette consumption in all smokers irrespective of their stage in the smoking cessation process. Literature on the impact of smokefree homes in LMICs is

important for policy making in these countries because policy makers are generally willing to consider evidence generated internally or within their geographical area (Cairney et al., 2012).

This study aimed to fill the gap in the literature by assessing the association between smokefree home rules and the average number of cigarettes smoked per day (CPD) by the stages of behavior change as described by the Transtheoretical model (TTM) of health behavior change (Prochaska et al., 1992): pre-contemplation, contemplation, and preparation. The TTM postulates that health behavioral change progresses through six stages: precontemplation, contemplation, preparation, action, maintenance stages, and termination (Prochaska et al., 1992; Prochaska and Velicer, n.d.; Pallonen et al., 1998). Applied to smoking cessation, the precontemplation stage is when smokers have no plans to quit within the next six months. Those in the contemplation stage intend to quit smoking within the next six months, while those in preparation stage intend to quit within the next 30 days and have already taken some practical steps such as previous quit attempts (Owusu et al., 2017; Mbulo et al., 2015; DiClemente et al., 1991). It has been suggested that TTM should inform the promotion of smokefree home rules (Escoffery et al., 2008). Therefore, it is important to understand how smokefree home rules influence the smoking behavior of smokers at different TTM stages of change. We hypothesized that smokefree homes will be associated with significant reductions in CPD (also referred to as smoking intensity in this study) among smokers in precontemplation, contemplation, and preparation stages in LMICs. This study provides information on the extent to which people are protected from SHS at home and how this relates with the average number of CPD. It will serve as the first comprehensive cross-country assessment of the association between smokefree home rules and the average number of CPD in LMICs. The results will also help understand whether smokefree home rules benefit all smokers, including those who do not plan to quit smoking.

2. Methods

2.1. Data

Data from the Global Adult Tobacco Survey (GATS), 2011–2017, were used. Details of GATS design have been published elsewhere (GATS Collaborative Group, 2010). GATS uses multi-stage clustered probability sampling design to select a nationally representative sample of noninstitutionalized adults aged ≥15 years old. To ensure crosscountry comparison of the data, standard protocol in the design, sampling, questionnaire, interview, and data analysis and reporting is used in each participating country. GATS has been recommended as a standard survey that can be used for monitoring tobacco cessation in LMICs (McRobbie et al., 2013).

This study included GATS data collected between 2011 and 2017 from 20 LMICs: India (2017), Ukraine (2017), Ethiopia (2016), Mexico (2015), Philippines (2015), Senegal (2015), Vietnam (2015), Kazakhstan (2014), Kenya (2014), Pakistan (2014), Cameroon (2013), Panama (2013), Uganda (2013), Argentina (2012), Nigeria (2012), Turkey (2012), Indonesia (2011), Malaysia (2011), Romania (2011), and Thailand (2011). Countries were included if they were classified as LMICs by the World Bank at the time of data collection. In addition, only countries with publicly available national GATS data collected no earlier

than 2011 were included in this study. The overall response rates ranged from 64.4% (Ukraine) to 97.0% (Senegal). Participants included were current daily cigarette smokers who reported smoking at least one CPD. Similar to previous studies (Warren et al., 2006; Owusu et al., 2018), data from the 20 countries were pooled to obtain an adequate sample to increase the power of the study because only a small proportion of smokers in LMICs are in the preparation stage to quit smoking (Owusu et al., 2017; Mbulo et al., 2015).

All participants were categorized into pre-contemplation, contemplation, and preparation stages based on the TTM. Consistent with literature (Mbulo et al., 2015), adults who had no intention to quit smoking within 12 months were classified as being in pre-contemplation. Participants who indicated their intention to quit within the next one year were classified as being in contemplation to quit smoking. Lastly, participants who attempted to quit in the past 12 months and intended to quit in the next one month were assumed to be in preparation stage to quit smoking.

2.2. Measures

The main outcome variable was average number of CPD. Daily cigarette consumption was assessed by the question, “On average, how many of the following products do you currently smoke each day? Also, let me know if you smoke the product, but not every day: Manufactured cigarettes?” The average number of CPD used in the current study was obtained from current daily smokers’ reports on the average number of manufactured cigarettes they currently smoked each day.

Smokefree home rules was the main exposure variable. This was assessed by the question: “Which of the following best describes the rules about smoking inside of your home: smoking is allowed inside of your home, smoking is generally not allowed inside of your home but there are exceptions, smoking is never allowed inside of your home, or there are no rules about smoking in your home?” “Smoking is never allowed” was considered complete smokefree home, and “smoking generally not allowed but with exception” was classified as partial smokefree home. Homes were considered not smokefree (or smoking allowed) if smoking was allowed or there were no rules about smoking inside the home.

Based on previous findings (Nazar et al., 2014; Owusu et al., 2017), the following individual level variables: sex, age, educational level, household wealth index, exposure to health warnings on cigarette packages, knowledge of smoking harm, exposure to anti-smoking media messages, and being employed in smokefree workplace were included in the analysis as covariates. Age was categorized into four age groups (15–24, 25–44, 45–64 and 65+ years old) using the recommendations from the GATS Collaborative Group (Global Tobacco Surveillance System (GTSS), 2009). Educational level was categorized into below high school, high school, and above high school. Household wealth index was calculated based on the availability of eight assets. The availability of the assets was ascertained by the question, “Please tell me whether this household or any person who lives in the household has the following items” [Electricity, flush toilet, fixed telephone, cell telephone, television, AM/FM radio, refrigerator, car]. The wealth index was calculated using the principal component analysis approach as described in the WHO Economics of Tobacco Toolkit

(WHO, 2010a). Participants were categorized into quintiles of the wealth index with the first quintile representing lowest wealth and fifth quintile representing the highest wealth.

Exposure to health warnings on cigarette packages (yes/no) was determined from the question, “In the last 30 days, have warning labels on cigarette packages led you to think about quitting?” (yes/no). Participants were considered to know smoking harm if they answered ‘Yes’ to the question, “Based on what you know or believe, does smoking tobacco cause serious illness?” Exposure to anti-smoking media messages was determined by the question, “In the last 30 days, have you noticed *information* about the dangers of smoking cigar ettes or that encourages quitting in any of the following places?” Consistent with literature (Owusu et al., 2017; CDC, 2013), we limited the analysis to the four main media channels (newspapers or magazines, television, radio and billboards) because other channels (e.g., internet) were assessed by a few countries and a minority of the participants in those countries indicated exposure to these channels. We classified exposure to anti-smoking media messages into ‘no exposure’, ‘exposure to only one of the media’, and ‘exposure to more than one media’. (Owusu et al., 2017; CDC, 2013)

We also included country level variables to adjust for country differences in the analysis. We obtained age and sex-standardized adult smoking prevalence for each country at the time of the survey. Further, we retrieved public smokefree policy compliance level information for each country from the WHO FCTC implementation reports.

The current study received human subject exemption from the Institutional Review Board of East Tennessee State University.

2.3. Statistical analysis

Data management and analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA). We performed descriptive analyses to detail the characteristics of study participants and the distribution of participants by the first three stages of TTM. Weighted means of smoking intensity were estimated for the categories of the smokefree home rules, and covariates. We examined the data for normality of the residuals, homoscedasticity, multicollinearity, outliers and influence. Log transformation was completed to improve the normality of the distribution of CPD. After the data were found to be adequate for the linear regression model, four weighted multivariable linear regression models were built using SAS survey procedure: 1) combined model (all stages), 2) a model for those in precontemplation, 3) a model for those in contemplation and 4) a model for those in preparation. In all models, in addition to the individual level covariates, WHO world region of the country of survey, age and sex-standardized smoking prevalence, and level of compliance with smokefree policies in the country were added as covariates to adjust for their possible effects on the estimates, and the standard errors were adjusted for the clustering and stratification design of the survey. Adjusted regression coefficients (β) with associated 95% confidence intervals (CI) were estimated. The regression coefficients were multiplied by 100 and reported as percent change in CPD.

3. Results

3.1. Demographic characteristics

Participants who reported living in homes where smoking was allowed ranged from 20.0% in Kazakhstan to 82.4% in Indonesia. Overall, 55.0%, 15.4% and 29.6% of the participants resided in homes where smoking was allowed, partial smokefree homes, and complete smokefree homes, respectively. By smoking cessation stage, 79.4%, 15.2%, and 5.4% of the participants were in precontemplation, contemplation, and preparation, respectively (Table 1). The average number of CPD was 12.3, 12.0, 10.6, and 12.2 for smokers in precontemplation, contemplation, preparation, and all smokers combined, respectively. The average number of CPD was 13.0, 12.0 and 10.9 for participants living in smoking allowed, partial smokefree, and complete smokefree homes, respectively (Table 2).

3.2. Smokefree home rules and CPD

In the total sample, there was an 18.5% (95% CI = 14.5%–22.5%) and a 22.4% (95%CI = 18.7%–26.1%) reduction in the average number of CPD in partial smokefree homes and complete smokefree homes, respectively, compared to homes where smoking was allowed (Table 3). Compared to living in homes where smoking was allowed, living in partial smokefree homes and complete smokefree homes were associated with an 18.0% (95%CI = 13.5%–22.5%) and a 22.5% (95%CI = 18.4%–26.5%) reduction in the average number of CPD, respectively, among adults in precontemplation stage. For adults in contemplation stage, partial smokefree and complete smokefree homes were associated with a 16.9% (95%CI = 6.3%–27.5%) and a 17.9% (95%CI = 8.4%–27.3%) reduction in the average number of CPD, respectively, compared to homes where smoking was allowed. Among adults in preparation to quit smoking stage, there was a 24.7% (95%CI = 10.5%–39.0%) reduction in the average number of CPD in those who reside in partial smokefree homes, compared to those living in homes where smoking was allowed. Further, participants from complete smokefree homes smoked 29.3% (95% CI = 17.1%–41.5%) fewer average number of CPD than participants living in homes where smoking was allowed (Table 4).

4. Discussion

Smoking reduction has been found to predict future tobacco cessation (Klemperer and Hughes, 2016), suggesting that factors that promote smoking reduction may increase cessation and reverse the increasing trend in LMICs, especially in places such as Africa and Eastern Mediterranean where they are projected to experience rapid increases in tobacco use among both men and women (Bilano et al., 2015). This study was conducted to assess the relationship between smokefree home rules and the average number of CPD among adult smokers in 20 LMICs. Overall, approximately 80% of the adult daily smokers were in the precontemplation stage of TTM, 15% were in contemplation stage, and 5% were in preparation stage to quit smoking, although the proportion of adults in different stages of TTM varied across countries (Table 1). Consistent with literature (Hopkins et al., 2010), living in smokefree homes was associated with a reduction in the average number of CPD in the total sample and across the three stages of TTM, although the reduction appears to be higher in daily smokers in precontemplation and preparation than those in contemplation.

Future studies should examine whether the impact of smokefree homes on cigarette consumption may be minimal in smokers in contemplation stage compared to those in precontemplation and preparation stages and why this may be the case.

The results of the present study suggest that making homes smokefree may encourage reduction in CPD among daily smokers at different stages of smoking cessation process. Thus, there is a need to encourage adoption of smokefree home rules in LMICs. Strategies to encourage the adoption of smokefree home rules include mass media campaigns educating the public about the dangers of SHS exposure (King et al., 2003) and health care provider's advice and counseling (Lepore et al., 2013; Collins et al., 2018). It has been suggested that, to promote adoption of home smokefree rules, the TTM could be used to classify households into stages of adoption of smokefree home rules (precontemplation, contemplation, preparation, action, and maintenance) so that specific interventions/messages can be developed and delivered to households based on their smokefree rules adoption stage (Escoffery et al., 2008). Further, studies have reported a link between national smokefree policies and adoption of smokefree home rules (Nazar et al., 2014; Mons et al., 2013; Cheng et al., 2011; Cheng et al., 2015), indicating that the implementation and enforcement of national smokefree policies in LMICs could facilitate the adoption of smokefree home rules.

Smokefree policy is one key strategy espoused by the WHO FCTC to protect non-smokers from exposure to SHS (i.e., Article 8). While many countries have signed the WHO FCTC and made progress in its implementation (WHO, 2015), it was reported by the WHO in 2017 that only 20% of the world nonsmokers were comprehensively protected by law from SHS exposure in public places (WHO, 2017), and SHS exposure is still very high in some LMICs who are parties to the WHO FCTC (Mamudu et al., 2015; Owusu et al., 2016). For instance, all countries in the West African region have ratified the WHO FCTC; yet, our previous study found that among youth in the region, SHS exposure inside the home ranged from 13.0% to 45.0%, while exposure outside the home range from 24.7% to 80.1% (Owusu et al., 2016). This suggests that smokefree policies are not fully implemented or enforced in these countries that are parties to the WHO FCTC. Our results add to the growing literature on the effect of smokefree policy on cigarette consumption globally and provide the first cross-country evidence on not only the association between smokefree home rules and CPD among adults in LMICs but also how such policy may reduce smoking intensity among smokers in the first three stages of the TTM. Coupling our findings with the existing literature (Hoffman and Tan, 2015; Hopkins et al., 2010) should provide support for full implementation and enforcement of smokefree policies in the countries included in this study that is consistent with the Article 8 of the WHO FCTC and its guidelines (WHO, 2010b).

This study has some limitations that should be considered in the interpretation of the results. First, information on average number of CPD and home smoking policy were self-reported, therefore, subject to recall and social desirability bias. Second, factors such as tobacco-related morbidities may affect average number of CPD, but since the survey protocol does not include this information, we could not adjust for their effects. Third, causal effect cannot be concluded from this study because we used cross-sectional data. Fourth, this study included only daily smokers, hence the result may not apply to nondaily smokers. Future

studies should assess how smokefree homes influence cigarette consumption among nondaily smokers. Fifth, although we controlled for several factors, we could not adjust for all factors that may affect cigarette consumption, including country differences in tobacco control policies.

Despite these limitations, this study provides information on the association between smokefree home rules and average number of CPD among adult smokers from 20 countries, representing about half of the global adult smokers (U.S. NCI and WHO, 2016). The findings suggest that smokefree rules in the home could lead to a significant reduction in average number of CPD among daily smokers at different stages of smoking cessation. Thus, education about the positive implications of making homes smokefree should be incorporated into national tobacco cessation campaigns across LMICs.

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Table 1

Characteristics of study participants (N = 18,718).

Country	Year	n	Response rate (%)	Female (%)	Male (%)	Smoking allowed in the home (%)	Partial smokefree homes (%)	Complete smokefree home (%)	PC (%)	C (%)	P (%)
India	2017	1878	92.9	2.4	97.6	44.5	14.1	41.4	81.6	14.1	4.3
Ukraine	2017	1545	64.4	19.1	80.9	25.0	20.1	54.8	76.2	19.5	4.3
Ethiopia	2016	432	93.4	3.4	96.6	82.4	6.4	11.3	76.4	14.4	9.2
Mexico	2015	861	82.7	25.0	75.0	33.9	13.7	52.4	69.4	22.5	8.1
Philippines	2015	2084	92.1	8.2	91.8	54.8	15.0	30.2	84.0	9.8	6.2
Senegal	2015	168	97.0	2.7	97.3	58.5	13.6	27.9	49.0	32.0	19.0
Vietnam	2015	1303	95.8	1.7	98.3	73.5	15.7	10.8	84.2	12.6	3.2
Kazakhstan	2014	854	96.7	8.4	91.6	20.0	34.0	46.0	86.9	12.1	1.0
Kenya	2014	331	87.1	5.4	94.6	45.8	17.5	36.7	56.2	27.2	16.5
Pakistan	2014	752	81.0	4.9	95.1	79.9	12.4	7.6	86.2	8.5	5.3
Cameroon	2013	276	94.1	3.4	96.6	60.3	12.0	27.6	76.1	17.3	6.6
Panama	2013	272	88.4	23.9	76.1	37.2	12.5	50.3	86.2	9.5	2.7
Uganda	2013	322	86.6	5.1	94.9	66.6	9.3	24.2	70.2	21.2	8.6
Argentina	2012	1182	74.3	39.0	61.0	48.8	20.8	30.4	80.8	15.2	4.0
Nigeria	2012	317	89.1	2.9	97.1	62.5	17.9	19.6	68.3	20.5	11.2
Turkey	2012	1985	90.1	23.1	76.9	46.4	21.0	32.6	65.7	26.8	7.6
Indonesia	2011	118	94.3	2.9	97.1	82.5	11.1	6.4	92.9	4.3	2.8
Malaysia	2011	729	85.3	1.4	98.6	66.8	12.4	20.8	87.4	7.8	4.8
Romania	2011	949	88.5	31.0	69.0	51.7	19.9	28.4	76.8	18.7	4.5
Thailand	2011	2360	94.2	3.4	96.6	69.0	1.6	29.4	84.1	12.9	3.0
Total		**18,718**		**11.2**	**88.8**	**55.0**	**15.4**	**29.6**	**79.4**	**15.2**	**5.4**

Note: *N*, sample size; PC, Precontemplation; C, contemplation; P, preparation. Countries have been arranged from the most recent survey to the oldest survey.

Table 2

Means of smoking intensity in independent variables by stage of smoking cessation (n = 18,718). Data source: GATS 2011–2017.

Variable	Precontemplation (n = 14,623)	Contemplation (n = 3010)	Preparation (n = 1013)	Overall (n = 18,718)
	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Home smoking rule				
Smoking allowed	13.1 (12.8, 13.5)	12.4 (11.6, 13.3)	11.7 (10.4, 12.9)	13.0 (12.7, 13.3)
Partial smokefree	12.2 (11.5, 12.8)	11.8 (10.7, 13.0)	9.7 (8.3, 11.1)	12.0 (11.5, 12.5)
Complete smokefree	10.9 (10.3, 11.4)	11.4 (10.6, 12.3)	9.7 (7.9, 11.5)	10.9 (10.4, 11.3)
Gender				
Female	12.2 (11.4, 13.1)	10.4 (9.5, 11.4)	11 (9.3, 12.8)	11.8 (11.1, 12.4)
Male	12.3 (12.1, 12.6)	12.3 (11.6, 12.9)	10.5 (9.4, 11.6)	12.2 (12.0, 12.5)
Age				
15–24 years	10.5 (9.8, 11.1)	10.6 (9.4, 11.8)	8.0 (6.9, 9.2)	10.3 (9.8, 10.9)
25–44 years	12.4 (12.0, 12.8)	12.3 (11.5, 13.0)	11.3 (9.8, 12.9)	12.3 (12.0, 12.7)
45–64 years	13.5 (13.0, 14.0)	12.4 (11.4, 13.5)	11.3 (10.1, 12.5)	13.2 (12.8, 13.7)
65+ years	11.0 (10.3, 11.7)	9.5 (7.8, 11.2)	9.0 (4.4, 13.5)	10.6 (9.9, 11.4)
Education				
Below high school	12.4 (12.1, 12.8)	11.3 (10.6, 12.1)	9.9 (9.0, 10.8)	12.1 (11.8, 12.5)
High school	13.2 (12.6, 13.8)	13.1 (12.1, 14.1)	10.7 (9.2, 12.2)	13.1 (12.6, 13.6)
Above high school	11.1 (10.6, 11.6)	12.4 (11.1, 13.7)	12.0 (9.2, 14.7)	11.4 (10.9, 11.8)
Wealth index				
1st quintile	10.4 (9.5, 11.4)	8.6 (7.1, 10.1)	7.7 (6.5, 8.8)	10.1 (9.3, 10.8)
2nd quintile	11.0 (10.4, 11.7)	9.3 (7.6, 11.1)	8.6 (6.7, 10.6)	10.7 (10.2, 11.3)
3rd quintile	11.9 (11.3, 12.4)	10.4 (9.0, 11.7)	9.0 (7.9, 10.1)	11.6 (11.1, 12.0)
4th quintile	12.5 (12.0, 13.0)	12.7 (11.6, 13.7)	10.7 (9.1, 12.3)	12.4 (12.0, 12.9)
5th quintile	13.9 (13.4, 14.4)	13.5 (12.7, 14.3)	13.0 (10.6, 15.3)	13.8 (13.3, 14.2)
Employed in smokefree workplace				
No	12.5 (12.1, 12.8)	11.6 (11.0, 12.3)	10.3 (9.5, 11.1)	12.2 (12.0, 12.5)
Yes	11.8 (11.3, 12.4)	12.8 (11.8, 13.9)	11.4 (8.4, 14.3)	12.0 (11.5, 12.6)
Exposure to warning labels				

Variable	Precontemplation (n = 14,623)	Contemplation (n = 3010)	Preparation (n = 1013)	Overall (n = 18,718)
	Mean (95% CI)	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
No	11.9 (10.9, 12.9)	9.9 (8.1, 11.6)	7.2 (5.6, 8.8)	11.5 (10.6, 12.4)
Yes	12.4 (12.1, 12.6)	12.1 (11.6, 12.7)	10.8 (9.8, 11.8)	12.3 (12.0, 12.5)
Know smoking harm				
No	12.7 (11.9, 13.4)	10.1 (8.0, 12.1)	7.7 (5.2, 10.3)	12.3 (11.6, 13)
Yes	12.3 (12.0, 12.6)	12.1 (11.5, 12.6)	10.7 (9.7, 11.7)	12.2 (11.9, 12.4)
Exposure to anti-smoking media message				
No	13.0 (12.5, 13.4)	12.3 (11.1, 13.6)	11.3 (9.2, 13.3)	12.8 (12.5, 13.2)
One channel	12.5 (11.9, 13.0)	12.6 (11.5, 13.6)	9.7 (8.5, 10.8)	12.3 (11.9, 12.8)
More than one channel	11.7 (11.3, 12.2)	11.6 (10.8, 12.3)	10.8 (9.2, 12.4)	11.7 (11.3, 12.0)
Total population	**12.3 (12.0, 12.6)**	**12.0 (11.4, 12.5)**	**10.6 (9.6, 11.5)**	**12.2 (11.9, 12.4)**

Note: CI, Confidence interval.

Table 3

Association between smokefree home rules and cigarettes per day among adults (N = 28,247).

Variable	Change in smoking intensity (%)
Smokefree home rules	
Partial smokefree vs smoking allowed	−18.5 (−22.5, −14.5)
Complete smokefree home vs smoking allowed	−22.4 (−26.1, −18.7)
Sex	
Male vs female	29.8 (26, 33.7)
Age	
25–44 years vs 15–24 years	18.1 (13.5, 22.7)
45–64 years vs 15–24 years	26.2 (21.1, 31.2)
65+ years vs 15–24 years	8.4 (1.4, 15.3)
Education	
High school vs below high school	1.6 (−2.1, 5.3)
Above high school vs below high school	−3 (−7.1, 1)
Wealth index	
2nd quintile vs 1st quintile	5.6 (−2.2, 13.3)
3rd quintile vs 1st quintile	13.8 (6, 21.6)
4th quintile vs 1st quintile	17.1 (9.3, 24.9)
5th quintile vs 1st quintile	17.8 (9.7, 25.8)
Employed in smokefree workplace	
Yes vs no	−5 (−8.6, −1.4)
Exposure to warning labels	
Warning labels led you to think about quitting (yes vs no)	−8.3 (− 11, − 5.5)
Knowledge of smoking harm	
Know smoking harm (yes vs no)	3.4 (−2.7, 9.5)
Exposure to antismoking messages	
Antismoking message in one media channel vs no exposure	−7 (−10.6, −3.4)
Antismoking message in > one media channel vs no exposure	−9.6 (− 13.2, −5.9)

Note: CI, confidence interval. Percent change intensity was estimated by PROC SURVEYREG procedure using the log of number of daily smoking as an outcome. Beta coefficients were multiplied by 100. Negative sign means percentage reduction in daily smoking. Estimates were also adjusted for WHO world region of the survey country, compliance with smokefree policy in the country, and age- and sex-adjusted adult smoke prevalence in the country.

Table 4

Association between smokefree home rules and cigarettes per day (CPD) by stage of smoking cessation (N = 28,247). Data source: GATS 2011–2017.

Variables	Precontemplation (n = 21,612)	Contemplation (n = 4943)	Preparation (n = 1566)
	Percent change in smoking intensity (95% CI)	Percent change in smoking intensity (95% CI)	Percent change in smoking intensity (95% CI)
Smokefree home rules			
Partial smokefree vs smoking allowed	− 18 (− 22.5, − 13.5)	−16.9 (−27.5, −6.3)	−24.7 (−39, −10.5)
Smokefree home vs smoking allowed	− 22.5 (− 26.5, − 18.4)	−17.9 (−27.3, −8.4)	− 29.3 (− 41.5, − 17.1)
Sex			
Male vs female	28.2 (23.9, 32.6)	37 (27.6, 46.5)	15.1 (− 0.7, 30.8)
Age			
25–44 years vs 15–24 years	18.9 (13.6, 24.3)	12 (1.5, 22.6)	21.7 (7.8, 35.6)
45–64 years vs 15–24 years	27.3 (21.6, 33.1)	16.2 (5, 27.4)	29 (13.1, 44.9)
65+ years vs 15–24 years	10.6 (3, 18.3)	11.8 (− 7.2, 30.8)	− 2.9 (− 25.7, 19.9)
Education			
High school vs below high school	0.1 (−4, 4.3)	11.3 (2.5, 20.1)	− 4.4 (-− 17.9, 9.1)
Above high school vs below high school	−5.6 (− 10, − 1.2)	8.2 (− 1.3, 17.7)	5.1 (−11.1, 21.3)
Wealth index			
2nd quintile vs 1st quintile	7.9 (−0.6, 16.4)	−1.8 (−25.7, 22.2)	− 6.4 (− 25.2, 12.3)
3rd quintile vs 1st quintile	14.8 (6.1, 23.5)	16.7 (− 3.2, 36.5)	−4 (−22.8, 14.8)
4th quintile vs 1st quintile	17.4 (8.7, 26.1)	22.7 (1.5, 43.9)	14.8 (− 2.3, 31.9)
5th quintile vs 1st quintile	18.3 (9.2, 27.4)	18.4 (− 2.3, 39.1)	26.4 (7, 45.8)
Employed in smokefree workplace			
Yes vs no	− 4.6 (− 8.7, − 0.6)	−3.4 (−11.5, 4.7)	−10 (−23, 2.9)
Exposure to warning labels			
Warning labels led you to think about quitting (yes vs no)	−7.1 (−10.2, −3.9)	−2.2 (−10.1, 5.7)	− 4.6 (− 16.1, 7)
Knowledge of smoking harm			
Know smoking harm (yes vs no)	0.3 (−5.6, 6.2)	19.7 (− 1, 40.3)	29.1 (13.1, 45.2)
Exposure to antismoking messages			
Antismoking message in one media channel vs no exposure	−5.6 (−9.6, −1.6)	−9.8 (−19.2, − 0.5)	− 15.4 (− 30.5, − 0.4)
Antismoking message in > one media channel vs no exposure	−7.4 (−11.5, −3.4)	−11.1 (−20.1, −2)	−24 (−37.9, −10.2)

Note: CI, confidence interval. Percent change intensity was estimated by PROC SURVEYREG procedure using the log of number of daily smoking as an outcome. Beta coefficients were multiplied by 100. Negative sign means percentage reduction in daily smoking. Estimates were also adjusted for WHO world region of the survey country, compliance with smokefree policy in the country, and ageand sex-adjusted adult smoke prevalence in the country.