BMJ Open

Association between SHS exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010058
Article Type:	Research
Date Submitted by the Author:	24-Sep-2015
Complete List of Authors:	xu, yue; Zhejiang Center for Disease Control and Prevention, Health education Xu, ShuiYang; Zhejiang Center for Disease Control and Prevention, Health Education wu, qingqing; Zhejiang Center for Disease Control and Prevention, Health Education guo, yujie; Zhejiang Center for Disease Control and Prevention, Health Education
Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Secondhand smoke, cigarette gifting and sharing, cross-sectional study

Title Page

Association between SHS exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Xu Yue[1], Xu SuiYang[1], Wu QingQing[1], Guo YuJie[1]

Running Head: Association between SHS exposure at home and cigarette gifting and sharing.

There are 3 tables, 1 figure and no supplementary materials in the manuscript.

Corresponding Author: Xu ShuiYang, Zhejiang Center for Disease Control and Prevention, 3399 BinSheng Road, Hangzhou, 310051, China; Tel: +86-571-8711-5248. Fax: +86-571-8711-5245. E-mail: xu5099109@163.com.

Author Affiliation: Zhejiang Center for Disease Control and Prevention, China.

[1] Zhejiang Center for Disease Control and Prevention, Hangzhou, China

Abstract

Objectives: The aims of current study were to assess the prevalence of cigarette gifting and sharing, and to evaluate relationship between secondhand smoke exposure (SHS) and cigarette gifting and sharing in Zhejiang.

Setting: 10 sites in 5 cities in Zhejiang, China.

Participants: A repeat cross-sectional survey was conducted with adults in Zhejiang, China in 2010 (N=2112) and 2012 (N=2279). At both waves the same questionnaire was used; respondents were asked the questions on residence, smokers in the family, indoor smoking rules, household income, and cigarette gifting and sharing.

Background: Cigarette gifting and sharing have influenced current tobacco control efforts in China.

Results: The findings revealed that more than half of respondent' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. Many families (54.73% in 2010, 47.04% in 2012) shared cigarettes with others, and a minority(14.91% in 2010, 14.17% in 2012) reporting giving cigarettes as a gift. There was a significant decrease in cigarette sharing from 2010 to 2012, irrespective of household with SHS exposure status, but the cigarette gifting was no significantly decreased, except households without SHS exposure.

Conclusions: Compared to households without SHS exposure, cigarette gifting and sharing in household with SHS exposure were more obvious. To encourage and promote smoke-free inside the house is necessary to change public smoking custom in Zhejiang, China.

Keywords: Secondhand smoke; cigarette gifting and sharing; cross-sectional study

Article summary

This is the first study in Zhejiang to assess the actual prevalence of cigarette gifting and sharing among18–59-year-olds.

Cigarette gifting and sharing have influenced current tobacco control efforts in China, and strongly contribute to smoking initiation as well as failure to quit smoking among Chinese.

The findings suggest that cigarette gifting and sharing in household with SHS exposure were more obvious, encouraged and promoted smoke-free in the house is necessary to change this custom.

The repeat cross-sectional design prohibits causal associations, and we relied on self-report measures, which may be subject to recall bias and social desirability.

The SHS exposure at home was relatively difficult to measure, and this study only used self-reporting to measure it, which potentially limited the findings.

Introduction

China is the world's largest consumer of tobacco products, with an estimated 301 million smokers[1] The annual number of deaths caused by tobacco use now exceeds 1 million and is expected to increase in the coming decades[2]. Since the Framework Convention on Tobacco Control came into force in 2006, the Chinese government has paid attention to tobacco control to reduce its use by conducting programs such as "Smoke-Free Olympics" [3], smoke-free legislation[4,5]. However, these tobacco control efforts have been

hampered by the practices of gifting and sharing cigarettes which are well accepted and pervasive across China [6].

Smoking in China is a very common societal phenomenon. The sharing and gifting cigarettes are extremely important social activity as they can convey politeness for others [7]. Compared to casual sharing of cigarettes, the formal gifting of cigarettes is more prevalent, especially during the Mid-Autumn Festival and Chinese New Year, as it shows respect for the recipient. Gifting and sharing cigarettes have become parts of Chinese custom, and they have become major factors in failing to motivate smokers to quit and increasing smoking among non-smokers[8-10].

Zhejiang is one of the smallest province-level political units of China, but it is also one of the most economically developed and densely populated. In recent years, the local government has implemented a number of tobacco control measures[11-12] to reduce smoking in public. In the provincial capital city, Hangzhou municipality expanded a smoking ban to hospitals, kindergartens, schools, libraries and stadiums in 2010. Local Centers for Disease Control printed the poster “Giving Cigarettes is Giving Harm” [13], which were disseminated across Zhejiang in 2011. They also launched a health promotion campaign graphic warnings on cigarette packets to educate smokers about the risks of smoking in 2012, which was an effective approach[14]. These campaigns provided knowledge about tobacco to the public with the aim of building a health-first and people-oriented culture, and to create a no-smoking social atmosphere.

Although studies in China have indicated that the acts of gifting and sharing cigarettes are major contributors to China’s high tobacco usage[9], there are

few studies to quantitatively assess the smoking and quit smoking behaviors attributable to cigarette gifting and sharing. Such a study is urgently needed to assess the impact of this practice in China. We employed a repeat cross-sectional design and obtained representative data to assess the prevalence of cigarette gifting and sharing, through an in-depth analysis of data from the Tobacco Control China survey regarding cigarette gifting and sharing.

Methods

Design

Data came from The Epidemiology and Intervention Research for Tobacco Control in China[15]. The baseline survey was conducted between May and October 2010, and a total of 2112 interviews were completed (response rate 92.31%). The final survey was conducted between May and October 2012, and a total of 2279 interviews were completed (response rate 93.02%). Fieldwork was conducted in Mandarin through face to face interviews with informed consent obtained from the respondents, and up to three visits to a household were made to interview targeted individuals within that household. All survey interviewers and supervisors were trained by the Peking Union Medical College staff. The training sessions took place in small groups and were given by the same trainers to ensure consistency. Before the interview, mapping and listing were conducted by local Centers for Disease Control staff to identify selected households.

Sample

Cross-sectional samples of 18–59-year-olds were drawn from Zhejiang households by a multi-stage stratified cluster sampling design. The 5 regions were selected based on their geographic locations (see Fig 1). In the first stage, each region was further divided into urban and rural areas, making 10 strata in total. In the second stage, each stratum was partitioned into several segments of around 50 households (using mapping and listing to determine the number). In the third stage, 6 segments were randomly selected from each stratum, and every household was visited in the selected segment. Finally, one eligible household member of 18–59-year-olds from each participating household was randomly sampled for an interview.

Measures

Cigarette gifting and sharing

Cigarette gifting was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: “Did you give cigarettes to others as a gift in the past year?”. Response categories were “yes” and “no”.

Cigarette sharing was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: “Did you share cigarettes with others in the past year?”. Response categories were “yes” and “no”.

Relevant independent variables included in the analysis were obtained through self-report and were residence (urban, rural), smokers in family (never, one smoker, two and more smokers), indoor smoking rule (allowed, not allowed but exceptions, never allowed, no rules), and household income was measured by asking if respondents have cars (yes, no).

SHS exposure at home

In this study, SHS exposure at home was identified if a respondent reported anyone smoking inside his or her household at least once per month. The question “How often does anyone smoke inside your house?” was used to evaluate the level of SHS exposure at home. A total of five options were available for this question, namely: Daily = 1, Weekly = 2, Monthly = 3, Less than monthly = 4, Never = 5. Selection of 1, 2 or 3 was defined as the respondent experiencing SHS exposure.

Statistical analysis

Data were analyzed using SPSS version 18.0. To examine differences in cigarette gifting and sharing by year, while controlling for potentially confounding variables, logistic regressions were conducted. For each dependent variable (cigarette gifting and sharing) logistic regressions were run for the total sample and each SHS group (household with SHS exposure, household without SHS exposure). Each analysis compared responses in 2012 with 2010, controlling for residence, indoor smoking rules, household income and family smoker amounts. Logistic regressions on the total sample also controlled for household with SHS exposure status.

Ethics

Ethics approval was obtained from the Institute of Basic Medical Sciences of Chinese Academy of Medical Sciences, and the Internal Review Boards at: Zhejiang Center for Disease Control and Prevention (Hangzhou, China). In each household surveyed, the informed consent form was discussed with participants, and signed by him (or her) once they agreed to participate.

Results

General information

The study was conducted in 10 counties/county-level cities, and valid interviews were conducted with 2112 respondents in 2010 and 2279 respondents in 2012. Half of the respondents (50.66% in 2010, 48.35% in 2012) came from urban settings. Many respondents (40.06% in 2010, 46.42% in 2012) reported one smoker at home, and a significant minority has two and more smokers(7.01% in 2010, 8.69% in 2012) . Only one-seventh of respondents' families (13.92% in 2010, 16.85% in 2012) had no-smoking rules inside the house, and about one-fifth of respondents' families (21.07% in 2010, 22.73% in 2012) have cars. (Details see Table 1)

SHS exposure at home

Table 2 shows the level of SHS exposure at home by 2010 and 2012. More than half of respondent' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. The statistical analysis was of no significance (χ^2=1.29，*P*>0.05). More than one-third of respondents' families (37.22% in 2010, 33.96% in 2012) were exposed almost daily to SHS.

Cigarette gifting and sharing

Between 2010 and 2012, there was a significant decrease(54.73% to 47.04%), in cigarette sharing at home (*AOR*=0.61, *P*<0.01), significantly for both households with SHS exposure (73.50% in 2010, 66.08% in 2012, *AOR*=0.56, *P*<0.01) and households without SHS exposure (32.26% in 2010, 25.74% in 2012, *AOR*=0.69, *P*<0.01).

14.91% and 14.17% of respondents reported "they give cigarettes to others as a gift" in 2010 and 2012 respectively, with no significant difference (Table 3). There was no difference for households with SHS exposure (18.59% in 2010,

19.29% in 2012, *AOR*=1.01, *P*=0.90) but there was a significant for households without SHS exposure (10.51% in 2010, 8.46% in 2012, *AOR*=0.73, *P*<0.05).

Discussion

The study, to our knowledge, is the first one to assess the level and prevalence of cigarette gifting and sharing in Zhejiang, one of most densely populated provinces in China (463.7/km^2)[16]. The major findings of the current study include: (1) More than half of respondent' families reported exposure to SHS, which shows no sign of slowing; (2) It seems to be a downward trend for cigarette sharing, but the proportion was still high(47% in 2012); (3) The study found that one out of seven families gave cigarettes to others as a gift, a number that has held steady in recent years; (4) Compared to the household without SHS exposure, cigarette gifting and sharing in the household with SHS exposure were more obvious.

We found that smoking was reported in half of households, matching previous research[17]. It indicated that the SHS exposure at home in Zhejiang remains very serious. The household is the main place where women and children are exposed to SHS[18], and SHS remains in household air for a considerable period after smoking a cigarette [19], which may adversely affect their health. Therefore, we should engage in campaigns to create smoke-free households, and this may be particularly true in China.

As we know, cigarette gifting and sharing have influenced current tobacco control efforts in China [8-9], and strongly contribute to smoking initiation as well as failure to quit smoking among Chinese. The study reveals a significant decrease in cigarette sharing from 2010 to 2012, regardless of whether the

household has SHS or not. This may be due to local government authorities implementing tobacco control practice, which was well accepted by locally. Many smoke-free intervention programs [11-12] were conducted to build smoke-free public places. People have begun to reduce cigarette sharing before the external environment becomes smoke-free.

The findings indicate that cigarette gifting has remained unchanged in recent years, the proportion was about one-seventh. Gifting cigarettes is most prevalent during the Mid-Autumn Festival and Chinese New Year in China [20] . It is ubiquitous throughout the country, even as part of Chinese custom.[9] We also started a mass media campaign called “Giving Cigarettes is Giving Harm” [13] in 2011, which has helped fight the tobacco epidemic [21]. However, it was not effective in Zhejiang. One possible interpretation might be differences in the economy, Zhejiang is one of the traditional hubs for China's private economy, and cigarette gifting plays an important role in economic activities.

This paper also found that cigarette gifting and sharing in household with SHS exposure were more obvious. As we know, family is the cell of society, and the family environment is microcosm of social environments. If we want to change the custom of cigarette gifting and sharing in China, we should encourage and promote smoke-free in the house first. For example, we could use mass media to highlight the high risks for women and children, which has been well-documented[22-23] in the United States and India.

In terms of potential limitations, the repeat cross-sectional design prohibits causal associations, and we relied on self-report measures, which may be subject to recall bias and social desirability. The SHS exposure at home was relatively difficult to measure, and this study only used self-reporting to

measure it, which potentially limited the findings. It would be better by using a combination of several methods to measure it, such as self-reporting and indoor PM2.5 (fine particles 2.5 mm in diameter and smaller) level measurements.

Conclusion

In summary, a repeat cross-sectional study with multi-stage stratified cluster sampling was employed to study cigarette gifting and sharing. The results showed that cigarette gifting and sharing in household with SHS exposure were more obvious, and it should encourage and promote smoke-free in the house to change public smoking custom in Zhejiang, China.

Acknowledgements: This work was supported by a grant from NIH project 'Epidemiology and Intervention Research for Tobacco Control in China' (R01 RFA-TW-06-006). The authors would like to acknowledge the Institute of Basic Medical Sciences at Chinese Academy of Medical Sciences & School of Basic Medicine, China CDC and the local CDC representatives in each city for their role in the field work and data collection.

Author's contribution: All authors were actively and substantially involved in drafting the article and final approval of the version to be published. Conceived and designed the experiments: YX. Analyzed the data: YX. Contributed reagents/materials/analysis tools: SX QW YG. Wrote the paper: YX.

Competing interests: The authors have declared that no competing interests exist.

Data sharing: No additional data available.

References

1. Li Q, Jason Hsia, Yang GH. Prevalence of smoking in China in 2010. *N Engl J Med*, 2011; 364(25):2469-2470. doi:10.1056/NEJMc1102459.
2. Yang GH. Monitoring epidemic of tobacco use, promote tobacco control. *Biomed Environ Sci*, 2010; 23:420-421. doi:10.1016/S0895-3988(11)60001-9.
3. Stewart E. IOC praises efforts to reduce air pollution in Beijing. 2008, http://www.guardian.co.uk/world/2008/aug/07/china.olympics2008. (accessed 25 Jun 2014*)*
4. China Daily Online. Chinese city spearheads national smoking ban. 2010, http://www.chinadaily.com.cn/china/2010-09/08/content_11275815.htm. (accessed 25 Jun 2014*)*
5.World Health Organization. WHO report on the global tobacco epidemic. 2013, http://www.who.int/tobacco/global_report/2013/report.pdf. (accessed 25 Jun 2014*)*
6. Kohrman, M. Depoliticizing tobacco's exceptionality: Male sociality, death and memory-making among Chinese cigarette smokers. *The China Journal*, 2007; 58:85-109.
7. Tu, S. P., Walsh, M., Tseng, B., et al. Tobacco use by Chinese American men: An exploratory study of the factors associated with cigarette use and smoking cessation. *Asian American and Pacific Islander Journal of Health*, 2000; 8:46–57.
8. Ding D, Hovell MF. Cigarettes, social reinforcement, and culture: a commentary on "Tobacco as a social currency: cigarette gifting and sharing in China". *Nicotine Tob Res*. 2012; 14 (3): 255-257. doi:10.1093/ntr/ntr277.
9. Rich ZC, Xiao S.. Tobacco as a social currency: cigarette gifting and sharing in China. *Nicotine Tob Res.* 2012; 14 (3): 258-263. doi:10.1093/ntr/ntr156.
10.Hu M, Rich ZC, Luo D, et al. Cigarette sharing and gifting in rural China: a focus group study. *Nicotine Tob Res*. 2012; 14 (3): 361-367. doi:10.1093/ntr/ntr262.
11. Xu Y, Zhang XW, Guo JX, et al. Impact evaluation of tobacco use prevention program on middle school students in Zhejiang. *Chinese J School Health*, 2007; 28(5):418-420.
12. Xu Y, Wu QQ, Xu SY, et al. Effectiveness evaluation of smoke-free intervention in 20 health institutions of Zhejiang province. *Chinese J Health Educ*, 2011; 27(8):563-567.
13. World Lung Foundation, Chinese Center for Disease Control and Prevention, & World Health Organization. Giving cigarettes is giving harm. 2009. http://tobaccocontrol.bmj.com/content/19/1.cover-expansion. (accessed 25 Jun 2014).
14. Geoffrey TF, David Hammond, Jiang Y, et al. Perceptions of tobacco health warnings in China compared with picture and text-only health warnings from other countries: an experimental study. *Tob Control*, 2010,19:i69-i77, doi:10.1136/tc.2010.036483.
15. Wan X, Stillman F, Liu HL, et al. Development of policy performance indicators to assess the implementation of protection from exposure to secondhand smoke in China. *Tob Control*, 2013, 22:ii9-ii15. doi:10.1136/tobaccocontrol-2012-050890.
16. Wikipedia. List of People's Republic of China administrative divisions by population density. 2004, http://en.wikipedia.org/wiki/List_of_People's_Republic_of_China_administrative_divisions_by_population_density. (accessed 25 Jun 2014).
17. Xiao L, Yang Y, Li Q, et al. Population-Based Survey of Secondhand Smoke Exposure in China. *Biomed Environ Sci*. 2010, 23:430-436. doi:10.1016/S0895-3988(11)60003-2.
18. U.S Department of Health and Human Services, Centers for Disease Control and Prevention. The health consequences of involuntary exposure to tobacco smoke: A report of the Surgeon General. 2006, Atlanta, U.S.

http://whb.ncpublichealth.com/Manuals/counseling/Secondhand-Smoke.pdf. (accessed 25 Jun 2014).
19. Semple S, Latif N. How Long Does Secondhand Smoke Remain in Household Air: Analysis of PM2.5 Data From Smokers' Homes. *Nicotine Tob Res*. 2014; doi:10.1093/ntr/ntu089.
20. Chu A., Jiang N,& Glantz, SA. Transnational tobacco industry promotion of the cigarette gifting custom in China. *Tob Control*, 2011;20:e3. doi:10.1136/tc.2010.038349.
21. Huang LL, Thrasher JF, Jiang Y. Impact of the 'Giving Cigarettes is Giving Harm' campaign on knowledge and attitudes of Chinese smokers. *Tob Control*, 2013; doi:10.1136/tobaccocontrol-2013-051475.
22. Sargent JD, Tanski SE, Gibson J. Exposure to movie smoking among US adolescents aged 10 to 14 years: a population estimate. *Pediatrics*. 2007; 119:1167-1176.
23. K. V, Leland KA, Glorian S, et al .Movies and TV Influence Tobacco Use in India: Findings from a National Survey. *Plos One*, 2010;5(6):e11365. doi:10.1371/journal.pone.0011365.

Table 1. Sample characteristics of family, Survey (2010) and Survey (2012)

Socio-demographic	2010		2012	
	N	%	N	%
Residence				
Urban	1070	50.66	1102	48.35
Rural	1042	49.34	1177	51.65
Smokers in the family				
Never	1118	52.94	1023	44.89
One smoker	846	40.06	1058	46.42
Two and more smokers	148	7.01	198	8.69
Indoor smoking rules				
Allowed	792	37.50	796	34.93
Not allowed, but exceptions	494	23.39	522	22.90
Never allowed	294	13.92	384	16.85
No rules	532	25.19	577	25.32
Household have cars				
Yes	445	21.07	518	22.73
No	1667	78.93	1761	77.27
Overall	2112		2279	

Table 2. SHS exposure at home, Survey (2010) and Survey (2012)

How often does anyone smoke inside your home?	2010		2012	
	N	%	N	%
Daily	786	37.22	774	33.96
Weekly	204	9.66	275	12.07
Monthly	161	7.62	154	6.76
Less than monthly	491	23.25	494	21.68
Never	470	22.25	582	25.54
SHS	1151	54.50	1203	52.79

Table 3. Cigarette gifting and sharing of family, Survey (2010) and Survey (2012)

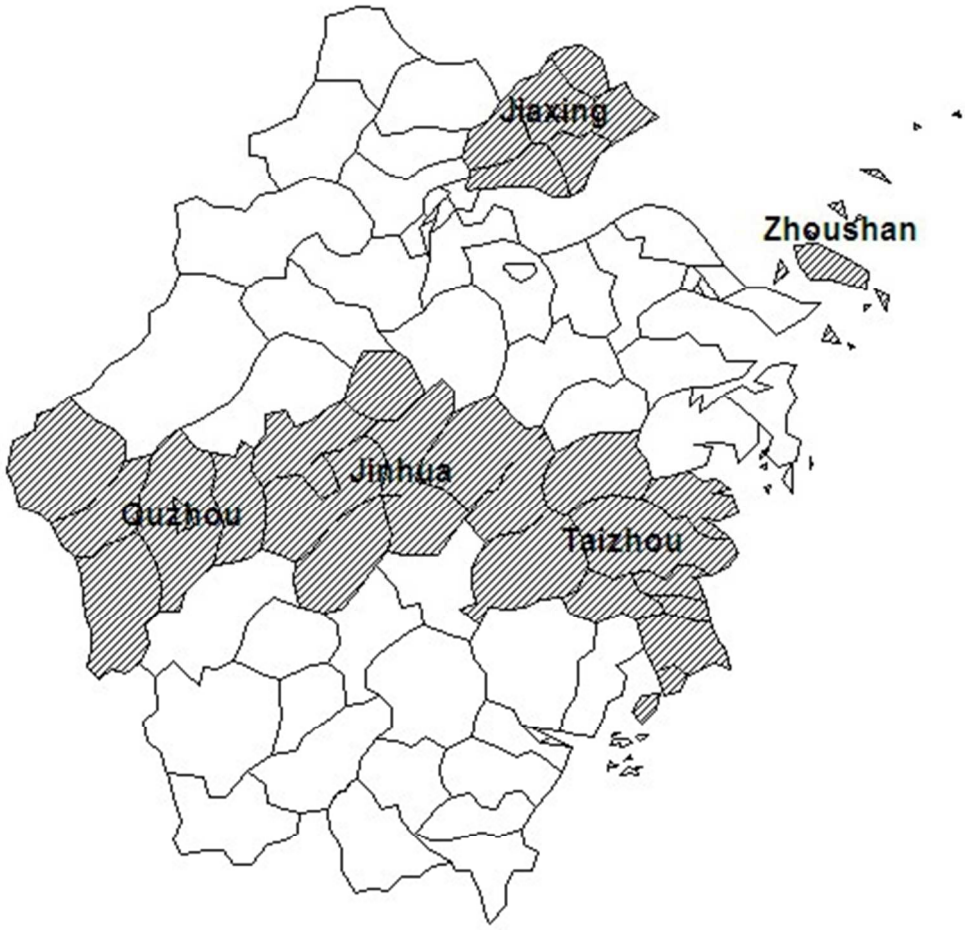
Cigarette gifting and sharing	Total sample						Household with SHS exposure						Household without SHS exposure					
	Percentages				Test of differences by year*		Percentages				Test of differences by year†		Percentages				Test of differences by year†	
	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value
	N	%	N	%			N	%	N	%			N	%	N	%		
Cigarette Sharing	1156	54.73	1072	47.04	0.61	<0.01	846	73.50	795	66.08	0.56	<0.01	310	32.26	277	25.74	0.69	<0.01
Cigarette Gifting	315	14.91	323	14.17	0.92	0.32	214	18.59	232	19.29	1.01	0.90	101	10.51	91	8.46	0.73	<0.05

**P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income, family smoker amounts and household with SHS exposure status.

† *P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income and family smoker amounts.

AOR: adjusted ORs.

Figure 1. The geographical distribution of the 5 regions in Zhejiang



The geographical distribution of the 5 regions in Zhejiang
127x130mm (96 x 96 DPI)

BMJ Open

Association between secondhand smoke exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010058.R1
Article Type:	Research
Date Submitted by the Author:	29-Dec-2015
Complete List of Authors:	xu, yue; Zhejiang Center for Disease Control and Prevention, Health education Xu, ShuiYang; Zhejiang Center for Disease Control and Prevention, Health Education wu, qingqing; Zhejiang Center for Disease Control and Prevention, Health Education guo, yujie; Zhejiang Center for Disease Control and Prevention, Health Education
Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Secondhand smoke, cigarette gifting and sharing, cross-sectional study

Title Page

Association between secondhand smoke exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Xu Yue[1], Xu ShuiYang[1], Wu QingQing[1], Guo YuJie[1]

Running Head: Association between secondhand smoke exposure at home and cigarette gifting and sharing.

There are 3 tables, 1 figure and no supplementary materials in the manuscript.

Corresponding Author: Xu ShuiYang, Zhejiang Center for Disease Control and Prevention, 3399 BinSheng Road, Hangzhou, 310051, China; Tel: +86-571-8711-5248. Fax: +86-571-8711-5245. E-mail: xu5099109@163.com.

Author Affiliation: Zhejiang Center for Disease Control and Prevention, China.

[1] Zhejiang Center for Disease Control and Prevention, Hangzhou, China

Abstract

Objectives: The aims of current study were to assess the prevalence of household cigarette gifting and sharing, and to evaluate the relationship between secondhand smoke (SHS) exposure and cigarette gifting and sharing in Zhejiang, China.

Design: A repeat cross-sectional design.

Setting: 10 sites in 5 cities in Zhejiang, China.

Participants: Two surveys were conducted with adults in Zhejiang, China in 2010 (N=2112) and 2012 (N=2279), respectively. At both waves the same questionnaire was used; respondents were asked the questions on residence, family smoker amounts, indoor smoking rules, household income, and cigarette gifting and sharing.

Results: The findings revealed that more than half of respondents' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. Many families (54.73% in 2010, 47.04% in 2012) shared cigarettes with others, and a minority (14.91% in 2010, 14.17% in 2012) reported their family giving cigarettes as a gift. There was a significant decrease in cigarette sharing from 2010 to 2012, irrespective of household with SHS exposure status; and the cigarette gifting was significantly decreased in household without SHS exposure.

Conclusions: Compared to household without SHS exposure, the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious. To encourage and promote smoke-free inside the house is necessary to change public smoking custom in Zhejiang, China.

Keywords: Secondhand smoke; cigarette gifting and sharing; cross-sectional study

Article summary

This is the first study in Zhejiang to assess the actual prevalence of household cigarette gifting and sharing among18–59-year-olds.

There was a significant decrease in cigarette sharing from 2010 to 2012, irrespective of household with SHS exposure status; and the cigarette gifting was significantly decreased in household without SHS exposure.

The prevalence of cigarette gifting and sharing in household with SHS exposure is more obvious, encouraging and promoting smoke-free in the house is necessary to change this custom.

The repeat cross-sectional design prohibits causal associations, and we rely on self-report measures, which may be subject to recall bias and social desirability.

The SHS exposure at home is relatively difficult to measure, and this study only use self-reporting to measure it, which potentially limit the findings.

Introduction

China is the world's largest consumer of tobacco products, with an estimated 301 million smokers[1]. The annual number of death caused by tobacco use now exceeds 1 million and is expected to increase in the coming decades[2]. Since the Framework Convention on Tobacco Control came into force in 2006, the Chinese government has paid attention to tobacco control to reduce its use by conducting programs such as "Smoke-Free Olympics"[3],

smoke-free legislation[4,5]. However, these tobacco control efforts have been hampered by the practices of gifting and sharing cigarettes which are well accepted and pervasive across China[6].

Smoking is a very common societal phenomenon in China. The sharing and gifting cigarettes are extremely important social activity as they can convey politeness to others [7]. Compared to casual sharing of cigarettes, the formal gifting of cigarettes is more prevalent, especially during the Mid-Autumn Festival and Chinese New Year, as it shows respect for the recipient. Gifting and sharing cigarettes have become parts of Chinese custom, and they have become major factors in failing to motivate smokers to quit and increasing smoking among non-smokers[8-10].

Zhejiang is a small area province in China, with a developed economy and dense population. There was high SHS exposure at home (60.9%) and in public (65.3%)[11] in Zhejiang, and the local government has implemented a number of tobacco control measures[12-13] to reduce smoking in public. In the provincial capital city, Hangzhou municipality expanded a smoking ban to hospitals, kindergartens, schools, libraries and stadiums in 2010. Local Centers for Disease Control printed the poster “Giving Cigarettes is Giving Harm”[14], which was disseminated across Zhejiang in 2011.They also launched a health promotion campaign graphic warnings on cigarette packets to educate smokers about the risks of smoking in 2012, which was an effective approach[15]. These campaigns provided knowledge about tobacco to the public with the aim of building a health-first and people-oriented culture, and to create a no-smoking social atmosphere.

Although studies in China have indicated that the acts of gifting and sharing cigarettes are major contributors to China's high tobacco usage[9], there are few studies to quantitatively assess the prevalence of cigarette gifting and sharing. Such a study is urgently needed to assess the impact of this practice in China. We employed a repeat cross-sectional design and obtained representative data to assess the prevalence of cigarette gifting and sharing, through an in-depth analysis of data from the Tobacco Control China survey regarding cigarette gifting and sharing.

Methods

Study design

Data came from The Epidemiology and Intervention Research for Tobacco Control in China[16]. The baseline survey was conducted between May and October 2010, and a total of 2112 interviewees were completed (effective rate 92.31%). The final survey was conducted between May and October 2012, and a total of 2279 interviewees were completed (effective rate 93.02%). Fieldwork was conducted in Mandarin through face to face interviews with informed consent obtained from the respondents, and up to three visits to a household were made to interview targeted individuals within that household. All survey interviewers and supervisors were trained by the Peking Union Medical College staff. The training sessions took place in small groups and were given by the same trainers to ensure consistency. Before the interview, mapping and listing were conducted by local Centers for Disease Control staff to identify selected households.

Participants

Cross-sectional samples of 18–59-year-olds were drawn from Zhejiang households by a multi-stage stratified cluster sampling design. The 5 regions were selected based on their geographic locations (see Fig 1). In the first stage, each region was further divided into urban and rural areas, making 10 strata in total, using probability proportional to size (PPS) sampling method. In the second stage, each stratum was partitioned into several segments of around 50 households and 6 segments were randomly selected from each stratum using the PPS method. In the third stage, every household was visited in the selected segment. Finally, one eligible household member of 18–59-year-olds from each participating household was randomly sampled for an interview.

Variables

Cigarette gifting and sharing

Cigarette gifting was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: “Did your family give cigarettes to others as a gift in the last year?”. Response categories were “yes” and “no”.

Cigarette sharing was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: “Did your family share cigarettes with others in the last year?”. Response categories were “yes” and “no”.

Relevant independent variables included in the analysis were obtained through self-report and were residence (urban, rural), family smoker amounts (none, one smoker, two and more smokers), indoor smoking rule (allowed, not

allowed but exceptions, never allowed, no rules), and household income was measured by asking if respondents' family have cars (more than one, none).

SHS exposure at home

In this study, SHS exposure at home was identified if a respondent reported anyone smoking inside his or her household at least once per month. The question "How often does anyone smoke inside your house?" was used to evaluate the level of SHS exposure at home. A total of five options were available for this question, namely: Daily = 1, Weekly = 2, Monthly = 3, More than monthly = 4, Never = 5. The respondents who selected 1, 2 or 3 were defined as their family experiencing SHS exposure.

Statistical analysis

Data were analyzed using SPSS version 18.0. Logistic regression was conducted to examine differences in cigarette gifting and sharing by year, while controlling for potentially confounding variables. For each dependent variable (cigarette gifting and sharing) logistic regressions were run for the total sample and each SHS group (household with SHS exposure, household without SHS exposure). Each analysis compared responses in 2012 with 2010, controlling for residence, indoor smoking rules, household income and family smoker amounts. Logistic regressions on the total sample were also controlled for household with SHS exposure status.

Ethics

Ethics approval was obtained from the Institute of Basic Medical Sciences of Chinese Academy of Medical Sciences, and the Internal Review Boards at: Zhejiang Center for Disease Control and Prevention (Hangzhou, China). In

each household surveyed, the informed consent form was discussed with participants, and signed by him (or her) once they agreed to participate.

Results

General information

The study was conducted in 10 counties/county-level cities, and valid interviews were conducted with 2112 respondents in 2010 and 2279 respondents in 2012. Half of the respondents' families (50.66% in 2010, 48.35% in 2012) came from urban settings. Many respondents' families (40.06% in 2010, 46.42% in 2012) reported one smoker at home, and a significant minority has two and more smokers(7.01% in 2010, 8.69% in 2012) . Only one-seventh of respondents' families (13.92% in 2010, 16.85% in 2012) had no-smoking rules inside the house, and about one-fifth of respondents' families (21.07% in 2010, 22.73% in 2012) have cars. (Details see Table 1)

SHS exposure at home

Table 2 shows the level of SHS exposure at home by 2010 and 2012. More than half of respondents' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. The statistical analysis was of no significance (χ^2=1.29，*P*>0.05). More than one-third of respondents' families (37.22% in 2010, 33.96% in 2012) were exposed almost daily to SHS.

Cigarette gifting and sharing

Between 2010 and 2012, there was a significant decrease (54.73% to 47.04%) in household cigarette sharing (*AOR*=0.61, *P*<0.01), significantly for both household with SHS exposure (73.50% in 2010, 66.08% in 2012,

AOR=0.56, *P*<0.01) and household without SHS exposure (32.26% in 2010, 25.74% in 2012, *AOR*=0.69, *P*<0.01).

14.91% and 14.17% of respondents reported “their family give cigarettes to others as a gift” in 2010 and 2012 respectively, with no significant difference (Table 3). There was no difference for household with SHS exposure (18.59% in 2010, 19.29% in 2012, *AOR*=1.01, *P*=0.90), but there was a significant difference in household without SHS exposure (10.51% in 2010, 8.46% in 2012, *AOR*=0.73, *P*<0.05).

Discussion

The present study, to our knowledge, is the first one to assess the prevalence of household cigarette gifting and sharing in Zhejiang, one of most densely populated provinces in China (463.7/km^2)[17]. The major findings of the current study included: (1) More than half of respondents’ families reported exposure to SHS, which shows no sign of slowing; (2) It seemed to be a downward trend for household cigarette sharing, but the proportion was still high (47% in 2012); (3) One out of seven families gave cigarettes to others as a gift, a number that has held steady in recent years; (4) The prevalence of cigarette gifting and sharing in household with SHS exposure was more higher than that in household without SHS exposure.

Our previous research[11] indicated that the SHS exposure at home in Zhejiang remained very serious. The household was the main place where women and children were exposed to SHS[18,19], and SHS remained in household air for a considerable period after smoking a cigarette[20], which may

adversely affected their health. Therefore, we should engage in campaigns to create smoke-free households, and this may be particularly true in China.

As we know, cigarette gifting and sharing have influenced current tobacco control efforts in China, and strongly contributed to smoking initiation as well as failure to quit smoking among Chinese[8-9]. The study revealed a significant decrease in cigarette sharing from 2010 to 2012, regardless of whether the household has SHS or not. This may be due to local government authorities implementing tobacco control practice, which was well accepted by locally. Many smoke-free intervention programs[12-13] were conducted to build smoke-free public places. People have begun to reduce cigarette sharing before the external environment becomes smoke-free.

The findings indicated that cigarette gifting has remained unchanged in recent years, and the proportion was about one-seventh. Gifting cigarettes was most prevalent during the Mid-Autumn Festival and Chinese New Year in China [21] , and some previous study[22, 23] also indicated that prevailing cigarette gifting custom should be drastically changed. It is ubiquitous throughout the country, even as part of Chinese custom[9]. We also started a mass media campaign called “Giving Cigarettes is Giving Harm”[14] in 2011, which has helped fight the tobacco epidemic[24]. However, it was not effective in Zhejiang. One possible interpretation might be the differences in the economy, Zhejiang is one of the traditional hubs for China's private economy, and cigarette gifting plays an important role in economic activities.

This paper also found that the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious. As we know, family is the cell of society, and the family environment is microcosm of social environments.

If we want to change the custom of cigarette gifting and sharing in China, we should encourage and promote smoke-free in the house first. For example, we could use mass media to highlight the high risks for women and children, which has been well-documented[25, 26] in the United States and India.

In terms of potential limitations, the repeat cross-sectional design prohibits causal associations, and we relied on self-report measures, which may be subject to recall bias and social desirability. The characteristics of the interviewee, such as age and gender, would induce the reporting bias, actually. We trained all the interviewers before field investigation and reinforced quality control to improve the data quality and reduce this bias. The household income could not be easily to measure, therefore we use family car ownership to estimate household income, which has been shown a positive correlation between household income and car ownership in China[27]. The SHS exposure at home was also relatively difficult to measure, and this study only used self-reporting to measure it, which potentially limited the findings. It would be better by using a combination of several methods to measure it, such as self-reporting and indoor PM2.5 (fine particles 2.5 mm in diameter and smaller) level measurements.

Conclusion

In summary, a repeat cross-sectional study with multi-stage stratified cluster sampling was employed to study household cigarette gifting and sharing. The results showed that the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious, and it should encourage and

promote smoke-free in the house to change public smoking custom in Zhejiang, China.

Acknowledgements: This work was supported by a grant from NIH project 'Epidemiology and Intervention Research for Tobacco Control in China' (R01 RFA-TW-06-006). The authors would like to acknowledge the Institute of Basic Medical Sciences at Chinese Academy of Medical Sciences & School of Basic Medicine, China CDC and the local CDC representatives in each city for their role in the field work and data collection.

Author's contribution: All authors were actively and substantially involved in drafting the article and final approval of the version to be published. Conceived and designed the experiments: YX. Analyzed the data: YX. Contributed reagents/materials/analysis tools: SX QW YG. Wrote the paper: YX.

Competing interests: The authors have declared that no competing interests exist.

Data sharing: No additional unpublished data are available.

References

1. Li Q, Jason Hsia, Yang GH. Prevalence of smoking in China in 2010. *N Engl J Med*, 2011; 364(25):2469-2470. doi:10.1056/NEJMc1102459.
2. Yang GH. Monitoring epidemic of tobacco use, promote tobacco control. *Biomed Environ Sci*, 2010; 23:420-421. doi:10.1016/S0895-3988(11)60001-9.
3. Stewart E. IOC praises efforts to reduce air pollution in Beijing. 2008, http://www.guardian.co.uk/world/2008/aug/07/china.olympics2008. (accessed 25 Jun 2014*)*
4. China Daily Online. Chinese city spearheads national smoking ban. 2010, http://www.chinadaily.com.cn/china/2010-09/08/content_11275815.htm. (accessed 25 Jun 2014*)*
5.World Health Organization. WHO report on the global tobacco epidemic. 2013, http://www.who.int/tobacco/global_report/2013/report.pdf. (accessed 25 Jun 2014*)*
6. Kohrman, M. Depoliticizing tobacco's exceptionality: Male sociality, death and memory-making among Chinese cigarette smokers. *The China Journal*, 2007; 58:85-109.

7. Tu, S. P., Walsh, M., Tseng, B., et al. Tobacco use by Chinese American men: An exploratory study of the factors associated with cigarette use and smoking cessation. *Asian American and Pacific Islander Journal of Health*, 2000; 8:46–57.
8. Ding D, Hovell MF. Cigarettes, social reinforcement, and culture: a commentary on "Tobacco as a social currency: cigarette gifting and sharing in China". *Nicotine Tob Res*. 2012; 14 (3): 255-257. doi:10.1093/ntr/ntr277.
9. Rich ZC, Xiao S.. Tobacco as a social currency: cigarette gifting and sharing in China. *Nicotine Tob Res.* 2012; 14 (3): 258-263. doi:10.1093/ntr/ntr156.
10.Hu M, Rich ZC, Luo D, et al. Cigarette sharing and gifting in rural China: a focus group study. *Nicotine Tob Res*. 2012; 14 (3): 361-367. doi:10.1093/ntr/ntr262.
11. Xu Y, WU QQ, Xu SY, et al. Current research of passive smoking exposure in Zhejiang. *Disease Surveillance*. 2012; 27(11):887-890,897.
12. Xu Y, Zhang XW, Guo JX, et al. Impact evaluation of tobacco use prevention program on middle school students in Zhejiang. *Chinese J School Health*, 2007; 28(5):418-420.
13. Xu Y, Wu QQ, Xu SY, et al. Effectiveness evaluation of smoke-free intervention in 20 health institutions of Zhejiang province. *Chinese J Health Educ*, 2011; 27(8):563-567.
14. World Lung Foundation, Chinese Center for Disease Control and Prevention, & World Health Organization. Giving cigarettes is giving harm. 2009. http://tobaccocontrol.bmj.com/content/19/1.cover-expansion. (accessed 25 Jun 2014).
15. Geoffrey TF, David Hammond, Jiang Y, et al. Perceptions of tobacco health warnings in China compared with picture and text-only health warnings from other countries: an experimental study. *Tob Control*, 2010,19:i69-i77, doi:10.1136/tc.2010.036483.
16. Wan X, Stillman F, Liu HL, et al. Development of policy performance indicators to assess the implementation of protection from exposure to secondhand smoke in China. *Tob Control*, 2013, 22:ii9-ii15. doi:10.1136/tobaccocontrol-2012-050890.
17.Wikipedia. List of People's Republic of China administrative divisions by population density. 2004, http://en.wikipedia.org/wiki/List_of_People's_Republic_of_China_administrative_divisions_by_population_density. (accessed 25 Jun 2014).
18. Xiao L, Yang Y, Li Q, et al. Population-Based Survey of Secondhand Smoke Exposure in China. *Biomed Environ Sci*. 2010, 23:430-436. doi:10.1016/S0895-3988(11)60003-2.
19. U.S Department of Health and Human Services, Centers for Disease Control and Prevention. The health consequences of involuntary exposure to tobacco smoke: A report of the Surgeon General. 2006, Atlanta, U.S. http://whb.ncpublichealth.com/Manuals/counseling/Secondhand-Smoke.pdf. (accessed 25 Jun 2014).
20. Semple S, Latif N. How Long Does Secondhand Smoke Remain in Household Air: Analysis of PM2.5 Data From Smokers' Homes. *Nicotine Tob Res*. 2014; doi:10.1093/ntr/ntu089.21. Chu A., Jiang N,& Glantz, SA. Transnational tobacco industry promotion of the cigarette gifting custom in China. *Tob Control*, 2011;20:e3. doi:10.1136/tc.2010.038349.
22. Wang J, Li C1, Jia C, et al . Smoking, smoking cessation and tobacco control in rural China: a qualitative study in Shandong Province. BMC Public Health. 2014;9(14):916. doi: 10.1186/1471-2458-14-916.
23. Rich ZC, Hu M, Xiao S. Gifting and sharing cigarettes in a rural Chinese village: a cross-sectional study. *Tob Control*. 2014;23(6):496-500. doi:10.1136/tobaccocontrol-2012-050956. 24. Huang LL, Thrasher JF, Jiang Y. Impact of the 'Giving Cigarettes is Giving Harm' campaign on knowledge and attitudes of Chinese smokers. *Tob Control*, 2013; doi:10.1136/tobaccocontrol-2013-051475.
25. Sargent JD, Tanski SE, Gibson J. Exposure to movie smoking among US

adolescents aged 10 to 14 years: a population estimate. *Pediatrics*. 2007; 119:1167-1176.

26. K. V, Leland KA, Glorian S, et al .Movies and TV Influence Tobacco Use in India: Findings from a National Survey. *Plos One*, 2010;5(6):e11365. doi:10.1371/journal.pone.0011365.

27. Deng X, Private Car Ownership in China: How Important is the effect of Income. Hobart, Australia, 2007.

Table 1. Sample characteristics of family, Survey (2010) and Survey (2012)

Socio-demographic	2010		2012	
	N	%	N	%
Residence				
Urban	1070	50.66	1102	48.35
Rural	1042	49.34	1177	51.65
Family smoker amounts				
None	1118	52.94	1023	44.89
One smoker	846	40.06	1058	46.42
Two and more smokers	148	7.01	198	8.69
Indoor smoking rules				
Allowed	792	37.50	796	34.93
Not allowed, but exceptions	494	23.39	522	22.90
Never allowed	294	13.92	384	16.85
No rules	532	25.19	577	25.32
Household have cars				
More than one	445	21.07	518	22.73
None	1667	78.93	1761	77.27
Overall	2112		2279	

Table 2. SHS exposure at home, Survey (2010) and Survey (2012)

How often does anyone smoke inside your home?	2010		2012	
	N	%	N	%
Daily	786	37.22	774	33.96
Weekly	204	9.66	275	12.07
Monthly	161	7.62	154	6.76
More than monthly	491	23.25	494	21.68
Never	470	22.25	582	25.54
SHS	1151	54.50	1203	52.79

Table 3. Household Cigarette gifting and sharing, Survey (2010) and Survey (2012)

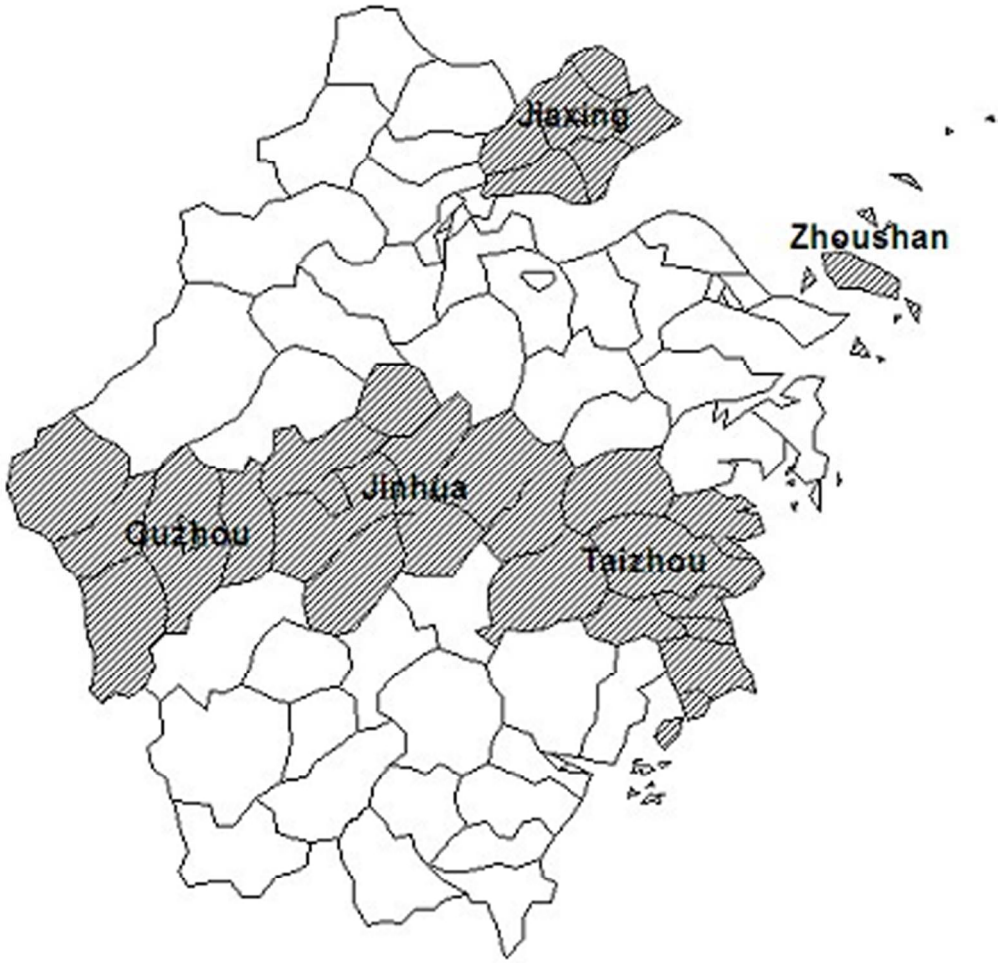
Cigarette gifting and sharing	Total sample						Household with SHS exposure						Household without SHS exposure					
	Percentages				Test of differences by year*		Percentages				Test of differences by year†		Percentages				Test of differences by year†	
	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value
	N	%	N	%			N	%	N	%			N	%	N	%		
Cigarette Sharing	1156	54.73	1072	47.04	0.61	<0.01	846	73.50	795	66.08	0.56	<0.01	310	32.26	277	25.74	0.69	<0.01
Cigarette Gifting	315	14.91	323	14.17	0.92	0.32	214	18.59	232	19.29	1.01	0.90	101	10.51	91	8.46	0.73	<0.05

**P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income, family smoker amounts and household with SHS exposure status.

† *P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income and family smoker amounts.

AOR: adjusted ORs.

Figure 1. The geographical distribution of the 5 regions in Zhejiang



The geographical distribution of the 5 regions in Zhejiang
102x104mm (300 x 300 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1 Yes (Page.1)	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2 Yes (Page.3)	Explain the scientific background and rationale for the investigation being reported
Objectives	3 Yes (Page.3)	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4 Yes (Page.5)	Present key elements of study design early in the paper
Setting	5 Yes (Page.5)	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6 Yes (Page.5)	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7 Yes (Page.6)	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8* Yes (Page.7)	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9 Yes (Page.7)	Describe any efforts to address potential sources of bias
Study size	10 Yes (Page.7)	Explain how the study size was arrived at
Quantitative variables	11 Yes (Page.7)	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

Statistical methods	12 Yes (Page.7)	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13* Yes (Page.7)	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14* Yes (Page.7)	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15* Yes (Page.7)	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16 Yes (Page.8)	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17 Yes (Page.8)	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18 Yes (Page.9)	Summarise key results with reference to study objectives
Limitations	19 Yes (Page.10)	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20 Yes (Page.10)	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21 Yes (Page.11	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22 Yes (Page.11)	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely

available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Association between secondhand smoke exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010058.R2
Article Type:	Research
Date Submitted by the Author:	01-Feb-2016
Complete List of Authors:	xu, yue; Zhejiang Center for Disease Control and Prevention, Health education Xu, ShuiYang; Zhejiang Center for Disease Control and Prevention, Health Education wu, qingqing; Zhejiang Center for Disease Control and Prevention, Health Education guo, yujie; Zhejiang Center for Disease Control and Prevention, Health Education
Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Secondhand smoke, cigarette gifting and sharing, cross-sectional study

Title Page

Association between secondhand smoke exposure at home and cigarette gifting and sharing in Zhejiang, China: a repeat cross-sectional study

Xu Yue[1], Xu ShuiYang[1], Wu QingQing[1], Guo YuJie[1]

Running Head: Association between secondhand smoke exposure at home and cigarette gifting and sharing.

There are 3 tables, 1 figure and no supplementary materials in the manuscript.

Corresponding Author: Xu ShuiYang, Zhejiang Center for Disease Control and Prevention, 3399 BinSheng Road, Hangzhou, 310051, China; Tel: +86-571-8711-5248. Fax: +86-571-8711-5245. E-mail: xu5099109@163.com.

Author Affiliation: Zhejiang Center for Disease Control and Prevention, China.

[1] Zhejiang Center for Disease Control and Prevention, Hangzhou, China

Abstract

Objectives: The aims of current study were to assess the prevalence of household cigarette gifting and sharing, and to evaluate the relationship between secondhand smoke (SHS) exposure and cigarette gifting and sharing in Zhejiang, China.

Design: A repeat cross-sectional design.

Setting: 10 sites in 5 cities in Zhejiang, China.

Participants: Two surveys were conducted with adults in Zhejiang, China in 2010 (N=2112) and 2012 (N=2279), respectively. At both waves the same questionnaire was used; respondents were asked the questions on residence, family smoker amounts, indoor smoking rules, household income, and cigarette gifting and sharing.

Results: The findings revealed that more than half of respondents' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. Many families (54.73% in 2010, 47.04% in 2012) shared cigarettes with others, and a minority (14.91% in 2010, 14.17% in 2012) reported their family giving cigarettes as a gift. There was a significant decrease in cigarette sharing from 2010 to 2012, irrespective of household with SHS exposure status; and the cigarette gifting was significantly decreased in household without SHS exposure.

Conclusions: Compared to household without SHS exposure, the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious. To encourage and promote smoke-free inside the house is necessary to change public smoking custom in Zhejiang, China.

Keywords: Secondhand smoke; cigarette gifting and sharing; cross-sectional study

Article summary

This is the first study in Zhejiang to assess the actual prevalence of household cigarette gifting and sharing among18–59-year-olds.

There was a significant decrease in cigarette sharing from 2010 to 2012, irrespective of household with SHS exposure status; and the cigarette gifting was significantly decreased in household without SHS exposure.

The prevalence of cigarette gifting and sharing in household with SHS exposure is more obvious, encouraging and promoting smoke-free in the house is necessary to change this custom.

The repeat cross-sectional design prohibits causal associations, and we rely on self-report measures, which may be subject to recall bias and social desirability.

The SHS exposure at home is relatively difficult to measure, and this study only use self-reporting to measure it, which potentially limit the findings.

Introduction

China is the world's largest consumer of tobacco products, with an estimated 301 million smokers[1]. The annual number of death caused by tobacco use now exceeds 1 million and is expected to increase in the coming decades[2]. Since the Framework Convention on Tobacco Control came into force in 2006, the Chinese government has paid attention to tobacco control to reduce its use by conducting programs such as "Smoke-Free Olympics"[3],

smoke-free legislation[4,5]. However, these tobacco control efforts have been hampered by the practices of gifting and sharing cigarettes which are well accepted and pervasive across China[6].

Smoking is a very common societal phenomenon in China. The sharing and gifting cigarettes are extremely important social activity as they can convey politeness to others[7]. Compared to casual sharing of cigarettes, the formal gifting of cigarettes is more prevalent, especially during the Mid-Autumn Festival and Chinese New Year, as it shows respect for the recipient. Gifting and sharing cigarettes have become parts of Chinese custom, and they have become major factors in failing to motivate smokers to quit and increasing smoking among non-smokers[8-10].

Zhejiang is a small area province in China, with a developed economy and dense population. There was high SHS exposure at home (60.9%) and in public (65.3%)[11] in Zhejiang, and the local government has implemented a number of tobacco control measures[12-13] to reduce smoking in public. In the provincial capital city, Hangzhou municipality expanded a smoking ban to hospitals, kindergartens, schools, libraries and stadiums in 2010. Local Centers for Disease Control printed the poster "Giving Cigarettes is Giving Harm"[14], which was disseminated across Zhejiang in 2011.They also launched a health promotion campaign graphic warnings on cigarette packets to educate smokers about the risks of smoking in 2012, which was an effective approach[15]. These campaigns provided knowledge about tobacco to the public with the aim of building a health-first and people-oriented culture, and to create a no-smoking social atmosphere.

Although studies in China have indicated that the acts of gifting and sharing cigarettes are major contributors to China's high tobacco usage[9], there are few studies to quantitatively assess the prevalence of cigarette gifting and sharing. Such a study is urgently needed to assess the impact of this practice in China. We employed a repeat cross-sectional design and obtained representative data to assess the prevalence of cigarette gifting and sharing, through an in-depth analysis of data from the Tobacco Control China survey regarding cigarette gifting and sharing.

Methods

Study design

Data came from The Epidemiology and Intervention Research for Tobacco Control in China[16]. The baseline survey was conducted between May and October 2010, and a total of 2112 interviewees were completed (effective rate 92.31%). The final survey was conducted between May and October 2012, and a total of 2279 interviewees were completed (effective rate 93.02%). Fieldwork was conducted in Mandarin through face to face interviews with informed consent obtained from the respondents, and up to three visits to a household were made to interview targeted individuals within that household. All survey interviewers and supervisors were trained by the Peking Union Medical College staff. The training sessions took place in small groups and were given by the same trainers to ensure consistency. Before the interview, mapping and listing were conducted by local Centers for Disease Control staff to identify selected households.

Participants

Cross-sectional samples of 18–59-year-olds were drawn from Zhejiang households by a multi-stage stratified cluster sampling design. The 5 regions were selected based on their geographic locations (see Fig 1). In the first stage, each region was further divided into urban and rural areas, making 10 strata in total, urban districts or rural counties/county-level cities were selected, using probability proportional to size (PPS) sampling method. In the second stage, each stratum was partitioned into several segments of around 50 households and 6 segments were randomly selected from each stratum using the PPS method. In the third stage, every household was visited in the selected segment. Finally, one eligible household member of 18–59-year-olds from each participating household was randomly sampled for an interview.

Variables

Cigarette gifting and sharing

Cigarette gifting was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: "Did your family give cigarettes to others as a gift in the last year?". Response categories were "yes" and "no".

Cigarette sharing was a dependent variable used in this analysis and was measured by asking if respondents agreed with the following statements: "Did your family share cigarettes with others in the last year?". Response categories were "yes" and "no".

Relevant independent variables included in the analysis were obtained through self-report and were residence (urban, rural), family smoker amounts (none, one smoker, two and more smokers), indoor smoking rule (allowed, not

allowed but exceptions, never allowed, no rules), and household income was measured by asking if respondents' family have cars (one or more, none).

SHS exposure at home

In this study, SHS exposure at home was identified if a respondent reported anyone smoking inside his or her household at least once per month. The question "How often does anyone smoke inside your house?" was used to evaluate the level of SHS exposure at home. A total of five options were available for this question, namely: Daily = 1, Weekly = 2, Monthly = 3, More than monthly = 4, Never = 5. The respondents who selected 1, 2 or 3 were defined as their family experiencing SHS exposure.

Statistical analysis

Data were analyzed using SPSS version 18.0. Logistic regression was conducted to examine differences in cigarette gifting and sharing by year, while controlling for potentially confounding variables. For each dependent variable (cigarette gifting and sharing) logistic regressions were run for the total sample and each SHS group (household with SHS exposure, household without SHS exposure). Each analysis compared responses in 2012 with 2010, controlling for residence, indoor smoking rules, household income and family smoker amounts. Logistic regressions on the total sample were also controlled for household with SHS exposure status.

Ethics

Ethics approval was obtained from the Institute of Basic Medical Sciences of Chinese Academy of Medical Sciences, and the Internal Review Boards at: Zhejiang Center for Disease Control and Prevention (Hangzhou, China). In

each household surveyed, the informed consent form was discussed with participants, and signed by him (or her) once they agreed to participate.

Results

General information

The study was conducted in 10 counties/county-level cities, and valid interviews were conducted with 2112 respondents in 2010 and 2279 respondents in 2012. Half of the respondents' families (50.66% in 2010, 48.35% in 2012) came from urban settings. Many respondents' families (40.06% in 2010, 46.42% in 2012) reported one smoker at home, and a significant minority has two and more smokers(7.01% in 2010, 8.69% in 2012) . Only one-seventh of respondents' families (13.92% in 2010, 16.85% in 2012) had no-smoking rules inside the house, and about one-fifth of respondents' families (21.07% in 2010, 22.73% in 2012) have cars. (Details see Table 1)

SHS exposure at home

Table 2 shows the level of SHS exposure at home by 2010 and 2012. More than half of respondents' families (54.50% in 2010, 52.79% in 2012) reported exposure to SHS. The statistical analysis was of no significance (χ^2=1.29，*P*>0.05). More than one-third of respondents' families (37.22% in 2010, 33.96% in 2012) were exposed almost daily to SHS.

Cigarette gifting and sharing

The prevalence of cigarette gifting and sharing in household with SHS exposure was higher than that in household without SHS exposure (Details see Table 3). Between 2010 and 2012, there was a significant decrease (54.73% to 47.04%) in household cigarette sharing (*AOR*=0.61, *P*<0.01),

significantly for both household with SHS exposure (73.50% in 2010, 66.08% in 2012, *AOR*=0.56, *P*<0.01) and household without SHS exposure (32.26% in 2010, 25.74% in 2012, *AOR*=0.69, *P*<0.01).

14.91% and 14.17% of respondents reported "their family give cigarettes to others as a gift" in 2010 and 2012 respectively, with no significant difference. There was no difference for household with SHS exposure (18.59% in 2010, 19.29% in 2012, *AOR*=1.01, *P*=0.90), but there was a significant difference in household without SHS exposure (10.51% in 2010, 8.46% in 2012, *AOR*=0.73, *P*<0.05).

Discussion

The present study, to our knowledge, is the first one to assess the prevalence of household cigarette gifting and sharing in Zhejiang, one of most densely populated provinces in China (463.7/km^2)[17]. The major findings of the current study included: (1) More than half of respondents' families reported exposure to SHS, which shows no sign of slowing; (2) It seemed to be a downward trend for household cigarette sharing, but the proportion was still high (47% in 2012); (3) One out of seven families gave cigarettes to others as a gift, a number that has held steady in recent years; (4) The prevalence of cigarette gifting and sharing in household with SHS exposure was higher than that in household without SHS exposure.

Our previous research[11] indicated that the SHS exposure at home in Zhejiang remained very serious. The household was the main place where women and children were exposed to SHS[18,19], and SHS remained in household air for a considerable period after smoking a cigarette[20], which may

adversely affected their health. Therefore, we should engage in campaigns to create smoke-free households, and this may be particularly true in China.

As we know, cigarette gifting and sharing have influenced current tobacco control efforts in China, and strongly contributed to smoking initiation as well as failure to quit smoking among Chinese[8-9]. The study revealed a significant decrease in cigarette sharing from 2010 to 2012, regardless of whether the household has SHS or not. This may be due to local government authorities implementing tobacco control practice, which was well accepted by locally. Many smoke-free intervention programs[12-13] were conducted to build smoke-free public places. People have begun to reduce cigarette sharing before the external environment becomes smoke-free.

The findings indicated that cigarette gifting has remained unchanged in recent years, and the proportion was about one-seventh. Gifting cigarettes was most prevalent during the Mid-Autumn Festival and Chinese New Year in China [21], the proportion was 74% in Hunan[22] and 67.9% in Jiangsu[23]. And some previous study[24, 25] also indicated that prevailing cigarette gifting custom should be drastically changed. It is ubiquitous throughout the country, even as part of Chinese custom[9]. We also started a mass media campaign called "Giving Cigarettes is Giving Harm"[14] in 2011, which has helped fight the tobacco epidemic[26]. However, it was not effective in Zhejiang. One possible interpretation might be the differences in the economy, Zhejiang is one of the traditional hubs for China's private economy, and cigarette gifting plays an important role in economic activities.

This paper also found that the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious. As we know, family is the

cell of society, and the family environment is microcosm of social environments. If we want to change the custom of cigarette gifting and sharing in China, we should encourage and promote smoke-free in the house first. For example, we could use mass media to highlight the high risks for women and children, which has been well-documented[27, 28] in the United States and India.

In terms of potential limitations, the repeat cross-sectional design prohibits causal associations, and we relied on self-report measures, which may be subject to recall bias and social desirability. The characteristics of the interviewee, such as age and gender, would induce the reporting bias, actually. We trained all the interviewers before field investigation and reinforced quality control to improve the data quality and reduce this bias. The household income could not be easily to measure, therefore we use family car ownership to estimate household income, which has been shown a positive correlation between household income and car ownership in China[29]. The SHS exposure at home was also relatively difficult to measure, and this study only used self-reporting to measure it, which potentially limited the findings. It would be better by using a combination of several methods to measure it, such as self-reporting and indoor PM2.5 (fine particles 2.5 mm in diameter and smaller) level measurements.

Conclusion

In summary, a repeat cross-sectional study with multi-stage stratified cluster sampling was employed to study household cigarette gifting and sharing. The results showed that the prevalence of cigarette gifting and sharing in household with SHS exposure was more obvious, and it should encourage and

promote smoke-free in the house to change public smoking custom in Zhejiang, China.

Acknowledgements: This work was supported by a grant from NIH project "Epidemiology and Intervention Research for Tobacco Control in China" (R01 RFA-TW-06-006). The authors would like to acknowledge the Institute of Basic Medical Sciences at Chinese Academy of Medical Sciences & School of Basic Medicine, China CDC and the local CDC representatives in each city for their role in the field work and data collection.

Author's contribution: All authors were actively and substantially involved in drafting the article and final approval of the version to be published. Conceived and designed the experiments: YX. Analyzed the data: YX. Contributed reagents/materials/analysis tools: SX QW YG. Wrote the paper: YX.

Competing interests: The authors have declared that no competing interests exist.

Data sharing: No additional data available.

References

1. Li Q, Jason Hsia, Yang GH. Prevalence of smoking in China in 2010. *N Engl J Med*, 2011; 364(25):2469-2470. doi:10.1056/NEJMc1102459.
2. Yang GH. Monitoring epidemic of tobacco use, promote tobacco control. *Biomed Environ Sci*, 2010; 23:420-421. doi:10.1016/S0895-3988(11)60001-9.
3. Stewart E. IOC praises efforts to reduce air pollution in Beijing. 2008, http://www.guardian.co.uk/world/2008/aug/07/china.olympics2008. (accessed 25 Jun 2014*)*
4. China Daily Online. Chinese city spearheads national smoking ban. 2010, http://www.chinadaily.com.cn/china/2010-09/08/content_11275815.htm. (accessed 25 Jun 2014*)*
5.World Health Organization. WHO report on the global tobacco epidemic. 2013, http://www.who.int/tobacco/global_report/2013/report.pdf. (accessed 25 Jun 2014*)*
6. Kohrman, M. Depoliticizing tobacco's exceptionality: Male sociality, death and memory-making among Chinese cigarette smokers. *The China Journal*, 2007; 58:85-109.

7. Tu, S. P., Walsh, M., Tseng, B., et al. Tobacco use by Chinese American men: An exploratory study of the factors associated with cigarette use and smoking cessation. *Asian American and Pacific Islander Journal of Health*, 2000; 8:46–57.
8. Ding D, Hovell MF. Cigarettes, social reinforcement, and culture: a commentary on "Tobacco as a social currency: cigarette gifting and sharing in China". *Nicotine Tob Res*. 2012; 14 (3): 255-257. doi:10.1093/ntr/ntr277.
9. Rich ZC, Xiao S.. Tobacco as a social currency: cigarette gifting and sharing in China. *Nicotine Tob Res.* 2012; 14 (3): 258-263. doi:10.1093/ntr/ntr156.
10.Hu M, Rich ZC, Luo D, et al. Cigarette sharing and gifting in rural China: a focus group study. *Nicotine Tob Res*. 2012; 14 (3): 361-367. doi:10.1093/ntr/ntr262.
11. Xu Y, WU QQ, Xu SY, et al. Current research of passive smoking exposure in Zhejiang. *Disease Surveillance*. 2012; 27(11):887-890,897.
12. Xu Y, Zhang XW, Guo JX, et al. Impact evaluation of tobacco use prevention program on middle school students in Zhejiang. *Chinese J School Health*, 2007; 28(5):418-420.
13. Xu Y, Wu QQ, Xu SY, et al. Effectiveness evaluation of smoke-free intervention in 20 health institutions of Zhejiang province. *Chinese J Health Educ*, 2011; 27(8):563-567.
14. World Lung Foundation, Chinese Center for Disease Control and Prevention, & World Health Organization. Giving cigarettes is giving harm. 2009. http://tobaccocontrol.bmj.com/content/19/1.cover-expansion. (accessed 25 Jun 2014).
15. Geoffrey TF, David Hammond, Jiang Y, et al. Perceptions of tobacco health warnings in China compared with picture and text-only health warnings from other countries: an experimental study. *Tob Control*, 2010,19:i69-i77, doi:10.1136/tc.2010.036483.
16. Wan X, Stillman F, Liu HL, et al. Development of policy performance indicators to assess the implementation of protection from exposure to secondhand smoke in China. *Tob Control*, 2013, 22:ii9-ii15. doi:10.1136/tobaccocontrol-2012-050890.
17.Wikipedia. List of People's Republic of China administrative divisions by population density. 2004, http://en.wikipedia.org/wiki/List_of_People's_Republic_of_China_administrative_divisions_by_population_density. (accessed 25 Jun 2014).
18. Xiao L, Yang Y, Li Q, et al. Population-Based Survey of Secondhand Smoke Exposure in China. *Biomed Environ Sci*. 2010, 23:430-436. doi:10.1016/S0895-3988(11)60003-2.
19. U.S Department of Health and Human Services, Centers for Disease Control and Prevention. The health consequences of involuntary exposure to tobacco smoke: A report of the Surgeon General. 2006, Atlanta, U.S. http://whb.ncpublichealth.com/Manuals/counseling/Secondhand-Smoke.pdf. (accessed 25 Jun 2014).
20. Semple S, Latif N. How Long Does Secondhand Smoke Remain in Household Air: Analysis of PM2.5 Data From Smokers' Homes. *Nicotine Tob Res*. 2014; doi:10.1093/ntr/ntu089.
21. Chu A., Jiang N,& Glantz, SA. Transnational tobacco industry promotion of the cigarette gifting custom in China. *Tob Control*, 2011;20:e3. doi:10.1136/tc.2010.038349.
22. Rich ZC, Hu M, Xiao SY. Gifting and sharing cigarettes in a rural Chinese village. *Tob Control.* 2014;23:496-500.
23. Qin Y, Su J, Xiang QY, et al. Effectiveness of a television advertisement campaign on giving cigarettes in a Chinese population. *J Epidemiol*. 2014;24(6)509-513; doi:10.2188/jea.JE20130172
24. Wang J, Li C, Jia C, et al . Smoking, smoking cessation and tobacco control in rural China: a qualitative study in Shandong Province. *BMC Public Health*. 2014;9(14):916. doi: 10.1186/1471-2458-14-916.

25. Rich ZC, Hu M, Xiao S. Gifting and sharing cigarettes in a rural Chinese village: a cross-sectional study. *Tob Control*. 2014;23(6):496-500. doi:10.1136/tobaccocontrol-2012-050956.

26. Huang LL, Thrasher JF, Jiang Y. Impact of the 'Giving Cigarettes is Giving Harm' campaign on knowledge and attitudes of Chinese smokers. *Tob Control*, 2013; doi:10.1136/tobaccocontrol-2013-051475.

27. Sargent JD, Tanski SE, Gibson J. Exposure to movie smoking among US adolescents aged 10 to 14 years: a population estimate. *Pediatrics*. 2007; 119:1167-1176.

28. K. V, Leland KA, Glorian S, et al .Movies and TV Influence Tobacco Use in India: Findings from a National Survey. *Plos One*, 2010;5(6):e11365. doi:10.1371/journal.pone.0011365.

29. Deng X, Private Car Ownership in China: How Important is the effect of Income. Hobart, Australia, 2007.

Table 1. Sample characteristics of family, Survey (2010) and Survey (2012)

Socio-demographic	2010		2012	
	N	%	N	%
Residence				
Urban	1070	50.66	1102	48.35
Rural	1042	49.34	1177	51.65
Family smoker amounts				
None	1118	52.94	1023	44.89
One smoker	846	40.06	1058	46.42
Two and more smokers	148	7.01	198	8.69
Indoor smoking rules				
Allowed	792	37.50	796	34.93
Not allowed, but exceptions	494	23.39	522	22.90
Never allowed	294	13.92	384	16.85
No rules	532	25.19	577	25.32
Household have cars				
One or more	445	21.07	518	22.73
None	1667	78.93	1761	77.27
Overall	2112		2279	

Table 2. SHS exposure at home, Survey (2010) and Survey (2012)

How often does anyone smoke inside your home?	2010		2012	
	N	%	N	%
Daily	786	37.22	774	33.96
Weekly	204	9.66	275	12.07
Monthly	161	7.62	154	6.76
More than monthly	491	23.25	494	21.68
Never	470	22.25	582	25.54
SHS	1151	54.50	1203	52.79

Table 3. Household Cigarette gifting and sharing, Survey (2010) and Survey (2012)

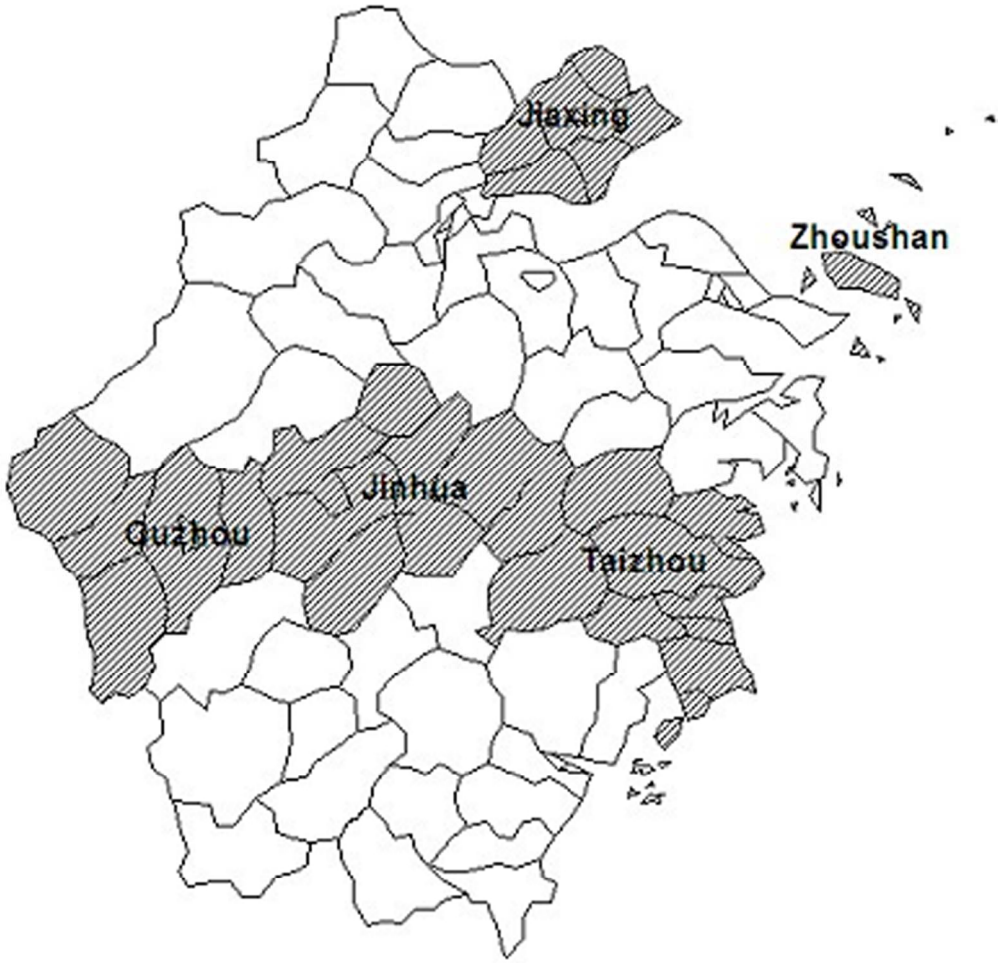
Cigarette gifting and sharing	Total sample						Household with SHS exposure						Household without SHS exposure					
	Percentages				Test of differences by year*		Percentages				Test of differences by year†		Percentages				Test of differences by year†	
	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value	2010		2012		*AOR*	*P* value
	N	%	N	%			N	%	N	%			N	%	N	%		
Cigarette Sharing	1156	54.73	1072	47.04	0.61	<0.01	846	73.50	795	66.08	0.56	<0.01	310	32.26	277	25.74	0.69	<0.01
Cigarette Gifting	315	14.91	323	14.17	0.92	0.32	214	18.59	232	19.29	1.01	0.90	101	10.51	91	8.46	0.73	<0.05

**P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income, family smoker amounts and household with SHS exposure status.

† *P* Values are based on logistic regressions, testing differences 2012 vs. 2010 after controlling for residence, indoor smoking rules, household income and family smoker amounts.

AOR: adjusted ORs.

Figure 1. The geographical distribution of the 5 regions in Zhejiang



The geographical distribution of the 5 regions in Zhejiang
102x104mm (300 x 300 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1 Yes (Page.1)	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2 Yes (Page.3)	Explain the scientific background and rationale for the investigation being reported
Objectives	3 Yes (Page.3)	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4 Yes (Page.5)	Present key elements of study design early in the paper
Setting	5 Yes (Page.5)	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6 Yes (Page.5)	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7 Yes (Page.6)	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8* Yes (Page.7)	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9 Yes (Page.7)	Describe any efforts to address potential sources of bias
Study size	10 Yes (Page.7)	Explain how the study size was arrived at
Quantitative variables	11 Yes (Page.7)	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

Statistical methods	12 Yes (Page.7)	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13* Yes (Page.7)	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14* Yes (Page.7)	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15* Yes (Page.7)	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16 Yes (Page.8)	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17 Yes (Page.8)	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18 Yes (Page.9)	Summarise key results with reference to study objectives
Limitations	19 Yes (Page.10)	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20 Yes (Page.10)	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21 Yes (Page.11	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22 Yes (Page.11)	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely

available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.