Spillover Effect of Presence of Children on Parents Smoking Behavior among Chinese Couples: Empirical Evidence Based on China Family Panel Studies

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Abstract

Background: Previous studies found social-psychological factors affect smoking behaviors. However those studies mainly focused on marriage, family, education background and gender factors. Studies regarding the impact of children are lacking. This study explores how presence of children is associated with parents' smoking behaviors.

Methods: The data used in this study was from China Family Panel Studies. The method used for data analyses is panel regression with fixed effect. We firstly regressed the dependent variable on number of children with other covariates. Then, we divided our sample into several groups based on education attainment, occupation, age difference and urban or rural residents to examine heterogeneous effect.

Results: Full sample regressions show that the number of children was significantly negatively associated with smoking behavior (OR=0.9292; P<0.01). Further subsample regression finds the spillover effect is only significant in the high-educated group (OR= 0.9151; P<0.01), high skilled workers (OR= 0.8891; P<0.05) and couples who had more than 2 years of age difference (OR=0.9148; P<0.01).

Conclusions: This study confirmed that the presence of children indeed has an association with couple's smoking behavior. Health promotional programs should take into account occupation, educational attainment and age difference of couples. For countries, stop smoking service is rare, if limited resources for cessation are to be used effectively then taking advantage of these 'teachable moments' becomes a necessity. Targeting cessation activities at those who presence children at early age is one such strategy.

Background

Tobacco use is a global problem with serious consequences for public health causing a huge burden on health system, especially in low and middle income countries [1]. The 2015 China Adult Tobacco Survey shows that China has the largest number of smokers over the world [2–3].

Social-psychological, biological, economic, policy and legislation factors are important influential factors for health behavior. Among all the social-psychological characteristics, previous studies mainly focused on marriage, family, education and stress in life [4–5]. Many studies indicated that marriage and presence of children has positive influence on family members' health. Some researches supported that compared with people who had divorced or remained single, married people have a lower death rate [6–7]. Furthermore, Umberson found that marriage or presence of children might benefit parents' health through building healthy behaviors, because family relationships in marriage can provide external regulation and promote self-regulation of health behaviors [8–9].

Despite a number of studies linked family and marriage factors with health behavior, the other way, from children to parents, is still understudied. In particular, reports for the association between children factors with parents smoking behavior is lacking. Tillgren et al. found married or cohabiting is a positive factor for smoking cessation, but they did not focus on the children factor [10]. Researchers believed the social

integration via family status may affect health behavior, presence of children and parenting could magnify this positive effect [11]. Until recently,the association between children's status and parents' health behavior has been investigated by a Chinese study [12]. However, the upward intergenerational transmission of presence of children on parents smoking behavior is almost untouched.

Because of the sustained increase in life expectancy in the past half century in China and reforms to its family planning policies whereby couples would be allowed to have a second child if either parent is an only child [13–14], the spillover effects from presence of children to parents' health behavior become increasingly important for both policy makers and scholars.

The main thrust of the present study was the hypothesis that presence of children have negative influence on parents smoking behavior. Additionally, we hypothesized that such upward spillover influence was different by demographic characteristics. With the China Family Panel Studies (CFPS) data, this study uses Ordinary Least Squares (OLS) regressions to explore how presence of children is associated with parents' smoking behaviors.

Methods

Data

The data used in this study was from China Family Panel Studies (CFPS). It is a national sampling survey launched in 2010 by the Institute of Social Science Survey of Peking University. It was designed to routinely collect individual, family, and community-level longitudinal data in contemporary China every two years. The CFPS consists of the following modules: demographics, family structure/transfer, health status and functioning, biomarkers, health care and insurance, work, income and consumption, assets (individual and household), and community level information. Its stratified multi-stage sampling design was sufficient to represent 95% of the Chinese population [15-16].

CFPS covers 25 provinces, 162 counties, and 635 villages (communities) of 14798 households. The baseline CFPS survey began in 2010, and Peking University conducts second round CFPS in 2012. This study used the panel data built from CFPS2010 and CFPS2012. Total observations counted up to around 45532 individuals. We selected respondents between the fertility age of 15-64 years and reported complete age and marriage information. For the process of building the panel, we first cleaned the CFPS2010 data, then matched them in CFPS2012 data, and retained the respondents who had complete age information in both of the survey.

The CFPS was funded by the Government of China through Peking University. The detail of this study is accessible via website: (http://www.isss.edu.cn/cfps//EN/About/).

Measures

Smoking and other key variables

The key variables included marriage related, family related, and smoking in the CFPS. Participants were asked to confirm their smoking status from two categories (1=current smoker in this month, 2= others). Participants who were categorized as 1(current smoker in this month), were then asked when they initiated smoking and more details about their smoking behavior. Participants who were categorized as 2 (others), were then identified if they are an ex-smoker or a non-smoker. Table 1 presents definition of the key variables.

Table 1. Key variables definition and statistical summary

Variable	Definition	Obs.	Mean	Std.	Min	Max
Smoker	If respondents smoked in last month=1; otherwise=0	45532	0.292	0.455	0	1
Ex-smoker	If respondents ever smoked but stopped in the last month=1; otherwise=0	17029	0.096	0.294	0	1
Married	If respondents are married or cohabitating with others=1; otherwise=0	45532	0.827	0.378	0	1
Number of children	Number of children in a family	45532	1.231	2.856	0	10
Age gap	The age difference between couple	8846	1.949	3.175	-24	29
Education	Years of education	45532	6.235	4.939	0	22
Age	The age of respondent in years	45532	46.591	15.796	16	110

Other variables

Regarding to the educational background, respondents were classified as low-educated group if they obtained a middle school or lower graduation. Respondents were classified as high-educated group if they obtained a high school or higher graduation.

Regarding to the occupations, participants were grouped into eight categories: (1) managers or leaders, including the leaders of parties□government, and companies; (2) specialists, including professionals and

technicians; (3) clerks; (4) service workers, including commercial and non-commercial service; (5) producers, including agriculture, forestry, husbandry, and fishery; (6) production workers, including production and transportation workers; (7) soldiers; (8) others. We further classify all respondents into two categories: high skilled workers (chose (1) or (2)) and low skilled workers (chose others). We excluded soldiers in all sample, for two reasons: 1. there are so many branches in army, some are skilled, some are not. 2. Positions for soldiers are not free to choose. People with high skill may perform low skilled job.

The mean age difference between husband and wife is 1.89 years in 2010 CFPS. However, the age difference increased to 3.86 years in 2012 CFPS. The median age for all samples is 2 years. So we classified the participants by median age and did the regression accordingly: (1) less than or equal to 2 years (excluded the couples with younger husband); (2) more than 2 years.

2.3 Statistical Analysis

The method used for data analyses is the OLS regression. The specification of our empirical model is:

[Please see the supplementary files section to access the equation.]

In order to ensure the consistency of the estimation results, we used the fixed effect model. Therefore, family variable can be controlled, not changed with time. We firstly regressed the dependent variable on number of children with other covariates. Then, we divided our sample into several groups based on education attainment, occupation, age difference and urban or rural resident to examine heterogeneous effect.

We used the STATA/SE 13.1□Stata Corporation□College Station□TX□USA□to conduct regression analyses, all statistical tests were two-sided□P□0.05 was statistically significant. CFPS data can be downloaded in DTA format, and is available for Stata.

Result

Table 2 reports the results of descriptive statistics. About 46% of the respondents were in their 50s or older. 57% of male and 66% of female had a middle school or lower educational attainment. More than

80% of respondents had children, 48% of male and 53% of female had more than one child. 58% of male and 2.7% of female were current smokers.

Table 2. Sample characteristics

	Male		Female	
Variable	n	%	n	%
Age				
20-29	3,156	13.34	3,605	14.09
30-39	4,056	17.15	4,695	18.36
40-49	5,374	22.72	6,184	24.18
50 or older	11,066	46.79	11,094	43.37
Education attainment				
Middle school or lower	12,237	57	15,726	66
High school or higher	9,329	43	8,018	34
Number of children				
Have children	17,377	81	20,530	86
More than 1	10,296	48	12,498	53
Marriage				
Married	17751	82.29	20452	86.08
Unmarried	3819	17.71	3307	13.92
Spouse Education				
Middle school or lower	14,555	69	15,735	67
High school or higher	2,861	14	4,461	19
Smoker				
Yes	12548	58.17	656	2.76
No	9022	41.83	23103	97.24
Ex-smoker				
Yes	1,113	8.15	109	14.25
No	12,548	91.85	656	85.75

Table 3 presents the all sample regression, estimated the relationship of the number of children with smoking behavior. The number of children was significantly negatively associated with smoking behavior (OR=0.9292; P<0.01), and the years of education was also significantly negatively associated with smoking behavior (OR=0.9533; P<0.05).

Table 3. Estimates of OLS regression for presence of children on smoking behavior: full sample

	(1)			(2)		
VARIABLS	Smoke			Smoke		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
Number of children	0.9284***	0.9031	0.9544	0.9292***	0.9027	0.9564
Age				1.0249	0.7460	1.4080
Married				1.0809	0.6886	1.6967
Years of edu				0.9533**	0.9185	0.9894
Year effect	0.5332***	0.4802	0.5920	0.5129**	0.2719	0.9677
Constant	0.9284***	0.9031	0.9544	0.9292***	0.9027	0.9564
Observations	45,513			45,513		
Number of household	23,157			23,157		

Note: *** p<0.01, ** p<0.05

To examine the role of other variables, we reconduct the regression above with subsamples separately and present results in Table 4. Table 4A examined whether the association between the number of children and smoking behavior varied depending on educational background. Results shows the spillover effects is only significant in the high-educated group (OR= 0.9151; P<0.01). The pattern is similar if we regression sample by occupations. (Table 4B). We only found significant association in high skilled workers (OR= 0.8891; P<0.05). We also recategorized respondents by where they lived (urban or rural areas). Table 4C shows the results. We found the number of children was significantly negatively associated with smoking behavior in both urban and rural areas.

Finally, we investigated the role of age differences between the relationship of children factors and smoking. Table 4D shows the results. We only observed such effect is significant among couples who had more than 2 years of age difference (OR=0.9148; P<0.01).

Table 4. Estimates of OLS regression for presence of children on smoking behavior: subsamples

Subsamples regression A: by education attainment

	(1)			(2)		
VARIABLES	Smoke			Smoke		
	Middle School and lower			High School and above		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
number of children	1.0160	0.9615	1.0735	0.9151***	0.8668	0.9660
Age	0.3671**	0.1701	0.7923	1.0827	0.5144	2.2790
Married	1.5439	0.6774	3.5188	0.7637	0.3303	1.7658
Years edu	0.9267***	0.8792	0.9767	0.9830	0.8569	1.1277
Year effect	3.733*	0.8116	17.173	0.6764	0.1527	2.9963
Observations	28,124			17,389		
Number of household	17,960			12,382		

Note: *** p<0.01, ** p<0.05, * p<0.1

Subsamples regression B: by occupations

	(1)			(2)		
VARIABLES	Smoke			Smoke		
	High Skilled labor			Low Skilled labor		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
number of children	0.8891**	0.8016	0.9861	1.0242	0.9390	1.1170
Age	0.2643	0.0485	1.4417	1.2908	0.6127	2.7190
Married	0.2090*	0.0363	1.2025	4.3452**	1.2361	15.273
Years ofedu	0.9557	0.8349	1.0939	0.9130*	0.8324	1.0014
Year effect	15.5057	0.5365	448.134	0.2704*	0.0618	1.1833
Observations	8,542			17,945		
Number of household	6,049			12,801		

Note: *** p<0.01, ** p<0.05, * p<0.1

Subsamples regression C: by urban and rural

	(1)			(2)		
VARIABLS	Smoke			Smoke		
	Rural			Urban		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
number of children	0.9304***	0.8966	0.9654	0.9211***	0.8783	0.9660
Age	0.7770	0.5093	1.1852	1.3015	0.7836	2.1619
Married	1.0787	0.6146	1.8932	1.1366	0.5227	2.4716
Years edu	0.9561*	0.9140	1.0002	0.9329**	0.8708	0.9996
12.year	0.7268	0.3153	1.6754	0.4321	0.1551	1.2036
Observations	25,905			19,570		
Number of household	13,175			9,978		

Note: *** p<0.01, ** p<0.05, * p<0.1

Subsamples regression D: by age gap

	(1)			(2)		
VARIABLES	Smoke			Smoke		
	age gap >2			age gap<=2		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
number of children	0.9148***	0.8819	0.9489	0.9647	0.8816	1.0556
Age	1.0948	0.6328	1.8941	0.1989**	0.0548	0.7214
Married	0.7710	0.4142	1.4352	2.2178	0.4174	11.7833
Years of edu	0.9602	0.9090	1.0143	0.9973	0.9322	1.0670
Year effect	0.4220	0.1417	1.2574	17.7299**	1.3646	230.3662
Observations	10,548			9,432		
Number of household	5,609			4,985		

Note: *** p<0.01, ** p<0.05, * p<0.1

Discussion

This study joins the recent debate on whether there exits an intergenerational influence of health from children to parents, which reflects the impact of having children on parents' smoking behavior in Chinese population. This is one of the first studies used national representative data to test such spillover effect.

As hypothesis, this study confirmed that the presence of children indeed has an association with couple's smoking behavior. This finding is consistent with Takagi et al (2014) who targeted Japanese as participants [11]. Several possible explanations may account for this association. First, if parents have the right concept that smoking is harmful, they may regulate their smoking behavior in an effort to improve the health of their children. Second, spouses may monitor and control their partner's health behaviors when they have children. This is particularly true in China as female smoking prevalence is very low (2.7% for female, 52.7%for male) [2]. Women are more likely to interfere their husband's smoking behavior. Third, children and teenagers are the priority of health promotion, well-educated children might also advise their parents to quit.

However, such spillover effect is only significant in the high-educated group and high skilled workers. Some other studies also found that more educated individuals are more likely to be motivated to protect their health. One possible explanation, based on education entering as a factor in the health production function. Scholars found education can promote the access to health-related information and the processing of that information to make health-related decisions [17–19]. This finding indicated that health education programs should not only consider age or gender, but also take into account of educational background and occupation. The program should involve both of the couple, especially for couples with low educational attainment.

Some studies focused on the recent trends in spousal differences in age. These studies had found that with increasing female educational attainment, women tend to find partners with higher socioeconomic statuses by realizing the pursuit of a better life. On the other hand, men with higher socioeconomic status also tend to find younger and more attractive women [20]. So in the larger age difference group, the percentage of husbands that have better educational attainment or high skilled occupations tend to be

higher than low age difference group. Thus, the husbands may be easier to accept positive advice from their partner, especially in China where the wife usually plays the role of suggesting husbands to quit. This could be an explanation of why the larger age difference group received more positive effect from increasing children.

Our findings have practical implications. According to the 2015 China Adult Tobacco Survey, the majority of smokers had not attempted to quit (only 17.6% smokers want to quit smoking within a year). Taking advantage of 'teachable moments' to support smokers to quit is a well-recognized approach to cessation. Presence of children, especially children at early age provide opportunities for such 'teachable moments' to support smoking cessation. In china, stop smoking service is rare [21–22]. If limited resources for cessation are to be used effectively then taking advantage of these 'teachable moments' becomes a necessity. Targeting cessation activities at those who presence children at early age is one such strategy.

Furthermore, our study supports the existence of the upward effect to parents smoking behavior. In this case, when do such effect become effective? How does it influence other health behavior? All these questions have strong policy implications. Further studies could explore those parts of mechanism.

There are several limitations in this study. First, the smoking status was based upon self-reporting, without any biomarker validation. However, a study in South Africa confirmed that self-reports are a reliable measure of smoking status [23]. Second, the multivariate analysis was adjusted by demographic factors, but we did not take their physical status or any disease as confounding factors which might have potential influence on their smoking behavior.

Conclusion

Our findings suggest that presence of children have negative influence on parents smoking behavior. Such effects are especially significant for highly-educated group, high skilled workers, and larger age difference couple (husband at least 2 years older than wife). Health promotional programs should take into account occupation, educational attainment and age difference of couples. In the resource-poor area, targeting cessation activities at those who presence children at early age may be an effective strategy.

Abbreviations

China Family Panel Studies (CFPS)

Ordinary Least Squares（OLS）

Declaration

Ethics approval and consent to participate

The CFPS was approved by the ethics committees of the institution of Social Science Survey, Peking University.

Competing interests

We declare no competing interests.

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Author's Contributions

HX L and Z L finished the first draft. CC managed the study. HQ T provide constructive advice and participant in this study. All authors have approved the final paper for submission.

Availability of Data and Materials

The data of the studies is accessible via website: (http://www.isss.edu.cn/cfps//EN/About/).

Consent for publications

Not applicable

Acknowledgements

Not applicable

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