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VOLUNTARY SMOKING BANS AT HOME AND IN THE CAR AND SMOKING CESSATION, OBESITY, AND SELF-CONTROL²

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Summary

This study of female former and current smokers assessed the associations between voluntary smoking bans at home and in the car and smoking cessation, obesity, and self-control. Data from self-reported female smokers ($N = 194$) who were in a community-based random cohort at four points in time, from 1983 to 2009 were analyzed. These female participants (M age = 63.7 yr.) were given self-administered questionnaires. Analyses showed that complete smoking bans at home and in the car were positively associated with a greater likelihood of smoking cessation. Complete smoking bans at home and in the car were positively associated with greater self-control. Public health policies should focus on the positive health effects of smoking bans on smoking cessation and greater self-control.

There is substantial evidence that smoking poses a significant environmental risk for adverse physical and mental health effects (Burgess, Fu, & van Ryn, 2009). There have been a number of smoke-free policies directed at public spaces (Eriksen & Chaloupka, 2007; Hyland, Higbee, Borland, Travers, Hastings, Fong, *et al.*, 2009). Currently, there have been steps to institute smoke-free policies at home, in the car, and in outdoor public spaces (Akhtar, Haw, Currie, Zachary, & Curry, 2009). This study fills a gap in the literature since it examines the relationship of smoking bans at home and in the car not only on smoking cessation but also on obesity. Since obesity and smoking cessation are aspects of self-control, it was also considered. From a policy perspective, it is important to empirically identify the effects of smoking bans at home and in the car on self-control and obesity. Knowledge of the effects will enable policy makers to focus on bans at home and in the car on aspects of obesity and self-control.

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Moreover, there is relatively little research on the effects of smoking bans at home and in the car on women's smoking cessation, obesity, and self-control using a sample of female smokers. Therefore, such bans merit further investigation in empirical studies of women smokers. Indeed, the recent literature suggests that female smokers in late midlife and older ages, as compared with male smokers, have more difficulty giving up smoking (Tait, Hulse, Waterreus, Flicker, Lautenschlager, Jamrozik, *et al.*, 2006).

Smoking bans in the workplace, and to a greater extent, in the home, have been found to be associated with increased smoking cessation (Fichtenberg & Glantz, 2002; Pierce, White, & Messer, 2009). Pierce, *et al.* (2009) reported that, a cigarette smoker who lived in a smoke-free home was more than three times more likely to be a light or intermittent smoker vs a heavy continuous smoker. As noted by Mills, *et al.* (2009), in a review of several studies of the effects of smoke-free homes on adult smoking, there are several ways that smoking restrictions can alter smoking behavior. To begin with, smokers who are exposed to smoking bans in the home may have to go outside to smoke, resulting in a reduction in the frequency of their smoking. Furthermore, living in a smoke-free home may make it more difficult to smoke, as cigarettes may be less available and others in the home may oppose smoking.

Recent research has documented the relationship between smoke-free policies and health among non-smokers (Pierce, Messer, White, Cowling, & Thomas, 2011). In general, the advantages of smoking restrictions for promoting physical health occur in several ways, including, but not limited to, decreasing the risks for heart disease, various cancers, and lung disease (Pierce, Messer, White, Kealey, & Cowling, 2010; Pierce, *et al.*, 2011). Although there is a relationship between smoking and obesity (e.g., sustained quitters gain from 5–6 kg in weight), relatively little research exists on the association of smoking bans and obesity in samples of smokers (Chatkin & Chatkin, 2007).

With regard to the relationship of smoke-free policies at home and obesity, the literature is inconsistent. Not being able to smoke may result in an increase in appetite among smokers and often leads to increased weight (Wildman & Hollingsworth, 2010). Moreover, since smokers who live in a house where smoking is forbidden may feel stigmatized and marginalized, and they may cope with these experiences by eating to reduce stress (Stuber, Galea, & Link, 2008). However, John, Meyer, Rumpf, Schumann, Dilling, & Hapke (2005) have reported that there was no evidence that decreased smoking leads to long-term weight gain. The present study sheds further light on this relationship in women in midlife, an understudied population.

Smoke-free policies at home and in the car may result in improving the psychological adjustment of smokers by creating smoke-free environments that will ultimately help smokers in their efforts to stop smoking (Farkas, Gilpin, Distefan, & Pierce, 1999; Gilpin, White, Farkas, & Pierce, 1999; Mills, *et al.*, 2009; Asbridge & Cartwright, 2011). Smoking bans may facilitate a feeling of confidence that one can take control of a potentially harmful part of one's life. In a study of African and Puerto Rican Americans, Pahl, Brook, Koppel, and Lee (2011) found that higher restrictions on smoking in the home were associated with a healthier lifestyle, which, in turn, was correlated negatively to psychological distress and positively to psychological well-being.

This research adds to the literature in several significant ways. The study is one of a few longitudinal studies using a community sample to examine the association between smoking bans at home and in the car and smoking cessation among a sample of female cigarette smokers. Whether the relations between smoking bans and smoking cessation are due to demographic factors, the extent of prior smoking, and number of additional smokers are also tested. To achieve these goals, four waves of data from an ongoing longitudinal sample for the years 1983, 1985–1986, 1992 and 2009 were analyzed, controlling for a number of factors that may be related to smoking bans and the dependent variables: age, education, family income, extent of prior cigarette smoking, number of smokers in the household, exercise, and earlier self-control.

- Hypothesis 1** Smoking bans at home and in the car will be associated with a greater likelihood of successful smoking cessation,
- Hypothesis 2** Smoking bans at home and in the car will be related to a greater likelihood of obesity in smokers.
- Hypothesis 3** Smoking bans at home and in the car will be associated with greater self-control.

METHOD

Participants

The women in this study ($N = 194$) were the sub-sample of self-reported smokers from a community-based random cohort of families who resided in two upstate New York counties in 1975. The randomly selected families were chosen to be representative of families living in Albany and Saratoga counties with regard to gender, family intactness, family income, and education. There was a close match of the participants' family income, education, and family structure with data reported by the 1980 U.S. Census.

The participants were interviewed at four points in time (1983, 1985–86, 1992, and 2009). Of the 772 women participants in the original cohort of families in 1983, 498 participated in the study in 2009, 104 had died, 27 refused to participate, and 143 were lost to follow-up, i.e., 78% of the original sample of women who were living participated in 2009. For the current analysis, 194 women were included who participated in 2009 and self-reported current daily smoking in at least one prior interview. Most of the 194 participants (85%) took part in the longitudinal study at all four waves. Among these 194 participants, 7, 15, and 12 did not take part in the 1983, 1985–1986, and 1992 data collection, respectively. Most of the 194 women were White (92%) and 49% lived in Albany County in 1983 when they were originally interviewed. The mean age of the 194 participants in 2009 was 63.7 yr. ($SD = 5.5$). Most reported having a high school degree (64%), but 26% attended college or achieved a higher level of education by 2009. The mean family annual income in 2009 was \$73,200 ($SD = \$61,000$). Among the 194 participants, 92%, 87.1%, 7.9%, and 38.7% smoked cigarettes in 1983, 1985–1986, 1992, and 2009, respectively. A more complete description of the sample appears in Brook, Brook, Gordon, Whiteman, and Cohen (1990).

Measures

Complete Smoking Bans at Home and in the Car in 2009—The participants reported on the smoking rules or restrictions in their households (Gilpin, *et al.*, 1999). The options for smoking bans at home were 5: smoking is completely banned for everyone inside the house and near the house, 4: smoking is allowed outside only, 3: smoking is generally banned for everyone and in every room, with a few exceptions, 2: smoking is allowed in some rooms only, and 1: there are no restrictions on smoking. A complete smoking ban at home was coded as 1 if a participant reported response 4 or 5, and 0 otherwise. The participants also reported on smoking rules and restrictions in their cars (Gilpin, *et al.*, 1999). There were four options, 4: smoking in the car is completely banned for everyone, 3: smoking in the car is generally banned for everyone, with a few exceptions, 2: smoking in the car is allowed except when children are present, and 1: there are no restrictions on smoking in the car. For those who had cars (95% of the participants), a complete smoking ban in the car was scored as 1 if a participant reported response 4, and 0 otherwise. Finally, a binary variable of complete smoking bans at home and in the car was created. A score of 1 was assigned to a participant who reported a complete smoking ban in her home and in her car (if she had a car), and a score of 0 was assigned otherwise. For a participant who did not have a car (5% of the participants), a score of 1 was assigned when she reported only a complete smoking ban in her home, and a score of 0 was assigned otherwise.

Smoking Cessation by 2009—The participants reported on the frequency of smoking in 2009. The variable of smoking cessation by 2009 was coded as follows: 1 if a participant reported that she did not currently smoke cigarettes in 2009. A score of 0 was assigned otherwise.

Obesity in 2009—BMI is a measure of weight that also takes height into consideration. Height (in inches) and weight (in pounds) were self-reported in 2009. BMI was calculated using the standard formula (Centers for Disease Control and Prevention [CDC] 2011):

$$BMI = \frac{Weight}{Height^2} \times 703$$

The CDC (2011) classifies adults more than 20 yr. of age as obese when $BMI > 29.9$. The indicator of 2009 obesity was 1 when $BMI > 29.9$, and zero otherwise.

Self-Control in 2009—The self-control measure assessed the extent to which an individual feels her life is under her control. The scale is similar in structure to other instruments used to assess perceived control (Pearlin & Schooler, 1978). The scale consisted of six items ($\alpha = .65$; e.g., “You generally rely on careful reasoning in making up your mind”). Each item was scored on an ordinal four-point scale with anchors 1: False and 4: True. Items were averaged with negatively valenced items reverse coded to create an index such that higher scores indicate greater self-control. The measure of self-control used in 1992 is described in the section on control variables. The 2009 measure had one less item

than the 1992 measure (five, not six), because that item was not age appropriate for women in late mid-life.

Control variables—Control variables were demographic, exercise, smoking, and self-control factors. The demographic factors included age, educational level, family income (U.S. dollars) in 2009, and an indicator variable of residency in Albany County in 1983 [yes (1) and no (0)]. The coding of the variable of educational level was 1: less than a high school diploma, 2: high school diploma or general educational development (GED), 3: Associate's degree, 4: Bachelor's degree, 5: Master's degree, and 6: Doctoral degree or equivalent. Exercise in 2009 was measured by one item, "How often do you exercise vigorously?", scored on a six-point scale with anchors 0: Never and 5: Every day (Johnston, Bachman, O'Malley, & Schulenberg, 2006). Self-control in 1992 was measured with 7 items scored on a four-point scale with anchors 1: False and 4: True. Internal consistency reliability was $\alpha = .78$; e.g., "You generally rely on careful reasoning in making up your mind" (Brook, *et al.*, 1990). Items were averaged with negatively valenced items reverse coded to create an index with higher scores indicating greater self-control. Number of additional smokers in household (0 – 3 smokers, other than the participant) was recorded in 2009. A mean score was calculated for the extent of cigarette smoking in the three waves between 1983 and 1992. At each time point, the participant had reported how many cigarettes she smoked per day on a five-point scale with choices 0: None, 1: Used to smoke but stopped, 2: Less than half pack a day, 3: Half pack to one pack a day, and 4: More than one pack a day. The above measures have been found to predict psychopathology, drug use, and cigarette smoking (Brook, *et al.*, 1990).

Procedure

Interviews of the participants were conducted in 1983 ($N = 772$, M age = 40 yr.), 1985–1986 ($N = 717$, M age = 43 yr.), 1992 ($N = 719$, M age = 48 yr.), and in 2009 ($N = 498$, M age = 65 yr.). Extensively trained and supervised lay interviewers administered interviews in private in 1983, 1985–1986, and 1992. In 2009, the participants were given self-administered questionnaires. Written informed consent was obtained from the participants at each wave. The Institutional Review Boards of New York University School of Medicine, Mount Sinai School of Medicine, and New York Medical College approved of the procedures used in this research study.

To impute missing data, the data available at other non-missing waves were used, as implemented by the SAS multiple imputation (MI) procedure. The Student's t test analyses were used to compare the smokers who were interviewed in 1983 and 2009 ($N = 194$) to the smokers who were interviewed in 1983 but did not participate in the 2009 data collection ($N = 133$). The results indicated that the 194 participants in 2009 had a higher educational level in 1983 ($t = 4.6$, $p < .001$) and greater family income in 1983 ($t = 3.3$, $p < .001$). The frequency of cigarette smoking in 1983 in these two groups was not significantly different.

Data Analysis

A multivariate logistic regression analysis was conducted to examine the association between smoking bans at home and in the car and smoking cessation (the dependent

variable). A multivariate logistic regression analysis with obesity as the dependent variable was also conducted. In addition, a multivariate linear regression analysis was conducted to examine the association of smoking bans at home and in the car with self-control in 2009. In each of the three analyses, the dichotomous variable of complete smoking bans at home and in the car was used as the independent variable.

The following were used as control variables for each of the dependent variables in all of three analyses: age, educational level, and family income in 2009, earlier residency in Albany County in 1983, and the average of cigarette smoking from 1983 through 1992. The number of household members who were smokers in 2009 was also statistically controlled. In the analysis of obesity, smoking cessation and exercise in 2009 were also statistically controlled. In the analysis of self-control, earlier self-control in 1992 was also statistically controlled.

RESULTS

Table 1 presents means and standard deviations of the dependent and independent variables. In 2009, the percentage who had quit smoking was 61%. The percentage of those who were obese was 41%. The means on the measures of self-control in 1992 and 2009 were 3.09 ($SD = 0.45$) and 3.29 ($SD = 0.44$), respectively. The percentage of participants with complete smoking bans at home and in the car was 58%. Twenty-four percent of the participants reported that there were one or more additional current smokers in the household, with an average of 0.28 additional smokers per participant.

Table 2 presents the results of the multivariate logistic regression analysis for smoking cessation. Complete smoking bans at home and in the car in 2009 were significantly associated with a greater likelihood of smoking cessation in 2009, after controlling for the covariates. Among the covariates, a greater number of additional smokers in the household was associated with a lower likelihood of smoking cessation. Increased age was associated with a greater likelihood of smoking cessation. Earlier residency in Albany County, as compared to residency in Saratoga County, was associated with a lower likelihood of smoking cessation.

Table 3 presents the results of the multivariate logistic regression analysis for obesity. Complete smoking bans at home and in the car in 2009 were not significantly associated with a greater likelihood of obesity in 2009, after controlling for the covariates. The results of the multivariate analysis indicated that, among the covariates, the following factors were associated with a lower likelihood of obesity: greater earlier cigarette smoking, exercising vigorously, and greater family income. Smoking cessation was associated with a greater likelihood of obesity in 2009, after controlling for smoking bans at home and in the car and other covariates.

Table 4 presents the results of the multivariate linear regression analysis for self-control. Complete smoking bans at home and in the car in 2009 were associated with greater self-control in 2009, after controlling for the covariates. Among the covariates, earlier cigarette

smoking was negatively associated with greater self-control in 2009. Earlier self-control was positively associated with greater self-control in 2009.

DISCUSSION

The present study adds to the literature in two important ways. To our knowledge, this is the first study to examine the associations of smoking bans at home and in the car with smoking cessation, obesity, and self-control in a community sub-sample of female current or former smokers in their mid-sixties. Further, the study design allowed controlling for a number of potential factors such as demographic factors, the extent of prior smoking, the number of additional smokers in the household, exercise, and earlier self-control.

Results provided partial support for the hypotheses and were consistent with a number of studies which demonstrated that smoking bans are associated with smoking cessation (Messer, Mills, White, & Pierce, 2008), adding to this important literature by demonstrating the significance of smoking bans while taking into account control variables. In a seminal paper on smoke-free homes and adult smoking behavior, Mills, *et al.* (2009) postulated that several mechanisms may explain this relationship. Living in a smoke-free home where cigarettes are less available makes it problematic to smoke and may indeed result in a reduction of smoking. The finding that fewer additional smokers in the home were associated with a greater likelihood of smoking cessation is in accord with this interpretation. Under these conditions, there are fewer cues and models for smoking, and fewer cigarettes available in the home.

Further, the presence of home smoking bans may be indirectly associated with a greater likelihood of obesity through smoking cessation. According to Wildman and Hollingsworth (2010), smokers may engage in compensatory behavior, such as increased food intake, when deprived of nicotine. Thus, the positive effects of smoking cessation on health and psychological functioning may be somewhat reduced.

Individuals who live in a house where there is a smoking ban reported greater self-control, even after controlling for earlier self-control. In fact, smoking bans in the home may reinforce feelings of self-control (Stuber, *et al.*, 2008). Smokers who adhere to a home smoking ban may identify with individuals who initiate or support a ban and, therefore, experience greater self-control. Many smokers may be very concerned about their smoking and may want to avoid harming others by refraining from smoking (Johnston, *et al.*, 2006). Another possibility is that smokers living in homes where there are smoking bans may avoid conflict around smoking with others who are non-smokers, resulting in greater self-control. Future research is warranted to elucidate the biological and biopsychosocial mechanisms operating between smoking bans and self-control.

Several limitations of the study need to be considered. Firstly, the sample consists primarily of rural white women in midlife. There are few studies using data that focus on white women smokers or former smokers at this important developmental stage. Future research should include urban women in order to obtain greater generalizability of the findings. Secondly, the study was limited to self-reported measures of weight and height. There is a

tendency to underreport obesity in women (Rowland, 1990). However, 41% of the participants did report weight and height (BMI) that were in the obese range. Thirdly, some earlier measures of the dependent variables (i.e., earlier weight and height and the duration of weight gain and measures of intention of smoking cessation) were not available and, therefore, it is impossible to make inferences regarding causality. Fourthly, the timing of smoking bans at home and in the car was not known. However, a number of possible control factors were taken into account, which makes the interpretation of the associations more plausible.

In sum, findings in the present study provide critical data on the association of the presence of smoking bans at home and in the car as related to smoking cessation and self-control. It is important to note that the present research does not support the premise that voluntary smoking bans could have the side-effect of an increased risk for obesity. If at all, voluntary smoking bans are associated with smoking cessation, which in turn could lead to weight gain. As regards the positive effects of smoking bans at home and in the car, they were associated with a greater likelihood of smoking cessation and greater self-control. From a policy perspective, smoking bans seem to be positive for reducing smoking and possibly improving the smoker's control of her behavior. Attention should be paid to finding other innovative ways to prevent individuals from smoking at home and in the car. This will likely improve not only the health of smokers but also those who live with smokers.

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Table 1Variable Coding, Mean, and Standard Deviation ($N = 194$)

Dependent and Independent Variables	Coding	<i>M</i>	<i>SD</i>
Smoking Cessation (2009)	0: No, 1: Yes	0.61	0.49
Obesity (2009)	0: No, 1: Yes	0.41	0.49
Self-control (2009)	1: False – 4: True	3.29	0.44
Complete Smoking Ban at Home and in the Car (2009)	0: No, 1: Yes	0.58	0.50
Average Cigarette Smoking (1983–1992)	0: None – 4: More than one pack a day	2.63	0.93
Number of Additional Smokers in Household (2009)	0: None – 3: Three Smokers	0.28	0.58
Exercise (2009)	0: Never – 5: Every day	1.14	1.17
Self-control (1992)	1: False – 4: True	3.09	0.45
Age (2009)	Years	63.7	5.50
Educational Level (2009)	1: Less than a high school – 6: Doctoral degree or equivalent	2.33	0.93
Family Income (2009)	U.S. Dollars	\$73,200	\$61,000
Indicator of Residency in Albany County (1983)	0: No, 1: Yes	0.49	0.50

Table 2

Multivariate Logistic Regression Analysis of Smoking Ban at Home on Smoking Cessation for Current or Former Women Smokers in Their Mid-Sixties ($N = 194$)

Independent Variables	Dependent Variable	
	Smoking Cessation (2009)	
	AOR	95% CI
Complete Smoking Bans at Home and in the Car (2009)	10.09 [‡]	4.59, 22.17
Average Cigarette Smoking (1983–1992)	0.93	0.61, 1.41
Number of Additional Smokers in Household (2009)	0.37 [†]	0.20, 0.70
Age (2009)	1.10 [†]	1.02, 1.18
Educational Level (2009)	0.71	0.47, 1.08
Family Income (2009)	1.08	0.70, 1.66
Indicator of Residency in Albany County (1983)	0.52 [*]	0.25, 1.10

Note.—AOR = adjusted odds ratio; CI = confidence interval.

* $p < .05$.

† $p < .01$.

‡ $p < .001$ (one-tailed test).

Table 3

Multivariate Logistic Regression Analysis of Smoking Ban at Home on Obesity for Current or Former Women Smokers in Their Mid-Sixties ($N = 186$)

Independent Variables	Dependent Variable	
	Obesity (2009)	
	AOR	95% CI
Complete Smoking Bans at Home and in the Car (2009)	1.31	0.59, 2.92
Smoking Cessation (2009)	2.51*	1.11, 2.54
Average Cigarette Smoking (1983–1992)	0.73*	0.51, 1.05
Exercise (2009)	0.65 [†]	0.46, 0.90
Age (2009)	0.96	0.90, 1.02
Educational Level (2009)	0.87	0.59, 1.28
Family Income (2009)	0.50 [†]	0.31, 0.82
Indicator of Residency in Albany County (1983)	1.55	0.81, 2.99

Note.—AOR = adjusted odds ratio; CI = confidence interval.

* $p < .05$.

[†] $p < .01$ (one-tailed test).

Table 4

Multivariate Linear Regression Analysis on Self-Control for Current or Former Women Smokers in Their Mid-Sixties (N = 194): Standardized Regression Coefficients

Independent Variables	Dependent Variable Self-control (2009)	
	β	<i>t</i>
Complete Smoking Bans at Home and in the Car (2009)	0.16*	2.33
Average Cigarette Smoking (1983–1992)	-0.11*	-1.67
Self-control (1992)	0.46 [‡]	7.27
Age (2009)	-0.05	-0.82
Educational Level (2009)	0.05	0.84
Family Income (2009)	0.07	1.15
Indicator of Residency in Albany County (1983)	0.05	0.89
R^2	0.32	

* $p < .05$,

[‡] $p < .001$ (one-tailed test).