

Original Investigation

Multunit housing residents' experiences and attitudes toward smoke-free policies

Brian A. King, Ph.D., M.P.H.,¹ K. Michael Cummings, Ph.D., M.P.H.,¹ Martin C. Mahoney, M.D., Ph.D.,¹
Harlan R. Juster, Ph.D.,² & Andrew J. Hyland, Ph.D.¹

¹ Department of Health Behavior, Division of Cancer Prevention and Population Sciences, Roswell Park Cancer Institute, Buffalo, NY

² Bureau of Chronic Disease Epidemiology and Surveillance, New York State Department of Health, Albany, NY

Corresponding Author: Brian A. King, Ph.D., M.P.H., Department of Health Behavior, Division of Cancer Prevention and Population Sciences, Roswell Park Cancer Institute, Elm and Carlton Streets, Buffalo, NY 14263, USA. Telephone: 716-845-8865; Fax: 716-845-1265; E-mail: brian.king@roswellpark.org

Received November 20, 2009; accepted March 11, 2010

Abstract

Introduction: Secondhand smoke (SHS) causes significant disease and death. A person's home represents a prominent source of SHS, and the potential for exposure is elevated among those who live in close proximity to smokers in multiunit housing (MUH). This study assessed the prevalence and predictors of SHS exposure and smoke-free policy support among MUH residents.

Methods: Data were obtained from 5,936 MUH residents who participated in the New York State Adult Tobacco Survey between May 2007 and May 2009. Bivariate analyses were used to assess the prevalence of smoke-free home policies, SHS incursions, and support for smoke-free policies. Logistic regression was used to identify predictors of these measures while adjusting for gender, age, ethnicity, education, region, children in household, and housing type.

Results: A total of 73.1% of respondents reported a personal smoke-free home policy in their home. Among these individuals, 46.2% indicated that SHS has ever entered their home in the past year, while 9.2% reported daily incursions. Overall, a majority of respondents (55.6%) support a policy that bans smoking in all areas of their building, including residential units; support was significantly higher among ethnic minorities and individuals who reside with children.

Discussion: Nearly half of New York MUH residents with a smoke-free home policy have experienced a SHS incursion in their home. Since a majority of MUH residents support smoke-free policies and nearly three quarters already prohibit smoking in their home, opportunities exist for initiatives to promote smoke-free building policies.

Introduction

Exposure to secondhand smoke (SHS) has been causally linked to adverse health outcomes in both adults and children (U.S. Department of Health and Human Services [USDHHS], 1986,

2006). SHS is an established cause of lung cancer and heart disease in adults and has been shown to produce decreased lung function and both acute and chronic respiratory symptoms in children (USDHHS, 2006). There is also evidence to suggest that even brief exposure to SHS can cause vascular dysfunction and interfere with the body's ability to repair itself after blood vessel injury (Heiss et al., 2008). Certain populations are particularly susceptible to the effects of SHS, including children, pregnant women, older individuals, and those with preexisting respiratory conditions or heart disease (USDHHS, 2006).

The extensive and well-documented health risks associated with SHS exposure have led many state and local municipalities to implement smoke-free policies, which prohibit smoking in indoor work-sites, including hospitality venues, such as bars and restaurants. As of July 2009, 31 states have instituted smoke-free air laws that prohibit smoking inside workplaces, bars, or restaurants, while 17 of these states have comprehensive laws in effect that require all three venue types to be 100% smoke free (Americans for Nonsmokers' Rights [ANR], 2009b). Along with local laws, these state laws cover 70% of Americans (ANR, 2009a) and have resulted in significant reductions in both indoor air pollution (Travers et al., 2003) and salivary cotinine, a biomarker of SHS exposure (Abrams et al., 2006; Bauer et al., 2007). However, efforts to promote and implement similar policies in personal living areas have been limited.

Personal living areas are a significant source of SHS exposure for many individuals. Research indicates that the home is the primary source of SHS exposure for children (Ashley & Ferrence, 1998), and metabolites of a tobacco-specific lung carcinogen attributable to SHS have been observed in otherwise healthy nonsmokers who have a spouse who smokes (Anderson et al., 2001). Although the prevalence of smoke-free homes continues to increase across the United States, nearly 60% of American smokers and more than 20% of nonsmokers report that smoking is currently allowed inside their home (Giovino et al., 2009). The potential for exposure is further exacerbated by the fact that Americans spend an average of 69% of their time in private residences (Klepeis et al., 2001), and health effects from SHS are generally correlated with length of exposure (USDHHS, 2006).

doi: 10.1093/ntr/ntq053

Advance Access published on April 15, 2010

© The Author 2010. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco.

All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

Although many studies have identified strong support for smoke-free policy implementation in public areas (Borland et al., 2006; Hyland et al., 2009), literature assessing support for policy implementation in personal living areas is limited, perhaps because the topic bridges the often controversial boundary between public and private space (Ritchie, Amos, Phillips, Cunningham-Burley, & Martin, 2009). Nonetheless, based upon health concerns, a convincing argument can be made in support of the implementation of smoke-free policies in homes, especially in multiunit housing (MUH). Tobacco smoke contains high concentrations of particulate matter less than 2.5 μ in diameter (Klepeis, Apte, Gundel, Sextro, & Nazaroff, 2003), which are capable of penetrating building cracks and easily inhaled into the lungs (Liu & Nazaroff, 2003; Thatcher, Lunden, Revzan, Sextro, & Brown, 2003). Moreover, even brief exposure can induce olfactory irritation (Junker, Danuser, Monn, & Koller, 2001) and lead to sustained vascular injury in nonsmokers (Heiss et al., 2008). Finally, a sizeable portion of Americans are susceptible to involuntary SHS exposure in MUH. The most recent American Housing Survey conducted by the U.S. Census Bureau (USCB) indicates that one third of American housing units are rented, 65% of which (22.5 million households) are MUH (USCB, 2008).

To our knowledge, only two published studies have assessed MUH residents' experiences with, and attitudes toward, smoke-free building policies. Hennrikus, Pentel, and Sandell (2003) conducted a mail-based survey of 301 tenants living in apartment buildings in Minneapolis, MN, and found that 53% of tenants in nonsmoking households have ever smelled tobacco smoke in their living unit that originated from the hallway or another apartment, while 64% reported that they would either strongly or somewhat prefer a smoke-free policy in their building. Hewett, Sandell, Anderson, and Niebuhr (2007) replicated these findings in a random sample of 405 Minnesota tenants. Similarly, 48% of respondents reported that tobacco smoke odors have entered their living unit from elsewhere in or around their building and 70% reported an interest in living in a smoke-free building. Although both studies also assessed select demographic predictors of personal smoke-free policy implementation and interest for smoke-free building policies, only Hennrikus et al. did so with a multivariate model that adjusted for the effects of other covariates.

In the present study, a cross-sectional survey was administered to a sample of MUH residents across New York State to determine the prevalence of, and predictors for, personal smoke-free home policies, SHS incursions, and support for smoke-free policies. The findings could contribute to the currently limited evidence base for smoke-free building policies and help identify target groups for interventions to promote smoke-free policy implementation and support among MUH residents.

Methods

Data source

Data were obtained from the New York State Adult Tobacco Survey (NYATS), an ongoing random digit-dialed survey conducted quarterly since 2003. The NYATS is designed to generate state and regional estimates of tobacco use behaviors and related attitudes among New York State adults. The target population is individu-

als aged 18 years or older living in residential housing in New York State, and the target accrual is 8,000 completed interviews per year (2,000 per quarter). Only households within landline telephones are included in the study, and one adult per household is randomly selected as the primary respondent. All participants are provided with \$20 compensation. Methodology is based upon the Behavioral Risk Factor Surveillance System (Nelson, Holtzman, Bolen, Stanwyck, & Mack, 2001). Data collection was approved by the Institutional Review Boards at both Roswell Park Cancer Institute and the New York State Department of Health.

Sample

The study sample comprised NYATS respondents between May 2007 (Quarter 2) and May 2009 (Quarter 1) who identified as a MUH resident. A MUH resident was defined as an individual who reported living in one of the following MUH structures: duplex, double or other multifamily home, apartment building, condominium, or town house. Among the 15,243 individuals who participated in NYATS during the aforementioned time period, 131 were excluded from the study due to undeterminable smoking status, type of residence, or home smoking policy. Among the remaining 15,112 participants, 5,936 ($n = 1,129$ smokers) self-identified as MUH residents (39.3%) and were subsequently included in the analyses. Overall response rates for NYATS, calculated according to the Council of American Survey Research Organizations (Lynn, Beerten, Laiho, & Martin, 2001), averaged 33.1% for the eight quarterly surveys (range: 29.7%–36.5%).

Measures

Sociodemographic variables

Sociodemographic measures included: self-reported gender (male or female), age (18–34, 35–54, 55–64, or 65+ years), ethnicity (non-Hispanic White, non-Hispanic black, Hispanic, or other), education (<12, 12, 13–15, or 16+ years), geographic region (New York State excluding New York City or New York City [Bronx, Kings, Queens, Richmond, or New York counties]), children less than 18 years old in the household (yes or no), and type of MUH (apartment building, duplex, double or multifamily home, condominium, or town house).

Smoking status

Smoking status was determined by asking respondents whether they had smoked at least 100 cigarettes in their lifetime and whether they now smoked cigarettes "every day," "some days," or "not at all." Respondents were classified as smokers if they reported smoking at least 100 cigarettes in their lifetime and currently reported smoking "everyday" or "some days."

Personal home smoking policy

Respondents were asked to identify which of the following statements best described the rules about smoking in their home: "smoking is not allowed anywhere inside home," "smoking is allowed in some places or at some times," "smoking is allowed anywhere inside home," or "there are no rules about smoking inside home." Respondents were classified as having a personal smoke-free home policy if they reported "smoking is not allowed anywhere inside home."

SHS incursions

Respondents who reported that "smoking is not allowed anywhere inside home" were asked to identify how often SHS has

entered their living space from somewhere else in or around their building within the last 12 months by choosing one of the following options: “daily,” “a few times a week,” “once a week,” “once every couple of weeks,” “once a month or less,” or “never.” Respondents were classified as having experienced a SHS incursion in their living space if they answered “daily,” “a few times a week,” “once a week,” “once every couple of weeks,” or “once a month or less.” These individuals were subsequently asked to identify whether the incursion bothered them by choosing one of the following options: “a lot, to the point I think of moving,” “a lot, but I do not think of moving,” “only slightly,” or “not at all.” Respondents were classified as being bothered by the incursion if they answered other than “not at all.”

The frequency of SHS incursions in shared areas was assessed from Quarter 1, 2008 through Quarter 1, 2009. Respondents who reported having each of the following areas in their building were asked whether SHS had entered that area within the past 12 months (“yes” or “no”): hallway, laundry room, lobby, lounge or common area, party room, patio, and/or balcony.

Support for a smoke-free building policy

Respondents were asked whether they would favor a policy in their building that bans smoking in all areas, including personal living spaces, such as balconies and patios, by choosing one of the following options: “definitely yes,” “probably yes,” “probably not,” “definitely not,” or “no opinion.” Respondents were classified as being in favor of a smoke-free policy in their building if they answered “definitely yes” or “probably yes.”

Data analysis

Data analyses were conducted using SPSS version 14.0 (SPSS Inc., Chicago, IL). All bivariate analyses were weighted to provide representative estimates of the New York State population for the following three indicators: self-reported implementation of a personal smoke-free home policy, self-reported SHS incursion in a personal living space within the past year, and support for a smoke-free building policy. For each bivariate analysis, a chi-square test was used to determine statistically significant differences between subgroups ($\alpha = .05$). A binary logistic regression model was also constructed to identify significant predictors of each indicator while simultaneously adjusting for the effects of all covariates, including: gender, age, ethnicity, education, geographic region, presence of children less than 18 years old in the household, type of MUH, and smoking status. Given that the assessed data were collected over a 2-year period, a continuous variable representing NYATS survey quarter (Quarter 2, 2007 through Quarter 1, 2009) was also entered into the model to account for time.

Results

Table 1 presents the sociodemographic characteristics of survey respondents. A total of 65.7% of participants were female, while a lower proportion of smokers (61.9%) were female than nonsmokers (66.5%, $p < .01$). Nonsmoking participants were also older ($p < .01$) and more educated ($p < .01$) than smokers. Although smokers were equally divided by geographic region, a higher proportion of nonsmokers resided (64.1%) in New

York City ($p < .01$). Approximately one quarter of respondents reported that a child less than 18 years old lived in their household, but no significant difference was observed following stratification by smoking status. Most respondents (61.8%) reported living in an apartment building, while the second most common residence was a double or multifamily home.

Personal home smoking policy

A total of 73.1% of respondents reported that smoking was not allowed anywhere inside their home. When compared with smokers (35.2%), a significantly higher proportion of nonsmokers (81.0%) reported having such a policy ($p < .05$). Table 2 presents the findings of a binary logistic regression analysis examining the association between sociodemographic predictors and the report of having a personal smoke-free home policy. Those who self-identify as Hispanic, those with children less than 18 years old living in their household, those with 16 or more years of education, and those who reported residence in a duplex or condominium were more likely to report having a personal smoke-free home policy. In contrast, current smokers were significantly less likely to report having a policy.

SHS incursions

Among respondents who reported having a personal smoke-free home policy, 46.2% indicated that SHS has ever entered their living space from somewhere else in or around their building within the past 12 months. A total of 9.2% of respondents reported that SHS entered daily, while 16.0% reported that SHS entered at least once per week. When compared with smokers (38.0%), a significantly higher proportion of nonsmokers (47.0%) reported ever experiencing a SHS incursion ($p < .05$). Among all those who experienced an incursion in their living space within the past 12 months, 76.5% reported that they were bothered by it. Respondents who self-identified as Hispanic and those with children less than 18 years old living in their household were more likely to report experiencing a SHS incursion. In contrast, nonsmokers, those 35 years of age or older and those who reside in a duplex, double or multifamily home, or condominium, were less likely to report an incursion (Table 3).

Respondents also reported experiencing SHS exposure in shared areas of their buildings within the past 12 months, including hallways (38.8%, $n = 3,099$), lobbies (32.3%, $n = 2,384$), balconies (25.5%, $n = 1,782$), patios (23.6%, $n = 1,975$), lounges (20.9%, $n = 1,934$), laundry rooms (14.3%, $n = 2,426$), and party rooms (10.5%, $n = 1,466$). When compared with nonsmokers, a significantly higher proportion of smokers reported exposure in a shared hallway, patio, or balcony ($p < .05$). No significant difference was observed between smokers and nonsmokers with regard to SHS exposure within the past 12 months in lobbies, lounges, laundry rooms, or party rooms.

Support for a smoke-free building policy

A majority (55.6%) of respondents indicated that they would favor the implementation of a policy in their building that bans smoking in all areas, including personal living spaces. When compared with smokers (26.6%), a higher proportion of nonsmokers (61.6%) reported that they would favor such a policy ($p < .05$). Table 4 presents the findings of a binary logistic regression analysis of the association between sociodemographic predictors and support for the implementation of a smoke-free

Table 1. Sociodemographic characteristics of respondents

Characteristic	Overall (%; n = 5,936)	Smokers (%; n = 1,129)	Nonsmokers (%; n = 4,807)	p Value ^a
Gender				
Female	65.7	61.9	66.5	
Male	34.3	38.1	33.5	<.01
Age (years)				
18–34	18.4	20.2	17.9	
35–54	34.9	45.5	32.5	
55–64	19.4	20.7	19.1	
65+	26.4	13.3	29.5	
Missing data	0.9	0.3	1.0	<.01
Ethnicity				
Non-Hispanic White	57.0	55.5	57.3	
Non-Hispanic Black	22.9	25.5	22.3	
Hispanic	14.1	14.6	14.0	
Other	6.0	4.4	6.4	<.01
Education (years)				
<12	12.5	18.1	11.2	
12	26.9	32.9	25.5	
13–15	24.8	30.3	23.5	
16+	35.3	18.4	39.2	
Missing data	0.5	0.3	0.6	<.01
New York State region				
New York excluding New York City	38.7	50.5	35.9	
New York City	61.3	49.5	64.1	<.01
Children <18 years old in household				
No	70.9	68.6	71.4	
Yes	28.2	30.5	27.7	
Missing data	0.9	0.9	0.9	.18
Type of multiunit housing				
Apartment building	61.8	62.6	61.5	
Duplex	7.6	9.1	7.2	
Double/multifamily home	19.8	22.3	19.3	
Condominium	7.4	3.5	8.3	
Town house	3.4	2.5	3.7	<.01

Note. ^aChi-square test comparing characteristic categories of smokers and nonsmokers.

building policy. Respondents with children less than 18 years of age living in their household and those who self-identified as non-Hispanic black, Hispanic, or some other minority ethnicity were more likely to favor a smoke-free building policy. In contrast, current smokers, males, those with 13 or more years of education, New York City residents, and those who reside in a town house were less likely to favor a policy.

Discussion

This study examined the prevalence and sociodemographic predictors of SHS exposure and smoke-free policy support among residents of MUH throughout New York State. The data indicate that nearly half of respondents with a personal smoke-free home policy (46.2%) have experienced a SHS incursion in their personal living area. Moreover, nearly 1 in 10 individuals with a smoke-free home policy reported that SHS enters their home on a daily basis. Therefore, as many as 3.4 million of the estimated 7.4 million New Yorkers who reside in smoke-free MUH units (Giovino et al., 2009; USCB, 2009) are being involuntarily and continuously exposed to SHS in their homes. Many individuals

are also exposed to SHS in various shared areas of their MUH buildings, including hallways, lobbies, balconies, and patios.

The high prevalence of SHS incursions observed in the present study is congruent with previous reports by Henrikus et al. (2003) and Hewett et al. (2007) in the state of Minnesota, both of whom employed self-reported survey methodology and found that 46% and 48% of all respondents have smelled tobacco smoke in their personal living area that did not originate there. Similar to Hewett et al., the present study also found an association between sociodemographic characteristics and the report of a SHS incursion. Most notably, both studies found that households with children were more likely to experience a SHS incursion. However, contrary to the findings of Hewett et al., ethnic minorities were more likely to experience a SHS incursion. The aforementioned disparity could be due to the greater size and ethnic diversity of the sample in the present study.

The present findings also indicate that SHS incursions are unwelcome by a majority of individuals on the receiving end of exposure. Over three quarters of respondents (76.5%) who

Table 2. Sociodemographic predictors of New York MUH residents with a personal smoke-free home policy

Characteristic	n (%)	OR (95% CI) ^a
Gender		
Female	3,898 (71.0)	1.00
Male	2,038 (67.1)	0.91 (0.80–1.04)
Age (years)		
18–34	1,089 (73.1)	1.00
35–54	2,074 (67.8)	0.92 (0.76–1.11)
55–64	1,153 (67.8)	0.98 (0.79–1.23)
65+	1,567 (70.6)	0.90 (0.72–1.11)
Missing data	53 (83.0)	1.58 (0.73–3.44)
Ethnicity		
Non-Hispanic White	3,383 (68.7)	1.00
Non-Hispanic Black	1,362 (67.8)	0.99 (0.84–1.17)
Hispanic	836 (73.8)	1.38 (1.11–1.71)
Other	355 (76.9)	1.28 (0.95–1.72)
Education (years)		
<12	739 (63.5)	1.00
12	1,597 (66.1)	1.06 (0.86–1.32)
13–15	1,472 (68.3)	1.21 (0.97–1.51)
16+	2,095 (75.3)	1.30 (1.04–1.63)
Missing data	33 (81.8)	1.73 (0.65–4.62)
New York State region		
New York State excluding New York City	2,298 (66.8)	1.00
New York City	3,638 (71.5)	0.91 (0.79–1.05)
Children <18 years old in Household		
No	4,206 (66.6)	1.00
Yes	1,676 (77.3)	2.05 (1.72–2.43)
Missing data	54 (72.2)	1.28 (0.64–2.55)
Type of MUH		
Apartment building	3,666 (67.8)	1.00
Duplex	451 (72.9)	1.43 (1.11–1.85)
Double/multifamily home	1,178 (69.9)	1.15 (0.97–1.35)
Condominium	437 (77.6)	1.35 (1.04–1.76)
Town house	204 (77.5)	1.39 (0.95–2.03)
Smoking status		
Nonsmoker	4,807 (79.8)	1.00
Smoker	1,129 (26.4)	0.08 (0.07–0.10)
Time (survey quarter) ^b	5,936	1.03 (1.00–1.06)

Note. Statistically significant OR noted in bold. MUH = multiunit housing; OR = odds ratio.

^aAdjusted for all covariates in table.

^bTime entered into model as a continuous variable.

experienced a SHS incursion in their personal living space in the past year indicated that they were bothered by it. Moreover, most nonsmokers (81%) and a sizeable minority of smokers (35.2%) have already made efforts to prevent SHS exposure by implementing a smoke-free home policy. This figure is markedly higher than previous studies of MUH residents (Henrikus et al., 2003; Hewett et al., 2007) but congruent with data on the increasing prevalence of smoke-free homes (Centers for Disease Control and Prevention, 2007).

In accordance with the high proportion of individuals with a smoke-free home policy, a majority (55.6%) of respondents

Table 3. Sociodemographic predictors of New York MUH residents^a who report that second-hand smoke entered their personal living space from somewhere else in or around their building within the past 12 months.

Characteristic	n (%)	OR (95% CI) ^b
Gender		
Female	2,248 (43.7)	1.00
Male	1,078 (40.2)	0.89 (0.77–1.04)
Age (years)		
18–34	666 (52.4)	1.00
35–54	1,172 (45.9)	0.80 (0.66–0.98)
55–64	634 (41.5)	0.73 (0.58–0.93)
65+	817 (30.7)	0.46 (0.36–0.59)
Missing data	37 (37.8)	0.58 (0.29–1.18)
Ethnicity		
Non-Hispanic White	1,803 (38.3)	1.00
Non-Hispanic Black	765 (43.3)	1.00 (0.83–1.22)
Hispanic	544 (55.7)	1.54 (1.23–1.92)
Other	214 (42.5)	0.97 (0.72–1.31)
Education (years)		
<12	395 (48.1)	1.00
12	848 (38.9)	0.81 (0.63–1.05)
13–15	820 (41.8)	0.85 (0.65–1.10)
16+	1,242 (43.9)	0.95 (0.73–1.23)
Missing data	21 (33.3)	0.59 (0.23–1.54)
New York State region		
New York State excluding New York City	1,186 (37.3)	1.00
New York City	2,140 (45.5)	1.06 (0.90–1.26)
Children <18 years old in household		
No	2,198 (38.7)	1.00
Yes	1,122 (50.1)	1.22 (1.02–1.46)
Missing data	6 (33.3)	0.75 (0.13–4.21)
Type of MUH		
Apartment building	2,078 (46.7)	1.00
Duplex	243 (33.7)	0.57 (0.43–0.77)
Double/multifamily home	630 (36.3)	0.69 (0.57–0.84)
Condominium	259 (32.4)	0.63 (0.47–0.83)
Town house	116 (42.2)	0.93 (0.63–1.39)
Smoking status		
Nonsmoker	3,075 (43.2)	1.00
Smoker	251 (35.1)	0.63 (0.47–0.84)
Time (survey quarter) ^c	3,326	0.88 (0.85–0.91)

Note. Statistically significant OR noted in bold. MUH = multiunit housing; OR = odds ratio.

^aAmong those with a personal smoke-free home policy.

^bAdjusted for all covariates in table.

^cTime entered into model as a continuous variable.

indicated that they would support the implementation of a policy in their building that prohibits smoking in all areas, including personal living spaces, balconies, and patios. This figure is comparable with that of Hewett et al. (2007), who reported that 64.4% of MUH residents either strongly or somewhat preferred a smoke-free building policy. However, contrary to the predominantly null findings of Henrikus et al. (2003), the present study identified several sociodemographic

Table 4. Sociodemographic predictors of New York MUH residents who favor the implementation of a smoke-free building policy

Characteristic	n (%)	OR (95% CI) ^a
Gender		
Female	3,863 (54.4)	1.00
Male	2,023 (48.5)	0.88 (0.78–0.98)
Age (years)		
18–34	1,078 (55.2)	1.00
35–54	2,054 (50.9)	0.96 (0.82–1.13)
55–64	1,146 (48.6)	0.91 (0.75–1.10)
65+	1,555 (54.9)	1.04 (0.86–1.25)
Missing data	53 (58.5)	1.13 (0.63–2.03)
Ethnicity		
Non-Hispanic White	3,367 (46.4)	1.00
Non-Hispanic Black	1,345 (56.7)	1.61 (1.38–1.86)
Hispanic	824 (66.7)	2.44 (2.02–2.95)
Other	350 (58.9)	1.63 (1.28–2.07)
Education (years)		
<12	730 (58.6)	1.00
12	1,579 (54.8)	0.91 (0.75–1.11)
13–15	1,466 (49.7)	0.73 (0.60–0.89)
16+	2,080 (50.2)	0.71 (0.58–0.87)
Missing data	31 (51.6)	0.54 (0.26–1.15)
New York State region		
New York State excluding New York City	2,285 (49.8)	1.00
New York City	3,601 (54.0)	0.80 (0.70–0.90)
Children <18 years old in household		
No	4,203 (50.1)	1.00
Yes	1,676 (57.9)	1.25 (1.09–1.44)
Missing data	7 (71.4)	2.03 (0.38–10.9)
Type of MUH		
Apartment building	3,640 (53.4)	1.00
Duplex	446 (55.6)	1.18 (0.95–1.47)
Double/multifamily home	1,166 (50.3)	0.91 (0.78–1.05)
Condominium	431 (50.3)	0.90 (0.73–1.12)
Town house	203 (42.4)	0.60 (0.44–0.81)
Smoking status		
Nonsmoker	4,768 (59.5)	1.00
Smoker	1,118 (22.1)	0.17 (0.14–0.19)
Time (survey quarter) ^b	5,886	1.03 (1.00–1.05)

Note. Statistically significant OR noted in bold. MUH = multiunit housing; OR = odds ratio.

^aAdjusted for all covariates in table.

^bTime entered into model as a continuous variable.

predictors of individuals who would favor policy implementation in their building, the most notable of which were ethnic minorities and individuals with children. Surprisingly, New York City residents and respondents with higher education, both of whom traditionally have lower smoking rates, were less likely to favor policy implementation. Since the survey did not inquire about building-wide smoking restrictions, it is possible that high proportions of these individuals already reside in a smoke-free building and were thus less inclined to indicate that they would favor the implementation of such a policy in their building. Nonetheless, the overall findings suggest that demo-

graphically targeted efforts to mobilize support for smoke-free buildings may be an effective means with which to enhance policy implementation.

Despite the high level of support for smoke-free building policies that was observed in this study and elsewhere, the proportion of MUH residents protected by such policies is minimal (Henrikus et al., 2003; Hewett et al., 2007; King, Travers, Cummings, Mahoney, & Hyland, 2010). However, there are presently no federal or state laws that prohibit MUH operators from restricting smoking inside their buildings (Schoenmarklin, 2005). This legal permissibility extends to units subsidized through the U.S. Department of Housing and Urban Development (USDHUD), which has not promulgated a policy specific to smoking but strongly encourages Public Housing Authorities to implement non-smoking policies in some or all of their units (USDHUD, 2009).

This study is one of the first to assess the prevalence and sociodemographic predictors of personal smoke-free policy implementation, SHS incursions, and support for smoke-free building policies in a large randomly selected sample of MUH residents. Limitations include self-reported SHS exposure, which may be inaccurate due to limited recall and variations in respondents' sensitivity toward tobacco smoke. Nonetheless, research on the validity of self-reported tobacco use and SHS exposure in the home suggests that individuals appear to accurately report such exposure (Arheart et al., 2008). Second, the survey was not equipped to identify respondents who reside in a building where smoking is already prohibited. However, given that the prevalence of smoke-free building policies is low, the inclusion of these individuals likely had little effect on overall estimates of personal policy implementation and support. Additional limitations include low response rate (33.1%) and the exclusion of individuals without a landline telephone.

In summary, the results of this study suggest that many New York State MUH residents are involuntarily exposed to SHS in their homes, and a majority would favor a policy to prohibit smoking in all areas of their building, including personal living spaces. Given that the implementation of such policies is within the legal rights of MUH operators, sociodemographically targeted efforts to promote smoke-free housing among MUH residents may be an effective means with which to enhance policy adoption.

Funding

The New York State Adult Tobacco Survey is funded by a grant from the New York State Department of Health, Division of Chronic Disease and Injury Prevention. Additional support was also provided by Grant/Cooperative Agreement Number 1R36 DP001848 from the U.S. Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the funding agencies.

Declaration of Interests

None declared.

References

- Abrams, S. M., Mahoney, M. C., Hyland, A., Cummings, K. M., Davis, W., & Song, L. (2006). Early evidence on the effectiveness of clean indoor air legislation in New York State. *American Journal of Public Health, 96*, 296–298.
- Americans for Nonsmokers' Rights (ANR). (2009a). *Percent of U.S. state population protected by 100% smoke-free air laws*, Retrieved 03 August 2009, from <http://www.no-smoke.org/pdf/percentstatepops.pdf>
- Americans for Nonsmokers' Rights (ANR). (2009b). *Smoke-free lists, maps, and data*, Retrieved 03 August 2009, from <http://www.no-smoke.org/goingsmokefree.php?id=519>
- Anderson, K. E., Carmella, S. G., Ye, M., Bliss, R. L., Le, C., Murphy, L., et al. (2001). Metabolites of a tobacco-specific lung carcinogen in nonsmoking women exposed to environmental tobacco smoke. *Journal of the National Cancer Institute, 93*, 378–381.
- Arheart, K. L., Lee, D. J., Fleming, L. E., LeBlanc, W. G., Dietz, N. A., McCollister, K. E., et al. (2008). Accuracy of self-reported smoking and secondhand smoke exposure in the US workforce: The National Health and Nutrition Examination Surveys. *Journal of Occupational & Environmental Medicine, 50*, 1414–1420.
- Ashley, M. J., & Ferrence, R. (1998). Reducing children's exposure to environmental tobacco smoke in homes: Issue and strategies. *Tobacco Control, 7*, 61–65.
- Bauer, U., Juster, H., Hyland, A., Farrelly, M., Engelen, M., Weitzkamp, D., et al. (2007). Reduced secondhand smoke exposure after implementation of a comprehensive statewide smoking ban—New York, June 26, 2003–June 30, 2004. *MMWR. Morbidity and Mortality Weekly Report, 56*, 705–708.
- Borland, R., Yong, H. H., Siahpush, M., Hyland, A., Campbell, S., Hastings, G., et al. (2006). Support for and reported compliance with smoke-free restaurants and bars by smokers in four countries: Findings from the International Tobacco Control (ITC) four country survey. *Tobacco Control, 15*, 34–41.
- Centers for Disease Control and Prevention. (2007). State-specific prevalence of smoke-free home rules—United States, 1992–2003. *MMWR. Morbidity and Mortality Weekly Report, 56*, 501–504.
- Giovino, G. A., Chaloupka, F. J., Hartman, A. M., Gerlach Joyce, K., Chriqui, J., Orleans, C. T., et al. (2009). *Cigarette smoking prevalence and policies in the 50 states: An era of change—The Robert Wood Johnson Foundation ImpacTeen Tobacco Chart Book*. Buffalo, NY: University at Buffalo, State University of New York.
- Heiss, C., Amabile, N., Lee, A. C., Real, W. M., Schick, S. F., Lao, D., et al. (2008). Brief secondhand smoke exposure depresses endothelial progenitor cells activity and endothelial function: Sustained vascular injury and blunted nitric oxide production. *Journal of the American College of Cardiology, 51*, 1760–1771.
- Hennrikus, D., Pentel, P. R., & Sandell, S. D. (2003). Preferences and practices among renters regarding smoking restrictions in apartment buildings. *Tobacco Control, 12*, 189–194.
- Hewett, M. J., Sandell, S. D., Anderson, J., & Niebuhr, M. (2007). Secondhand smoke in apartment buildings: Renter and owner or manager perspectives. *Nicotine & Tobacco Research, 9*, S39–S47.
- Hyland, A., Higbee, C., Borland, R., Travers, M., Hastings, G., Fong, G. T., et al. (2009). Attitudes and beliefs about secondhand smoke and smoke-free policies in four countries: Findings from the International Tobacco Control four country survey. *Nicotine & Tobacco Research, 11*, 642–649.
- Junker, M. H., Danuser, B., Monn, C., & Koller, T. (2001). Acute sensory response of nonsmokers at very low environmental tobacco smoke concentrations in controlled laboratory settings. *Environmental Health Perspectives, 109*, 1045–1052.
- King, B. A., Travers, M. J., Cummings, K. M., Mahoney, M. J., & Hyland, A. J. (2010). Prevalence and predictors of smoke-free policy implementation and support among owners and managers of multiunit housing. *Nicotine & Tobacco Research, 12*, 159–163.
- Klepeis, N. E., Apte, M. G., Gundel, L. A., Sextro, R. G., & Nazaroff, W. W. (2003). Determining size-specific emission factors for environmental tobacco smoke particles. *Aerosol Science and Technology, 37*, 780–790.
- Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J., Tsang, A. M., Switzer, P., et al. (2001). The national human activity pattern survey (NHAPS): A resource for assessing exposure to environmental pollutants. *Journal of Exposure Analysis & Environmental Epidemiology, 11*, 231–252.
- Liu, D. L., & Nazaroff, W. W. (2003). Particle penetration through building cracks. *Aerosol Science and Technology, 37*, 565–573.
- Lynn, P., Beerten, R., Laiho, J., & Martin, J. (2001). *Recommended standard final outcome categories and standard definitions of response rate for social surveys*. Colchester, Essex: The Institute for Social and Economic Research.
- Nelson, D. E., Holtzman, D., Bolen, J., Stanwyck, C. A., & Mack, K. A. (2001). Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Social and Preventive Medicine, 46*, S3–S42.
- Ritchie, D., Amos, A., Phillips, R., Cunningham-Burley, S., & Martin, C. (2009). Action to achieve smoke-free homes: An exploration of experts' views. *BMC Public Health, 22*, 112.
- Schoenmarklin, S. (2005). *Analysis of the authority of housing authorities and section 8 multiunit housing owners to adopt smoke-free policies in their residential units. Smoke-free environments law project*. Retrieved 07 August 2009, from http://www.tscg.org/sfelp/public_housing24E577.pdf
- Thatcher, T. L., Lunden, M. M., Revzan, K. L., Sextro, R. G., & Brown, N. J. (2003). A concentration rebound method for measuring particle penetration and deposition in the indoor environment. *Aerosol Science and Technology, 37*, 847–864.
- Travers, M. J., Cummings, K. M., Hyland, A., Repace, J., Babb, S., Pachacek, T., et al. (2003). Indoor air quality in hospitality

venues before and after implementation of a clean indoor air law—Western New York. *MMWR. Morbidity and Mortality Weekly Report*, 53, 1038–1041.

U.S. Census Bureau (USCB). (2008). *American housing survey for the United States: 2007*. Current Housing Report, Series H150/07). Washington, DC: Government Printing Office.

U.S. Census Bureau (USCB). (2009). *2005–2007 American community survey three year estimates*, Retrieved 06 August 2009, from <http://factfinder.census.gov>

U.S. Department of Health and Human Services (USDHHS). (1986). *The health consequences of involuntary smoking. A report of the surgeon general*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, Center for Health Promotion and Education, Office on Smoking and Health.

U.S. Department of Health and Human Services (USDHHS). (2006). *The health consequences of involuntary exposure to tobacco smoke: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

U.S. Department of Housing and Urban Development (USDHUD). (2009). *Memo to Regional Directors; State and Area Coordinators; Public Housing Hub Directors; Program Center Coordinators; Troubled Agency Recovery Center Directors; Special Applications Center Director; Public Housing Agencies; Resident management Corporations; Healthy Homes Representatives*, 17 July, 2009. Notice: PIH-2009-21 (HA). Retrieved 07 August 2009, from <http://www.hud.gov/offices/pih/publications/notices/09/pih2009-21.pdf>