Predictors of individual action to reduce exposure to environmental tobacco smoke

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Abstract

Objective - To determine the extent to which persons exposed to environmental tobacco smoke (ETS) take action to reduce exposure.

Design - Cross-sectional telephone survey.

Setting - Missouri, USA, 1991-92.

Participants - Population-based sample of Missouri residents aged ≥ 18 years ($n = 3024$).

Main outcome measures - A special series of questions was added to ascertain beliefs about ETS and actions taken to reduce individual exposure to ETS. The three primary variables of interest were (a) asking someone not to smoke in one's presence, (b) asking to be seated in a nonsmoking section of a restaurant, and (c) asking about reduction of workplace smoking.

Results - Overall among nonsmokers, 34.1% of respondents had asked someone not to smoke in their presence, 77.8% had asked to be seated in a nonsmoking section of a restaurant, and 26.9% had discussed reduction of workplace smoking. The strongest sociodemographic predictors of action to reduce ETS exposure included younger age, increasing education, and metropolitan or city residence. Actions to reduce ETS exposure also were higher among: those aware of the health consequences of ETS exposure, persons who were annoyed by ETS exposure, and respondents who favoured restrictions on smoking in public places.

Conclusions - Certain population subgroups are more likely to advocate protection from the health hazards of ETS exposure. Use of such data in policy-oriented tobacco control projects may increase the likelihood of their success.

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Introduction

Research on the health effects of environmental tobacco smoke (ETS) has proliferated in the last decade. ETS is now known to cause lung cancer in nonsmokers and lower respiratory tract infections in infants and children,¹⁻⁴ and is linked with heart disease⁵ and sudden infant death syndrome.⁶ Recently, the US Environmental Protection Agency (EPA) designated ETS as a group A (known human) carcinogen.⁴

Despite the well-known health effects of ETS exposure and the proliferation of state and local policies to control smoking in public places,^{7,8} recent evidence suggests that exposure to ETS is widespread.^{9,10} To combat ETS exposure in the workplace and in other public areas, the US Centers for Disease Control and Prevention (CDC) recently launched a public information campaign to increase knowledge of the dangers of ETS exposure and to empower individuals to decrease ETS exposure.¹¹

Few published studies have examined the extent of individual action to reduce ETS exposure. To evaluate the patterns and predictors of actions to reduce exposure to ETS, we analysed recent survey data.

Methods

The Behavioral Risk Factor Surveillance System (BRFSS) was developed in 1981 by the CDC. The BRFSS provides a flexible, state health agency-based surveillance system to assist in planning, implementing, and evaluating health promotion and disease prevention programmes.^{12,13}

We will briefly review survey methods, which have been discussed in detail elsewhere.¹²⁻¹⁴ Using random-digit dialing,¹⁵ a random sample was selected from Missouri's noninstitutionalised adult population (aged ≥ 18 years) who had telephones. The survey was administered by trained interviewers during a two-week period of each month between January 1991 and December 1992. Each month, 126 interviews were conducted, for a total of 3024 interviews over the study period. Among eligible respondents (ie, working phones, non-business phone extensions), the response rate was 72%. Our sample was generally representative of the overall Missouri population,¹⁶ although it underrepresented younger persons, males, and blacks (table 1).

The BRFSS instrument consists mainly of standardised questions developed by CDC. In 1991, the Missouri Department of Health added a series of questions (based mainly on earlier surveys¹⁷⁻¹⁹) to ascertain beliefs about ETS and actions taken to reduce individual exposure to ETS (table 2). A former smoker had smoked at least 100 cigarettes in his/her lifetime but did not currently smoke. A current smoker had smoked 100 cigarettes and answered "yes" to the question "Do you smoke now?" In tables 3-5, "nonsmokers" include never-smokers and former smokers,

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Table 1 Respondent characteristics by sociodemographic grouping, geographic area, and smoking status, Missouri, 1991-92

Characteristic	Number	Sample (%)	Census (%)*
Age (years)			
18-34	955	31.6	35.9
35-54	1008	33.3	33.1
≥ 55	1047	34.6	30.9
Unknown/refused	14	0.5	
Gender			
Female	1790	59.2	52.9
Male	1234	40.8	47.1
Race			
White	2729	90.2	88.8
Black	250	8.3	9.7
Other	45	1.5	1.5
Education level			
Less than high school graduate	555	18.3	25.5
High school or technical school graduate	1854	61.3	58.1
College graduate	613	20.3	16.4
Unknown/refused	2	0.1	
Geographic area†			
Rural	1055	34.9	
Metropolitan	753	24.9	
Core cities	1207	39.9	
Unknown/refused	9	0.3	
Smoking status			
Never smoker	1541	51.0	
Former smoker	735	24.3	
Current smoker	745	24.6	
Unknown/refused	3	0.1	

* Based on the 1990 US Census population ages 18 years and older.¹⁶† Core cities include St Louis City and County and Jackson County (includes Kansas City); metropolitan areas are other metropolitan statistical areas (as defined by the 1990 US Census¹⁶); rural areas are all other Missouri counties.

Table 2 Questions used to measure actions to reduce ETS exposure and beliefs about ETS, Missouri, 1991-92

Category	Question
Actions to reduce ETS exposure	<ul style="list-style-type: none"> ● In the past year, have you asked anyone not to smoke in your presence? ● In the past year, have you asked to be seated in the nonsmoking area of a restaurant? ● In the past year, have you talked with anyone where you work about reducing the amount of tobacco smoke in your workplace?
Health effects and attitudes toward ETS	<ul style="list-style-type: none"> ● Think now for a moment about a nonsmoker who lives or works with smokers. Do you think that exposure to tobacco smoke is harmful or not harmful to the nonsmoker's health? ● Is the smoke from someone else's cigarette: Very annoying to you? Somewhat annoying to you? Not annoying at all? ● Do you think smokers should be able to smoke anywhere in public places, only in certain areas, or not at all?

and "smokers" include only current smokers.

Following completion of each month's interviewing cycle, data were edited and weighted to adjust for the probability of selection, and for the age-, race-, and gender-distribution of the population.^{16,20,21} We calculated odds ratios (OR) and 95 % confidence intervals (CI),²² and utilised the exact method when called for due to a small sample size.²³

Results

Approximately one-third (34.1 %) of non-smoking respondents and 7.7 % of smoking respondents had asked someone not to smoke in their presence in the previous year. Among nonsmokers, those more likely to ask someone not to smoke were persons aged 54 years and younger, blacks, persons with a high school education and greater, and city dwellers (table 3). In addition, action was higher among nonsmoking respondents who: believed that ETS was harmful, found ETS annoying, and favoured smoking restrictions in public places. Among smokers, persons aged 18 to 34 years,

and those who found ETS harmful and annoying were the only variables that predicted action.

The majority (77.8 %) of nonsmokers and 32.1 % of smokers had asked to be seated in a nonsmoking section of a restaurant in the previous year. Among nonsmokers, persons more likely to ask for nonsmoking seating in a restaurant included younger respondents, persons with a high school education or more, metropolitan and city residents, respondents who acknowledged the harmfulness or annoyance of ETS, and persons who favoured restrictions on public smoking (table 4).

Among eligible respondents (ie, excluding persons who worked in a smoke-free workplace, were unemployed, or retired), 26.9 % of nonsmokers and 9.4 % of smokers had discussed reduction of exposure to workplace ETS in the past year. In general, fewer subgroups were predictive of action to reduce workplace exposure than for variables examined in tables 3 and 4. Among non-smokers, those significantly more likely to discuss workplace ETS reduction were persons

Table 3 Likelihood of asking someone not to smoke in one's presence by sociodemographic grouping, geographic area, and beliefs about ETS, Missouri, 1991-92

Characteristic	Asked someone not to smoke in one's presence					
	Nonsmokers			Smokers		
	%*	OR†	95 % CI	%*	OR†	95 % CI
Age (years)						
≥55	20.2	1.0		4.5	1.0	
35-54	35.7	2.2	1.7-2.8	8.1	1.9	0.8-5.3
18-34	42.5	3.5	2.8-4.3	10.6	2.6	1.1-7.2
Gender						
Male	31.0	1.0		7.8	1.0	
Female	34.1	1.1	1.0-1.4	8.7	1.1	0.6-1.9
Race						
White	32.0	1.0		8.5	1.0	
Black	42.4	1.6	1.1-2.1	5.7	0.7	0.2-2.3
Educational level						
Less than high school graduate	22.7	1.0		5.3	1.0	
High school or technical school graduate	34.5	1.9	1.4-2.4	9.0	1.6	0.7-3.6
College graduate	36.5	2.0	1.5-2.7	9.1	1.6	0.5-4.6
Geographic area‡						
Rural	27.1	1.0		7.6	1.0	
Metropolitan	34.5	1.4	1.1-1.8	10.3	1.4	0.7-2.8
Core cities	37.0	1.6	1.3-2.0	7.5	1.0	0.5-2.0
Presence of local ordinance§						
No	32.9	1.0		8.3	1.0	
Yes	32.5	1.1	0.9-1.4	6.7	0.8	0.4-1.7
ETS is harmful to nonsmokers' health						
No	9.2	1.0		3.9	1.0	
Yes	37.5	6.1	3.4-11.1	11.1	3.1	1.3-9.1
Don't know	4.0	0.5	0.2-1.2	3.3	0.8	0.2-3.6
ETS is annoying						
No	7.7	1.0		5.2	1.0	
Yes¶	40.0	7.5	5.3-10.7	15.7	3.5	2.0-6.1
Smoking should be allowed						
Anywhere	13.8	1.0		5.6	1.0	
Certain areas	30.7	2.9	1.5-5.6	7.9	1.5	0.6-4.8
Not at all	45.9	5.6	2.9-11.0	17.7	3.6	0.8-16.0

* Weighted values;²¹ unless indicated, subjects were excluded who answered "don't know" or refused to answer.

† Odds ratios (OR) and 95 % confidence intervals (CI).

‡ Core cities include St Louis City and County and Jackson County (includes Kansas City); metropolitan areas are other metropolitan statistical areas (as defined by the 1990 US Census¹⁸); rural areas are all other Missouri counties.

§ Counties for which ≥50 % of the population was covered by a comprehensive smoking control ordinance (ie, restricting smoking in workplaces, restaurants, and other public places) prior to the beginning of the study.⁷

¶ Includes respondents who found ETS "very annoying" or "somewhat annoying".

Table 4 Likelihood of asking to be seated in a nonsmoking area of a restaurant by sociodemographic grouping, geographic area, and beliefs about ETS, Missouri, 1991-92

Characteristic	Asked to be seated in a nonsmoking section					
	Nonsmokers			Smokers		
	%*	OR†	95 % CI	%*	OR†	95 % CI
Age (years)						
≥55	68.1	1.0		25.5	1.0	
35-54	81.7	2.1	1.6-2.6	32.7	1.4	0.9-2.2
18-34	84.9	2.8	2.1-3.6	39.9	2.0	1.2-3.1
Gender						
Male	75.8	1.0		33.6	1.0	
Female	78.3	1.1	0.9-1.4	34.0	1.0	0.7-1.4
Race						
White	77.7	1.0		33.7	1.0	
Black	73.0	0.8	0.5-1.1	35.9	1.1	0.6-2.0
Educational level						
Less than high school graduate	58.2	1.0		25.7	1.0	
High school or technical school graduate	77.7	2.6	2.0-3.3	33.5	1.4	0.9-2.2
College graduate	91.1	7.2	4.9-10.5	50.0	3.0	1.7-5.3
Geographic area‡						
Rural	69.1	1.0		28.8	1.0	
Metropolitan	82.9	2.2	1.7-2.9	35.1	1.4	0.9-2.1
Core cities	80.9	1.9	1.5-2.4	38.2	1.6	1.1-2.3
Presence of local ordinance§						
No	77.2	1.0		33.6	1.0	
Yes	79.5	1.2	0.9-1.6	40.0	1.2	0.8-1.9
ETS is harmful to nonsmokers' health						
No	41.2	1.0		19.6	1.0	
Yes	82.5	6.6	4.6-9.5	41.3	2.8	1.8-4.4
Don't know	52.5	1.5	1.0-2.5	24.4	1.3	0.7-2.3
ETS is annoying						
No	51.4	1.0		28.2	1.0	
Yes	84.6	5.1	4.1-6.4	47.7	2.3	1.6-3.2
Smoking should be allowed						
Anywhere	46.0	1.0		20.2	1.0	
Certain areas	77.7	4.4	2.8-6.9	35.1	2.2	1.2-3.9
Not at all	86.4	7.7	4.6-12.9	50.0	3.9	1.6-10.1

For explanation of footnotes see table 3.

Table 5 Likelihood of discussing the reduction of smoking in the workplace by sociodemographic grouping, geographic area, and beliefs about ETS, Missouri, 1991-92

Characteristic	Discussed the reduction of workplace smoking					
	Nonsmokers			Smokers		
	%*	OR†	95% CI	%*	OR†	95% CI
Age (years)						
≥55	22.0	1.0		4.4	1.0	
35-54	29.1	1.5	0.9-2.3	9.8	2.3	0.5-21.2
18-34	25.9	1.2	0.8-1.9	11.2	3.1	0.7-27.5
Gender						
Male	24.6	1.0		9.6	1.0	
Female	28.4	1.2	0.9-1.6	10.2	1.0	0.5-1.8
Race						
White	26.3	1.0		9.4	1.0	
Black	28.7	1.1	0.7-1.9	16.7	1.9	0.6-5.1
Educational level						
Less than high school graduate	19.6	1.0		4.0	1.0	
High school or technical school graduate	27.1	1.6	0.9-2.7	10.7	2.2	0.7-8.7
College graduate	27.8	1.6	0.9-3.0	13.5	3.7	0.9-17.0
Geographic area						
Rural	23.5	1.0		7.3	1.0	
Metropolitan	29.2	1.3	0.9-1.9	12.2	1.9	0.8-4.4
Core cities	27.2	1.3	0.9-1.8	11.1	1.8	0.8-3.9
Presence of local ordinance§						
No	26.4	1.0		9.8	1.0	
Yes	28.6	0.8	0.5-1.2	13.0	0.9	0.4-2.1
ETS is harmful to nonsmokers' health						
No	3.3	1.0		3.3	1.0	
Yes	29.1	12.1	3.1-102.5	13.6	3.6	1.2-14.0
Don't know	10.9	3.4	0.6-35.0	4.0	0.9	0.1-5.5
ETS is annoying						
No	10.5	1.0		8.2	1.0	
Yes¶	30.3	3.6	2.2-6.1	14.1	1.9	1.0-3.7
Smoking should be allowed						
Anywhere	2.0	1.0		6.6	1.0	
Certain areas	25.9	17.3	17.3-701	9.7	1.7	0.6-6.6
Not at all	36.1	28.1	4.6-1146	19.1	3.4	0.6-19.7

For explanation of footnotes see table 3.

aware of the harmful effects of ETS exposure, persons who were annoyed by ETS, and respondents who favoured restrictions on smoking in public places (table 5).

Discussion

In our population-based survey data, we identified several predictors of higher individual action to reduce ETS exposure. The strongest sociodemographic predictors of low actions to reduce ETS exposure included younger age, city residence, and higher education level. Additionally, actions to reduce ETS exposure were lower among respondents unaware of the health consequences of ETS, among persons who were not annoyed by ETS exposure, and among respondents who did not favour restrictions on smoking in public places. Actions that may be perceived as less confrontational (eg, asking for a nonsmoking section in a restaurant) were generally more common.

Although few previous studies have reported similar data, a recent California study²⁴ used telephone survey methods to assess responses to the question: "In the past 12 months, have you ever asked someone not to smoke in a certain situation?" In the California study, a majority of nonsmokers (59.1%) and almost half of smokers (44.4%) reported having asked in certain situations. These percentages are considerably higher than those we observed. A higher level of individual action in California compared with other areas of the US would not be unexpected considering the 1988 en-

actment of California Proposition 99, with its aggressive media campaign^{25,26} and more common local smoking control restrictions in California.²⁷ The wording of questions also varied between Missouri and California. Consistent with our results, Elder *et al.*²⁴ observed more activism among younger respondents and among persons more aware of the health effects of ETS exposure.

Conversely, the level of individual action in our study was considerably higher than findings reported by Davis *et al.*²⁸ Based on analysis of the 1987 National Health Interview Survey (NHIS), only 4% of nonsmokers asked a smoker not to smoke in their presence.²⁸ However, an important distinction between this study and ours may be that nonsmokers in the NHIS were asked if they take action *after* the smoker lights up.

Canadian data on compliance with smoking restrictions in public places have shown higher compliance for females and younger respondents.²⁹ In addition, knowledge of the health effects of ETS exposure was higher among city and more educated populations.²⁹

Numerous perspectives in behavioural science (eg, the health belief model^{30,31}) assert that an individual needs to feel susceptible to a health risk prior to taking action to change behaviour. This model appears to be supported by our data showing the low level of individual action among persons unaware of the health effects of ETS exposure.

The current CDC national public information campaign on ETS risks (ie, "Second-hand Smoke: We're All At Risk") includes

television advertisements, print and radio advertisements, and an action guide for the public¹¹ (see *Tobacco Control* 1993; 2: 326). Supporting this and similar public education activities, a substantial percentage of respondents either believed that ETS exposure was not harmful to nonsmokers (10.0%) or did not know if ETS were harmful (9.6%). Among these subgroups, the level of actions to reduce ETS exposure was substantially lower than among persons who knew that ETS is harmful to nonsmokers. BRFSS data such as ours will aid in evaluating the effects of educational campaigns, policy changes, and release of risk assessments such as the recent report from the US EPA.⁴

It is well documented that smoking is much more common among groups with lower education levels.³²⁻³⁵ Similarly, in our data, non-high school graduates were less likely to take action to reduce ETS exposure than were those with a high school or college education.

The limitations of our study should be noted. We relied on self-reported telephone survey data and had no comprehensive information on the accuracy of the BRFSS data during the study period. However, previous studies^{36,37} have shown relatively high accuracy of BRFSS-collected data on reported cardiovascular risk factors and demographics. For variables that have been measured previously, our data compared closely to other studies. For example, we found that 80.2% of respondents knew ETS was harmful to nonsmokers, which compares with 78% in an earlier Missouri study¹⁹ and 81% in national studies.^{18,28,38} In addition, a 1993 test-retest study of the Missouri BRFSS found relatively high reliability for questions involving individual actions to reduce exposure to ETS (kappa values 0.62 to 0.82).³⁹ Since BRFSS relies on telephone interviews, the potential exists for response bias due to lack of phone coverage among certain sociodemographic groups.⁴⁰

Because of the limited number of questions available for analysis, we were unable to differentiate some important measurement issues. For example, our question on whether respondents had asked someone not to smoke in their presence cannot discriminate between friends, family members, co-workers, or strangers. Similarly, discussion of workplace smoking reduction cannot differentiate whether discussion was among co-workers, management, or trades unions. Finally, our survey asked whether action regarding ETS had been taken during the past year, and affirmative responses may have included cases in which the respondent had taken such action only once. Questions that inquired about the frequency of actions taken to avoid ETS – eg, whether the respondent *usually* requests to be seated in the nonsmoking area of a restaurant – might yield different results.

In summary, our study identified certain population subgroups that were more likely to advocate for protection from the harmful effects of ETS. With the advent of policy-oriented projects such as the American Stop Smoking Intervention Study,⁴¹ data such as

ours may be useful in targeting efforts to population segments. Despite the large body of literature on the health effects of ETS exposure, few studies are available on policy and advocacy issues.⁴² Additional research in this area will be helpful in targeting and refining public health messages to reduce exposure to ETS.

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First description of tobacco in English

Early European observers appreciated that the peoples of the Western Hemisphere used tobacco to achieve pharmacologic effects. The following is the first English description of tobacco use. It is a translation from the French, published in 1568 (MacInnes CM. *The early English tobacco trade*. London: Kegan Paul, Trench, Trubner & Co, Ltd, 1926, pp 19-20). In describing customs of the people native to Brazil, André Thevet noted,

There is another secrete herbe which they name in their language 'Petun,' the which most commonly they beare about them, for that they esteem it marvellous proffitable for many things, this herbe is like to our Buglos. They gather this herbe very charely (*cf.* chary - careful) and dry it within their little cabanes or houses. Their manner to use it is this, they wrappe a quantitie of this herbe being dry in a leafe of a Palme tree, which is very great, and so they make rolles of the length of a candle, and then they fire the one end and receive the smoke thereof by their nose and by their mouthe. They say it is very holesome to clense and consume the superfluous humours of the brain. Moreover, being taken after this sort, it kepeth the parties from hunger and thirst for a time, therefore they use it ordinarily. Also, when they have any secret talke or counsel among themselves, they draw this smoke and then they speake. The which they do customably the one after the other in the warre, whereas it is very needful. The women use it by no means. If they take too much of this parfume, it will make them light in the head as the smell or taste of strong wine[.] The Christians that do now inhabite there, are become very desirous of this parfume, although that the first use thereof is not without danger, before that one is accustomed thereto, for this smoke causeth sweates and weaknesse even to fall into 'syncope' which I have tried in my selfe.

André Thevet

The New Founde Worlde or Antarctike, 1568

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