



Coverage by smoke-free workplace policies by race/ethnicity and health outcomes

Can workplace health policies improve worker health?

Smoke-free workplace policies

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Abstract

Purpose – The present research has three goals: to examine the prevalence of smoke-free workplace policies; to examine how coverage by a smoke-free workplace policy differs among racial/ethnic groups; and to examine the impact of smoke-free workplace policy (SFWP) coverage on health outcomes.

Design/methodology/approach – The research uses secondary analysis of data from the Behavioral Risk Factor Surveillance System (BRFSS) from 1998-2006.

Findings – It was found that SFWP coverage is below government goals – especially for Hispanic workers and that SFWP coverage was associated with health outcomes.

Research limitations/implications – The relatively slow progress in coverage by smoke-free workplace policies during the last eight years suggests the possibility that a ceiling has been reached in smoke-free workplace policy coverage. Limitations include factors that might negatively influence SFWP reporting (e.g. lack of knowledge about SFWP; language barriers), availability of data after 2006, and a cross-sectional design for health outcomes.

Practical implications – The findings suggest that there is health value in SFWP, but that coverage is not at 100 percent and a federal-level mandate might be necessary to reach that level. In situations where customers are allowed to smoke, it may be more difficult to justify and enforce a smoke-free workplace policy.

Originality/value – This is the first study to examine SFWP coverage by race over time. This study allows for examination of progress toward published SFWP goals.

Keywords Business policy, Cigarettes, Health and safety, Personal health, Ethnic groups, United States of America

Paper type Research paper

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Over the past two decades, companies have increasingly developed workplace policies directed at increasing employee health and well being (Huang *et al.*, 2004; Ong and Glantz, 2005). Companies have multiple reasons for targeting employee safety and health behaviors through workplace policies, which can range from limiting company exposure to liability (Huang *et al.*, 2004), to decreasing healthcare costs associated with company sponsored benefit plans (DeSimone and Harris, 1998), to improving employee performance and thus company financial performance (Musich *et al.*, 2006), to altruistic reasons of wanting to help employees become healthier (DeGroot and Kiker, 2003; Noe *et al.*, 1997). The adoption of a particular type of workplace policy, a smoke-free workplace policy (SFWP), has been encouraged, if not mandated, by governments around the world (Ong and Glantz, 2005).

The impetus for implementing SFWPs is fairly obvious. Secondhand smoke exposure (SHS) has been identified as a significant occupational health risk (Howard, 2004; US Department of Health and Human Services, 2006). A national study of SHS in Finland underscores the life threatening consequences of SHS, as SHS has a “considerable” effect on employee mortality, accounting for nearly 0.9 percent of fatalities in Finland in one year (Nurminen and Jaakkola, 2001). Moreover, SHS has been associated with lung cancer (Wells, 1998), respiratory illness (McGhee *et al.*, 2002) and reduced lung function (Chen *et al.*, 2001). Interestingly, some demographic groups of employees experience greater risks of exposure to SHS. For example, largely because of SHS exposure, “the most hazardous occupation for women is being a waitress. For men, being a bartender ranks among the seven most hazardous occupations” (Sigel *et al.*, 2006, p. 31). The goal of SFWPs is to reduce employee exposure to SHS; initial evidence suggests they satisfy this goal (though perhaps do not eliminate SHS exposure entirely; Verdonk-Kleinjan *et al.*, 2009).

While the benefits of SFWPs to employees and companies are considerable, perplexing issues of SFWP implementation, coverage, and acceptance exist. SFWPs, which explicitly prohibit smoking at work and in common areas in the workplace, differ from State- and local-level laws, which are not uniformly applied across jurisdictions in the USA, making SFWP largely voluntary acts by organizations to prohibit employee smoking. According to the Council of State Governments (CSG), only 21 States in the USA have passed all-inclusive public smoking bans, with an additional ten States providing patchworks of industry-based restrictions for bars, restaurants, non-hospitality workplaces, or combinations thereof (CSG, 2008). This leaves 19 States without Statewide non-smoking restrictions, although municipal jurisdictions within these States can institute forms of non-smoking bans (CSG, 2008); thus the issue of employee health related to smoking becomes a voluntary choice for many companies in these States to make. In fact, Americans for Non-smokers’ Rights (2006) estimates that just over 50 percent of Americans are covered by some form of a non-smoking restriction in their State or municipality, but this estimate does not specifically indicate the nature of the smoking restrictions. In light of the heavy financial burden faced by employers as a result of tobacco use, in terms of health costs, employment litigation from SHS exposure-related illnesses, and costs associated with decreased productivity from SHS exposure (*cf.* Tsai *et al.*, 2005), organizations use such policies to help mitigate the financial and productivity burdens (Javitz *et al.*, 2006).

Interestingly, despite the significant costs to organizations resulting from smoking and its associated health outcomes, scant management research exists exploring the

prevalence of such policies and the impact they have on employee health. This study seeks to close that research gap by examining coverage by SFWPs. We specifically examined the possibility that employees may not see equal coverage by SFWPs and that coverage by such policies may converge with coverage by health insurance benefits. Thus, organizations may be more or less likely to be “health friendly” by providing health insurance coverage and protection from SHS exposure. Additionally, we examine the relationship between SFWP and health outcomes, specifically, asthma, myocardial infarction, angina, and stroke between employees covered or not covered by organizationally sanctioned SFWP.

Work policies and smoke-free workplace coverage

Work policies are “broad guidelines developed by the employer to guide organizational decisions” (Bogardus, 2004, p. 276). Companies have the right to establish work policies regarding acceptable employee behaviors so long as those work policies are consistent with local, State, and federal laws (DeGroot and Kiker, 2003; Hornsby and Kuratko, 2005). For example, a company can set absenteeism or tardiness work policies that mandate specific employee behaviors regarding the start and end time of the workday. Employees are likely to follow stated work policies to the extent that the policy is specific about which behaviors are acceptable and to the degree to which the company holds employees accountable for their behaviors (Mischel, 1977). Government mandates can also require companies to set specific work policies about acceptable behavior, as seen with equal employment opportunity, sexual harassment, and disability laws translated into company specific workplace policies. Thus, it is at this point somewhat perplexing that government mandates relative to smoking in the workplace have not increased SFWP across the country.

In light of the general public health benefits of SFWP, various local, State, and federal government agencies have attempted to promote such policies for workplaces. Foremost in those efforts was the Healthy People 2010 report (US Department of Health and Human Services, 2000). As part of the report, a goal was set to have 100 percent coverage by SFWP in the USA by 2010. Indeed, the evidence suggests that there has been progress toward that goal, as only three percent of those working indoors in the United States reported being covered by 1986 (CDC, 1988); that number grew to 46 percent by 1993 (Gerlach *et al.*, 1997) and 70 percent in 1999 (Shopland *et al.*, 2001). The first objective of this paper is to assess the level of coverage by smoke-free workplace policies in the United States and how that coverage has changed from 1998 through 2006 (the most recent point at which data are available).

- RQ1a.* What is the current level of coverage by smoke-free workplace policies in the United States?
- RQ1b.* How has coverage by smoke-free workplace policies in the United States changed from 1998-2006?

Racial/ethnic disparities in coverage

A number of studies have explored race and ethnicity as potential predictors of SFWP coverage, finding disconcerting disparities between racial and ethnic groups. Gerlach *et al.* (1997) found that Black (43.3 percent) respondents were less likely to be covered by a SFWP than White (46.2 percent) or Asian/Pacific (51.4 percent) respondents. On

the other hand, Sweeney *et al.* (2000) found no racial differences between Whites (63.4 percent) and Blacks (63.3 percent), but did find that Hispanics (59.5 percent) were less likely to be covered by a SFWP. Both studies relied on data from the National Cancer Institute's Tobacco Use Supplement to the Current Population Survey.

In their study of employee predictors of coverage by a SFWP using BRFSS data from 2001, Delnevo *et al.* (2004) found that White, non-Hispanic respondents (73.1 percent \pm 0.7) were significantly more likely to be covered by a SFWP than Black, non-Hispanic respondents (66.2 percent \pm 2.2). Moreover, Blacks were significantly more likely to be covered than Hispanics (59.4 percent \pm 3.1). They note that because of the timing of the data they used, racial differences may have actually widened because of increased emphasis on policies designed to reduce SHS exposure.

The comment by Delnevo *et al.* (2004) regarding emphasis on SHS exposure highlights two gaps in the current literature on SFWP. First, the previous studies of racial disparities have cross-sectionally focused on data from a single year; such an emphasis does little to aid in our understanding of how coverage under these policies has changed longitudinally. Moreover, previous research does not capture the current concern regarding the effects of SHS exposure and policies to minimize exposure (Bell *et al.*, 2009). Ideally, the current emphasis on SFWP coverage would serve to reduce the racial disparities as coverage moves closer to 100 percent. However, as Delnevo *et al.* suggest, the opposite may be occurring. As such, an objective of this study is to explore trends in racial and ethnic disparities in SFWP coverage from 1998-2006 using data from the BRFSS.

Public health research provides evidence that ethnic minorities vary in smoking cessation rates compared to White employees (Houston *et al.*, 2005). While Whites tend to smoke more frequently than Blacks and Hispanics (Barbeau *et al.*, 2004; Shaver *et al.*, 2005), Whites on average receive more organizational support to quit smoking than both Blacks and Hispanics (Houston *et al.*, 2005). Moreover, while Hispanics tend to on average smoke less than Blacks, Blacks have more success in quitting smoking than Hispanics even when both groups receive smoking cessation interventions (Brown *et al.*, 2006). Thus, some underlying reason must explain why Whites receive more help and why when offered assistance, Blacks tend to find more success in smoking cessation than Hispanics.

As SFWPs vary in their specificity about which behaviors the organization condones and the evidence that even amidst some form of SFWPs that organizations appear to not uniformly enforce, employee behavior is influenced by personally salient features in the environment (Mischel and Shoda, 1998; Mischel, 2004). That is, in lieu of strong situation cues directed at employees by the organization about expected behaviors and accountability for exhibited behaviors, employees will act in accordance with situational cues that they find personally meaningful. We posit that relational demographic factors act as the personally salient cues, and these demographic factors explain the existing empirical evidence. Social identity theory provides the theoretical support for relational demography. SIT stipulates the individuals actively seek membership in groups that they find attractive, and belonging to attractive groups becomes a central component of any individual's self-concept. Moreover, belonging to and identifying with personally attractive groups can bolster an individual's self-esteem. That is, belonging to an attractive group can make an individual feel better about him or herself. Using SIT as a foundation, researchers have examined how

individual demographic characteristics, specifically demographic similarities and dissimilarities between two or more people, affect employee attitudes toward work-related outcomes (Tsui *et al.*, 2002).

Research on relational demography points to two possible reasons that explain the disparities in SFWP coverage. First, individuals belonging to demographic minority groups develop a stronger identification with members of their minority groups than do individuals belonging to demographic majority groups (Elfenbein and O'Reilly, 2007). In response to perceived societal power differentials between demographic groups, members of minority groups have been found to over identify with the characteristics of their group as a means of protested perceived inequities between groups (Linnehan *et al.*, 2006). To this point, while tobacco-smoking Hispanics smoke less than Whites and Blacks, health behavior research has demonstrated that Hispanics less frequently accept smoking cessation assistance than other demographic groups and even if they do accept assistance are less successful in quitting smoking after the intervention (Brown *et al.*, 2006). On the other hand, both Whites and Black are more likely to accept smoking cessation help and more likely to quit smoking after receiving assistance (Brown *et al.*, 2006). Hispanic smoking attitudes may also vary depending on their immigration status and country of origin. As noted by Thrasher *et al.* (2009), some countries (e.g. Mexico) have less stringent smoke-free policies and thus employees from those countries are less likely to support (and perhaps, acknowledge) such policies.

Second, members of minority groups often receive fewer offers of assistance from members of majority groups. In other areas of HRM, evidence exists to support this contention. Performance management researchers have found that Whites are less likely to offer minority employees performance feedback (see Tsui *et al.*, 2002) and work-family support (Foley *et al.*, 2006). Furthermore, HRM researchers have also found that members of ethnic minority groups perceive greater work-related discrimination (Avery *et al.*, 2008). Thus the findings that members of minority groups are either resistant to smoking cessation efforts or do not have such cessation efforts offered is easily understood. Taken together, previous research and theory suggest that we should expect a difference among racial groups in SFWP coverage.

H1. Hispanic workers will be less likely to report being covered by a smoke-free workplace policy than non-Hispanic White or non-Hispanic Black workers.

Racial/ethnic disparities in health care coverage

Given the detrimental health effects of SHS exposure, insurance coverage for those individuals not covered by a SFWP becomes more important. However, as with the previous research on SFWP, the literature consistently reports racial and ethnic disparities in health insurance coverage (*cf.* Hargraves, 2002; Kaiser Commission, 2004). Specifically, the Kaiser Commission on Medicaid and the Uninsured (2004) found significantly higher uninsurance rates among Blacks (21.0 percent) and Hispanics (34.3 percent) than Whites (12.9 percent) when considering public (e.g. Medicaid) and private (e.g. employer-sponsored) insurance coverage.

When we combine these insurance coverage findings with the SFWP evidence, a potentially concerning pattern emerges. Those that are least likely to be covered by smoke-free workplace policies appear to also be least likely to be covered by insurance. As such, these individuals do not have preventive mechanisms in place to avert health

conditions derived from SHS exposure and do not have as many options for treatment should a health condition develop as a result of SHS exposure. However, this conclusion has not been tested within the same dataset in order to confirm this pattern within a discrete group of participants. The third objective of this study is to examine the extent to which SFWP coverage and health insurance coverage intersect among different racial and ethnic groups; based on previous research we predict that a pattern will emerge where Hispanic workers will be least likely to report health insurance coverage as well as least likely to report SFWP coverage.

- H2.* Hispanic workers will be less likely to report being covered by workplace health insurance benefits than non-Hispanic White or non-Hispanic Black workers.

Smoke free workplace policies and health outcomes

A goal of smoke-free workplace policies is to improve employee health by reducing exposure to SHS, which should improve not only employee health but also reduce the cost of employer-provided healthcare to these employees. Emerging evidence suggests that attempts to ban workplace smoking can impact health outcomes of employees. Sargent *et al.* (2004) reported a decline in admissions for acute myocardial infarction (heart attack) in the months following the implementations of a local ordinance banning smoking in workplaces. Allwright *et al.* (2005) found similar findings when examining respiratory symptoms in Ireland following the passage of more widespread smoke-free workplace legislation. While not examining voluntary smoke-free workplace policies, these studies provide evidence that similar policies may impact health outcomes.

Using previous data to estimate the impact of smoke-free workplace policies on health, Caron *et al.* (2005) predicted that a State law restricting smoking in workplaces in Rhode Island would significantly reduce cases of asthma. Moreover, Ong and Glantz (2004) estimated that universal smoke-free workplace policies would result in preventing approximately 6,250 myocardial infarctions and 1,270 strokes annually. These studies suggest that smoke-free workplace policies could hold significant potential in protecting employee health; however, they are based on estimates of potential health concerns and do not examine associations between SFWP and current health outcomes.

To that end, we set out to examine how one's coverage by a SFWP at work was associated with health concerns. The data available to examine this question allowed for tests of a number of illnesses that are associated with smoking: asthma, myocardial infarction, angina, and stroke. In addition, we examined a general assessment of overall health. In all cases, we predict that coverage by a smoke-free workplace policy will be associated with a lower incidence of health problems.

- H3a.* Coverage by a smoke-free workplace policy will be associated with a lower incidence of asthma, myocardial infarction, angina and stroke.
- H3b.* Coverage by a smoke-free workplace policy will be positively associated with overall physical health.

Method

The data used for this study were derived from the Behavioral Risk Factor Surveillance System (BRFSS) from 1998-2006. The BRFSS is a State-based random digit dial telephone survey of civilian, non-institutionalized adults in each of the 50 States, the District of Columbia, and the Virgin Islands. The questions regarding smoking policies at work are part of an optional module. The States administering the module varied from 1998-2006; the States administering the module each year may be found in Table I. For each year, the data from the States administering the module were pooled. The BRFSS uses a complex sampling strategy where data are weighted in order to account for the manner in which they represent the general population; this strategy is taken into account through the analyses.

All data from 1998-2006 were used to assess the research questions. With regard to the hypotheses for health outcomes, only data from 2006 were used. Those hypotheses were not specifically concerned with trends; moreover due to changes in the ways health outcomes were assessed over time, it was more prudent to limit our analysis to the most recent data available.

Measures

Smoke-free workplace policy coverage. The BRFSS includes two items that assess aspects of smoke-free workplace policies; both questions are asked of respondents who work primarily indoors. The first asks “Which of the following best describes your place of work’s official smoking policy for indoor public or common areas, such as lobbies, rest rooms, and lunch rooms?” The second asks “Which of the following best describes your place of work’s official smoking policy for work areas?” Four responses were offered for each item, including smoking is not allowed in any areas, smoking is allowed in some areas, smoking is allowed in all areas, or no official policy. In line with other studies, we defined a smoke-free workplace policy as a situation where a workplace prohibits smoking in both common and work areas (see also Delnevo *et al.*, 2004; Gerlach *et al.*, 1997; CDC, 2000; Sweeney *et al.*, 2000; Shopland *et al.*, 2004).

Insurance coverage. This was assessed by asking participants “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?” The options for this question were “Yes” or “No;” Don’t know/Not sure and refused responses were coded where appropriate but not included in the present study.

Race and ethnicity. The predictor of interest to the present work was race and ethnicity. This was assessed by asking respondents which group best represents their race (for the specific protocol on race, see www.cdc.gov/brfss/technical_infodata/surveydata.htm). Consistent with other studies of smoke-free workplace policies, only White (non-Hispanic), Black (non-Hispanic) and Hispanic racial and ethnic groups were considered. In cases where we examined the overall trends (e.g. in examining *RQ1a* and *RQ1b*), all races were included.

Health outcomes. The present study was interested in four specific health outcomes: asthma, myocardial infarction, angina, and stroke. These were each measured with one item from the BRFSS. Examples questions were “Has a doctor, nurse, or other health professional EVER told you that you had any of the following? For each, tell me “Yes”, “No”, or you’re “Not sure.” With a stem such as “(Ever told) you had a heart attack, also called a myocardial infarction?”

Table I.
Demographic and
smoking characteristics
of US adults from the
behavioral risk factor
surveillance system,
1998-2006

	1998		1999		2000		2001		2002		2003		2004		2005		2006	
	<i>n</i> ^a	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<i>n</i>	16,309		21,989		30,635		48,992		47,294		44,005		55,750		43,731		50,882	
<i>Race</i>																		
White,																		
non-																		
Hispanic	13,199	80.9	17,952	81.6	23,673	77.3	39,492	80.6	32,230	68.1	35,445	80.5	44,509	79.8	33,705	77.1	40,866	80.3
Black,																		
non-																		
Hispanic	1,553	9.5	2,423	11.0	3,687	12.0	3,833	7.8	4,773	10.1	3,811	8.7	5,161	9.3	4,634	10.6	5,176	10.2
Hispanic	1,027	6.3	940	4.3	1,936	6.3	2,720	5.6	2,767	5.9	2,389	5.4	3,308	5.9	2,826	6.5	2,295	4.5
<i>Gender</i>																		
Female	10,148	62.2	13,560	61.7	18,841	61.5	30,214	61.7	29,966	63.4	27,915	63.4	35,758	64.1	28,221	64.4	26,153	51.4
Male	6,161	37.8	8,429	38.3	11,794	38.5	18,778	38.3	17,328	36.6	16,090	36.6	19,992	35.9	15,510	35.5	24,728	48.6
Mean age																		
(standard																		
deviation)	38.9	20.1	39.6	22.2	39.7	20.4	40.1	21.1	40.3	21.5	40.6	22.3	40.8	22.7	40.5	22.5	45.58	23.1
<i>Current</i>																		
<i>smoking</i>																		
<i>status</i>																		
Current	4,045	23.8	5,563	25.6	7,527	14.6	12,295	25.1	11,008	23.3	9,550	21.7	12,056	21.6	9,067	20.8	10,300	20.2
Former																		
smoker	3,330	20.4	4,494	20.4	6,227	20.3	10,896	22.2	10,292	21.8	10,338	23.5	11,877	21.3	10,102	23.2	11,721	23.0
Never																		
smoked	8,934	54.8	11,932	54.3	16,881	55.1	25,801	52.7	25,994	55.0	24,117	54.8	31,817	57.1	24,431	56.0	28,709	56.4

(continued)

States included in data	1998		1999		2000		2001		2002		2003		2004		2005		2006	
	<i>n</i> ^a	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
AK,			CO, DE,		CO, DE,		AK, AZ,		AL, AR,		AR, CO,		AL, AZ,		AZ,		AL, AZ,	
GA,			DC, IN,		DC, IN,		AR, CT,		CO, DE,		CT, IA,		AR, CO,		AR,		AR, GA,	
IN,			LA, MS,		LA, MS,		DE, IN,		FL, IN,		KY,		IN, IA,		IA,		IN, IA,	
IA,			MO,		MO,		KY, LA,		IA, LA,		LA,		LA, MN,		KY,		LA, MO,	
MT,			MT,		MT,		ME, MS,		ME, NE,		MT,		MT, NE,		NV,		NV, NH,	
NE,			NE, NJ,		NE, NJ,		MO, MT,		NJ, NC,		NE, NJ,		NV, NJ,		NJ,		NJ, ND,	
NC,			NC, OH,		NC, OH,		NE, NH,		ND, OH,		NJ, NC,		NC, ND,		NC,		OH, OK,	
OH,			OK, SC,		OK, SC,		NJ, OK,		OK, PA,		OK, RI,		OH, OK,		OK,		PA, VI,	
OK,			TX,		TX,		PA, RI,		EI, SC,		TX, VI,		TX, VA,		SC,		VA,	
SC,			VA,		VA,		SC, SD,		SD, TX,		VA,		TX, VA,		TX,		WV,	
TX,			WV,		WV,		TX, VA,		VI, VA,		WV,		WV, WY		TX,		WI, WY	
WV,			WI, WY		WI, WY		WV, WI,		WV, WI,		WY		WV, WI,		VI,		WI, WY	
WI,							WY								VA,			
WY															WV,			
															WI,			
															WY			

Note: ^aunweighted *n*, weighted %

Table I.

Additionally, overall assessments of physical health and poor health were considered. Physical health was assessed with a one item that read “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” Poor health was assessed with one item that read “During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?”

Control variables. Because smoking is not the sole determinant of the health outcomes in this study, we controlled for a variety of other risk factors. These included current smoking status, body-mass index, binge drinking behavior, race, age, and sex. These were measured with single item measures in most cases (specific wording of questions for the 2006 survey are available at <http://cdc.gov/brfss/>). In the case of body-mass index, this was a calculated variable that was derived from each participant’s self-reported height and weight.

Analysis

All statistical analyses were performed using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA). The complex sampling design was taken into account in the analysis (e.g. by using PROC SURVEYLOGISTIC or PROC SURVEYMEANS). When looking at issues like smoke-free workplace policy coverage by racial group, statistically significant differences were determined by non-overlapping confidence intervals, consistent with past research (Delnevo *et al.*, 2004). In the analysis for the hypotheses, logistic regression was used, resulting in odds ratios. An odds ratio with a confidence interval that does not include 1.00 is considered statistically significant (at $p < 0.05$).

Results

RQ1a and *RQ1b* were concerned with the current status of smoke-free workplace policies and how coverage by smoke-free workplace policies has changed. Table II displays the weighted percentage of respondents that reported smoke-free workplace policy coverage from 1998-2006. The data indicate a number of important findings. First, to address *RQ1*, we have a great deal further to go in order to satisfy the goals set out by Healthy People 2010. As of 2006, just over 74 percent of workers were covered under a smoke-free workplace policy.

Second, in light of *RQ2*, the changes in smoke-free workplace policy coverage have been very gradual; based on these trends it seems unlikely that the goal of 100 percent coverage will be attained by 2010 without a significant shift in the data. Figure 1 is a graphical depiction of the overall trend in coverage by smoke-free workplace policies. This figure further emphasizes the gradual change in coverage over the seven-year period. Particularly when one considers at data points where the error bars overlap, the differences in those data points are not statistically significant. A trend analysis confirmed that the overall change in smoke-free workplace coverage was significant from 1998-2006, however, follow-up contrasts indicated there was not a significant change from 2000-2006.

H1 predicted a racial/ethnic different in coverage by SFWP where Hispanics would report lower coverage than White or Black workers. In addition to the overall trend in smoke-free workplace policy coverage, Table II includes a breakdown of coverage by race/ethnicity across the period. Further, these data have been graphically presented in

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Trend <i>p</i> - value
Overall (%)	65.81	71.97	69.22	70.24	71.06	73.55	71.89	74.37	74.06	0.011
<i>Race</i>										
White, non-Hispanic (%)	66.78	71.99	70.81	72.55	73.25	76.49	74.64	76.79	75.71	0.029
Black, non-Hispanic (%)	64.36	70.06	66.95	65.28	68.40	71.25	67.97	72.86	70.18	0.037
Hispanic (%)	59.51	72.69	60.66	58.69	59.51	59.05	56.46	62.71	60.60	0.0041
<i>F</i> (<i>p</i>) for racial difference by year	4.32 (0.0017)	0.50 (0.73)	12.92 (<0.0001)	23.90 (<0.0001)	19.96 (<0.0001)	26.01 (<0.0001)	40.91 (<0.0001)	21.19 (<0.0001)	22.51 (<0.0001)	

Table II.
Weighted percentage of
BRFSS respondents
covered by a smoke-free
workplace policy,
1998-2006

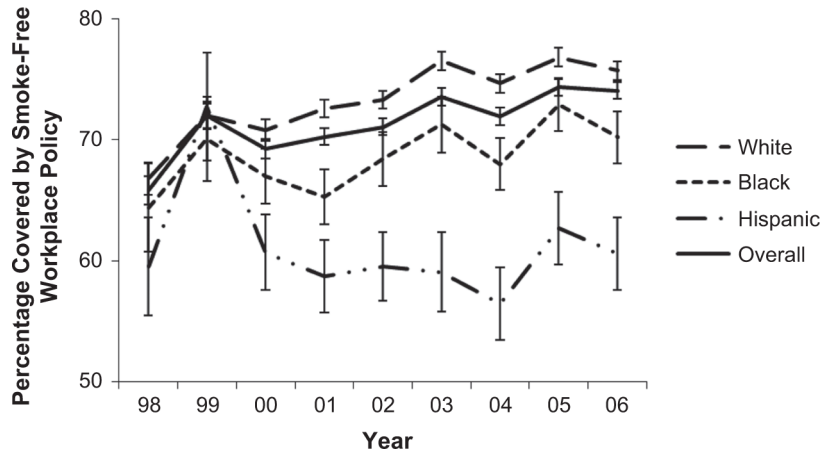


Figure 1.
Percentage coverage by
smoke-free workplace
policy by race, 1998-2006

Figure 1; again where error bars do not overlap there is a statistically significant difference between the data points. The data indicate a clear pattern. With the exception of one year (1999), White workers are consistently more likely to be covered by a smoke-free workplace policy than Black workers. Moreover, Black workers are consistently more likely to be covered by a smoke-free workplace policy than Hispanic workers. This pattern provided support for *H1*. Perhaps most troubling is the trend (though not statistically significant at this point) toward decreasing coverage by smoke-free workplace policies among Hispanics.

H2 was concerned with combined coverage by a smoke-free workplace policy and insurance coverage for different racial/ethnic groups, predicting that Hispanic workers would report lower coverage by health insurance. The data indicate that White respondents are more likely than Black and Hispanic respondents to be covered by both a smoke-free workplace policy and health insurance coverage (see Table III and Figure 2). Of particular interest in the data combining smoke-free workplace policy coverage with health insurance coverage are those individuals who would be considered at highest risk: the respondents not covered by a smoke-free workplace policy and without health insurance. The percentage of those participants by race is depicted in Figure 2 across the period. These data clearly indicate that Hispanics are at higher risk than Blacks, who are at higher risk than Whites, when we combine smoke-free workplace policy coverage and health insurance coverage. For example, in 2006, over 21 percent of Hispanics who were not covered by a smoke-free workplace policy also were not covered by health insurance. By comparison, 7.91 percent of Blacks and 5.32 percent of Whites fit into this category. These findings supported *H2*.

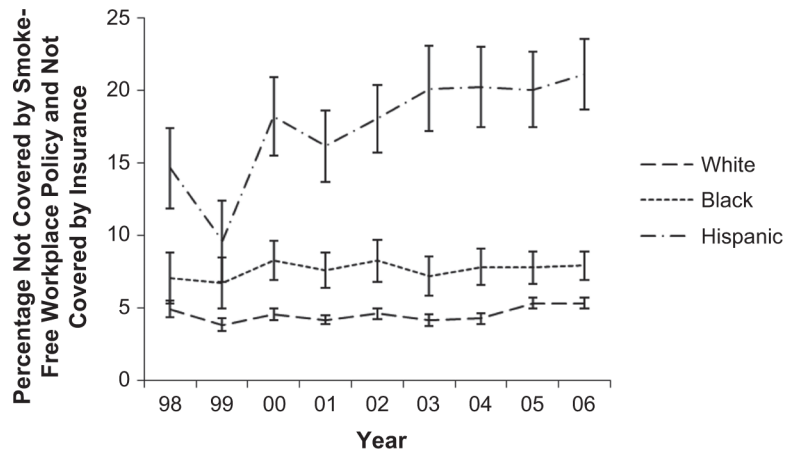
Health outcomes

In *H3a*, we predicted that coverage by the SFWP would be associated with asthma, myocardial infarction, angina, and stroke. Logistic regression analyses (performed using PROC SURVEYLOGISTIC in SAS) indicated significant relationships between SFWP and asthma (odds ratio = 1.19, 95 percent confidence interval 1.04-1.37), myocardial infarction (odds ratio = 1.70, 95 percent confidence interval 1.27-2.27), and stroke (odds ratio = 1.44, 95 percent confidence interval 1.01-2.04), after controlling

	SFWP		No SFWP	
	Insurance	No Insurance	Insurance	No Insurance
<i>1998</i>				
White	61.68	5.09	28.3	4.92
Black	55.45	9.04	28.45	7.06
Hispanic	41.83	17.64	25.91	14.62
Overall	28.96	6.87	28.03	6.14
<i>1999</i>				
White	67.17	4.83	24.17	3.83
Black	61.62	9.14	22.51	6.72
Hispanic	52.62	20.08	17.71	9.59
Overall	65.47	6.54	23.36	4.63
<i>2000</i>				
White	65.93	4.88	24.66	4.53
Black	57.1	9.66	24.96	8.27
Hispanic	45.17	15.56	21.09	18.18
Overall	62.56	6.64	24.47	6.32
<i>2001</i>				
White	67.34	5.21	23.26	4.18
Black	56.22	9.03	27.18	7.57
Hispanic	42.9	15.86	25.1	16.14
Overall	63.44	6.82	23.92	5.82
<i>2002</i>				
White	67.67	5.67	22.04	4.61
Black	58.11	10.49	23.16	8.24
Hispanic	43.51	15.99	22.45	18.04
Overall	63.76	7.39	22.39	6.47
<i>2003</i>				
White	70.16	6.33	19.35	4.14
Black	59.7	11.56	21.5	7.2
Hispanic	39.72	19.2	20.98	20.11
Overall	64.96	8.59	20.06	6.39
<i>2004</i>				
White	68.63	6.04	21.07	4.26
Black	56.54	11.42	24.2	7.83
Hispanic	39.37	17.22	23.17	20.24
Overall	64.07	7.84	21.72	6.36
<i>2005</i>				
White	67.65	6.14	20.89	5.32
Black	57.52	11.59	23.12	7.77
Hispanic	40.61	17.21	22.14	20.04
Overall	65.62	7.68	20.48	6.22
<i>2006</i>				
White	67.78	5.99	20.91	5.32
Black	57.44	11.64	23.01	7.91
Hispanic	39.35	17.55	21.99	21.11
Overall	64.63	7.61	21.58	6.18

Table III.
Combined coverage by a
smoke-free workplace
policy (SFWP) and health
insurance by year and
race, 1998-2006

Figure 2. Percentage of respondents not covered by a smoke-free workplace policy and not covered by health insurance by race, 1998-2006



for smoking status, body-mass index, binge drinking behavior, race, age, and sex. The relationship between SFWP and angina was not significant (odds ratio = 0.96, 95 percent confidence interval 0.78-118). These findings partially support *H3a*, finding that SFWP were associated with three smoking-related health conditions.

With regard to *H3b*, the relationship between SFWP and physical health was also significant in the nationwide dataset ($F = 6.36, p = 0.011$) after control variables were considered. This finding supports *H3b* regarding the predicted positive relationship between coverage by a SFWP and self-reported overall physical health.

Discussion

A number of findings emerge from this study. First, despite having four years left to hit the targets outlined in Healthy People 2010, organizations have a long way to go in meeting the federal government’s goals of SFWP coverage. As Figure 1 indicates, there has been relatively little progress in increasing smoke-free workplace policy coverage since 1998; this is despite increased attention given to the dangers of SHS exposure at work. Second, consistent with the prediction of Delnevo *et al.* (2004), racial disparities in smoke-free workplace policy coverage have not diminished, and in some cases have actually increased over the last seven years. As depicted in Figure 1, the gap between Hispanics and other racial and ethnic groups has actually increased over the last seven years. Interestingly, the racial disparities in smoke-free workplace policy coverage are exacerbated by racial disparities in health insurance coverage. Racial/ethnic groups that are least likely to be covered by a smoke-free workplace policy are also least likely to be also be covered by health insurance. For example, in 2006, over 21 percent of Hispanics were not covered by a smoke free policy and also did not have health insurance coverage (See Table III and Figure 2). These groups are at particular risk for health conditions that result from SHS exposure; they are missing a key preventative factor (a smoke-free workplace policy) and may be limited in their treatment options because of a lack of health insurance coverage. This may be further exacerbated by occupational segregation that leads Hispanic workers to jobs where smoking is more common and SFWPs are less common (Osypuk *et al.*, 2009).

This study adds to the mounting literature that finds that the existence of smoke-free workplace policies is associated with better health outcomes. Of course, it is possible that individuals who are otherwise healthy choose to work in smoke-free workplaces (Brownson *et al.*, 1997), resulting in a selection bias. That said, the consistency in the literature with regard to the positive impact of smoke-free workplace policies suggests that there is indeed some effect. Interestingly, the relationship between smoke-free workplace policies and angina was not significant. One potential reason for this finding was a lack of variability in the dependent variable. A relatively small number of participants reported having been diagnosed with angina, which may have limited the ability to detect significant effects.

The relatively slow progress in coverage by smoke-free workplace policies during the last eight years suggests the possibility that a ceiling has been reached in smoke-free workplace policy coverage. The possibility exists that in addition to the formal smoke-free workplace policy coverage, there may be additional organizations that do not have a stated smoke-free workplace policy, but rather have an implied policy that acts in the same way a smoke-free workplace policy would. This could happen in a number of instances. For example, in States or communities with smoking bans in certain areas (e.g. government buildings, restaurants), those workplaces not have a formal smoke-free workplace policy because the law prohibits smoking in those establishments anyway. In those cases, respondents may have indicated that their employer did not have a formal policy. This may also explain why some States with widespread smoking bans (e.g. California) have not participated in this BRFSS optional module. Similarly, in certain industries smoking bans may be implied even when the employer does not have a formal policy. For example, even in cases where hospitals do not have smoking bans, it may be implied to workers that smoking, particularly in work areas that are around patients, is prohibited. Again, in those cases workers may report that there is not a formal policy but the workplace setting effectively functions as though a policy were in place.

The notion of implied or legally superseded smoke-free workplace policy has clear implications for studies that rely on employees to report coverage under such policies. In the future, this research should be supplemented by studies that sample employers or policy handbooks given to employees to determine the true coverage by smoke-free workplace policy.

Practical implications

At this point, it becomes important to consider whether there should be a continued concerted effort to increase smoke-free workplace policy coverage and, further, special attention given to policy initiatives that may help address the racial disparities in coverage. The evidence suggests that while the battle may be difficult, it is worth waging. As noted earlier, smoke-free workplace policies have been associated with positive outcomes, particularly smoking cessation, and are cost-effective when compared to other programs. Moreover, compliance with the policies tends to be very high (Shopland *et al.*, 2004), suggesting that when they are put into place, employees are following them.

One challenge in attaining 100 percent smoke-free workplace policy implementation nationwide is the wide variability between States. As noted by Shopland *et al.* (2001), this suggests that a federal-level mandate might be necessary to attain full coverage of

smoke-free policies. A further challenge concerns permissible smoking by patrons of business. In situations where customers are allowed to smoke, it may be more difficult to justify and enforce a smoke-free workplace policy. This may help to explain the finding by Shopland *et al.* (2004) that food service workers were far less likely to be covered by a smoke-free workplace policy.

Strengths and limitations

The very large dataset, available over nine years, collected using a complex sampling strategy improves both the generalizability of our findings as well as our confidence in the statistical power of the tests presented. That said, we recognize that there are clear limitations to the study, many of which related back to the notion that this is a secondary analysis of a dataset not specifically designed to address the research questions and hypotheses we have posed. Clearly, the data suggest a deviation from the racial trends in 1999. While it is impossible to fully determine the cause of the divergence, we explored a number of possibilities. First, the wording and coding of the items related to smoke-free workplace policies and race did not change in 1999. Second, while the number of Hispanic respondents was lower in 1999 than from 2000-2006, it did not differ dramatically from 1998. Further investigation is needed to understand potential anomalies in the 1999 data.

We also acknowledge that while the nine-year time frame of our study offers important information on trends, 2006 was the last year that smoke-free workplace policies were included in the BRFSS. Therefore, we are unable to assess more recent overall SFWP coverage and/or changes in racial/ethnic disparities in coverage.

Because of the nature of the data collection, we acknowledge the possibility of cases where an employer has a smoke-free workplace policy but the respondent does not know it exists (and thus reports on the BRFSS that his or her company does not have such a policy). This may be particularly possible for non-smokers, for whom a policy would not require a lifestyle change and therefore who may be less likely to be aware of the existence of a policy. Such instances may underestimate the coverage by smoke-free workplace policies; however, it seems unlikely that this would be differentially associated with other variables in the study, like race or the health outcomes.

Moreover, in cases where a State- or local-level ordinance restricts smoking in the workplace (e.g. bans on smoking in restaurants or bars) may reduce the existence of workplace policies (because the employer assumes employees would extend the ordinance to the workplace setting). As a result, employees may under-report workplace policies despite being covered by a policy. However, findings of Moskowitz *et al.* (2000) that suggest local ordinances increase reporting of workplace policies and mitigate these concerns somewhat.

A related issue is race/ethnicity in relation to language. Most company policy information is conveyed to employees through the use of employee handbooks (Brock and Cabbell, 1989). In the case of Hispanic workers, a handbook printed in English may not be the most effective means of providing them with information. As a result, while the company may list a smoke-free workplace policy in their handbook, the employee may be unaware that the policy exists.

In considering the analyses of health, the cross-sectional nature of the data, preclude the causal conclusions concerning the relationship between smoke-free workplace policies and those outcomes. Longitudinal designs may assist in strengthening

conclusions drawn in this line of research. This is particularly important as longitudinal studies of this topic have occasionally found that SFWP are less effective in reducing smoking over the long-term, largely because of lack of enforcement (Biener and Nyman, 1999). An additional concern that is more easily captured in longitudinal studies is relapse, as a number of studies have found initial reductions in smoking for employees in smoke-free workplaces but with relapse (Hudzinski and Sirois, 1994; Longo *et al.*, 2001), perhaps due to increases in craving (Brigham *et al.*, 1994). That said, previous research that is longitudinal in nature has found significant effects for SFWP in reducing health concerns. Work by Sargent *et al.* (2004) and Allwright *et al.* (2005) suggest lower myocardial infarction and respiratory symptoms over time as a result of SFWP.

Conclusion

Despite its limitations, this study makes important contributions to the health management literature. Policies designed to protect or improve employee health have become important issues over the past few decades. This study reinforces that policies may have a meaningful impact on employee health; however, there is a need to carefully consider whether there are segments of the American population that are not as adequately protected as others. It is our hope that this study will spark further research from the academic community regarding the role that policies can play in improving the health of workers through health-related policies, including assessing the effectiveness of such policies.

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