Effects of work-family responsive policies and practices on smoking: a 6th-month follow-up examination of the Work, Family and Health Network Study

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Abstract

Objectives: The work of direct care workers in nursing homes has been characterized as stressful and challenging. Smoking is one of the behavioral pathways by which adverse work environments impact workers' health. We tested the impact of an intervention designed to decrease work-family conflict on smoking among nursing homes workers.

Methods: The Work, Family and Health Network (WFHN) study is a group randomized-field trial, where 1,524 direct-care workers in 30 nursing homes were assigned to either intervention or control (usual practice) conditions. We used general lineal mixed models to estimate the effect of the intervention on self-reported smoking cessation and intensity.

Results: At baseline, 30 percent of workers were smokers averaging 77 cigarettes per week. At six-month follow-up, smokers at intervention sites smoked fewer cigarettes per week compared with smokers at usual practices sites (b=-7.5, 95% CI -14.83, -0.22, $p<0.05$). However, we found no smoking cessation effects comparing intervention with usual practices sites (OR: 0.75, 95% CI 0.35, 1.57, $p>0.05$).

Conclusions: Although the WFHS intervention did not include specific tobacco cessation components, smoking intensity was reduced in the presence of organizational policies and practices that supported the integration of work and family roles.

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Cigarette smoking remains one of the leading causes of preventable deaths and illnesses. In the Unites States, about one in five working adults are regular smokers, for a national 2010 prevalence of 19.6 percent (1). Cigarette smoking is one of the behavioral pathways by which an adverse work environment affects health (2, 3), increasing workers' risk for chronic disease as well as organizational costs such as sickness absence or disability (4, 5).

Studying workplace determinants of smoking for direct-care workers, a rising employment sector that includes occupations like Registered Nurses (RNs), Licensed Practical Nurses (LPNs) and Certified Nursing Assistants (CNAs), is relevant because the prevalence nursing aids who smoke (23.7 percent) is higher than the national average for US working adults (1). A large number of CNAs (who comprise the majority of the direct-care workforce) lack college degrees, are from low-income communities, and a substantial proportion come from immigrant or racial/ethnic minorities (6, 7). CNAs perform the majority of patient-care duties (8), and are therefore exposed to several time-related demands at home and at the job (9-15). In addition, there are many CNAs who are young, single mothers, coping with both work and family responsibilities (15). Researchers posit that one of the ways that workers, such as nursing home workers, deal with the stress of their work environment is through smoking (16). Consequently, implementing and evaluating worksite interventions promoting health and well-being for vulnerable socioeconomic segments is a crucial step towards the promotion of occupational health and safety, and the reduction of occupational health disparities.

Work-family conflict, defined as incompatibility between occupational and family roles (17), is a frequent adverse psychosocial exposure for nursing home workers (11, 13,

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14, 18). Adverse time arrangements at work such as long hours and inflexible schedules are considered one of the precursors of work-family conflict (19-21), and smoking has been linked to work-time factors such as fast-paced work (22), prolonged work hours, non-regular or non-day shifts (23), insufficient or unavailable breaks (24), shift work (25), and low schedule flexibility (26). Flexible work schedules and other work-family strategies might reduce tobacco use, by decreasing time-related demands, increasing job control and discretion and by increasing the ability to reconcile work with family or personal roles.

Workers at nursing homes where managers are less supportive of work-family integration have higher risk for cardiovascular disease and less sleep relative to those with managers who are more supportive (9). Although, observational studies have shown associations between higher work-family conflict and lower flexibility with higher tobacco use (16, 27), it is unclear whether the introduction of work-family responsive organizational policies and practices would affect smoking cessation or reduction.

The aim of this study is to examine whether a workplace intervention introducing work-family responsive policies and practices produced effects on smoking cessation or intensity 6-months later. The current analyses are part of The Work Family and Health Network (WFHN) study (28, 29), a group-randomized field trial aimed at (*i*) increasing employee perceptions of supervisor and co-worker support for employees work and family/personal lives; (*ii*) increasing workers' control over work time, and (*iii*) reorienting the work culture towards results, rather than time on task. Although the intervention did not include specific components regarding tobacco control, most nursing

homes in New England are smoke-free worksites, prohibiting residents or workers from smoking on the premises (30, 31). We tested the following hypotheses:

1. Smokers employed at nursing homes randomly assigned to the intervention would have greater likelihood of quitting smoking, compared with smokers at control nursing homes.
2. Smokers at nursing homes who were randomly assigned to the intervention would reduce the number of cigarettes per week, compared with smokers at UP sites.
3. The effects on smoking cessation or intensity would be stronger among less skilled workers (CNAs vs. RNs or LPNs) and those with children at home.

Method

The facilities were recruited from partnership with a corporation in the extended-care industry, a New England company we refer to as "Leef." Details of the partnership and characteristics of the facilities and intervention designed has been published elsewhere (29, 32). Briefly, the corporation was identified after they responded to letters sent to several potential extended care companies with appropriate characteristics (e.g., large number of facilities with geographic proximity, and stability and willingness to participate and to donate work time for respondents' participation). The 30 facilities in the study were identified out of 56 facilities at Leef that met inclusion criteria. Facilities were excluded if they were in very isolated settings in which no comparable site could be randomized, if there were fewer than 30 direct patient-care employees, or if facilities had been acquired in the year prior to study initiation. Nursing homes facilities were

randomized into intervention and usual practice groups (15 each) through adaptive randomization that balanced condition assignment based on geography, employee retention rate, and number of employees per site. (29).

Employees eligible to participate in the study were those with direct-care responsibilities such as Registered Nurses (RNs), Licensed Practical Nurses (LPNs) or Certified Nursing Assistants (CNAs), working 24 hours or more per week. Regular night workers were excluded. Eligible participants provided informed written consent to complete a computer-assisted personal interview (CAPI) and received a $20 supermarket debit card as incentive for participation (Figure 1). At baseline, a total of 1,524 of 1,783 eligible workers completed the questionnaire (response rate 85 percent) (Figure 1). Baseline data collection occurred from September 2008 to May 2011. Follow-up assessments started on September 2010 and lasted until November 2011. This study was approved by appropriate Institutional Review Boards.

Outcome

Cigarette smoking was measured with questions from the National Health Interview Survey (NHIS), 2010 edition (33). Information was collected on *(i)* frequency of smoking (every day, some days and never), (*ii*) and intensity of smoking, i.e., the number of cigarettes per week. Smoking status at baseline and follow-up was defined with an indicator variable including those who reported not smoking or otherwise. Cessation was defined as those who reported smoking at baseline but not at follow-up. Smoking initiation was defined as those who reported not smoking at baseline but reported the contrary at follow-up.

Intervention

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The rationale, contents and delivery of the WFHN intervention can be found elsewhere (28, 29, 32). The intervention was delivered over a total period of four months per nursing home. Supervisors completed a computer-based training on family supportive supervisor behaviors and tracked their behaviors to provide performance support and support for families and personal lives. In addition, participatory sessions with employees and managers were conducted in order to discuss current organizational practices, to enhance control over work hours, and to reduce work-family conflict, without affecting delivery of resident care.

Covariates

Covariates were self-reported in the CAPI baseline assessment. Employees were asked about their gender (male or female). Marital status (married or living with partner) categorized as binary variable (yes/no). Race/ethnicity was categorized with a dichotomous variables (Non-Hispanic White vs. Others). US-born status was categorized with a dichotomous variable (yes/no). Information about presence of children under 18 years at home was coded as a binary variable (yes/no). Occupation was assessed by asking job titles, and coded as Registered Nurse or Licensed Practical Nurse (RN/LPN), Certified Nurse Assistant (CNA) and other, including administration. Regular shift was categorized with a binary variable for regular (day or evening) or non-regular (rotating or split shift). Second job status outside the company was dichotomized (yes/no), and we also measured years of tenure and total work hours per week.

Analysis plan

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We used an intent-to-treat approach to test the effect of the intervention on the outcomes, comparing six month changes in cigarette smoking between workers in facilities assigned to the intervention with those assigned to control facilities. We fitted several General Linear Mixed Models (GLMM), a statistical technique that models average changes (fixed effects) accounting for clustering by worksites and time of the observations (34). After describing the baseline variables by condition and smoking status, we tested the hypothesis that the intervention would increase the odds of smoking cessation, fitting a binomial model to test the hypothesis that baseline smokers randomly assigned to the intervention would have higher odds of quitting smoking at the 6^{th}- month follow-up, relative to smokers in the control group. We fitted random intercept linear models to examine the average difference in cigarettes per week of smokers in the intervention vs. control worksites. In addition, we fitted quintile regression models to assess the average changes in intensity by baseline quintiles of the smoking distribution, in order to test if the effect of the intervention would be different by levels of baseline tobacco consumption. To test the hypothesis that the intervention had a differential effect by socio-demographic and occupational variables, the previous models were examined introducing an interaction term comparing CNAs vs. RNs/LPNs and presence of children at home (yes vs. no). We conducted both crude and adjusted models, controlling for pre-randomization covariates. Analyses were two-tailed with a 0.05 level of significance. Analyses were conducted using SAS 9.3 (35).

Results

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Workers at intervention (n=725) or usual practice (n=799) nursing homes did not differ in any baseline socio-demographic or occupational characteristics (Table 1). The majority of workers were women (90 percent). Nearly two thirds (62 percent) of the sample was US-born Non-Hispanic White, and 57.6 percent reported presence of children at home. About 70 percent worked as CNAs.

Baseline prevalence of smokers (n=461; 30.2 percent) did not differ by condition. Likewise, smoking intensity was similar across conditions, with an average of 72 cigarettes or 3.6 packs per week (Table 1). By the 6th-month follow-up (n=1275), 121 participants had left the usual practice group, and 128 subjects had left the intervention group, with no statistically significant differences in attrition across conditions (n=249; 16.3 percent attrition rate). Although nearly half of the dropouts were baseline smokers (n=111; 44.5 percent), smokers in either condition were equally likely to drop from the study compared with non-smokers.

Intervention effects on smoking

Smokers at intervention worksites were equally likely to quit smoking, relative to smokers at control worksites (Adjusted Odds Ratio [OR]: 0.75, 95% CI 0.35, 1.57, p=0.5). However, we found a statistically significant effect of the intervention on smoking intensity (Figure 2). Those in the intervention group had a significant reduction in the number of cigarettes compared to the control group at six months (Table 2), and this effect did not change after controlling for race/ethnicity, second job and job title, (b=-7.5, 95% CI -14.83, -0.22, p<0.05). The WFHN intervention shifted the distribution of smoking consumption, reducing smoking intensity by 0.19 standard deviations.

We also examined non-linear reductions of smoking intensity. This analysis

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revealed that the reduction of smoking intensity occurred among smokers who were at the lowest (reduction of 12 cigarettes per week) and highest quintiles (reduction of 21 cigarettes per week) of the baseline smoking distribution (Table 3).

Subgroup analyses

At baseline, workers with children at the intervention or usual practice conditions had similar smoking rates and intensity, and the reduction after six months among this subgroup did not differ from the average reduction (b= 3.3, 95% CI -17.2, 10.6, p=0.7). At baseline, CNAs were more likely to be smokers, relative to RNs/LPNs, but we found no statistically significant interactive effect of the intervention by occupational status (b= -3.6, 95% CI -17, 10, p=0.7). Therefore, there was no evidence for additional reductions among the examined subgroups.

Discussion

We investigated whether a work-family responsive organizational intervention caused a reduction of smoking prevalence and intensity among nursing home workers. The WFHN intervention significantly reduced the intensity of cigarette smoking, with an effect size of 0.2 standard deviations. At baseline, smokers in both conditions consumed an average of 75 cigarettes (3.5 packs) per week. At the 6th-month follow-up, smokers in intervention nursing homes had an adjusted mean reduction of 8.3 cigarettes a week compared to smokers at usual practice worksites, for whom there were not changes in cigarette intensity. The reduction was stronger among smokers who at baseline were in the lowest and highest quartiles of the smoking distribution. However, we found no statistically significant effect on smoking prevalence. At follow-up, the prevalence of

smoking remained at 27.5 percent, with no significant changes relative to baseline. Cessation of smoking rates were similar across conditions (12 percent).

Even though the WFHN study was a comprehensive and multilevel intervention, it did not have specific smoking cessation components, which could explain the lack of effects on smoking cessation or prevalence. Organizational or workplace interventions that have had successful effects on smoking cessation included specific anti-smoking components, for example nicotine replacement options, group therapy or individual counseling (36), or have been comprehensive efforts to reduce adverse occupational exposures that interact with smoking (37, 38).

Nevertheless, these results highlight the fact that smoking intensity is related to workplace factors and that it can be modified with family-responsive organizational policies and practices (39). Work-family responsive policies and practices can alleviate work-related factors that have been associated with smoking, possibly by decreasing time-related demands, increasing job control and discretion and by increasing the ability to reconcile work with family or personal roles. This claim is consistent with several systematic reviews that established a positive association between tobacco consumption and higher job demands (e.g. fast-paced, prolonged durations and non-standard or regular hours), lower resources (e.g. low control and predictability of the job), and lower of social support at work (4, 40). Likewise, quasi-experimental worksite interventions have shown that organizations that have promoted work-family balance have experienced better health outcomes like psychological distress (41), self-reported general health (20) and somatic complains (42). Since only longitudinal observation studies have examined

associations with smoking (27, 43), therefore this study addressed a research gap by adding experimental evidence for this specific outcome.

Despite the reduction of smoking intensity, smokers at interventions worksites still consumed a large quantity of tobacco (67 cigarettes or 3.2 packs per week), which would increase risk of chronic disease. Prospective studies have documented higher mortality risk with 1-4 cigarettes a day (7-28 per week) in men and women (44), as well as a dose-response risk for smoking-related, all-cause mortality (45). Integrating tobacco control messages as part of occupational health, safety and wellness strategies are probably necessary to reduce smoking rates.

We also hypothesized that the effect of the WFHN intervention on smoking intensity would be stronger among workers who reported presence of children in the household or among less-skilled workers like CNAs. Although smokers of these subgroups at interventions sites smoked fewer cigarettes per week than smokers at usual practice sites, we found no evidence of additional reductions among these subgroups. Work-family organizational factors have been particularly salient among direct-care workers with parental responsibilities (11, 14). The reduction on smoking intensity among this subgroup (60 percent of the total sample) was similar to the average intervention effect among smokers. Finally, we also hypothesized the intervention would be more beneficial for Certified Nursing Assistants (CNAs). Nationwide, the smoking prevalence in nursing aides is higher than for the general working adult population, and the rate in our sample was also higher than the national for this occupation. In our sample, tobacco consumption was also concentrated in CNAs, independent of their race/ethnicity, though consistent with other studies, tobacco consumption was lower

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among immigrants, and in our sample, the majority of smokers were US-born Non-Hispanic White (46).

Study limitations

Although cluster-randomized, controlled trials are very strong study designs to evaluate community-level interventions (47, 48), our study has limitations that may affect its internal, statistical or external validity (49). Attrition is the main threat to validity in this study. The 16.3 percent attrition rate at the 6th-month follow-up is a concern for statistical validity, given the loss of sample size, but it is not a threat for internal validity because we found no differences in attrition according to pre-randomization characteristics, including smoking status or study condition. Moreover, the intervention was not differentially administered by smoking status or any other health or social features, ruling out potential sampling or selection-into-study biases that explain the bigger effects in the highest and lowest quintiles of smoking intensity.

Sample size and power calculations were carried out considering other psychosocial and health outcomes and not tobacco consumption, therefore our study may have been underpowered to detect changes in smoking behaviors, as reflected in the wide confidence intervals of the point estimates. Although we used a valid, reliable and widely used measure of cigarette consumption (NHIS), we cannot rule out presence of misclassification of exposure, as self-reported number of cigarettes per week may underestimate measures of actual smoking intensity, such as serum cotinine levels (50), especially in a racially diverse sample (51). Finally, cessation was defined as reporting not smoking at follow-up but reporting the opposite at baseline. However, a review of cessation measures recommends including specific cessation questions at baseline and

follow-up assessments, e.g. intention to quit, abstinence during the last 7 days (52). The response rate of 85 percent minimizes the possibility of sampling bias, and the findings could be generalized to others workers not included in the sample and potentially to other direct-care workers in New England because most sites have similar staffing and quality-of-care profiles relative to other nursing homes of their respective states.

Conclusions

This study adds experimental evidence on how family responsive organizational policies and practices causally impact smoking intensity in a low socioeconomic status population like nursing aides. Smokers employed at nursing homes randomly assigned to the intervention significantly reduced their smoking intensity relative to smokers employed in control worksites (average effect size of 0.2 SD), with greater effect in the lowest and highest quintiles of the smoking distribution. However, without specific smoking cessation components, organizational changes or statewide policies alone may not produce effects on smoking cessation. Our results are relevant for the long-term care industry, and other small businesses where insufficient or unavailable family-responsive policies (e.g., flexible schedules) are common (53), or that employ workers from low socioeconomic status backgrounds (15, 54).

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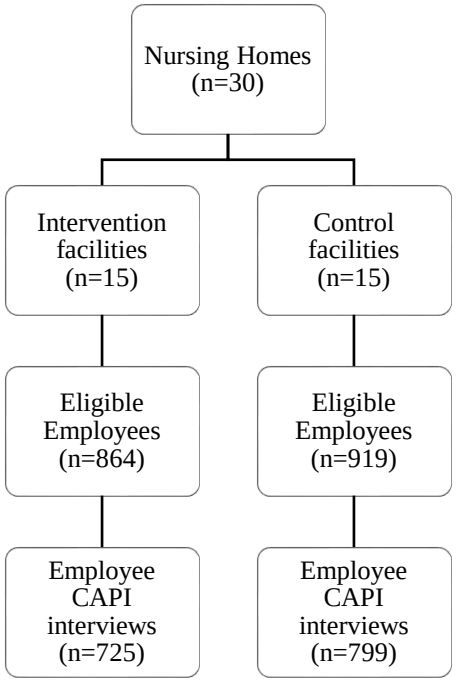

Figure 1. Baseline recruitment and participation of the WFHS

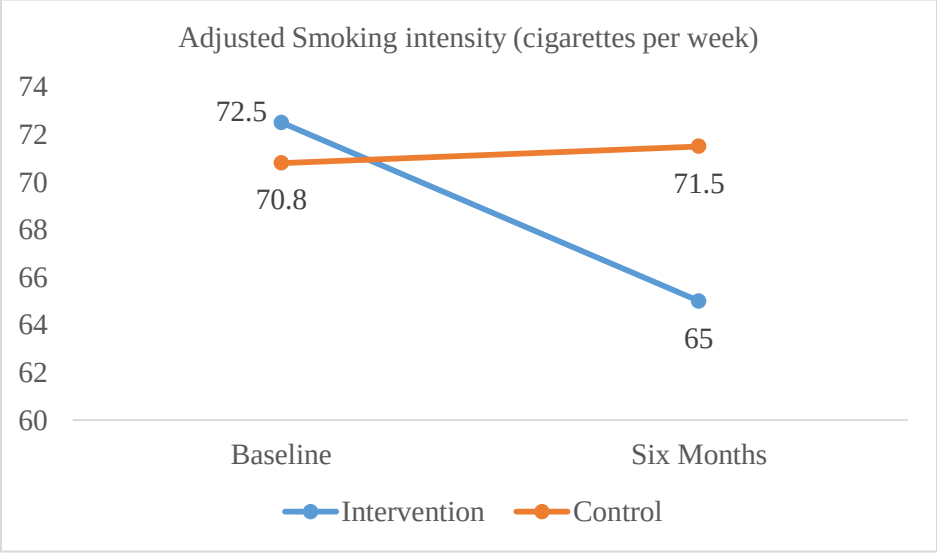

Figure 2. Average smoking intensity (cigarettes per week) between intervention and control sites, adjusted by race/ethnicity, second job and job title.

Table 1. Baseline distribution of the WFHS (n=1,524).

		Control Nursing Homes (n=15)				Intervention Nursing Homes (n=15)			
		Sample (n=799)		Smokers (31.4%; n=251)		Sample (n=725)		Smokers (28.9%; n=210)	
		n	%	n	%	n	%	n	%
Age (yr)	*(M, SD)*	*39.0*	*12.3*	*40.2*	*12.5*	*37.9*	*12.6*	*38.5*	*11.8*
Sex	Female	725	90.7	232	32.0	674	92.9	200	29.7
	Male	74	9.3	19	25.7	51	7.1	10	20.0
Race/ethnicity	Non-Hispanic White	526	65.8	205	38.9	488	36.5	178	36.5
	Non-Hispanic Black	100	12.5	10	10.0	104	14.4	10	9.6
	Non-Hispanic Other Race	59	7.4	18	30.5	47	7.4	9	19.15
	Hispanic*	118	14.7	20	16.9	84	11.6	13	15.5
Nativity	US-born	586	73.3	232	39.4	536	73.9	196	36.6
	Other	213	26.6	19	9.8	189	26.0	14	7.5
Marital Status	Married or living with partner	518	64.8	157	30.3	440	60.9	126	28.7
	Other	247	35.1	94	33.4	254	38.7	125	29.6
Children in household (0-18 years)	Yes	460	57.6	99	33.0	388	53.5	116	29.9
	No	339	42.4	152	29.2	337	46.4	94	27.9

Job Title	Registered Nurses (RNs)	81	10.1	19	23.4	78	10.8	20	25.6
	Licensed Practical Nurses (LPNs)	138	17.3	40	28.9	131	18.1	32	24.4
	Certified Nursing Assistants (CNAs)	558	69.8	184	32.9	498	68.7	151	30.4
Second Job	Yes	150	18.7	36	24	130	17.9	28	21.5
	No	649	81.2	215	33.1	595	82.7	182	30.6
Shift	Regular Day	398	49.8	132	33.1	370	51.1	115	31.1
	Regular Evening	273	34.2	75	27.5	244	33.6	69	28.3
	Non-regular	128	16.6	44	34.3	111	15.3	26	23.4
Tenure (years)	*(M, SD)*	*6.1*	*6.7*	*5.03*	*5.4*	*5.7*	*6.3*	*4.9*	*5.3*
Work Hours	*(M, SD)*	*37.3*	*7.6*	*37.6*	*6.9*	*36.4*	*6.7*	*36.6*	*6.4*

[*]Difference between control and intervention sites $p<0.05$.

Table 2. Unadjusted effect of the WFHS intervention on smoking intensity.

	β	SE	95 % CI	
Fixed Effects				
Intercept	72.9**	3.6	65.6	80.3
Intervention	3.3	5.3	-7.5	14.1
Follow-up	0.6	2.17	-3.6	5.3
Intervention*Follow-up	-7.7*	3.4	-13.9	-0.4
Random Effects				
Intercept	6.22	20.3	-	-
Cov. individuals and sites	1703.5**	135.6	-	-
Residual	454.3**	35.8	-	-

* $p<0.05$; ** $p<0.001$.

Table 3. Adjusted follow-up differences in smoking intensity presented by quintiles of smoking intensity at baseline.

		β[†]	SE	95 % CI	
	Quintile I				
Intercept		42	9.5	23.3	60.6
Intervention		-12[*]	6.5	-24.7	0.7
	Quintile II				
Intercept		70	6.3	57.6	82.4
Intervention		0	3.2	-6.3	6.3
	Quintile III				
Intercept		70	5.6	59.2	80.8
Intervention		0	3.9	-7.7	7.7
	Quintile IV				
Intercept		126	19.9	86.7	165.2
Intervention		-21[*]	12.7	-45.9	3.9

[†]Adjusted by race/ethnicity, second job and job title; [*] $p<0.01$.