Research Article

Smoking and Smoking Increase in Caregivers of Alzheimer's Patients

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Abstract

Purpose of the Study: The relationship between stress and smoking has been established, but there is little research on the effects of stress and coping on smoking in caregivers of Alzheimer's disease patients. This study examines how caregiver stressors and coping resources explain smoking status and recent smoking increase.

Design and Methods: Data were obtained from the Resources for Enhancing Alzheimer's Caregivers Health (REACH II) study. Analyses identified differences between caregiver smokers and nonsmokers and between caregiver smokers who reported a recent smoking increase and those who did not. Variables that were significantly different between the groups were examined in two logistic regression analyses to explain smoking status and smoking increase.

Results: Of 642 caregivers, nearly 40% reported smoking and 25% of smokers reported recent increase in smoking. Younger caregivers were more likely to report smoking. Explanatory variables for smoking increase were being Caucasian or African-American, higher depression scores, and less caregiving skills.

Implications: This study demonstrates that smoking among caregivers is a valid public health concern. Further investigation of ways that explanatory variables affect smoking status and increase in caregivers, and incorporation of smoking cessation strategies that address depression and low caregiving skills, seem warranted in future caregiver interventions.

Key Words: Stressors, Burden, Depression, Caregiving skills, Social support

Smoking is a major cause of morbidity and mortality in the United States and is associated with increased cardiovascular disease (Centers for Disease Control and Prevention [CDC], 2010). Smoking in caregivers of Alzheimer's and dementia patients has not been widely investigated. However, limited evidence suggests that at least 15% to 20% of caregivers smoke (Crawford, DeFries, Brumback, & Andresen, 2009; DeFries & Andresen, 2010; Zhou, Xu, & Zhao, 2007). Another study found that 16.5% of caregivers smoked relative to 12.8% of noncaregivers, and seriously distressed caregivers were 208% more likely to smoke compared to caregivers with low distress (Hoffman & Mendez-Luck, 2011). Also, caregivers who smoke are more likely to experience cardiovascular disease than caregivers who do not smoke (Mausbach, Patterson, Rabinowitz, Grant, & Schulz, 2007).

Previous studies have demonstrated important disparities between caregivers and noncaregivers. Caregivers experience worse cardiovascular health (von Känel et al., 2008), depression, burden, less social support, and less coping resources than noncaregivers (Vitaliano et al., 2002). Moreover, caregivers experience deficits in health behaviors (Rabinowitz, Hartlaub, Saenz, Thompson, & Gallagher-Thompson, 2010), and report an increase in smoking upon assuming a caregiving role (Connell, 1994).

Stress and Coping in Caregiving

Caregiving stress may be understood through an appropriate stress-health process model (e.g., Lazarus & Launier, 1978). Caregivers experience stress if they perceive that the demands placed on them are greater than the resources available to them and their capacity to manage those demands (Cohen, Kessler, & Gordon, 1995). Caregiving stressors can impact health and health behaviors, such as smoking (Gallant & Connell, 1998). Caregiving stress has been associated with caregiver mental and physical health problems (Haley, LaMonde, Han, Burton, & Schonwetter, 2003; Mausbach et al., 2007), which have been reported by 56% of caregivers in previous research (Schulz et al., 1997). These problems can include depression, anxiety, sleep disturbance, and increased hospitalization and mortality (Mahoney, Regan, Katona, & Livingston, 2005). Although responses are individualized (Belle et al., 2006), one of the major situational demands for dementia caregivers, and a major component of stress, is managing patient behaviors and activities of daily living and instrumental activities of daily living (i.e., ADLs and IADLs).

Although varying theoretical frameworks to categorize coping strategies exist (Powers, Gallagher-Thompson, & Kraemer, 2002), the Lazarus and Launier (1978) stress model expands the concept of managing demands to focus on actions that caregivers can take to cope with stressors: both intrapersonal efforts to manage cognitive and emotional responses to situational demands and action-oriented management of environmental demands (Folkman,

Lazarus, Gruen, & DeLongis, 1986). Emotion-focused resources regulate emotional reactions to stress (Lazarus, 1985) through spiritual or social support seeking (Folkman et al., 1986) and reframing caregiving demands that cannot be changed to a positive construction. For example, caregivers who perceive more benefits from caregiving (i.e., positive aspects of caregiving) report lower levels of depression (Haley et al., 2003). Spiritual and religious coping has been related to increased well-being (Lopez, Romero-Moreno, Marquez-González, & Losada, 2012), less cumulative health risk (Rabinowitz et al., 2010), and less depressive symptoms (Gilliam & Steffen, 2006) among caregivers. Similarly, social support has been related to positive mental and physical health (Au et al., 2009; Rabinowitz et al., 2010) and to decreases in stress over time (Lee, Czaja, & Schulz, 2010). In addition, increased social support is related to less depression (Trouillet, Gana, Lourel, & Fort, 2009).

Active coping resources are used to alter or plan a solution for a stressful situation (Lazarus, 1985). Effective action-oriented coping depends in part on information and skills directed toward diminishing, tolerating, or mastering situational demands. Active coping resources, such as high self-efficacy and the perceived ability to perform actions that lead to a goal (Bandura, 1999), have been related to less stress, better health, and fewer health-compromising behaviors (Gallagher et al., 2011; Rabinowitz, Mausbach, Thompson, & Gallagher-Thompson, 2007).

Stress and Coping in Relation to Smoking

Smoking is an important health behavior that has been associated with stress and coping. Stressors and coping resources are similar to those related to caregiver stress. Previous research suggests that stress is related to increased smoking (Sun, Buys, Stewart, & Shum, 2011), and some individuals smoke to cope with stress (McEwen, West, & McRobbie, 2008). Lack of coping resources, such as less social support, is related to smoking (Holm, LaChance, Bowler, Make, & Wamboldt, 2010). Conversely, religious coping reduces the likelihood of smoking (Horton & Loukas, 2012). Active coping resources, such as exercise or self-efficacy, are protective against smoking (McMahon & Jason, 1998; Sun et al., 2011).

Relationships between stress and caregiving and between stress and smoking have been established. However, there is little research on stress and coping and caregiver smoking. This secondary data analysis examined how stressors and coping resources explain smoking status and recent smoking increase in caregivers. We hypothesized that caregivers who *smoke* would score higher on stress variables and lower on measures of coping resources than caregivers who do not smoke. Similarly, we hypothesized that caregivers who reported a recent *smoking increase* would have higher scores on stressors and lower scores on coping resources than smokers who did not report smoking increase. Also, we hypothesized that higher levels of stressors and lower

levels of coping resources would explain smoking status and recent smoking increase in logistic regression analyses.

Design and Methods

Participants

Baseline data from 642 caregivers in the Resources for Enhancing Alzheimer's Caregivers Health (REACH II) study (Belle et al., 2006) were analyzed. REACH II, a randomized clinical trial funded by the National Institute of Aging and the National Institute of Nursing Research, was conducted from 2002 to 2004 in Birmingham, Memphis, Miami, Palo Alto, and Philadelphia. Sites obtained approval from their Institutional Review Boards. Full and complete methodology for the REACH II RCT has been published elsewhere (see Belle et al., 2006). Staff identified potential participants at each site, screened participants through a telephone call, and scheduled a home interview with caregivers who met inclusion criteria and were interested in participating. All caregivers in the study provided informed consent to participate.

Inclusion criteria were being 21 years of age or older, living with the care recipient, providing at least 4 hr per day of care for the past 6 months, and reporting caregiving distress. Exclusion criteria were being enrolled in any other study, having an illness or disability that would prevent participation in REACH II, or planning care recipient institutionalization within 6 months. Care recipients had a diagnosis of Alzheimer's disease or related dementia or had a Mini-Mental State Examination score less than 24 and at least one limitation in Activities of Daily Living or two in Instrumental Activities of Daily Living.

Data Collection and Measures

A standardized approach was used with substantial training of research specialists, each of whom had at least a bachelor's degree. Cross-site certification of staff was necessary before data could be collected. Staff directly assessed care recipient cognitive functioning. All other data was obtained through caregiver self-report. Instruments used in REACH II investigations were used for analyses (e.g., Belle et al., 2006; Nichols et al., 2008). Measures of caregiver stressors and coping resources were selected based on the conceptual framework of the stress-health process model. Cronbach's α was estimated for continuous measures.

Dependent Variables

Smoking status and smoking increase were examined with one question asking about increases in smoking in the past month. Response options included *no*, *yes*, or *not applicable*. Smoking status was coded as "smoker" if caregivers answered *no* or *yes* to changes in smoking and as "non-smoker" if caregivers answered *not applicable*. Within caregiver smokers, smoking increase was coded as "no

smoking increase" if caregivers answered *no* and as "smoking increase" if caregivers answered *yes*.

Characteristics

Demographic information included age, sex, race and ethnicity, employment status, education, and care recipient age and sex. Other characteristics included the number of years providing care and relationship to the care recipient (i.e., spouse, child, and other).

Caregiver-related Stressors

Financial stress was assessed with one item that asked how difficult it was for respondents to pay for basic needs such as goods, housing, medical care, and heating. Response options ranged from 0 (*not difficult at all*) to 3 (*very difficult*). Caregiver health, another potential stressor, was assessed with one item from the Medical Outcomes Study 36-Item survey (Ware et al., 1995) asking about general health. Response options include *poor* (1), *fair* (2), *good* (3), *very good* (4), and *excellent* (5).

The short Zarit Burden Interview (Bédard et al., 2001) was used to measure overall caregiver stress. This measure consists of 12 items with an item scale ranging from 0 (*never*) to 4 (*nearly always*). Total scores range from 0 to 48, where higher scores denote higher levels of caregiving burden (Cronbach's $\alpha = .87$).

The Center for Epidemiologic Studies-Depression Scale (CES-D; Irwin, Artin, & Oxman, 1999; Radloff, 1977) was used to measure psychological stress. The CES-D consists of 10 items measured on a scale ranging from 0 (*rarely or none of the time*) to 3 (*most or almost all of the time*). Total scores range from 0 to 30, with higher scores denoting more depressive symptoms (Cronbach's $\alpha = .82$). A score of four or above indicates major depression (Irwin et al., 1999).

Caregiver-related Coping Resources

The positive aspects of caregiving scale (Tarlow et al., 2004) contains 9 items rated from 0 (*disagree a lot*) to 4 (*agree a lot*). Total scores range from 0 to 36, where higher scores denote more positive feelings toward caregiving (Cronbach's $\alpha = .90$).

Social support was measured with questions from instruments utilized in previous research (Barrera, Sandler, & Ramsay, 1981; Krause, 1995; Krause & Markides, 1990; Lubben, 1988). This instrument includes 10 items that focus on four areas. The *first area*, received support, includes three items scored on a scale ranging from 0 (*never*) to 3 (*very often*). Area scores range from 0 to 9, where higher scores denote higher levels of social support (Cronbach's $\alpha = .66$). The *second area*, satisfaction with support, includes three items scored from 0 (*not at all satisfied*) to 3 (*very satisfied*). Area scores range from 0 to 9, where higher scores denote more satisfaction (Cronbach's $\alpha = .76$). The *third area*, social network, contains two items scored using a scale with response options *none* (0), *one* (1), *two* (2), *three or four* (3), *five to eight* (4), and *nine*

or more (5). Area scores range from 0 to 10, where higher scores denote larger social networks (Cronbach's $\alpha = .69$). The *fourth area*, negative interactions, contains four items scored on a scale ranging from 0 (*never*) to 3 (*very often*). Area scores range from 0 to 12, where higher scores denote more negative interactions (Cronbach's $\alpha = .76$). Items from *negative interactions* were reverse coded and summed with the scores of *received support* and *satisfaction* to calculate the total score for this instrument. Items from *social network* were excluded from the total score because this area reflected the size of the network, but did not reflect the quality of support. Also, social support excluded social network in accordance with the original study (c.f., Belle et al., 2006). Total scores range from 0 to 30 with higher scores denoting more social support (Cronbach's $\alpha = .77$).

Religious and spiritual coping was measured with the Brief RCOPE (Pargament, Koenig, & Perez, 2000). A six-item version was used for this study (c.f., Lee et al., 2010). Items are scored on a scale ranging from 0 (*a great deal*) to 3 (*not at all*). Total scores range from 0 to 18, with higher scores denoting *less* religious or spiritual coping (Cronbach's $\alpha = .75$).

Self-efficacy was assessed with eight items that measure how stressful caregivers perceive several activities (e.g., cleaning, helping the care recipient with tasks). This cluster of items was named "Caregiving Skills" in the questionnaire. Response options include *never* (0), *sometimes* (1), and *often* (2). Total scores range from 0 to 16. Because more stress in performing caregiving activities would reflect less ability to perform those tasks, higher scores denote *low* levels of self-efficacy and caregiving skills (Cronbach's $\alpha = .66$).

Care Recipient-related Stressors

Stressors related to care recipients' health, cognitive functioning, and daily functioning were assessed with instruments commonly used in caregiving research. First, care recipient physical health was measured using the same question used for caregiver health, asking the caregiver to rate the physical health (not related to memory or confusion) of the care recipient. Response options range from 1 (*poor*) to 5 (*excellent*).

Second, the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) contains 11 items that directly assessed the care recipient's cognitive functioning in regard to orientation to time and place, recall ability, short-term memory, and arithmetic ability. Total scores range from 0 to 30 with higher scores denoting better cognitive functioning (Cronbach's $\alpha = .84$). A score of 23 or less denotes cognitive impairment (Lopez, Charter, Mostafavi, Nibut, & Smith, 2005).

Third, two measures were included to assess daily function of care recipients. First, the index of Activities of Daily Living (ADL; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963) examines the care recipient's need for help with tasks such as bathing, toileting, and grooming. This instrument

includes six items answered as *no* or *yes*. Total scores range from 0 to 6 with higher scores denoting more functional impairment (Cronbach's $\alpha = .85$). Second, the Instrumental Activities of Daily Living scale (IADL; Lawton & Brody, 1969) assesses the need for caregiver assistance with tasks such as using the telephone, grocery shopping, and house-keeping. IADL consists of eight items answered as *no* or *yes*. Total scores range from 0 to 8 with higher scores denoting higher levels of care recipient impairment (Cronbach's $\alpha = .78$).

The Revised Memory and Behavior Problem Checklist (Teri et al., 1992) contains 24 items that assess care recipients' problems with memory such as trouble remembering recent events, forgetting what day it is, difficulty concentrating on a task, and behavioral problems such as destroying property, waking up family members at night, and talking loudly. Items are answered on a scale ranging from 0 (*not in the past week*) to 3 (*daily or more often*). Total scores range from 0 to 72, with higher scores denoting a greater frequency of problematic behaviors (Cronbach's $\alpha = .81$).

Data Analyses

The variable "years as caregiver" was not normally distributed and a natural logarithmic transformation was performed before analyses. Due to the differences in item scales for social support, standardized scores of the four areas and the full instrument were calculated, but results were similar to those using raw scores. Therefore, raw scores are presented for this study.

Chi-square and *t* tests were used to identify differences between caregiver smokers and non-smokers and, among smokers, differences between smoking increase and no smoking increase. Variables that were significantly different between smokers and nonsmokers and between increasers and nonincreasers were used as explanatory variables for smoking status and smoking increase in logistic regression models.

Effect sizes, Cramer's *V* for categorical variables and Cohen's *d* for continuous variables, were calculated for significant differences between smokers and nonsmokers and between increasers and nonincreasers. Weak effect sizes of Cramer's *V* range from .10 to .19 and moderate effect sizes range from .20 to .39 (Rea & Parker, 2012). Small Cohen's *d* values range from .20 to .49 and medium values range from .50 to .79 (Cohen, 1992).

Results

Caregiver and Care Recipient Characteristics

The mean age of caregivers was 60.6 years ($SD = 13.3$). Caregivers rated their health as good ($M = 2.1$, $SD = 1.1$). Nearly 40% of caregivers reported smoking in the past month. Approximately 83% of caregivers were women, 58% had received education beyond high school, 37% were retired and 24% were employed

full-time, 48% were adult children, and 42% were spouses of the care recipient. This study included similar proportions of Hispanics (33%), Caucasians (34%), and African-Americans (33%). Caregivers reported low depression ($M = 10.0$, $SD = 6.5$) and burden ($M = 18.8$, $SD = 9.8$), but considerable financial stress ($M = 1.4$, $SD = 1.0$). Caregivers reported positive caregiving attitudes ($M = 25.5$, $SD = 9.0$), high caregiving skills scores ($M = 5.9$, $SD = 2.9$), high religious and spiritual coping scores ($M = 3.3$, $SD = 3.6$), and moderate social support scores ($M = 17.6$, $SD = 5.7$).

Nearly 58% of care recipients were women. Mean care recipient age was 79.0 years ($SD = 9.3$). Caregivers reported good care recipient health ($M = 2.5$, $SD = 1.1$) and some impairment in ADL scores ($M = 3.4$, $SD = 2.0$) and IADL scores ($M = 6.6$, $SD = 1.9$). Care recipients demonstrated low MMSE scores ($M = 12.5$, $SD = 7.4$).

Differences in Smoking Status

Demographic differences were found between smoker and nonsmoker caregivers. Tables 1 and 2 show chi-square and *t*-test results, respectively. Post hoc tests with Bonferroni corrections were conducted for variables with more than two categories. Caregivers who smoke were more likely to be Hispanic or African-American (Cramer's $V = .10$),

employed full-time (Cramer's $V = .18$), a child of the care recipient (Cramer's $V = .14$), and younger ($d = .45$) relative to caregivers who did not smoke.

To test our first hypothesis, we assessed differences in stressors and coping resources between caregivers who smoke and those who did not (see Table 2). Caregivers who smoke reported more financial stress ($d = .25$), higher burden ($d = .25$), more depressive symptoms ($d = .29$), lower levels of caregiving skills ($d = .17$), and lower levels of social support ($d = .23$) relative to nonsmoking caregivers. Social support areas were further analyzed and caregivers who smoke reported smaller social networks ($d = .24$) and higher levels of negative interactions ($d = .29$) relative to nonsmoker caregivers.

Differences in Smoking Increase

Some smokers reported an increase in smoking in the past 30 days ($n = 63$, 10% of the total sample, 25% of smokers). Post hoc tests with Bonferroni corrections were conducted for variables with more than two categories. Caregivers who reported smoking increase were more likely to be Caucasian or African-American (Cramer's $V = .25$), unemployed (Cramer's $V = .24$), and younger ($d = .33$) than smoker caregivers who did not report a smoking increase (see Tables 3 and 4).

Table 1. Categorical Variable Comparisons Between Smoker and Nonsmoker Caregivers

Categorical variable	Total ($N = 642$)		Smoker ($n = 252$)		Nonsmoker ($n = 390$)		χ^2	<i>df</i>	<i>p</i> -Value
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%			
Caregiver sex							1.76	1	.185
Male	110	17	37	15	73	19			
Female	532	83	215	85	317	81			
Caregiver race and ethnicity							6.57	2	.037
Hispanic	212	33	92	37	120	31			
Caucasian	219	34	71	28	148	38			
African-American	211	33	89	35	122	31			
Caregiver employment status							21.00	4	<.001
Full-time employment	152	24	72	29	80	21			
Part-time employment	53	8	17	7	36	9			
Homemaker	130	20	59	23	71	18			
Retired	237	37	69	27	168	43			
Unemployed	70	11	35	14	35	9			
Caregiver education beyond high school							3.62	1	.057
No	271	42	118	47	153	39			
Yes	371	58	134	53	237	61			
Relationship to recipient							12.87	2	.002
Spouse	272	42	85	34	187	48			
Child	307	48	137	54	170	44			
Other	63	10	30	12	33	8			
Care recipient sex							0.84	1	.360
Male	269	42	100	40	169	43			
Female	373	58	152	60	221	57			

Table 2. Continuous Variable Comparisons Between Smoker and Nonsmoker Caregivers

Continuous Variable	Smoker (<i>n</i> = 252)		Nonsmoker (<i>n</i> = 390)		<i>t</i>	<i>df</i>	<i>p</i> -Value	95% CI of the difference	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)				<i>LL</i>	<i>UL</i>
Demographics									
Caregiver age	57.02	(12.73)	62.84	(13.25)	5.52	640	<.001	3.75	7.89
Recipient age	78.75	(9.55)	79.17	(9.06)	0.55	640	.582	-1.06	1.88
Years as caregiver ^a	5.60	(8.53)	4.49	(6.08)	0.01	633	.992	-0.06	0.06
Caregiver-related stressors									
Caregiver health	2.78	(1.08)	2.93	(1.07)	1.75	640	.081	-0.02	0.32
Pay for basic needs	1.54	(1.00)	1.29	(1.03)	-2.97	637	.003	-0.41	-0.08
Burden	20.27	(10.46)	17.79	(9.31)	-3.07	490.8	.002	-4.07	-0.89
CES-D	11.10	(6.64)	9.27	(6.24)	-3.54	638	<.001	-2.85	-0.82
Caregiver-related coping resources									
Positive aspects of caregiving	25.77	(9.11)	25.28	(8.88)	-0.68	640	.498	-1.91	0.93
Caregiving skills	6.17	(3.16)	5.68	(2.67)	-2.03	470.9	.043	-0.96	-0.02
Religious/spiritual coping	3.51	(3.69)	3.18	(3.50)	-1.14	640	.254	-0.90	0.24
Social support	16.82	(5.72)	18.11	(5.57)	2.84	637	.005	0.40	2.19
Received support	3.36	(2.16)	3.51	(2.26)	0.82	640	.411	-0.21	0.50
Satisfaction	4.75	(2.75)	5.04	(2.81)	1.33	637	.185	-0.14	0.74
Social network	6.04	(2.36)	6.59	(2.27)	2.99	640	.003	0.19	0.92
Negative interactions	3.31	(2.94)	2.53	(2.56)	-3.49	482.7	.001	-1.23	-0.34
Care recipient-related stressors									
Recipient health	2.46	(1.03)	2.44	(1.11)	-0.22	640	.825	-0.19	0.15
MMSE	12.14	(7.27)	12.70	(7.43)	0.94	640	.346	-0.61	1.73
IADL	6.59	(1.79)	6.56	(1.94)	-0.19	640	.850	-0.33	0.27
ADL	3.47	(2.04)	3.36	(2.03)	-0.67	640	.501	-0.43	0.21
Behavioral problems	22.99	(10.45)	22.29	(9.93)	-0.86	640	.389	-2.32	0.90

Notes: CI = confidence interval; LL = lower level; UL = upper level; CES-D = Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; IADL = instrumental activities of daily living; ADL = activities of daily living.

^aFor ease of interpretation, means and standard deviation of caregiving years are reported in original units, whereas *t*-test statistics and *p*-values of the logarithmic transformation of the variable are reported.

To test our second hypothesis, we assessed differences in stressors and coping resources between smokers who reported a recent smoking increase and those who did not (see Table 4). Caregivers who reported smoking increase experienced more burden ($d = .41$) and depression ($d = .52$) and reported lower scores in caregiving skills ($d = .59$) and social support ($d = .31$) than caregivers with no smoking increase. Specifically, smoking increasers reported more negative interactions ($d = .33$) relative to nonincreasers.

Explanatory Variables of Smoking Status and Smoking Increase

To test the third hypothesis, variables that were different between caregivers who smoke and non-smoking caregivers were entered into a logistic regression model to explain smoking status (see Table 5). The model was significant ($p < .001$) and explained 11% of the variance (Nagelkerke $R^2 = .11$). Only age explained smoking status, where younger caregivers were more likely to be smokers.

A second logistic regression was performed to investigate explanatory variables of recent smoking increase

(see Table 6). The model was significant ($p < .001$) and explained 28% of the variance (Nagelkerke $R^2 = .28$). This model demonstrated that Caucasians and African-Americans, higher depression, and lower caregiving skills were more likely to explain smoking increase.

Discussion

Approximately 39% of caregivers reported smoking, which is considerably higher than the 22% smoking rate in the general population (Substance Abuse and Mental Health Services Administration [SAMHSA], 2012) and smoking rates in representative samples of caregivers (15%–20%; Crawford et al., 2009; DeFries & Andresen, 2010). Also, 25% of caregivers who smoke reported an increase in smoking in the past 30 days. Therefore, inclusion of smoking questions in future caregiver research seems warranted.

Differences between smokers and nonsmokers were similar to differences between increasers and nonincreasers. Age, ethnicity, and employment were related to smoking status and smoking increase in bivariate analyses. Both smokers and increasers were more likely to be younger

Table 3. Categorical Variable Comparisons Between Increaser and Nonincreaser Caregivers

Categorical variable	Total (N = 252)		Smoking increase (n = 63)		No smoking increase (n = 189)		χ^2	df	p-Value
	n	%	n	%	n	%			
Caregiver sex							2.38	1	.123
Male	37	15	13	21	24	13			
Female	215	86	50	79	165	87			
Caregiver race and ethnicity							15.74	2	<.001
Hispanic	92	37	10	16	82	43			
Caucasian	71	28	22	35	49	26			
African-American	89	35	31	49	58	31			
Caregiver employment status							14.23	4	.007
Full-time employment	72	29	19	30	53	28			
Part-time employment	17	7	3	5	14	7			
Homemaker	59	23	13	21	46	24			
Retired	69	27	11	17	58	31			
Unemployed	35	14	17	27	18	10			
Caregiver education beyond high school							1.04	1	.308
No	118	47	26	41	92	49			
Yes	134	53	37	59	97	51			
Relationship to recipient							4.92	2	.085
Spouse	85	34	15	24	70	37			
Child	137	54	37	59	100	53			
Other	30	12	11	17	19	10			
Care recipient sex							3.18	1	.074
Male	100	40	19	30	81	43			
Female	152	60	44	70	108	57			

than nonsmokers and nonincreasers, respectively. Smokers were more likely to be employed full-time than nonsmokers, whereas increasers were more likely to be unemployed than nonincreasers. Also, smokers were more likely to be Hispanic and African-American, whereas increasers were more likely to be African-American relative to non-smokers and nonincreasers, respectively. Smokers and increasers faced more stressors, such as more burden and depression, and exhibited less coping resources, such as lower levels of caregiving skills and less overall social support relative to non-smokers and nonincreasers, respectively.

Caregivers who reported smoking were similar to other smokers. In previous research, individuals who smoke were younger (SAMHSA, 2012) and more likely to be employed full-time or unemployed (Williams, Lewis-Jack, Johnson, & Adams-Campbell, 2001). Smokers also report higher levels of financial stress (Grafova, 2011), general distress (Choi & DiNitto, 2011), and depression (Trosclair & Dube, 2010).

Also, previous research has demonstrated that using coping resources is associated with less general health risk, including smoking (Rabinowitz et al., 2007). Smokers may experience social support deficits because they are more isolated than in previous decades as a consequence of general lower smoking rates (Christakis & Fowler, 2008) or may smoke in the absence of positive social support (Holm et al., 2010).

Explanatory Variables of Smoking and Smoking Increase

Contrary to our expectations, age was the only significant explanatory variable for smoking status, and stressors and coping resources did not explain smoking status in logistic regression analyses. Data from national surveys have established that smoking rates decrease as age increases (SAMHSA, 2012). The reasons for lower smoking rates in older adults have been neglected in research (Kleykamp & Heishman, 2011). However, smoking-related health complications (CDC, 2010) may motivate aging individuals to quit smoking (Abdullah et al., 2006). Future studies could investigate how age affects smoking in caregivers and aging adults.

Race and ethnicity explained smoking increase in logistic regression analysis. Even though racial and ethnic minorities have the lowest smoking rates (SAMHSA, 2012), aging African-Americans have higher smoking rates compared to other aging racial and ethnic groups (Blazer & Wu, 2012). Racial differences in nicotine metabolism (Pérez-Stable, Herrera, Jacob, & Benowitz, 1998), targeted tobacco advertisement (Balbach, Gasior, & Barbeau, 2003), and psychosocial stressors that affect African-Americans (Slopen et al., 2012) may explain the ethnic differences in smoking. In addition, Hispanic caregivers may have a lower likelihood of

Table 4. Continuous Variable Comparison Between Increaser and Nonincreaser Caregivers

Continuous variable	Smoking increase (<i>n</i> = 63)		No smoking increase (<i>n</i> = 189)		<i>t</i>	<i>df</i>	<i>p</i> -Value	95% CI of the Difference	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)				<i>LL</i>	<i>UL</i>
Demographics									
Caregiver age	53.93	(10.77)	58.05	(13.18)	2.47	128.8	.015	0.82	7.40
Recipient age	79.54	(9.46)	78.49	(9.59)	-0.75	250	.454	-3.78	1.70
Years as caregiver ^a	3.53	(3.04)	6.29	(9.60)	1.48	243	.139	-0.03	0.20
Caregiver-related stressors									
Caregiver health	2.59	(0.89)	2.85	(1.13)	-1.66	250	.098	-0.57	0.05
Pay for basic needs	1.65	(1.02)	1.50	(0.99)	-1.02	250	.309	-0.43	0.14
Burden	23.43	(10.78)	19.22	(10.16)	-2.80	250	.005	-7.16	-1.25
CES-D	13.63	(6.76)	10.26	(6.40)	-3.58	249	<.001	-5.24	-1.52
Caregiver-related coping resources									
Positive aspects of caregiving	24.03	(10.51)	26.35	(8.54)	1.58	90.8	.117	-0.59	5.22
Caregiving Skills	7.52	(3.44)	5.72	(2.94)	-4.04	250	<.001	-2.68	-0.92
Religious/Spiritual coping	4.11	(3.87)	3.31	(3.62)	-1.49	250	.137	-1.85	0.26
Social Support	15.52	(6.49)	17.25	(5.39)	2.09	249	.037	0.10	3.36
Received support	3.27	(2.34)	3.39	(2.11)	0.37	250	.713	-0.51	0.74
Satisfaction	4.30	(3.00)	4.89	(2.65)	1.48	249	.139	-0.19	1.38
Social network	5.94	(2.47)	6.07	(2.32)	0.39	250	.701	-0.54	0.81
Negative interactions	4.03	(3.35)	3.07	(2.76)	-2.05	91.6	.043	-1.89	-0.03
Care recipient-related stressors									
Recipient health	2.35	(1.00)	2.50	(1.04)	0.98	250	.326	-0.15	0.44
MMSE	11.05	(7.25)	12.50	(7.26)	1.38	250	.169	-0.62	3.53
IADL	6.63	(1.56)	6.58	(1.87)	-0.25	126.1	.805	-0.53	0.41
ADL	3.83	(1.93)	3.35	(2.07)	-1.59	250	.113	-1.05	0.11
Behavioral problems	24.51	(11.06)	22.49	(10.22)	-1.33	250	.185	-5.01	0.97

Notes: CI = confidence interval; LL = lower level; UL = upper level; CES-D = Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; IADL = instrumental activities of daily living; ADL = activities of daily living.

^aFor ease of interpretation, means and standard deviation of caregiving years are reported in original units, whereas *t*-test statistics and *p*-values of the logarithmic transformation of the variable are reported.

smoking increase due to distinct smoking habits and cultural differences. For instance, Hispanics are more likely to be low-level smokers compared to other racial and ethnic groups (Ackerson & Viswanath, 2009) and to have low levels of nicotine dependence (Rodríguez-Esquivel, Cooper, Blow, & Resor, 2009). Moreover, family connectedness has been demonstrated to reduce the likelihood of smoking in Hispanics (Mahabee-Gittens, Xiao, Gordon, & Khoury, 2012).

Depression was the only stressor that significantly explained smoking increase. There is evidence that people with depression have higher smoking rates than people without depression (McClave et al., 2009). The relationship between smoking and depression is complex. One longitudinal study found no significant relationship between smoking and depression over time, which suggests that a third variable may be responsible for their co-occurrence (Holma, Holma, Melartin, Ketokivi, & Isometsä, 2013). Perhaps, stress may promote depression and smoking increase in caregivers. Further investigation of the relationship of stress and depression and smoking as well as interventions that address depression and smoking may improve caregivers' mental and physical health.

Reporting fewer coping resources also explained smoking increase. More specifically, less caregiving skills explained smoking increase in this study. Previous research has demonstrated that better general coping skills are associated with better health outcomes (Folkman et al., 1986). Fewer caregiving skills may increase stress in a way that promotes smoking increases. Similar to our results, caregiver self-efficacy in the form of caregiving skills has been related to less health-compromising behaviors in previous research (Rabinowitz et al., 2007).

Limitations and Strengths

These secondary analyses present some limitations. Instruments in REACH II did not measure the amount or frequency of cigarettes smoked. However, public health research has used dichotomous questions to assess smoking in populations that are difficult to reach (e.g., Trocki, Drabble, & Midanik, 2009). Although higher levels of stress are related to higher levels of smoking (Cohen, Schwartz, Bromet, & Parkinson, 1991), even low-level smoking has been related to heart disease and cancer

Table 5. Logistic Regression Explaining Smoking Status

Variable	<i>B</i>	<i>SE</i>	<i>OR</i>	95% <i>CI</i>		<i>Wald</i>	<i>p</i> -Value
				<i>LL</i>	<i>UL</i>		
Explanatory variables of smoking status (χ^2 (16) = 52.06, $p < .001$, Nagelkerke $R^2 = .11$)							
Demographics							
Caregiver age	−0.03	0.01	0.97	0.96	0.99	7.30	.007
Relationship to recipient: spouse ^a							
Child	−0.04	0.24	0.96	0.60	1.53	0.04	.851
Other	0.14	0.33	1.15	0.60	2.20	0.18	.669
Race and ethnicity: Hispanic ^a							
Caucasian	−0.19	0.23	0.83	0.52	1.31	0.64	.422
African-American	0.03	0.22	1.03	0.67	1.59	0.02	.892
Employment: Part-time ^a							
Full-time	0.59	0.36	1.81	0.90	3.63	2.76	.097
Homemaker	0.65	0.37	1.92	0.94	3.93	3.19	.074
Retired	0.35	0.37	1.42	0.69	2.94	0.90	.342
Unemployed	0.75	0.40	2.12	0.97	4.65	3.54	.060
Caregiver-related stressors							
Paying for basic needs	0.11	0.09	1.12	0.93	1.34	1.46	.228
Burden	0.00	0.01	1.00	0.98	1.03	0.04	.838
CES-D	0.03	0.02	1.03	1.00	1.07	3.00	.083
Caregiver-related coping resources							
Caregiving skills	0.01	0.04	1.01	0.94	1.09	0.10	.752
Social Support	0.00	0.02	1.00	0.96	1.04	0.01	.932
Social network	−0.03	0.04	0.97	0.89	1.06	0.41	.522
Negative interactions	0.01	0.04	1.01	0.93	1.10	0.10	.748

Notes: Smoking status $n = 252$; CES-D = Center for Epidemiologic Studies Depression Scale; *SE* = standard error; *OR* = odds ratio; *CI* = confidence interval; *LL* = lower level; *UL* = upper level.

^aReferent group.

Table 6. Logistic Regression Explaining Smoking Increase

Variable	<i>B</i>	<i>SE</i>	<i>OR</i>	95% <i>CI</i>		<i>Wald</i>	<i>p</i> -Value
				<i>LL</i>	<i>UL</i>		
Explanatory variables of smoking increase (χ^2 (12) = 52.37 p < .001, Nagelkerke R^2 = .28)							
Demographics							
Caregiver age	−0.02	0.02	0.98	0.95	1.02	1.26	.262
Race and ethnicity: Hispanic ^a							
Caucasian	1.08	0.48	2.93	1.15	7.49	5.08	.024
African-American	1.70	0.45	5.46	2.26	13.18	14.25	.000
Employment: Part-time ^a							
Full-time	0.09	0.76	1.09	0.25	4.82	0.01	.907
Homemaker	0.44	0.78	1.56	0.34	7.25	0.32	.571
Retired	−0.13	0.82	0.88	0.18	4.40	0.02	.878
Unemployed	1.37	0.79	3.94	0.84	18.46	3.02	.082
Caregiver-related stressors							
Burden	−0.01	0.02	0.99	0.94	1.04	0.18	.672
CES-D	0.08	0.03	1.09	1.02	1.16	6.16	.013
Caregiver-related coping resources							
Social support	−0.02	0.04	0.98	0.91	1.06	0.19	.664
Negative interactions	−0.02	0.07	0.98	0.85	1.14	0.06	.815
Caregiving skills	0.14	0.07	1.15	1.01	1.31	4.47	.034

Notes: Smoking increase $n = 63$; CES-D = Center for Epidemiologic Studies Depression Scale; *SE* = standard error; *OR* = odds ratio; *CI* = confidence interval; *LL* = lower level; *UL* = upper level.

^aReferent group.

(Bjartveit & Tverdal, 2005). Future research should strive to find standardized smoking instruments to assess for continuous relationships between smoking and stress in large-scale, community-based investigations of caregiver health. Second, our results may not generalize to all caregivers due to lack of a randomized sample and the small sample size found in smoking increasers. However, results can generalize to an ethnically diverse population of caregivers of Alzheimer's patients. Moreover, even when only 63 smokers reported recent smoking increase, we were able to detect important explanatory variables. Third, some instruments in REACH II have not been previously validated. Nonetheless, they have been used in previous caregiver studies (e.g., Belle et al., 2006; Nichols, Martindale-Adams, Burns, Graney, & Zuber, 2011; Nichols et al., 2008) and were tested for internal consistency in this study.

These analyses also present important strengths. First, caregivers of Alzheimer's patients experience higher smoking rates than expected (Zhou et al., 2007). Therefore, it is important to investigate smoking and other health risk behaviors that have been understudied in this population. Second, this is the first study to investigate explanatory variables for smoking and recent smoking increase in caregivers of Alzheimer's patients, which may result in better smoking cessation strategies specifically tailored for caregivers. Third, our results could lead to the inclusion of smoking cessation components in caregiver interventions. For example, motivational interviewing strategies may help caregivers quit smoking (Miller & Rollnick, 2002). Moreover, interventions could develop coping resources that address depression and lack of caregiving skills to promote smoking cessation in caregivers.

Conclusions

Although smoking research in caregivers of Alzheimer's patients is limited, this study demonstrated that smoking rates in this population are important to investigate and that caregivers need more support to improve their health. While younger age places caregivers at risk for smoking status, race and ethnicity, depression, and fewer caregiving skills place caregivers at risk for smoking increase. Given that only age explained smoking in this sample of caregivers, more research on smoking and caregivers is necessary to investigate variables that may explain higher smoking rates in distressed caregivers. Smoking measurements should be included as part of health risks and risk priorities in future caregiver studies. Future studies could also investigate mechanisms through which stress and coping affect smoking status and increase in caregivers.

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