

Original Investigation

Depressive Symptoms and Smoking in Middle-Aged and Older Women

Carole K. Holahan, Ph.D.,¹ Charles J. Holahan, Ph.D.,² Daniel A. Powers, Ph.D.,³ Rashelle B. Hayes, Ph.D.,⁴ C. Nathan Marti, Ph.D.,⁵ & Judith K. Ockene, Ph.D.⁶

¹ Department of Kinesiology and Health Education, University of Texas at Austin, Austin, TX

² Department of Psychology, University of Texas at Austin, Austin, TX

³ Department of Sociology and Population Research Center, University of Texas at Austin, Austin, TX

⁴ Division of Preventive and Behavioral Medicine, University of Massachusetts Medical School, Worcester, MA

⁵ Division of Statistics and Scientific Computation, University of Texas at Austin, Austin, TX

⁶ Division of Preventive and Behavioral Medicine, University of Massachusetts Medical School, Worcester, MA

Corresponding Author: Carole K. Holahan, Ph.D., Department of Kinesiology and Health Education, University of Texas at Austin, 1 University Station (D3700), Austin, TX 78712, USA. Telephone: 512-471-2428; Fax: 512-471-3845; E-mail: c.holahan@mail.utexas.edu

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Abstract

Introduction: Smoking research and intervention efforts have neglected older women. Depressive symptoms, which are common in middle-aged and older women, are related to the maintenance of adult smoking.

Methods: This study investigated the relation of a composite measure of current depressive symptoms, derived from a short form of the Center for Epidemiological Studies Depression Scale, and history of depressive symptoms, derived from two items from the Diagnostic Interview Schedule, to smoking outcomes in the Women's Health Initiative Observational Study ($N = 90,627$). Participants were postmenopausal with an average age of 63.6 years at baseline. Participants were recruited from urban, suburban, and rural areas surrounding 40 clinical centers in the United States. Analyses controlled for age, educational level, and ethnicity.

Results: In multinomial logistic regression analyses, depressive symptoms were related cross-sectionally to current light (odds ratio [OR] = 1.19, 95% CI = 1.14–1.23) and heavier (OR = 1.28, 95% CI = 1.23–1.32) smoking at baseline compared with non-smokers. In prospective multiple logistic regression analyses, baseline depressive symptoms were negatively predictive of smoking cessation at a 1-year follow-up (OR = .85, 95% CI = 0.77–0.93) and at participants' final assessments in the study (OR = .92, 95% CI = 0.85–0.98). Light smokers had more than 2 times higher odds of smoking cessation than did heavier smokers.

Conclusions: The present findings demonstrate a consistent link between depressive symptoms and negative smoking-related behaviors among middle-aged and older women at both light and heavier smoking levels.

Introduction

Smoking research and intervention efforts have substantially neglected older adults, with older women particularly underserved

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(Brown et al., 2004; Donze, Ruffieux, & Cornuz, 2007; Morgan et al., 1996; Rimer, Orleans, Keintz, Cristinzio, & Fleisher, 1990). The U.S. Surgeon General's report on women and smoking (U.S. Department of Health and Human Services [U.S. DHHS], 2001) has underscored a need for longitudinal research on depression and smoking in women across the adult life span. Depressive symptoms have been shown to relate to the maintenance of adult smoking (Curtin, Brown, & Sales, 2000; Niaura et al., 2001); however, much less is known about the role of depressive symptoms among older smokers (Green, Polen, & Brody, 2003). The purpose of this study was to examine depressive symptoms and smoking among middle-aged and older women in the Women's Health Initiative (WHI) Observational Study.

Women, Age, and Smoking

Cigarette smoking is a significant cause of morbidity and mortality among adult women (Hustun et al., 1997; LaCroix et al., 1991; U.S. DHHS, 2004), and reducing adult smoking is a central goal of Healthy People 2010 (U.S. DHHS, 2000). Almost 174,000 women died annually during 2000–2004 from smoking-related causes, mostly from cancer, cardiovascular diseases, and respiratory diseases (Centers for Disease Control and Prevention, 2008). Lung cancer has replaced breast cancer as the leading cause of cancer mortality among women (U.S. DHHS, 2001). In addition, cigarette smoking is associated with numerous other cancers and lower bone density and increased risk of hip fractures in postmenopausal women (U.S. DHHS, 2004).

There are significant health benefits of smoking cessation for middle-aged (age 40–60 years) and older women (over age 60 years) (Burns, 2000; Hermanson, Omenn, Kronmal, & Gersh, 1988; Ockene, 1993; U.S. DHHS, 1990, 2001, 2004). When middle-aged and older individuals quit smoking, they experience immediate and longer-term health benefits (Hermanson et al., 1988; Taylor, Hasselblad, Henley, Thun, & Sloan, 2002; U.S. DHHS, 1990). Moreover, although older persons are less likely

to attempt to quit smoking (U.S. DHHS, 2000), they are equally or more likely to be as successful as younger smokers when they do attempt to quit smoking (Burns, 2000; Ossip-Klein, Carosella, & Krusch, 1997; Sorlie & Kannel, 1990; Whitson, Heflin, & Burchett, 2006).

There has been a recent trend toward increased light smoking associated with tobacco control efforts, such as workplace smoking bans and cigarette taxes (Burns, Major, & Shanks, 2003; Pierce, White, & Messer, 2009), but there is limited research especially focused on light smoking (Businelle et al., 2009; CDC, 1994; Fagan & Rigotti, 2009; Falba, Jofre-Bonet, Busch, Duchovny, & Sindelar, 2004; Godtfredsen, Prescott, & Osler, 2005; Godtfredsen, Prescott, Vestbo, & Osler, 2006; Hatsukami et al., 2006; Reitzel et al., 2009; Shiffman, 2009; Wilson, Parsons, & Wakefield, 1999). Although little information is available concerning level of smoking in older women, in a study of women smokers aged 70 years and older (Donze et al., 2007), 53% smoked 10 or fewer cigarettes/day. The study of light smoking is important because cigarette smoking is unsafe at all levels (Coggins, Murrelle, Carchman, & Heidbreder, 2009; Schane, Ling, & Glantz, 2010).

Depressive Symptoms and Smoking

Individuals with psychiatric disorders carry a disproportionate burden in cigarette consumption and nicotine dependence (Grant, Hasin, Chou, Stinson, & Dawson, 2004; Lasser et al., 2000). Mood disorders, in particular, have been shown to be risk factors for smoking prevalence (Husky, Mazure, Paliwal, & McKee, 2008; Kendler et al., 1993; Lasser et al., 2000; Murphy et al., 2003), nicotine dependence (Breslau, Kilbey, & Andreski, 1993; Grant et al., 2004), and reduced smoking cessation (Curtin et al., 2000). There is also evidence that current depressive symptoms are associated with smoking prevalence (Anda et al., 1990) and reduced smoking cessation (McClave et al., 2009; Niaura et al., 2001). Some studies have found a stronger relation of current depressive symptoms (Anda et al., 1990) to reduced smoking cessation for women compared with men in adulthood. However, the relation of depressive symptoms to smoking is complex (Hayes, Dunsiger, & Borrelli, 2010), particularly among older smokers (Sachs-Ericsson et al., 2009; van Gool et al., 2003), and the National Institute of Mental Health has called for additional longitudinal research on depressive symptoms and smoking (Ziedonis et al., 2008).

Understanding the relationship between depressive symptoms and smoking is especially relevant to middle-aged and older women. Throughout adulthood, women show higher levels of depressive disorders than men (Kessler, 2006). The association between age and depressive disorders is curvilinear, with a drop in depressive disorders during middle age and a subsequent rise; however, the drop is less pronounced for women than for men (Mirowsky & Ross, 2003). Moreover, women are more prone to engage in negative affect-related smoking (Brandon & Baker, 1991; Livson & Leino, 1988) and to show stronger relations of life stressors to smoking maintenance or relapse (McKee, Maciejewski, Falba, & Mazure, 2003).

The Present Study

The present study examined the relation of depressive symptoms to smoking in more than 90,000 middle-aged and older women using data from the WHI Observational Study. The

WHI Observational Study was framed to examine the role of lifestyle factors in the prevention of heart disease, some cancers, and osteoporosis in women who were postmenopausal (Hays et al., 2003). Participants were recruited from areas surrounding clinical centers in the United States from urban, suburban, and rural areas. The WHI Observational Study presents a unique opportunity to examine the link between depressive symptoms and smoking in a sample of postmenopausal women ranging in age from 50 to 79 years at baseline, with depressive symptoms indexed at baseline and smoking examined across an ensuing 8-year period.

Based on increasing concern about the prevalence and adverse health consequences of light smoking (Fagan & Rigotti, 2009; Schane, Ling, & Glantz, 2010; Shiffman, 2009), we examined the association of depressive symptoms to both light and heavier smoking. Extending previous research on the role of depressive symptoms in smoking in mixed-age samples (Anda et al., 1990; McClave et al., 2009; Niaura et al., 2001), two hypotheses were advanced: (a) we hypothesized that depressive symptoms would be associated cross-sectionally with both current light and heavier smoking at baseline among middle-aged and older women and (b) we hypothesized that among baseline smokers, depressive symptoms at baseline would be associated prospectively with smoking cessation at a one-year follow-up and at participants' last assessments. In exploratory analyses, we examined (a) the potential role of light versus heavier smoking in moderating (i.e., either strengthening or weakening) the strength of the relationship between depressive symptoms and smoking and (b) the role of depressive symptoms in prospectively predicting smoking uptake among nonsmokers at baseline, including relapse among former smokers.

Methods

Sample Selection and Characteristics

The WHI Observational Study included 93,676 participants between the ages of 50 and 79 years who were postmenopausal at enrollment between 1993 and 1998 (Hays et al., 2003). The original purpose of the WHI Observational Study was to explore the predictors and natural history of important causes of morbidity and mortality in postmenopausal women related to heart disease, cancers, and osteoporosis, with participants followed for up to 8 years. Postmenopausal was defined as not having a menstrual period for at least six months if age was greater than or equal to 55 and having no menstrual period for at least twelve months if aged 50–54 years. The WHI Observational Study is an observational study tracking a large sample of postmenopausal women and is not part of the WHI clinical trials. The participants in the WHI Observational Study were not asked to take medications or to change their health habits.

Inclusion criteria included the ability and willingness to provide written informed consent and plans to stay in the same area for at least three years. Potential participants were excluded if they had medical conditions that predicted survival of less than three years or if they had conditions such as alcohol or drug dependency, mental illness, including severe depression or dementia, which might affect retention. Participants were recruited from urban, suburban, and rural areas surrounding 40 clinical centers, mainly at major academic health centers, located

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in 24 states and the District of Columbia in the United States (for a complete list of the WHI clinical centers, see [Rossouw et al., 1995](#)). Geographic distribution of participant enrollment in the WHI Observational Study was 22.7% from the Northeast, 26.1% from the South, 22.0% from the Midwest, and 29.2% from the West. The inclusion of participants from racial/minority groups proportionate to their age group representation in the U.S. population was a priority ([Hays et al., 2003](#)). Ten clinical centers emphasized minority recruitment and enrolled an average of 40% minorities, while other clinics recruited an average of 10% minorities. Main details of the WHI design have been published previously ([Hays et al., 2003](#); [Langer et al., 2003](#); [WHI Study Group, 1998](#)).

The present sample includes the 90,627 (97%) of baseline participants in the WHI Observational Study who provided complete data on the measures used here. At baseline, the participants in the present sample were an average age of 63.6 ($SD = 7.36$) years, with smokers 2 years younger than nonsmokers. Most participants (62%) were married. The sample was predominantly White (83.9%), with the remainder of the sample American Indian/Alaskan Native (0.4%), Asian/Pacific Islander (2.9%), Black (8.0%), Hispanic (3.7%), and unknown (1.1%). Both White and Black ethnicity categories specified not-of-Hispanic origin. Five percent of participants had less than a high-school education, 16% had a high-school (or vocational school) education, 37% had some education beyond high school but had not completed college, and 42% had completed college.

Measures

Sociodemographic factors and depressive symptoms were assessed at baseline, and smoking status was assessed at baseline, an initial 1-year follow-up, and six additional annual follow-ups across Years 3 through 8.

Sociodemographic Factors

Sociodemographic factors used as control variables included age (in years), educational level, and ethnicity. Educational level was operationalized as less than a high-school (or vocational school) education, high-school (or vocational school) education, some education beyond high school (or vocational school) but not having completed college, and completed college.

Depressive Symptoms

A measure of depressive symptoms at baseline was indexed as a composite of a *history of depressive symptoms* and *current depressive symptoms*. History of depressive symptoms was derived from two items from the Diagnostic Interview Schedule (DIS; [Robbins, Helzer, Croughan, & Ratliff, 1981](#)). Participants were asked at baseline (a) if in the past year, they had 2 weeks or more during which they felt sad, blue, or depressed or lost pleasure in things that they usually cared about or enjoyed and (b) if they had 2 years or more in their life when they felt depressed or sad most days. History of depressive symptoms was operationalized as responding “yes” to both items (score = 1) versus “no” to either item (score = 0), following the approach of previous WHI investigators ([Wassertheil-Smoller et al., 2004](#)) in indexing history of depressive symptoms in the WHI Observational Sample.

Current depressive symptoms, assessed by symptoms in the past week, were indexed at baseline by a shortened six-item version of the Center for Epidemiological Studies Depression

Scale (CES-D; [Burnam, Wells, Leake, & Landsverk, 1988](#); [Wassertheil-Smoller et al., 2004](#)). The CES-D is a currently and widely used self-report measure of depressive symptoms in epidemiological studies ([Santor, Gregus, & Welch, 2006](#)). The items in the six-item scale are felt depressed, sleep was restless, enjoyed life (reversed scored), had crying spells, felt sad, and felt that people disliked you. Participants were asked how often they experienced each depressive symptom during the past week, with items scaled from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Current depressive symptoms are a sum of the six items. The six-item version of the CES-D correlated .88 with the full 20-item CES-D in a similar population of older women ([Borhani et al., 1991](#)).

Following [Burnam et al. \(1988\)](#) and [Wassertheil-Smoller et al. \(2004\)](#), a continuous measure of depressive symptoms was created as the average of history of depressive symptoms and current depressive symptoms when both of these measures were available. Standard scores were used for both measures to equate their scales. In the full sample 313 (0.3%), participants were excluded who did not provide data on both measures; among baseline smokers, 20 (0.04%) participants were excluded who did not provide data on both measures. The correlation between the measures of history of depressive symptoms and current depressive symptoms was .44 in the full sample and .51 among baseline smokers.

Smoking Outcomes

Three smoking outcomes were assessed: *smoking status* at baseline and, among baseline smokers, *smoking cessation at one year* and *smoking cessation at participants' last assessments*. Smoking status at baseline (nonsmoker, light smoker, and heavier smoker) was indexed in two steps. First, participants were asked if, “During your entire life, have you smoked at least 100 cigarettes?” Participants who reported that they did not currently smoke cigarettes were coded as nonsmokers. Next, participants who reported having smoked at least 100 cigarettes in their entire life and who reported that they currently smoked cigarettes were coded as either light or heavier smokers based on their responses to a question that asked, “on the average, how many cigarettes do you usually smoke each day?” Response choices were less than 1, 1–4, 5–14, 15–24, 25–34, 35–44, and 45 or more. For the present study, following definitions of light smoking used in other studies ([CDC, 1994](#); [Falba, Jofre-Bonet, Busch, Duchovny, & Sindelar, 2004](#); [Godtfredsen et al., 2005, 2006](#); [Hatsukami et al., 2006](#); [Wilson, Parsons, & Wakefield, 1999](#)), light smoking was operationalized as less than 15 cigarettes/day. Heavier smoking was operationalized as 15 or more cigarettes/day ([Hatsukami et al., 2006](#)). Among baseline smokers, smoking cessation at one year was operationalized as reporting no smoking at the one-year follow-up (score = 1) versus continuing to smoke at the one-year follow-up (score = 0). Among baseline smokers, smoking cessation at participants' last assessments (restricted to assessments beyond the one-year follow-up) was operationalized as not smoking at both of participants' last two assessments (score = 1) versus continuing to smoke at either of participants' last two assessments (score = 0).

Data Analysis Strategy

Multinomial logistic regression analyses were used to partition the outcome variables ([Kleinbaum & Kline, 2010](#)) to analyze the cross-sectional relation of baseline depressive symptoms to

smoking status (nonsmokers vs. light and heavier smokers). Multiple logistic regression analyses were used to analyze the relation of baseline depressive symptoms to smoking cessation one year later and at the participants' final two assessments. All analyses controlled for age (in years), educational level (less than a high-school education was the reference group), and ethnicity (White was the reference group). To simplify the presentation, all analyses used the composite measure of a history of depressive symptoms and current depressive symptoms. In fact, the underlying pattern of findings is the same for history of depressive symptoms and current depressive symptoms, and all results are significant ($\alpha < .05$) for both history of depressive symptoms and current depressive symptoms if they are examined separately.

Results

Descriptive Statistics

At baseline, 11,170 of 90,627 participants (12.3%) reported a history of depressive symptoms, and mean current depressive symptoms from the CES-D were 2.37 ($SD = 2.58$). At baseline, the first quartile on the composite measure of depressive symptoms included no participants with a history of depressive symptoms and no participants with high (score of 5 or more; Wassertheil-Smoller et al., 2004) current depressive symptoms. In contrast, the fourth quartile on depressive symptoms included 11,170 (56.6%) participants with a history of depressive symptoms and 14,490 (73.5%) participants with high current depressive symptoms.

Current smoking was reported by 5,691 participants (6.3%) at baseline, 3,010 of whom (52.9%) reported light smoking of less than 15 cigarettes/day. Among current smokers at baseline, 1,155 participants (20.3%) reported a history of depressive symptoms, and mean current depressive symptoms were 2.86 ($SD = 3.00$). Among current smokers at baseline, the first quartile on the composite measure of depressive symptoms included no participants with a history of depressive symptoms and no participants with high current depressive symptoms. In contrast, the fourth quartile on depressive symptoms included 1,155 (84.2%) participants with a history of depressive symptoms and 899 (65.6%) participants with high current depressive symptoms.

The 5,691 baseline smokers began smoking at a median age of 15–19 years and had been regular smokers for a median of 30–39 years. Among these baseline smokers, smoking cessation was reported by 852 of 5,178 participants (16.5%) providing data at the one-year follow-up and by 1,801 of 4,984 participants (36.1%) across participants' last two assessments (i.e., participants who provided data for two assessments beyond the one-year follow-up). Tables 1 and 2 show baseline smoking and smoking cessation, respectively, for each control variable (to facilitate interpretation, age is presented in 10-year categories in the table).

Baseline Smoking Status

We began by examining the cross-sectional association between depressive symptoms and current smoking status at baseline in the full sample ($N = 90,627$). We used multinomial logistic regression in order to contrast light and heavier

Table 1. Baseline Smoking by Demographic Characteristics for the Total Sample ($N = 90,627$)

	Light smokers, % (95% CI)	Heavier smokers, % (95% CI)	Number of participants
Age (years)			
50–59	4.3 (4.1–4.5)	3.9 (3.7–4.1)	28,846
60–69	3.2 (3.0–3.4)	3.0 (2.8–3.2)	39,919
70–79	2.3 (2.1–2.5)	1.7 (1.5–1.9)	21,862
Education			
Less than high school	5.3 (4.7–5.9)	4.8 (4.2–5.4)	4,576
High school	3.4 (3.1–3.7)	3.5 (3.2–3.8)	14,764
Some school after high school	3.7 (3.5–3.9)	3.5 (3.3–3.7)	33,106
College degree	2.7 (2.5–2.9)	2.0 (1.9–2.1)	38,181
Race or ethnicity			
American Indian/ Alaskan Native	5.3 (3.2–7.7)	5.5 (3.3–7.9)	397
Asian/Pacific Islander	2.4 (1.8–3.0)	1.1 (0.6–1.4)	2,623
Black	8.0 (7.4–8.6)	3.2 (2.8–3.6)	7,248
Hispanic	5.5 (4.7–6.3)	1.2 (0.8–1.6)	3,320
White, not-of- Hispanic origin	2.8 (2.7–2.9)	3.1 (3.0–3.2)	76,028
Unknown	3.9 (2.7–5.1)	2.5 (1.5–3.4)	1,011

smokers with nonsmokers, which was the reference category. Results are presented in Table 3. Controlling for age, educational level, and ethnicity, depressive symptoms were significantly positively associated with both current light and heavier smoking. Compared with nonsmokers, each one-unit increase in depressive symptoms (range = 5.00) was linked to a 19% increase in the odds of being a current light smoker and to a 28% increase in the odds of being a current heavier smoker. The association between depressive symptoms and current smoking status at baseline remained significant with comparable effect sizes when this analysis was repeated restricting current nonsmokers to either former smokers ($n = 38,828$) or never-smokers ($n = 46,108$). There were no significant interactions between depressive symptoms and either age (for light smoking, odds ratio [OR] = 0.999, $p = .58$; for heavier smoking, OR = 0.998, $p = .46$), educational level (χ^2 change [6 *df*] for the model including educational level = 4.76, $p = .57$), or ethnicity (χ^2 change [10 *df*] for the model including ethnicity = 5.61, $p = .85$) in predicting smoking status at baseline. That is, the relationship between depressive symptoms and smoking status at baseline did not vary by age, educational level, or ethnicity.

Prospective Analyses

Smoking Cessation at One Year

We then examined the prospective association between depressive symptoms at baseline and smoking cessation at the one-year follow-up among baseline smokers ($N = 5,178$; average age = 63) in a multiple logistic regression analysis. Results are presented Table 4. Controlling for age, educational level, and ethnicity, depressive symptoms at baseline were significantly negatively associated with smoking cessation at the one-year follow-up. Each one-unit increase in depressive symptoms

Table 2. Smoking Cessation at One Year (*n* = 5,178) and at Participants' Last Assessments (*n* = 4,984) by Demographic Characteristics for Baseline Smokers

	1 Year		Last assessments	
	Smoking cessation % (95% CI)	Number of participants	Smoking cessation % (95% CI)	Number of participants
Age (years)				
50–59	17.1 (15.5–18.7)	2,124	35.5 (33.4–37.6)	2,086
60–69	16.3 (14.8–17.8)	2,259	36.6 (34.6–38.6)	2,180
70–79	15.2 (12.7–17.8)	795	36.6 (33.1–40.1)	718
Education				
Less than high school	16.5 (12.7–20.3)	375	30.3 (25.6–35.0)	363
High school	15.2 (12.9–17.5)	935	31.8 (28.7–34.9)	893
Some school after high school	16.3 (14.7–17.9)	2,178	36.5 (34.4–38.6)	2,098
College degree	17.3 (15.5–19.1)	1,690	39.3 (36.9–41.7)	1,630
Race or ethnicity				
American Indian/ Alaskan Native	20.5 (7.8–33.2)	39	35.1 (19.7–50.5)	37
Asian/Pacific Islander	6.2 (1.0–11.4)	83	36.1 (25.8–46.4)	83
Black	15.3 (12.6–35.2)	660	31.7 (28.2–35.2)	669
Hispanic	17.9 (12.3–23.5)	179	31.8 (24.9–38.7)	176
White, not-of-Hispanic origin	16.7 (15.6–17.8)	4,163	37.1 (35.6–38.6)	3,971
Unknown	18.5 (8.1–28.9)	54	33.3 (20.0–46.6)	48

(range = 4.24) was linked to a 15% decrease in the odds of smoking cessation one year later. There were no significant interactions between depressive symptoms and either age (*OR* = 1.003, *p* = .65), educational level (χ^2 change [3 *df*] for the model including educational level = 7.10, *p* = .07), or ethnicity (χ^2 change [5 *df*] for the model including ethnicity = 5.38, *p* = .37) in predicting smoking cessation at the one-year follow-up.

Table 3. Results of a Cross-Sectional Multinomial Logistic Regression Analysis Predicting Current Light and Heavier Smoking Status at Baseline in the Full Sample (*N* = 90,627)^a

Predictors	Light smoking		Heavier smoking	
	<i>OR</i>	95% <i>CI</i>	<i>OR</i>	95% <i>CI</i>
Depressive symptoms	1.19**	1.14–1.23	1.28**	1.23–1.32
Age (in years)	0.97**	0.96–0.97	0.96**	0.95–0.96
High school ^b	0.82*	0.69–0.96	0.63**	0.53–0.74
Some school after high school ^b	0.85*	0.74–0.99	0.60**	0.52–0.71
College degree ^b	0.62**	0.53–0.72	0.32**	0.28–0.38
American Indian/Alaskan Native ^c	1.58*	1.01–2.46	1.23	0.79–1.91
Asian/Pacific Islander ^c	0.84	0.65–1.09	0.37**	0.25–0.53
Black ^c	2.68**	2.43–2.95	0.88	0.77–1.02
Hispanic ^c	1.48**	1.26–1.74	0.24**	0.18–0.33
Unknown ^c	1.31	0.95–1.81	0.72	0.48–1.08

Note. *OR* = odds ratio.

^aNonsmoking was the reference category.

^bLess than a high-school education was the reference category.

^cWhite was the reference category.

p* < .05. *p* < .01.

Smoking Cessation at Participants' Last Assessments

In addition, we examined the prospective association between depressive symptoms at baseline and smoking cessation at participants' last assessments among baseline smokers (*N* = 4,984; average age = 69) in a multiple logistic regression analysis. Among baseline smokers who were smoking at their last assessments, 162 individuals (5.4%) had quit at the one-year follow-up but later

Table 4. Results of Prospective Multiple Logistic Regression Analyses Predicting Smoking Cessation at the One-Year Follow-Up (*N* = 5,178) and Across Participants' Last Two Assessments (*N* = 4,984) Among Baseline Smokers

Predictors	One-year follow-up		Last two assessments	
	<i>OR</i>	95% <i>CI</i>	<i>OR</i>	95% <i>CI</i>
Depressive symptoms	0.85**	0.77–0.93	0.92*	0.85–0.98
Age (in years)	0.99	0.98–1.00	1.00	0.99–1.01
High school ^a	0.88	0.63–1.22	1.00	0.76–1.31
Some school after high school ^b	0.94	0.70–1.28	1.23	0.96–1.58
College degree ^b	1.00	0.74–1.37	1.37*	1.07–0.76
American Indian/Alaskan Native ^a	1.34	0.61–2.95	1.01	0.51–2.01
Asian/Pacific Islander ^a	0.31*	0.13, 0.77	0.95	0.60, 1.49
Black ^a	.90	0.72, 1.14	0.80*	0.67, 0.96
Hispanic ^a	1.14	0.76, 1.70	0.87	0.63, 1.22
Unknown ^a	1.17	0.58, 2.33	0.87	0.47, 1.59

Note. *OR* = odds ratio.

^aLess than a high-school education was the reference category.

^bWhite was the reference category.

p* < .05. *p* < .01.

relapsed. Results are presented in Table 4. Controlling for age, educational level, and ethnicity, depressive symptoms at baseline were significantly negatively associated with smoking cessation at participants' last assessments when smokers were an average of 69 years of age. Each one-unit increase in depressive symptoms (range = 4.24) was linked to an 8% decrease in the odds of smoking cessation at participants' last assessments. There were no significant interactions between depressive symptoms and either age ($OR = 1.004, p = .42$), educational level (χ^2 change [3 *df*] for the model including educational level = 6.87, $p = .08$), or ethnicity (χ^2 change [5 *df*] for the model including ethnicity = 4.86, $p = .43$) in predicting smoking cessation at participants' last assessments. However, one noteworthy effect emerged in comparisons of each ethnic minority group's smoking cessation at participants' last assessments; Black women were less likely to report smoking cessation at participants' last assessments compared with White women.

Additional Analyses

Light Versus Heavier Smoking

In multiple logistic regression analyses, we explored the role of light (score = 1) versus heavier (score = 0) smoking at baseline in subsequent smoking cessation. Controlling for age, educational level, and ethnicity as well as for baseline depressive symptoms, light smokers were significantly more likely to report smoking cessation both at one-year ($OR = 2.41, p < .01, CI = 2.05-2.83$) and at participants' last assessments ($OR = 2.05, p < .01, CI = 1.81-2.32$) compared with heavier smokers. At both points, light smokers had more than two times higher odds of smoking cessation than did heavier smokers. There was not a significant ($p > .05$) interaction between depressive symptoms and light versus heavier smoking in predicting smoking cessation either at the one-year follow-up or at the participants' last assessments.

Smoking Uptake

In a multiple logistic regression analysis, we also explored the role of depressive symptoms in prospectively predicting smoking uptake among the 83,431 nonsmokers at baseline who provided information on smoking status for at least one follow-up. Smoking uptake at some time during the follow-up period was reported by 1,049 baseline nonsmokers (1.3%). Controlling for age, educational level, and ethnicity, baseline depressive symptoms were significantly positively related to smoking uptake ($OR = 1.29, p < .01, CI = 1.22-1.37$). Each one-unit increase in depressive symptoms (range = 5.00) was linked to a 29% increase in the odds of smoking uptake. Because 88% of smoking uptake occurred among former smokers, we repeated this analysis restricted to the 38,179 former smokers who were nonsmokers at baseline and who provided follow-up information. Smoking relapse at some time during the follow-up period was reported by 920 (2.4%) baseline nonsmokers who were former smokers. Results were essentially the same as those with the full sample of baseline nonsmokers. Controlling for age, educational level, and ethnicity, baseline depressive symptoms were significantly positively related to smoking relapse among former smokers ($OR = 1.28, p < .01, CI = 1.20-1.36$).

Discussion

The present findings demonstrate a consistent link between depressive symptoms and negative smoking-related behaviors among middle-aged and older women in the WHI Observational

Study. Extending previous research on the role of depressive symptoms in smoking in mixed-age samples (Anda et al., 1990), depressive symptoms were related cross-sectionally to both current light and heavier smoking at baseline. In addition, extending previous research on depressive symptoms and reduced smoking cessation in mixed-age samples (McClave et al., 2009; Niaura et al., 2001), baseline depressive symptoms were negatively predictive of smoking cessation both at a one-year follow-up when smokers were an average of 63 years of age and at participants' final assessments in the study when smokers were an average of 69 years of age. Furthermore, in exploratory analyses, baseline depressive symptoms were significantly positively related to smoking uptake. In general, the effect sizes across these analyses are meaningful in light of the close link between cigarette smoking and both morbidity and mortality (CDC, 2008).

Consistent with earlier research reporting that a majority of older women smokers were light smokers (Donze et al., 2007), we found that over half of the smokers in the WHI Observational Study were light smokers smoking fewer than 15 cigarettes/day. This result is consistent with research documenting a trend toward light smoking (Burns, Major, & Shanks, 2003; Pierce et al., 2009). The finding of high prevalence of light smoking in middle-aged and older women is important because adult cessation trials tend to exclude light smokers (Fagan & Rigotti, 2009; Shiffman, 2009), and most research on depression and smoking cessation has neglected light smoking (Shiffman, 2009). We found that light smokers had more than two times higher odds of smoking cessation than did heavier smokers, both at one year and at participants' last assessments. Light smokers in general and light smokers among older women tend to underestimate the health risks of light smoking (Ayanian & Cleary, 1999; Donze et al., 2007), suggesting the importance of educational interventions focused on light smokers.

We found that Black, Native American, and Hispanic women were significantly more likely to be current light smokers compared with White women. This finding is consistent with earlier work indicating that light smoking is particularly common among ethnic minorities (Tong, Nyuden, Vittinghoff, & Perex-Stable, 2009; Trinidad et al., 2009). In addition, we found that Black women were less likely to have quit smoking at their last assessments compared with White women, even though Black women were more likely to be light smokers. Although Black women start smoking later than White women (Moon-Howard, 2003), they show lower cessation rates (Geronimus, Neidert, & Bound, 1993; King, Polednak, Bendel, Vilsaint, & Nahata, 2004) compared with White women. Sociodemographic differences may contribute to disparities in smoking cessation in adulthood for Black women (King et al., 2004). Older cohorts of Black women may have received less education regarding the health risks of smoking (Mickens, Ameringer, Brightman, & Leventhal, 2010). Black older light smokers may represent a particularly important target of intervention.

Overall, the findings of the present study highlight the importance of depressive symptoms in smoking in middle-aged and older women. Extending existing literature on depressive symptoms and smoking (Anda et al., 1990, McClave et al., 2009; Niaura et al., 2001), we found that depressive symptoms were related concurrently to more light and heavier smoking as well as to reduced smoking cessation. In addition, we found that

depressive symptoms were positively related to the high-risk situations of smoking uptake and relapse among former smokers. The findings that a majority of smokers in the sample were light smokers and that light smoking was related to depressive symptoms are important and suggest that middle-aged and older women may offer a promising target for smoking cessation interventions.

The present study has several strengths. A central contribution is the analysis of depressive symptoms and smoking in middle-aged and older women, a population that has been neglected in smoking research. Additional strengths are the large representative sample, the longitudinal design, and the availability of well-validated measures of depressive symptoms.

Some limitations should be noted in interpreting these results. The WHI Observational Study measure of smoking relied on self-report, and self-report measures are subject to both social desirability and common method variance. However, several comparisons of self-report with biochemical or cross-informant measures of smoking have found that self-report measures are accurate in most situations, particularly, as in the WHI, in studies of adults who are not in smoking intervention studies (Caraballo, Giovino, Pechacek, & Mowery, 2001; Rebagliato, 2002). Nevertheless, the self-report format may have underestimated true smoking status and overestimated true smoking cessation. In addition, consistent with some other studies (Falba et al., 2004; Godtfredsen et al., 2005, 2006), we used a cutoff of less than 15 cigarettes/day to define light smoking. The WHI Observational Study did not index “less than 10 cigarettes/day” or intermittent daily smoking, both of which have been suggested as alternative operationalizations of light smoking (Husten, 2009). Furthermore, future research might examine the role of depressive symptoms in more subtle aspects of smoking change, such as the transition from heavy to light smoking. Moreover, in the smoking cessation analyses, participants lost to follow-up through either death or failure to respond were treated as missing. An alternative approach would have been to consider these participants as continuing smokers. Finally, because participants in the WHI Observational Study were healthier emotionally and physically than the general population of women in their cohort, the results may not be generalizable to all groups of women. For example, the prevalence of smoking in the WHI Observational Sample was substantially lower than that reported in comparably aged samples of women (e.g., see Langer et al., 2003).

In conclusion, the results of this study indicate that depressive symptoms are important correlates of both light and heavier smoking, maintenance of smoking, and smoking uptake and relapse among former smokers among middle-aged and older women. Efforts to help middle-aged and older women smokers reduce negative mood or enhance skills for coping may offer promising avenues of smoking cessation intervention. Recent reviews conclude that depressed smokers profit by including a focus on mood management along with traditional smoking intervention strategies (Gierisch, Bastian, Calhoun, McDuffie, & Williams, 2010; Ranney, Melvin, Lux, McClain, & Lohr, 2006). More broadly, understanding the relation of depressive symptoms to smoking maintenance and cessation in middle-aged and older women provides an essential foundation for the development of effective interventions to reduce women’s smoking in middle and later adulthood.

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Declaration of Interests

None declared.

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References

- Anda, R. F., Williamson, D. F., Escobedo, L. G., Mast, E. E., Giovino, G. A., & Remington, P. L. (1990). Depression and the dynamics of smoking: A national perspective. *Journal of the American Medical Association*, *264*, 1541–1545. doi:10.1001/jama.264.12.1541
- Ayanian, J. Z., & Cleary, P. D. (1999). Perceived risks of heart disease and cancer among cigarette smokers. *Journal of the American Medical Association*, *281*, 1019–1021. doi:10.1001/jama.281.11.1019
- Borhani, N. O., Applegate, W. B., Cutler, J. A., Davis, B. R., Furberg, C. D., Lakatos, E., et al. (1991). Systolic hypertension in the elderly program (SHEP), part 1: Rationale and design. *Hypertension*, *17*, ii2–ii15.
- Brandon, T. H., & Baker, T. B. (1991). The Smoking Consequences Questionnaire: The subjective expected utility of smoking in college students. *Psychological Assessment*, *3*, 484–491. doi:10.1037/1040-3590.3.3.484
- Breslau, N., Kilbey, M. M., & Andreski, P. (1993). Nicotine dependence and major depression: New evidence from a prospective investigation. *Archives of General Psychiatry*, *50*, 31–35. Retrieved from <http://archpsyc.ama-assn.org.ezproxy.lib.utexas.edu/cgi/reprint/50/1/31>
- Brown, D. W., Croft, J. B., Schenck, A. P., Malarcher, A. M., Giles, W. H., & Simpson, R. J., Jr. (2004). Inpatient smoking-cessation counseling and all-cause mortality among the elderly. *American Journal of Preventive Medicine*, *26*, 112–118. doi:10.1016/j.amepre.2003.10.004
- Burnam, M. D., Wells, K. B., Leake, B., & Landsverk, J. (1988). Development of a brief screening instrument for detecting depressive disorders. *Medical Care*, *26*, 775–789. doi:10.1097/00005650-198808000-00004

- Burns, D. M. (2000). Cigarette smoking among the elderly: Disease consequences and the benefits of cessation. *American Journal of Health Promotion, 14*, 357–361.
- Burns, D. M., Major, J. M., & Shanks, T. G. (2003). Changes in number of cigarettes smoked per day: Cross-sectional and birth cohort analyses using NHIS. In S. E. Marcus (Ed.), *Those who continue to smoke: Is achieving abstinence harder and do we need to change our interventions?* 83–99, Bethesda, MD: National Cancer Institute. Smoking and Tobacco Control Monograph No. 15; NIH Publication No. 03-5270 Retrieved from <http://cancercontrol.cancer.gov/tcrb/monographs/15/index.html>
- Businelle, M. S., Kendzor, D. W., Costello, T. J., Cofta-Woerpel, L., Li, Y., Mazas, C. A., et al. (2009). Light versus heavy smoking among African American men and women. *Addictive Behaviors, 34*, 197–203. doi:10.1016/j.addbeh.2008.10.009
- Caraballo, R. S., Giovino, G. A., Pechacek, T. F., & Mowery, P. D. (2001). Factors associated with discrepancies between self-reports on cigarette smoking and measured serum cotinine levels among persons aged 17 years or older: Third National Health and Nutrition Examination Survey, 1988–1994. *American Journal of Epidemiology, 153*, 807–814. doi:10.1093/aje/153.8.807
- Centers for Disease Control and Prevention. (1994). Surveillance for selected tobacco-use behaviors—United States, 1900–1994. *Morbidity and Mortality Weekly Report, 43*, 1–43. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00033881.htm>
- Centers for Disease Control and Prevention. (2008). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. *Morbidity and Mortality Weekly Report, 57*, 1226–1228. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm>
- Coggins, C. R., Murrelle, E. L., Carchman, R. A., & Heidbreder, C. (2009). Light and intermittent cigarette smokers: A review (1989–2009). *Psychopharmacology, 207*, 343–363. doi:10.1007/s00213-009-1675-4
- Curtin, L., Brown, R. A., & Sales, S. D. (2000). Determinants of attrition from cessation treatment in smokers with a history of major depressive disorder. *Psychology of Addictive Behaviors, 14*, 134–142. doi:10.1037/0893-164X.14.2.134
- Donze, J., Ruffieux, C., & Cornuz, J. (2007). Determinants of smoking and cessation in older women. *Age and Ageing, 36*, 53–57. doi:10.1093/ageing/af1120
- Fagan, P., & Rigotti, N. A. (2009). Light and intermittent smoking: The road less traveled. *Nicotine & Tobacco Research, 11*, 107–110. doi:10.1093/ntr/ntn015
- Falba, T., Jofre-Bonet, M., Busch, S., Duchovny, N., & Sindelar, J. (2004). Reduction of quantity smoked predicts future cessation among older smokers. *Addiction, 99*, 93–102. doi:10.1111/j.1360-0443.2004.00574.x
- Geronimus, A. T., Neidert, L. J., & Bound, J. (1993). Age patterns of smoking in US Black and White women of childbearing age. *American Journal of Public Health, 83*, 1258–1264. doi:10.2105/AJPH.83.9.1258
- Gierisch, J. M., Bastian, L. A., Calhoun, P. S., McDuffie, J. R., & Williams, J. W., Jr. (2010). *Comparative effectiveness of smoking cessation treatments for patients with depression: A systematic review and meta-analysis of the evidence*. U.S. Department of Veterans Affairs. ESP Project #09–010 Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBK51226/>
- Godtfredsen, N. S., Prescott, E., & Osler, M. (2005). Effect of smoking reduction on lung cancer risk. *Journal of the American Medical Association, 294*, 1505–1510. doi:10.1001/jama.294.12.1505
- Godtfredsen, N. S., Prescott, E., Vestbo, J., & Osler, M. (2006). Smoking reduction and biomarkers in two longitudinal studies. *Addiction, 101*, 1516–1522. doi:10.1111/j.1360-0443.2006.01542.x
- Grant, B. F., Hasin, D. S., Chou, P., Stinson, F. S., & Dawson, D. (2004). Nicotine dependence and psychiatric disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 61*, 1107–1115. doi:10.1001/archpsyc.61.11.1107
- Green, C. A., Polen, M. R., & Brody, K. K. (2003). Depression, functional status, treatment for psychiatric problems, and the health-related practices of elderly HMO members. *American Journal of Health Promotion, 17*, 269–275.
- Hatsukami, D. K., Le, C. T. L., Zhang, Y., Joseph, A. M., Mooney, M. E., Carmella, S. T., et al. (2006). Toxicant exposure in cigarette reducers versus light smokers. *Cancer Epidemiology, Biomarkers, and Prevention, 15*, 2355–2358. doi:10.1158/1055-9965.EPI-06-0240
- Hayes, R. B., Dunsiger, S., & Borrelli, B. (2010). The influence of quality of life and depressed mood on smoking cessation among medically ill smokers. *Journal of Behavioral Medicine, 33*, 209–218. doi:10.1007/s10865-010-9254-z
- Hays, J., Hunt, J. R., Hubbell, A., Anderson, G. L., Limacher, M., Allen, C., et al. (2003). The Women's Health Initiative recruitment methods and results. *Annals of Epidemiology, 13*, S18–S77. doi:10.1016/S1047-2797(03)00042-5
- Hermanson, B., Omenn, G. S., Kronmal, R. A., & Gersh, B. J. (1988). Beneficial six-year outcome of smoking cessation in older men and women with coronary artery disease. Results from the CASS registry. *New England Journal of Medicine, 319*, 1365–1369. doi:10.1056/NEJM198811243192101
- Husky, M. M., Mazure, C. M., Paliwal, P., & McKee, S. A. (2008). Gender differences in the comorbidity of smoking behavior and major depression. *Drug and Alcohol Dependence, 93*, 176–179. doi:10.1016/j.drugalcdep.2007.07.015
- Husten, C. G. (2009). How should we define light or intermittent smoking? Does it matter? *Nicotine & Tobacco Research, 11*, 111–121. doi:10.1093/ntr/ntp010
- Husten, C. G., Shelton, D. M., Crismon, J. H., Lin, Y. W., Mowery, P., & Powell, F. A. (1997). Cigarette smoking and smoking cessation among older adults: United States, 1965–1994. *Tobacco*

Control, 6, 175–180. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/issues/140639/>

Kendler, K. S., Neale, M. C., MacLean, C. J., Heath, A. C., Eaves, L. J., & Kessler, R. C. (1993). Smoking and major depression: A causal analysis. *Archives of General Psychiatry*, 50, 36–43. Retrieved from <http://archpsyc.ama-assn.org.ezproxy.lib.utexas.edu/cgi/reprint/50/1/36>

Kessler, R. C. (2006). The epidemiology of depression among women. In C. L. M. Keyes & S. H. Goodman (Eds.), *Women and depression: A handbook for the social, behavioral, and biomedical sciences* (pp. 22–37). New York, NY: Cambridge University Press.

King, G., Polednak, A., Bendel, R. B., Vilsaint, M. C., & Nahata, S. B. (2004). Disparities in smoking cessation between African Americans and Whites: 1990–2000. *American Journal of Public Health*, 94, 1965–1971.

Kleinbaum, D. B., & Klein, M. (2010). *Logistic regression: A self-learning text*. New York: Springer. doi:10.1007/978-1-4419-1742-3_12

LaCroix, A. Z., Lang, J., Scherr, P., Wallace, R. B., Cornoni-Huntley, J., Berkman, L., et al. (1991). Smoking and mortality among older men and women in three communities. *New England Journal of Medicine*, 324, 1619–1625. doi:10.1056/NEJM199106063242303

Langer, R. D., White, E., Lewis, C. E., Kotchen, J. M., Hendrix, S. L., & Trevisan, M. (2003). The Women's Health Initiative Observational Study: Baseline characteristics of participants and reliability of baseline measures. *Annals of Epidemiology*, 13, S107–S121. doi:10.1016/S1047-2797(03)00047-4

Lasser, K., Boyd, J. W., Wolhandler, S., Himmelstein, D. U., McCormick, D., & Bor, D. H. (2000). Smoking and mental illness. *Journal of the American Medical Association*, 284, 2606–2610. doi:10.1001/jama.284.20.2606

Livson, N., & Leino, E. V. (1988). Cigarette smoking motives: Factorial structure and gender differences in a longitudinal study. *International Journal of Addiction*, 23, 535–544. doi:10.3109/10826088809039218

McClave, A. K., Dube, S. R., Strine, T. W., Kroenke, K., Caraballo, R. S., & Mokdad, A. H. (2009). Associations between smoking cessation and anxiety and depression among U.S. adults. *Addictive Behaviors*, 34, 491–497. doi:10.1016/j.addbeh.2009.01.005

McKee, S. A., Maciejewski, P. K., Falba, T., & Mazure, C. M. (2003). Sex differences in the effects of stressful life events on changes in smoking status. *Addiction*, 98, 847–855. doi:10.1046/j.1360-0443.2003.00408.x

Mickens, L., Ameringer, K., Brightman, M., & Leventhal, A. M. (2010). Epidemiology, determinants, and consequences of cigarette smoking in African American women: An integrative review. *Addictive Behaviors*, 35, 383–391. doi:10.1016/j.addbeh.2009.12.014

Mirowsky, J., & Ross, C. E. (2003). *Social causes of psychological distress* (2nd ed.). Hawthorne, NY: Aldine De Gruyter.

Moon-Howard, J. (2003). African American women and smoking: Starting later. *American Journal of Public Health*, 93, 418–420. doi:10.2105/AJPH.93.3.418

Morgan, G. D., Noll, E. L., Orleans, C. T., Rimer, B. K., Amfoh, K., & Bonney, G. (1996). Reaching midlife and older smokers: Tailored interventions for routine medical care. *Preventive Medicine*, 25, 346–354. doi:10.1006/pmed.1996.0065

Murphy, J. M., Horton, N. J., Monson, R. R., Laird, N. M., Sobol, A. M., & Leighton, A. H. (2003). Cigarette smoking in relation to depression: Historical trends from the Stirling County Study. *American Journal of Psychiatry*, 160, 1663–1669. doi:10.1176/appi.ajp.160.9.1663

Niaura, R., Britt, D. M., Shadel, W. G., Goldstein, M., Abrams, D., & Brown, R. (2001). Symptoms of depression and survival experience among three samples of smokers trying to quit. *Psychology of Addictive Behaviors*, 15, 13–17. doi:10.1037/0893-164X.15.1.13

Ockene, J. K. (1993). Smoking among women across the life span: Prevalence, interventions, and implications for cessation research. *Annals of Behavioral Medicine*, 15, 135–148.

Ossip-Klein, D. J., Carosella, A. M., & Krusch, D. A. (1997). Self-help interventions for older smokers. *Tobacco Control*, 6, 188–193. doi:10.1136/tc.6.3.188

Pierce, J. P., White, M. M., & Messer, K. (2009). Changing age-specific patterns of cigarette consumption in the United States, 1992–2002: Association with smoke-free homes and state-level tobacco control activity. *Nicotine & Tobacco Research*, 11, 171–177. doi:10.1093/ntr/ntp014

Ranney, L., Melvin, C. L., Lux, L., McClain, E., & Lohr, K. N. (2006). Systematic review: Smoking cessation intervention strategies for adults and adults in special populations. *Annals of Internal Medicine*, 145, 845–856.

Rebagliato, M. (2002). Validation of self reported smoking. *Journal of Epidemiology and Community Health*, 56, 163–164. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/issues/139568/>

Reitzel, L. R., Costello, T. J., Masas, C. A., Vidrine, J. I., Businelle, M. S., Kendzor, D. E., et al. (2009). Low-level smoking among Spanish-speaking Latino smokers: Relationships with demographics, tobacco dependence, withdrawal, and cessation. *Nicotine & Tobacco Research*, 11, 178–184. doi:10.1093/ntr/ntn021

Rimer, B. K., Orleans, C. T., Keintz, M. K., Cristinzio, & Fleisher, L. (1990). The older smoker: Status, challenges, and opportunities for intervention. *Chest*, 97, 547–553. doi:10.1378/chest.97.3.547

Robbins, L. N., Helzer, J. E., Croughan, J., & Ratliff, K. S. (1981). National Institute of Mental Health Diagnostic Interview Schedule: Its history, characteristics, and validity. *Archives of General Psychiatry*, 38, 381–389. Retrieved from <http://archpsyc.ama-assn.org.ezproxy.lib.utexas.edu/content/vol38/issue4/index.dtl>

Rossouw, J. E., Finegan, C. P., Harlan, W. R., Pinn, V. W., Clifford, C., & McGowan, J. A. (1995). The evolution of the Women's

- Health Initiative: Perspectives from the NIH. *Journal of the American Medical Women's Association*, 50, 50–55.
- Sachs-Ericsson, N., Schmidt, N. B., Zvolensky, M. J., Mitchell, M., Collins, N., & Blazer, D. G. (2009). Smoking cessation behavior in older adults by race and gender: The role of health problems and psychological distress. *Nicotine & Tobacco Research*, 11, 433–443. doi:10.1093/ntr/ntp002
- Santor, D. A., Gregus, M., & Welch, A. (2006). Eight decades of measurement in depression measurement. *Measurement*, 4, 135–155.
- Schane, R. E., Ling, P. M., & Glantz, S. A. (2010). Health effects of light and intermittent smoking: A review. *Circulation*, 121, 1518–1522. doi:10.1161/CIRCULATIONAHA.109.904235
- Shiffman, S. (2009). Light and intermittent smokers: Background and perspective. *Nicotine & Tobacco Research*, 11, 122–125. doi:10.1093/ntr/ntn020
- Sorlie, P. D., & Kannel, W. B. (1990). A description of cigarette smoking cessation and resumption in the Framingham Study. *Preventive Medicine*, 19, 335–345. doi:10.1016/0091-7435(90)90033-G
- Taylor, D. H., Jr., Hasselblad, V., Henley, J., Thun, M. J., & Sloan, F. A. (2002). Benefits of smoking cessation for longevity. *American Journal of Public Health*, 92, 990–996. doi:10.2105/AJPH.92.6.990
- Tong, E. K., Nguyen, T., Vittinghoff, E., & Perex-Stable, E. J. (2009). Light and intermittent smoking among California's Asian Americans. *Nicotine & Tobacco Research*, 11, 197–202. doi:10.1093/ntr/ntp013
- Trinidad, D. R., Perex-Stable, E. J., Emery, S. L., White, M. M., Grana, R. A., & Messer, K. S. (2009). Intermittent and light daily smoking across racial/ethnic groups in the United States. *Nicotine & Tobacco Research*, 11, 203–210. doi:10.1093/ntr/ntn018
- U.S. Department of Health and Human Services. (1990). *The health benefits of smoking cessation: A report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, CDC. Retrieved from <http://profiles.nlm.nih.gov/NN/B/B/C/T/>
- U.S. Department of Health and Human Services. (2000). *Healthy People 2010*. (2nd ed.). Understanding and improving health and objectives for improving health. (2 vols.). Washington, DC: U.S. Government Printing Office.
- U.S. Department of Health and Human Services. (2001). *Women and smoking: A report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, CDC, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health. Retrieved from http://www.cdc.gov/tobacco/data_statistics/sg/2001/index.htm
- U.S. Department of Health and Human Services. (2004). *The health consequences of smoking: A report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, CDC. Retrieved from http://www.cdc.gov/tobacco/data_statistics/sg/2004/index.htm
- van Gool, C. H., Kempen, G. I. J. M., Penninx, B. W. J. H., Deeg, D. J. H., Beekman, A. T. F., & van Eijk, J. T. M. (2003). Relationship between changes in depressive symptoms and unhealthy lifestyles in late middle aged and older persons: Results from the Longitudinal Aging Study Amsterdam. *Age and Ageing*, 32, 81–87. doi:10.1093/ageing/32.1.81
- Wassertheil-Smoller, S., Shumaker, S., Ockene, J., Talavera, G. A., Greenland, P., Cochrane, B., et al. (2004). Depression and cardiovascular sequelae in postmenopausal women. *Archives of Internal Medicine*, 164, 289–298. doi:10.1001/archinte.164.3.289
- Whitson, H. E., Heflin, M. T., & Burchett, B. M. (2006). Patterns and predictors of smoking cessation in an elderly cohort. *Journal of the American Geriatric Society*, 54, 466–471. doi:10.1111/j.1532-5415.2005.00641.x
- Wilson, D., Parsons, J., & Wakefield, M. (1999). The health-related quality-of-life of never smokers, ex-smokers, and light, moderate, and heavy smokers. *Preventive Medicine*, 29, 139–144. doi:10.1006/pmed.1999.0523
- Women's Health Initiative Study Group. (1998). Design of the Women's Health Initiative Clinical Trial and Observational Study. *Controlled Clinical Trials*, 19, 61–109.
- Ziedonis, D., Hitsman, B., Beckham, J. C., Zvolensky, M., Adler, L. W., Audrain-McGovern, J., et al. (2008). Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report. *Nicotine & Tobacco Research*, 10, 1691–1715. doi:10.1080/14622200802443569