

The Impact of Quitting Smoking on Weight Among Women Prisoners Participating in a Smoking Cessation Intervention

Karen L. Cropsey, PsyD, Leslie A. McClure, PhD, Dorothy O. Jackson, MA, Gabrielle C. Villalobos, BA, Michael F. Weaver, PhD, and Maxine L. Stitzer, PhD

Smoking and obesity are the 2 major causes of mortality and morbidity in the United States.^{1,2} Although smoking is the leading preventable cause of death, resulting in approximately 440 000 deaths each year,³ obesity is a growing epidemic and is the second leading cause of preventable death, resulting in more than 300 000 deaths annually.^{4,5} Whereas smoking rates have declined from their peak in the 1960s, obesity rates have been steadily climbing each year, and obesity is expected to soon eclipse smoking as the most preventable cause of mortality in the United States.¹

The relationship between smoking and weight is complex, and the mechanisms by which smoking influences weight are not fully understood. Smoking affects weight by increasing metabolic rate and decreasing caloric absorption, which is thought to help suppress appetite.⁶ Sympathoadrenal activation by nicotine is thought to be primarily responsible for the metabolic effect of smoking.⁷ Smoking is also associated with increased energy expenditure.⁸ Smoking a single cigarette also decreases caloric consumption by 3% within 20 minutes.⁹

Compared with light smokers and nonsmokers, heavy smokers tend to have greater body weight, which likely reflects a clustering of risk behaviors (i.e., little physical activity and poor diet) and increased insulin resistance and accumulation of abdominal fat.^{6,10,11} Overall, smokers tend to be less physically active than nonsmokers, which may confound explanations of weight differences between smokers and nonsmokers.¹²

Most studies on weight and smoking have reported postcessation weight gain. Smoking cessation has been associated with approximately 10 pounds of weight gain after 1 year of abstinence,¹³ suggesting that health benefits from smoking cessation may be mitigated to some degree by increased health risks associated with weight gain.¹⁴ To prevent or reduce weight gain, those administering cessation programs

Objectives. We examined the impact of smoking cessation on weight change in a population of women prisoners.

Methods. Women prisoners (n=360) enrolled in a smoking cessation intervention; 250 received a 10-week group intervention plus transdermal nicotine replacement.

Results. Women who quit smoking had significant weight gain at 3- and 6-month follow-ups, with a net difference of 10 pounds between smokers and abstainers at 6 months. By the 12-month follow-up, weight gain decreased among abstainers.

Conclusions. We are the first, to our knowledge, to demonstrate weight gain associated with smoking cessation among women prisoners. Smoking cessation interventions that address postcessation weight gain as a preventative measure may be beneficial in improving health and reducing the high prevalence of smoking in prisoner populations. (*Am J Public Health.* 2010;100:1442–1448. doi: 10.2105/AJPH.2009.172783)

are recommended to integrate follow-up support for weight control, provide regular body weight measurement, provide recommendations for dietary change, and encourage increased physical activity.¹⁴ Despite concerns about weight, few studies have systematically investigated weight gain following smoking cessation, particularly with underserved populations such as prisoners.

Correctional populations especially are vulnerable to the negative health consequences of smoking. Smoking rates are 3 to 4 times higher among correctional populations than among the general population, and smoking is normative within the correctional environment.^{15–17} Smoking prevalence is 70% to 80% among male and female prisoners,^{15–20} while almost half (46%) of adolescents in juvenile justice are daily smokers.²¹ This compared to about 21% of adults in the general population who are current smokers.²² However, in the research literature, the emphasis on smoking prevalence, prevention, cessation, and policies is much greater among other populations than it is among criminal justice populations—despite the human, health, and economic costs that occur in prison and in the community.^{20,23}

In addition to the larger prevalence of smoking in prisons, there is less access to interventions for smoking cessation in correctional facilities. Lack of resources amplifies the negative health risks associated with smoking, such as heart, circulatory, and respiratory problems. Over the past 2 decades, correctional facilities in the United States have implemented tobacco-control policies ranging from restrictions on indoor smoking to complete tobacco bans.²⁴ Tobacco restrictions and bans have not succeeded in suppressing smoking, and reduced access to programs and materials that might increase long-term smoking cessation have paralleled them.^{16,17,24,25}

We recently conducted a randomized controlled trial of smoking cessation with women prisoners and found 7-day point prevalence cessation rates comparable to those seen in community smoking cessation interventions.¹⁵ The intervention combined nicotine replacement with a 10-week group therapy intervention.²⁶ The community-tested intervention was modified for the prison environment and included a discussion of weight gain and weekly monitoring of weight during the intervention and follow-up assessments.¹⁵ Point prevalence quit

rates for intervention participants were 18% at end of treatment, 17% at 3-month follow-up, 14% at 6-month follow-up, and 12% at 12-month follow-up, compared with less than 1% at these same time points for control participants.¹⁵ We examined differences in weight change over time for (1) women in the intervention condition compared with women in the control condition and (2) women in the intervention condition who quit smoking compared with those who continued to smoke. To our knowledge, ours is the first study to conduct such a trial among women prisoners.

METHODS

We enrolled participants if they were aged 18 years or older, smoked at least 5 cigarettes per day, were housed in the general prison population (e.g., not held in segregation), and desired smoking cessation treatment. We excluded potential participants if they had severe acute mental illness (e.g., current suicidal ideation or intent, active psychosis) or mental retardation such that they could not provide informed consent or participate in group therapy, had a known allergy to nicotine replacement patches, had less than 1 year remaining to serve on their sentence, or were non-English speaking. We admitted participants with other disabilities (e.g., illiteracy, visual impairment) into the study, and the study research assistant assisted them in completing survey instruments.

A total of 364 women provided written informed consent, 360 completed the baseline assessment, and 250 started the intervention, with 71 starting immediately after the baseline assessment and 179 starting after a 6-month wait-list period. The control sample was composed of 289 participants, 179 of whom crossed over to the active intervention after 6 months¹⁵ (Figure 1). We excluded 1 participant from the current analyses because of a baseline weight value that was skewed and we believed to be mistakenly recorded; this left a sample of 249 women who participated in the intervention.

Demographic characteristics are presented in Table 1 for control-only participants (n=110), intervention-only participants (n=71), and crossover participants who served as both intervention and control participants

(n=249). There were no differences in baseline characteristics between control-only and intervention-only participants or between control-only and intervention participants (including wait-list controls). Overall, the women in our sample were generally young (mean age=34.0 ± 9.0 years), and the sample was almost evenly split between White (45.3%) and Black (44.6%) race/ethnicity. About one third had less than a high school education, one third had obtained a high school diploma or general equivalency diploma, and one third had more than a high school education. Nearly half (46%) had never been married, nearly one third were divorced or separated, and only a small number (15%) were married at the time of the study. The most common charges were the following: larceny or robbery (33.4%), homicide (17.2%), drug-related crime (e.g., possession, distribution, prescription forgery; 16.2%), assault (13.3%), and

parole or probation violation (8.3%); other crimes (e.g., arson, child abuse) accounted for 2.6% of the population, and data were missing in 9% of the cases. The mean duration of sentence was 9.9 years, and 31 women were serving a life sentence, defined as 50 years or more.

Procedures

Study procedures have been described elsewhere.¹⁵ We conducted the study at a medium-maximum security prison housing women offenders in the southeastern United States. We enrolled the participants between June 2004 and June 2006. We distributed flyers in the housing units at the prison, along with formal announcements for opportunities to enroll in the study. Participants completed contact information and placed this information in a locked box accessible only to research staff. Study staff conducted recruitment and informed consent

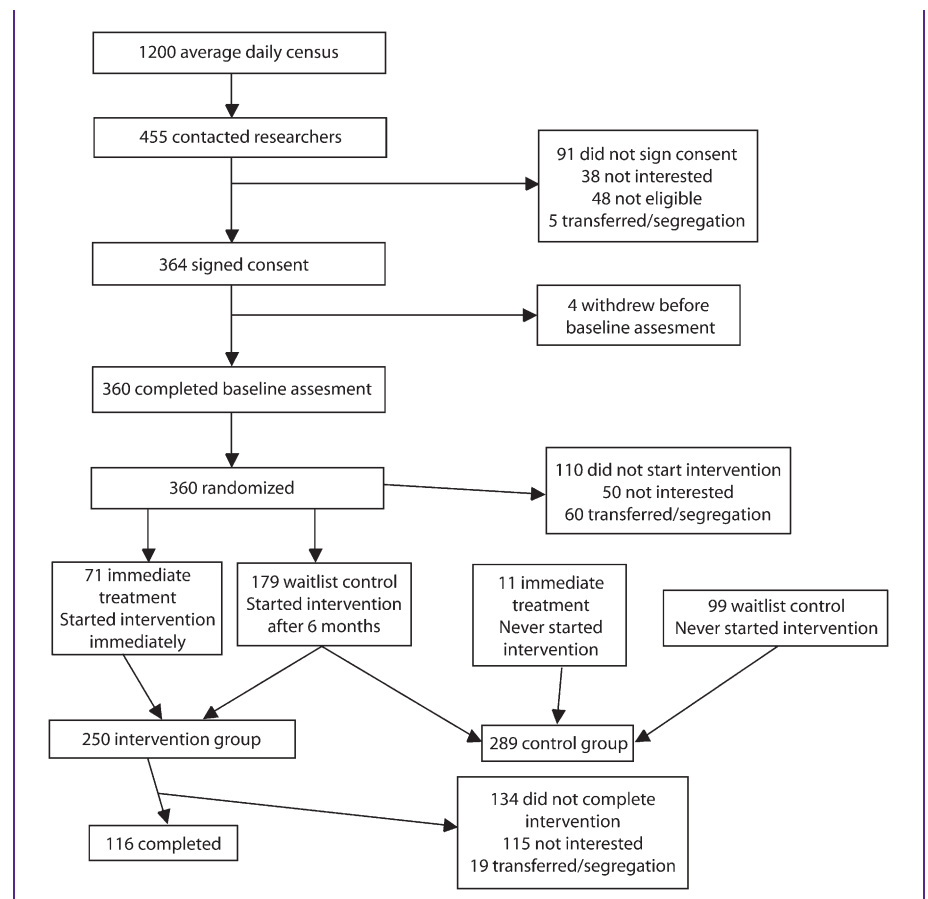


FIGURE 1—Study flow for Project STOP (Smoking Treatment of Prisoners): southeastern United States, 2005–2007.

TABLE 1—Demographic Characteristics at Baseline, by Treatment Group: Project STOP, Southeastern United States, 2005–2007

Demographic Characteristics	Control Only (n = 110), Mean (SD) or No. (%)	Intervention Only (n = 71), Mean (SD) or No. (%)	Intervention + Wait-List Crossover (n = 250), Mean (SD) or No. (%)
Age, y	34.1 (8.1)	35.6 (8.4)	33.8 (9.0)
Weight, lbs	169.1 (39.4)	180.8 (45.3)	169.9 (41.1)
Body mass index, kg/m ²	28.4 (6.8)	29.9 (6.8)	28.3 (6.5)
No. children	2.3 (1.6)	2.2 (1.6)	2.2 (1.6)
Age, y, at first cigarette	14.5 (5.6)	13.7 (5.2)	13.7 (4.9)
Age, y, became daily smoker	16.5 (5.4)	16.7 (5.4)	16.2 (4.9)
No. cigarettes/d	14.0 (8.6)	16.2 (7.9)	16.5 (8.7)
No. cigarettes yesterday	13.9 (9.6)	14.9 (8.3)	14.5 (8.6)
CO concentration, ppm	13.1 (8.0)	13.5 (8.0)	14.4 (8.4)
Duration of smoking, y	19.3 (9.4)	22.0 (8.7)	20.1 (9.9)
No. quit attempts	3.2 (4.8)	1.7 (2.2)	2.4 (2.8)
Duration last quit attempt, mo	38.9 (58.8)	32.8 (58.2)	29.3 (53.3)
Race			
Black	53 (49%)	34 (48%)	119 (48%)
White	47 (44%)	30 (42%)	110 (44%)
Other	8 (7%)	7 (10%)	21 (8%)
Education			
< High school	33 (31%)	16 (23%)	67 (28%)
High school graduate	40 (38%)	30 (43%)	100 (42%)
> High school	32 (31%)	23 (33%)	73 (30%)
Marital status			
Single	49 (46%)	29 (43%)	115 (48%)
Married	22 (21%)	9 (13%)	37 (15%)
Divorced	29 (27%)	26 (38%)	74 (31%)
Widowed	7 (7%)	4 (6%)	15 (6%)

Notes: CO = carbon monoxide; ppm = parts per million; STOP = Smoking Treatment of Prisoners.

procedures in a confidential room in the prison medical building.

After providing written informed consent, participants completed baseline demographic and smoking information questionnaires. Expired air carbon monoxide (CO) concentration in parts per million was measured by a Vitalograph BreathCO monitor (Vitalograph, Inc, Lenexa, KS). A CO reading of 3 parts per million or higher, which was the optimal cutoff indicated in a previous investigation of smoking and nonsmoking women prisoners,²⁷ was used to indicate current smoking. We measured height at baseline and weight at all subsequent study contacts. During the group intervention, we collected weekly measures of daily smoking, concentrations of expired CO, and weight.

Intervention Description

We modified the behavioral intervention for the prison environment (from the Mood Management Training to Prevent Smoking Relapse program)²⁶ and focused on mood management skills including standard behavioral interventions for smoking cessation. The intervention also included discussions of weight gain and techniques to reduce gain during cessation, such as increasing physical activity and decreasing caloric intake. Although the intervention did not have any sessions devoted exclusively to weight concerns associated with quitting smoking, we weighed participants at every contact and provided them with feedback on their weight. This feedback included suggestions for making healthier choices, even within limited cafeteria and commissary options.

We modified the 10-session group intervention for the unique environment that women prisoners encounter, and we included examples of smoking triggers encountered in prison and acceptable coping strategies that could be used in the prison environment. A full description of the intervention and modifications was reported previously.¹⁵ The pharmacotherapy adjunct was the use of NicoDerm CQ (GlaxoSmithKline, Brentford, Middlesex, United Kingdom) patches while following the manufacturer's suggested dosing regimen. Participants started nicotine replacement during the third week of the intervention, and we asked them to quit smoking the same day they started the nicotine replacement.

Participants attended 10 weekly sessions and completed assessments at the end of treatment (week 10) and at 3-, 6-, and 12-month follow-up. Participants who started on 21-mg nicotine patches had an additional medication check-in the week after the end of treatment assessment so we could refill medication and assess for side effects.

Data Analysis

The first comparison was between women in the control-only condition and women in the intervention-only condition (excluding women who participated as controls and crossed over to the intervention condition after the 6-month wait-list period).

Thus, we included only women whom we randomized to the intervention immediately after baseline or who completed only the control period. We examined baseline factors using means and standard deviations. We used repeated measure analysis of covariance (ANCOVA) to assess the relationship between weight changes over time and treatment. Time points included in the model were the following: 10 weeks (end of treatment), 3 months, and 6 months. (Women in the control condition completed only 6 months of follow-up.) We included baseline weight as a covariate to account for different starting weights. After assessing a variety of options using the Akaike Information Criteria, we chose the unstructured covariance structure for the model. We determined whether weight change differed over time between the 2 groups on the basis of the interaction between treatment group and time; we deemed a *P* value of <.05 significant.

The second comparison was between women in the intervention condition who quit smoking and women in the intervention condition who continued to smoke. At each time point (3 months, 6 months, and 12 months), we compared baseline factors for women who had quit smoking versus women who continued to smoke. We used repeated measures ANCOVA to assess the relationship between weight change over time and quit status at each of these time points. We assessed weekly measurements of weight beginning with the intervention, and we included baseline weight in the model to account for different starting weights. We deemed the unstructured covariance structure most appropriate for these models. We determined whether weight change differed over time by quit status on the basis of the interaction between quit status and time. We deemed a P value of $<.05$ significant. We analyzed the data with SAS version 9.1.3 (SAS Institute, Cary, NC).

RESULTS

The first comparison was between women in the control-only condition and women in the intervention-only condition (excluding women who participated as controls and crossed over to the intervention condition after the 6-month wait-list period). We found that at week 10, those in the intervention had lost 1.5 pounds ($SD=5.0$), whereas those in the control group had lost 2.4 pounds ($SD=7.7$; Cohen $d=0.130$). At week 12 (3 month follow-up), the weight loss was similar between the 2 groups: those in the intervention had lost 3.5 pounds ($SD=6.1$), whereas those in the control group had lost 3.4 pounds ($SD=9.5$; Cohen $d=-0.012$). At 24 weeks (6 month follow-up), the weight loss in the intervention group was larger than that in the control group (mean loss $\pm SD=5.8 \pm 15.5$ vs 4.1 ± 12.5 , respectively; Cohen $d=-0.120$). The results from the repeated measures ANCOVA indicate that there is no significant difference in weight change between these groups over time ($P=.89$).

The second comparison was between women in the intervention condition who quit smoking and women in the intervention condition who continued to smoke. Table 2 presents demographic data for all women in the

intervention condition, comparing those who had a sustained quit at 3, 6, and 12 months with those who were still smoking at each time point. The results from our preliminary univariate analyses showed no significant differences in demographic characteristics between smokers and nonsmokers at any time point (for all, $P>.05$), with the exception that women who had quit at 12 months had fewer children than did those who continued to smoke (mean $\pm SD=1.5 \pm 1.4$ and 2.3 ± 1.6 , respectively; $P=.009$).

Figure 2 presents changes in weight in pounds for each week of the trial for intervention participants who had quit or who continued to smoke at 3-, 6-, and 12-month follow-ups. Panel 1 presents means and standard deviations of the change in weight by quit status at 3 months. Results from the repeated measures ANCOVA indicate a significant difference in weight change between these groups over time ($P=.014$). However, although weight decreased over time for women who continued smoking, the decrease was not significantly different from zero ($P=.082$). Similarly, although weight increased over time for women who quit smoking, the increase was not significantly different from zero ($P=.065$).

Panel 2 in Figure 2 presents changes in weight by quit status at 6 months. Results from the repeated measures ANCOVA indicate that the change in weight over time differs by quit status at 6 months ($P\leq.001$), with weight decreasing significantly over time for women who continued to smoke ($P=.035$) and increasing significantly over time for women who had quit at 6 months ($P=.009$). Overall, at 6 months, there was a weight gain greater than 6 pounds among abstainers compared with an almost 3-pound weight loss among smokers.

Panel 3 in Figure 2 presents changes in weight by quit status at 12 months. There is a significant interaction between time and quit status, indicating that the change in weight over time differs by quit status at 12 months ($P\leq.001$). As with the 6-month quit status, weight decreased significantly over time for women who continued to smoke at 12 months ($P=.014$). By contrast, for women who had quit smoking at 12 months, weight change did not differ significantly from zero ($P=.066$). By the 12-month follow-up, women in the intervention group who had maintained smoking abstinence reversed

the trend of weight gain and returned to their 3-month weight gain levels, resulting in about a 4-pound weight gain by 12 months.

DISCUSSION

This study is the first, to our knowledge, to examine weight changes over time among women prisoners who completed an in-prison smoking cessation intervention. Consistent with findings from previous studies that have demonstrated weight gain following smoking cessation,^{6,14} our data suggest that incarcerated women who quit smoking gain weight whereas women who continue to smoke are more likely to lose weight. Although changes in weight over time were not apparent when comparing intervention-only participants with control-only participants, postintervention changes in weight differed for women who quit smoking versus women who continued to smoke. As expected, those who maintained abstinence from smoking saw a notable increase in weight after completing the intervention. However, 1 year after the end of the intervention, successful quitters saw their weight begin to return to 3-month post-cessation levels despite significant increases at the 6-month follow-up. Although we do not know if women who quit smoking ever return to their baseline (smoking) weight, the findings of this study generally support the previously documented tendency for weight gain after smoking cessation to dissipate over time.^{6,14}

Although this is the first study, to our knowledge, to examine weight change after smoking cessation in prisoners, it is logical to assume that the negative health consequences associated with quitting smoking will also include postcessation weight changes. Increased weight following smoking cessation is even more likely when additional factors, such as limited food options (e.g., those provided by commissaries and prisons), limit possibilities for dietary changes.

The replication of findings from larger clinical trials in our sample of women prisoners has important implications, most notably that women smokers in prison experience similar weight change patterns as do women smokers in the general population. Given the pervasive health risks associated with both smoking and obesity, documenting the relationship between smoking cessation and weight gain in women

TABLE 2—Demographic Characteristics at Baseline, by Quit Status at 3, 6, and 12 Months Among the Intervention Group (N=249): Project STOP, Southeastern United States, 2005–2007

Demographic Characteristics	3-Month Status		6-Month Status		12-Month Status	
	Smoker (n=207), Mean (SD) or No. (%)	Quit (n=42), Mean (SD) or No. (%)	Smoker (n=214), Mean (SD) or No. (%)	Quit (n=35), Mean (SD) or No. (%)	Smoker (n=220), Mean (SD) or No. (%)	Quit (n=29), Mean (SD) or No. (%)
Age, y	33.6 (9.0)	34.6 (9.2)	33.9 (9.0)	33.1 (9.2)	33.8 (9.0)	34.0 (9.6)
Weight, lbs	170.4 (42.1)	167.5 (37.0)	171.0 (42.5)	163.1 (31.4)	170.6 (42.1)	164.5 (33.4)
Body mass index, kg/m ²	28.2 (6.6)	28.5 (6.2)	28.3 (6.7)	28.0 (5.7)	28.3 (6.6)	28.3 (6.1)
No. children	2.3 (1.6)	1.8 (1.6)	2.3 (1.6)	1.6 (1.6)	2.3 (1.6)	1.5 (1.4)
Age, y, at first cigarette	13.7 (4.6)	13.7 (5.8)	13.5 (4.4)	14.8 (6.9)	13.7 (4.9)	13.3 (4.1)
Age, y, became daily smoker	16.1 (4.3)	16.8 (5.6)	15.9 (4.6)	17.9 (6.5)	16.1 (5.0)	16.6 (4.4)
No. cigarettes/d	16.4 (8.6)	16.8 (5.6)	16.6 (8.8)	15.2 (8.3)	16.5 (8.8)	15.9 (8.3)
No. cigarettes yesterday	14.5 (8.6)	14.6 (8.8)	14.7 (8.7)	12.9 (7.9)	14.6 (8.7)	13.8 (7.9)
CO concentration, ppm	14.8 (8.5)	12.2 (7.7)	14.5 (8.5)	13.6 (8.0)	14.4 (8.5)	13.8 (8.1)
Duration of smoking, y	20.0 (9.5)	21.0 (11.6)	20.4 (9.6)	18.7 (11.5)	20.1 (9.8)	20.8 (10.1)
No. quit attempts	2.3 (2.6)	2.8 (3.6)	2.4 (2.8)	2.4 (2.8)	2.4 (2.8)	2.4 (3.0)
Duration last quit attempt, mo	29.6 (55.7)	27.9 (41.4)	29.4 (54.1)	28.6 (46.1)	28.8 (53.5)	34.9 (54.7)
Race						
Black	99 (48%)	20 (48%)	102 (47%)	17 (49%)	103 (47%)	16 (55%)
White	90 (43%)	20 (48%)	94 (44%)	16 (46%)	97 (44%)	13 (45%)
Other	19 (9%)	2 (5%)	19 (9%)	2 (6%)	21 (10%)	0 (0%)
Education						
< High school	58 (29%)	9 (22%)	60 (29%)	7 (21%)	63 (30%)	4 (14%)
High school graduate	85 (43%)	15 (37%)	85 (41%)	15 (44%)	85 (40%)	15 (54%)
> High school	56 (28%)	17 (42%)	61 (30%)	12 (35%)	64 (30%)	9 (32%)
Marital status						
Single	94 (47%)	21 (51%)	95 (45%)	21 (62%)	97 (46%)	18 (64%)
Married	31 (16%)	6 (15%)	32 (15%)	5 (15%)	34 (16%)	3 (11%)
Divorced	63 (32%)	11 (27%)	67 (32%)	7 (21%)	68 (32%)	6 (24%)
Widow	12 (6%)	3 (7%)	14 (7%)	1 (3%)	14 (7%)	1 (4%)

Notes: CO = carbon monoxide; ppm = parts per million; STOP = Smoking Treatment of Prisoners.

prisoners provides a basis for developing an intervention to target weight gain in future trials of smoking cessation with incarcerated populations.

Our findings contribute to a growing body of literature that encourages the exploration of therapeutic approaches to reduce or prevent weight gain after smoking cessation.¹⁴ Combining smoking and weight interventions may result in greater willingness to quit smoking and greater success rates among individuals who attempt to stop smoking. This study also provides additional evidence that immediate weight gain after smoking cessation is generally short term, with a general trend toward returning to within a few pounds of baseline weight within a year of smoking abstinence. Emphasizing the short-term nature of weight increase may affect a smoker's

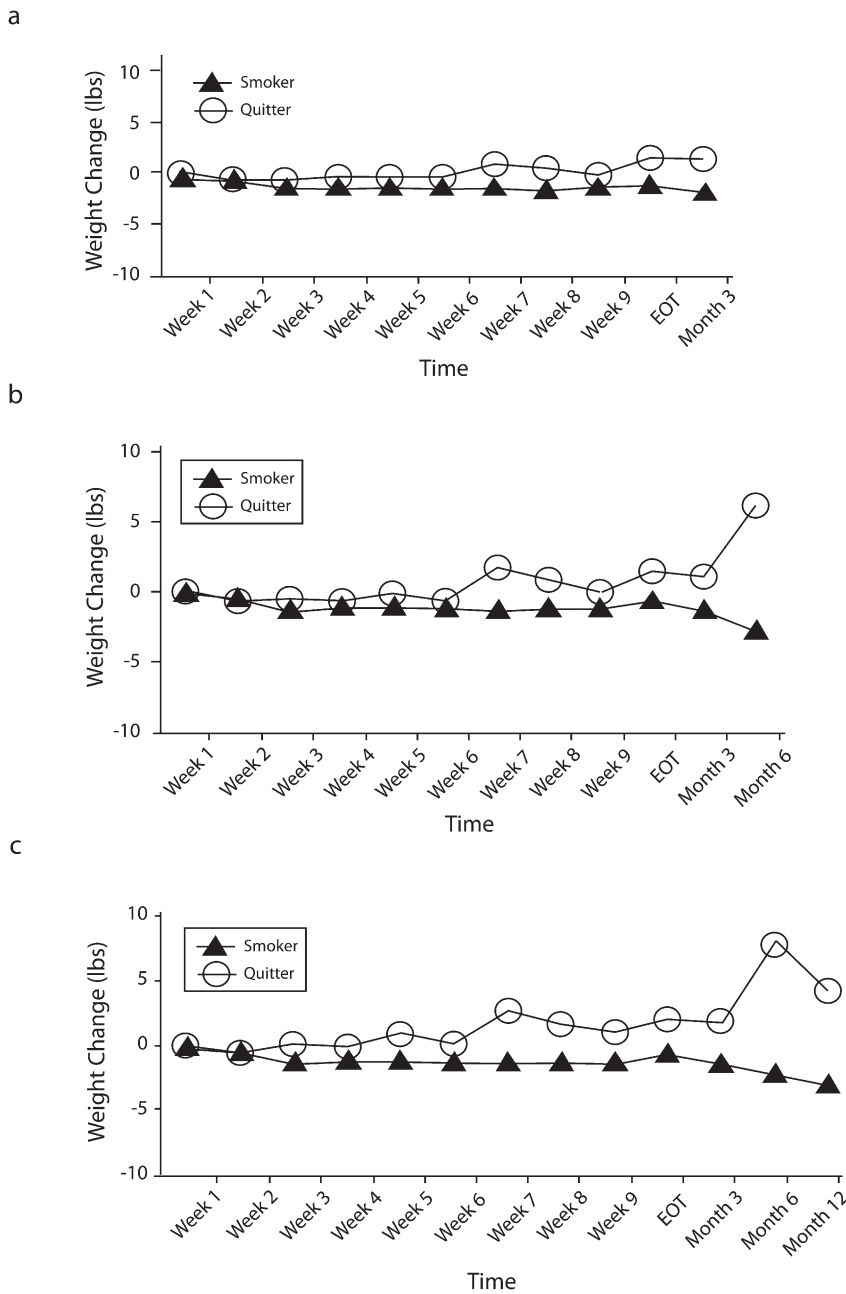
decision to quit, particularly among women smokers. Increasing smokers' awareness about what to expect after cessation, coupled with improved interventions to prevent or reduce weight gain, may help address this critical barrier to smoking cessation in women.

Study Limitations

This study has several limitations that may decrease the generalizability of the findings. First, with the exception of women who have funds or the ability to purchase or barter for food items available in the prison commissary, incarcerated women have less control over the content or quantity of their diet than do women in the general population. In addition, incarcerated women have less control over exercise opportunities. Thus, the process of

weight gain—and the process of limiting weight gain—after smoking cessation may differ in important ways from that of nonincarcerated women. We do not know whether the response to interventions observed in this population will hold true outside an institutional setting.

Second, we examined only women prisoners, and we do not know how these results would apply to men prisoners involved in a smoking cessation intervention. Although both men and women gain weight after quitting smoking, women tend to gain more than do men.²⁸ Paradoxically, postcessation weight gain is more likely to result in smoking relapse for men than for women,²⁹ which is unexpected given that women are more likely to express concern over weight gain, are



Note. EOT = end of treatment.

FIGURE 2—Mean changes in weight over time by quit status among the intervention group (N=249) at (a) 3 months, (b) 6 months, and (c) 12 months: Project STOP (Smoking Treatment of Prisoners), southeastern United States, 2005–2007.

more likely to continue smoking to control weight, and more often report that they would resume smoking if postcessation weight gain occurred.^{30–32}

A final limitation relates to available data. We did not ask participants about

a number of factors that could also contribute to weight change, such as diabetes, thyroid conditions, or other health problems. In future studies, it would be useful to collect more health background information and to also collect a fasting blood sample for an

analysis of serum lipids and other health indicators.

Conclusions

Prison populations continue to grow at an alarming rate and, on any given day, about 1% of the general population in the United States is maintained in a correctional institution.³³ Given that most correctional systems have already banned smoking or are in the process of implementing complete smoking bans,²⁵ appropriately adapted cessation interventions are urgently needed.³⁴ Previous studies have demonstrated that implementing smoking bans without providing smoking cessation treatment results in poor compliance with smoking bans, continued smoking, and the growth of a contraband industry within the correctional system.^{16,17} Paradoxically, the implementation of smoking bans is associated with reduced availability of smoking cessation programs and materials in correctional settings.²⁵

Researchers have examined the efficacy of an intervention that combines smoking cessation and weight control in the general population and found no increased cessation benefits. However, incorporating weight gain prevention into smoking cessation is attractive to many smokers who are contemplating quitting.³⁵ We have demonstrated that a community-tested smoking cessation intervention can be successfully tailored to a correctional setting. Interventions for preventing or reducing weight gain after smoking cessation must be fit to the unique circumstances of incarceration, with the recognition that incarcerated women have less control over diet and exercise than do women in the general population. Providing a smoking cessation intervention that addresses postcessation weight gain within the constraints of institutionalization may improve the attractiveness of cessation programs to incarcerated women and reduce the high rate of smoking among incarcerated individuals. ■

About the Authors

Karen L. Cropsey is with the Department of Psychiatry, University of Alabama, Birmingham. Leslie A. McClure is with the Department of Biostatistics, University of Alabama, Birmingham. Dorothy O. Jackson is with the Department of Psychology, University of Alabama, Birmingham. Gabrielle C. Villalobos is with the Department of Psychology, Virginia Commonwealth University.

Richmond. Michael F. Weaver is with the Department of Internal Medicine, Virginia Commonwealth University, Richmond. Maxine L. Stitzer is with the Department of Psychiatry, Johns Hopkins University, Baltimore, MD.

Correspondence should be sent to Karen L. Cropsey, PsyD, Department of Psychiatry, University of Alabama at Birmingham, 401 Beacon Parkway West, Birmingham, AL 35209 (e-mail: kcropsey@beapsy1.his.uab.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints/Eprints" link.

This article was accepted November 15, 2009.

Contributors

K.L. Cropsey, L.A. McClure, and D.O. Jackson contributed to the design, analysis, and writing of the article. G.C. Villalobos, M.F. Weaver, and M.L. Stitzer contributed to the original design, data collection, and editing of the article.

Human Participation Protection

The institutional review boards at Virginia Commonwealth University, University of Alabama at Birmingham, and the Virginia Department of Corrections approved this study. The National Institutes of Health obtained a certificate of confidentiality to further protect the confidentiality of participants.

References

- Mokdad AH, Marks JS, Stroup DF, et al. Actual causes of death in the United States, 2001. *JAMA*. 2004;291(24):1238–1245.
- Haslam DW, James WP. Obesity. *Lancet*. 2005; 366(9492):1197–1209.
- US Public Health Service. *The Health Consequences of Smoking: A Report of the Surgeon General*. Washington, DC: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.
- Allison DB, Fontaine KR, Manson JE, et al. Annual deaths attributable to obesity in the United States. *JAMA*. 1999;282(16):1530–1538.
- Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003;289(1):76–79.
- Chiolero A, Faeh D, Paccaud F, et al. Consequences of smoking for body weight, body fat distribution, and insulin resistance. *Am J Clin Nutr*. 2008;87(4):801–809.
- Perkins KA. Metabolic effects of cigarette smoking. *J Appl Physiol*. 2008;72(2):401–409.
- Perkins KA. Effects of tobacco smoking on caloric intake. *Br J Addict*. 1992;87(2):193–205.
- Dallosso HM, James WP. The role of smoking in the regulation of energy balance. *Int J Obes*. 1984;8(4):365–375.
- Eliasson B. Cigarette smoking and diabetes. *Prog Cardiovasc Dis*. 2003;45(5):405–413.
- Houston TK, Person SD, Pletcher MJ, et al. Active and passive smoking and development of glucose intolerance among young adults in a prospective cohort: CARDIA study. *BMJ*. 2006;332(7549):1064–1069.
- Klesges RC, Eck LH, Isbell TR, et al. Smoking status: effects on the dietary intake, physical activity, and body fat of adult men. *Am J Clin Nutr*. 1990;51(5):784–789.
- Pisinger C, Jorgensen T. Waist circumference and weight following smoking cessation in a general population: the Inter99 study. *Prev Med*. 2007;44(4):290–295.
- Cairella G, Ciaralli F, Longo P, et al. Smoking cessation and weight gain. *Ann Ig*. 2007;19(1):73–81.
- Cropsey K, Eldridge G, Weaver M, et al. Smoking cessation intervention for female prisoners: addressing an urgent public health need. *Am J Public Health*. 2008; 98(10):1894–1901.
- Cropsey KL, Kristeller JL. Motivational factors related to quitting smoking among prisoners during a smoking ban. *Addict Behav*. 2003;28(6):1081–1093.
- Cropsey KL, Kristeller JL. The effects of a prison smoking ban on smoking behavior and withdrawal symptoms. *Addict Behav*. 2005;30(3):589–594.
- Conklin TJ, Lincoln T, Tuthill RW. Self-reported health and prior health behaviors of newly admitted correctional inmates. *Am J Public Health*. 2000;90(12): 1939–1941.
- Colsher PL, Wallace RB, Loeffelholz PL, et al. Health status of older male prisoners: a comprehensive survey. *Am J Public Health*. 1992;82(6):881–884.
- Cropsey K, Eldridge GD, Ladner T. Smoking among female prisoners: an ignored public health epidemic. *Addict Behav*. 2004;29(2):425–431.
- Cropsey KL, Linker JA, Waite DE. An analysis of racial and sex differences for smoking among adolescents in a juvenile correctional center. *Drug Alcohol Depend*. 2008;92(1–3):156–163.
- Centers for Disease Control and Prevention. *Smoking and Tobacco Use: Fact Sheet. Morbidity and Mortality Weekly Report*. Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention; 2007.
- Awofeso N. Implementing smoking cessation programmes in prison settings. *Addict Res Theory*. 2003; 11(2):119–130.
- Hall SM, Muñoz RF, Reus VI. Cognitive-behavioral intervention increases abstinence rates for depressive-history smokers. *J Consult Clin Psychol*. 1994;62(1):141–146.
- Cropsey KL, Eldridge GD, Weaver MF, et al. Expired carbon monoxide levels in self-reported smokers and nonsmokers in prison. *Nicotine Tob Res*. 2006;8(5):653–659.
- Flegal KM, Troiano RP, Pamuk ER, et al. The influence of smoking cessation on the prevalence of overweight in the United States. *N Engl J Med*. 1995; 333(18):1165–1170.
- Borrelli B, Spring B, Niaura R, et al. Influences of gender and weight gain on short-term relapse to smoking in a cessation trial. *J Consult Clin Psychol*. 2001;69(3): 511–515.
- Borrelli B, Mermelstein R. The role of weight concern and self-efficacy in smoking cessation and weight gain among smokers in a clinic-based cessation program. *Addict Behav*. 1998;23(5):609–622.
- French SA, Jeffery RW. Weight concerns and smoking: a literature review. *Ann Behav Med*. 1995; 17(3):234–244.
- Klesges RC, Klesges LM. Cigarette smoking as a dieting strategy in a university population. *Int J Eat Disord*. 1988;7:413–419.
- Public Safety Performance Project. One in 100: Behind Bars in America 2008. Pew Center on the States. Available at: http://www.pewcenteronthestates.org/uploadedFiles/8015PCTS_Prison08_FINAL_2-1-1_FORWEB.pdf. Accessed August 18, 2009.
- Kauffman RM, Ferketich AK, Wewers ME. Tobacco policy in American prisons, 2007. *Tob Control*. 2008; 17(5):357–360.
- Eldridge GD, Cropsey KL. Smoking bans and restrictions in U.S. prisons and jails: consequences for incarcerated women. *Am J Prev Med*. 2009;37(2 Suppl): S179–S180.
- Pirie PL, McBride CM, Hellerstedt W, et al. Smoking cessation in women concerned about weight. *Am J Public Health*. 1992;82(9):1238–1242.
- Patrick S, Marsh R. Current tobacco policies in U.S. adult male prisons. *Soc Sci J*. 2001;38(1):27–37.