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Likelihood of Unemployed Smokers vs Nonsmokers Attaining Reemployment in a One-Year Observational Study

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Abstract

Importance—Studies in the United States and Europe have found higher smoking prevalence among unemployed job seekers relative to employed workers. While consistent, the extant epidemiologic investigations of smoking and work status have been cross-sectional, leaving it underdetermined whether tobacco use is a cause or effect of unemployment.

Objective—To examine differences in reemployment by smoking status in a 12-month period.

Design, Setting, and Participants—An observational 2-group study was conducted from September 10, 2013, to August 15, 2015, in employment service settings in the San Francisco Bay Area (California). Participants were 131 daily smokers and 120 nonsmokers, all of whom were

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unemployed job seekers. Owing to the study's observational design, a propensity score analysis was conducted using inverse probability weighting with trimmed observations. Including covariates of time out of work, age, education, race/ethnicity, and perceived health status as predictors of smoking status.

Mainoutcomes and measures—Reemployment at 12-month follow-up.

Results—Of the 251 study participants, 165 (65.7) were men, with a mean (SD) age of 48 (11) years; 96 participants were white (38.2%), 90 were black (35.9%), 24 were Hispanic (9.6%), 18 were Asian (7.2%), and 23 were multiracial or other race (9.2%); 78 had a college degree (31.1%), 99 were unstably housed (39.4%), 70 lacked reliable transportation (27.9%), 52 had a criminal history (20.7%), and 72 had received prior treatment for alcohol or drug use (28.7%). Smokers consumed a mean (SD) of 13.5 (8.2) cigarettes per day at baseline. At 12-month follow-up (217 participants retained [86.5%]), 60 of 108 nonsmokers (55.6%) were reemployed compared with 29 of 109 smokers (26.6%) (unadjusted risk difference, 0.29; 95% CI, 0.15-0.42). With 6% of analysis sample observations trimmed, the estimated risk difference indicated that nonsmokers were 30% (95% CI, 12%-48%) more likely on average to be reemployed at 1 year relative to smokers. Results of a sensitivity analysis with additional covariates of sex, stable housing, reliable transportation, criminal history, and prior treatment for alcohol or drug use (25.3% of observations trimmed) reduced the difference in employment attributed to smoking status to 24% (95% CI, 7%-39%), which was still a significant difference. Among those reemployed at 1 year, the average hourly wage for smokers was significantly lower (mean [SD], $15.10 [$4.68]) than for nonsmokers (mean [SD], $20.27 [$10.54]; $F_{(1,86)} = 6.50$, $P = .01$).

Conclusions and Relevance—To our knowledge, this is the first study to prospectively track reemployment success by smoking status. Smokers had a lower likelihood of reemployment at 1 year and were paid significantly less than nonsmokers when reemployed. Treatment of tobacco use in unemployment service settings is worth testing for increasing reemployment success and financial well-being.

Cross-sectional surveys have shown a consistent association between tobacco smoking and unemployment. A study of 52 418 construction workers in the 2006-2007 US Current Population Survey reported a greater likelihood of unemployment among smokers (229 [11.1%]) than nonsmokers (136 [6.4]%).[1] In the study's fully adjusted model with sex, age, education, ethnicity, and household income as covariates, unemployment remained a significant predictor of current smoking (odds ratio [OR], 1.51; 95% CI, 1.38-1.65). Among 68 501 adults surveyed in the California Health Interview Survey from 2007 to2009, unemployed job seekers had the highest smoking prevalence (679 [20.9%]) relative to unemployed individuals who were not seeking a job (2652 [15.9%]) and employed individuals (7189 [14.8%]); the difference remained significant when adjusting for demographic factors and other risk behaviors (eg, obesity, binge drinking) (OR, 1.23; 95% CI, 1.01-1.49).[2] Analysis of data from the French National Health Survey from the early 1990s reported a smoking prevalence of 45% among employed menvs 67% for unemployed men (OR, 2.3; 95% CI, 1.7-3.1).[3] Adjusting for demographic and social-psychological variables, analysis of data from Italy's 2003 Health Determinants Surveillance System with 4002 civilians found that smoking remained a significant correlate of unemployment status (OR, 2.23; 95% CI, 1.28-3.88).[4] Among 7906 jobseekers presenting to employment

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agencies in Germany between 2008 and 2009,the smoking prevalence was 57.7% overall (N = 4328) and exceeded 80% (women, 80.2%; men, 84.8%) for young adults (aged 18-24 years) unemployed more than 24 months.[5]

While consistent, the extant epidemiologic investigations have been cross-sectional, leaving it underdetermined as to whether smoking is a cause or effect of unemployment. Tobacco use among employees is associated with greater health care costs, unproductive time, and absenteeism.[6-8] An employee who smokes costs private employers in the United States an estimated excess cost (above that for a nonsmoking employee) of $5816 per year.[9] Concerned about the health risks and related costs associated with tobacco use, employers are increasingly taking action to reduce smoking in the workforce.[10] Smokers are not a protected class entitled to special legal protections, based on a 1987 Federal Appeals Court ruling,[11] and hiring policies requiring that employees do not use nicotine are legal in more than 20 states. Hence, employers can make judgments about tobacco use among prospective employees. For example, health care and other industries have implemented testing of applicants' urine for nicotine or cotinine (a nicotine metabolite) as a contingency for employment. Employers have prohibited tobacco use during working hours, offered financial incentives for employees to quit smoking, or charged higher medical insurance co-payments for those who continue to smoke. In many states, employers are able to fire or discipline employees who smell of tobacco smoke at work.[12] Employees who have claimed nicotine addiction under the Americans with Disabilities Act have not been successful, as the courts have refused to find that addiction to cigarette smoking is a disability.[13]

Research has not quantified the economic burden of tobacco use for job seekers. To evaluate whether tobacco use is indeed a detriment to employability, prospective trials that observe unemployed smokers and nonsmokers through the job search process are needed. Our study, using a longitudinal observational design, sought to examine differences in reemployment success by smoking status during a 12-month period. We hypothesized that nonsmokers would be more successful than smokers in gaining reemployment. Among those reemployed at 1 year, we examined hours employed and hourly pay by smoking status. To inform tobacco treatments for job seekers, we also assessed strategies and motivations for quitting.

Methods

Sample Recruitment

Smokers and nonsmokers were recruited from September 10, 2013,to August 15,2015, from 2 employment development departments in adjacent California counties (1 urban, San Francisco, and 1 suburban, Marin) serving a combined estimated 7000 clients annually in the San Francisco Bay Area. Both counties had 100%smoke-free nonhospitality work place laws that banned smoking of tobacco products in an enclosed space at a place of employment, with several designated exceptions, and comparable unemployment rates at the start of recruitment (Marin, 5.0%; San Francisco, 5.2%) and study completion (Marin, 3.5%; San Francisco, 3.6%). To be eligible, smokers had to report daily smoking with a carbon monoxide breath sample more than 10 ppm; nonsmokers had to deny tobacco use in the past year with a carbon monoxide breath sample less than 10 ppm.[14] Daily marijuana users were excluded, as smoked cannabis can elevate carbon monoxide levels. Participants had to be 18

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years or older, English literate, unemployed, actively job seeking at the time of study enrollment, able to provide collateral sources of contact for follow-up, and not actively planning to relocate out of the area. Recruitment efforts were reactive (via flyers) and proactive (via onsite outreach).

The Stanford University Institutional Review Board approved all study procedures, participants provided written informed consent, and confidentiality was assured. The computer-delivered surveys, administered at the employment service settings, took 60 minutes at baseline and 30 minutes at follow-up. Participants received up to $100 cash for their time in the study.

Measures

Participants reported their age, sex, race/ethnicity, educational level, marital status, housing status, transportation, and height and weight to calculate body mass index (calculated as weight in kilograms divided by height in meters squared). We assessed criminal history reportable on a job application; prior treatment for alcohol or drug use, including 12-step programs; and treatment for psychological or emotional problems. A question about general health had participants rate their health as fair, poor, good, very good, or excellent. The Kessler 6 scale assessed psychological distress, scored as low (total score, <5), moderate (5-12), or high (>12).[15]

The primary outcome of interest was reemployment at 12-month follow-up We defined reemployment as current hired work at least 10 hours per week or 40 hours per month. Among those reemployed, we assessed their hourly wage. At baseline, we assessed the reason for leaving their last position, duration of unemployment, past year gross income, and career cluster(s) of interest, categorized per O*Net classifications (part of the American JobCenter Network [http://www.onetonline.org]) (Table 1).

Measures of tobacco use were usual number of cigarettes per day, the Fagerström Test for Cigarette Dependence,[16] stage of change for quitting smoking,[17] past 30-day use of other tobacco and nicotine products, daily cost of smoking, and preference for menthol tobacco products. We assessed tobacco-related work experiences (eg, perceived discrimination owing to tobacco use) with a 4-point scale ranging from strongly disagree to strongly agree, and work-related expectations as a result of tobacco abstinence (eg, increased productivity) with a 7-point Likert scale ranging from not likely at all to extremely likely (Table 2).[19]

We created a measure to assess discretionary spending priorities. Smokers ordered items based on what they were most likely to purchase, assuming finite resources, using their discretionary funds, defined as money available after one's bills are paid (Table 3). Possible rank values ranged from 1 to 13. The online survey system randomly ordered the items for presentation.

Statistical Analysis

The study was powered to detect an absolute difference in reemployment of 20% between smokers and nonsmokers at 12-month follow-up (eg, 50% vs 70%). With 2-tailed testing, a 0.05 type I error rate, and 80% retention, a sample size of 120 participants per group

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provided greater than 80% power for detecting this group difference. Analysis of variance, χ^2, and gamma tests for ordinal associations tested for group differences in baseline variables. Among those reemployed at 12 months, we performed analysis of variance tests for group differences in hours worked and hourly wage by smoking status.

As this was an observational study comparing self-selected groups (smokers vs nonsmokers), we used a propensity score (PS) design[20-25] to mitigate confounding and investigate the main causal hypothesis of interest. The PS design helped to account for inherent differences between smokers and nonsmokers that could produce biased estimates of the effect of smoking on successful reemployment by balancing the distribution of covariates between smokers and nonsmokers. Under certain assumptions, a PS approach allows statistical inference to be interpreted as causal inference.[22]

We conducted an inverse probability weight (IPW) analysis with trimmed observations, where the weight was the inverse (ie, reciprocal) of the PS; the smoking and nonsmoking groups were weighted so as to be similar (on average) to each other in baseline characteristics. Propensity score–based IPWs are used to enhance the internal validity of an analysis, while survey sampling weights are used to support external validity or generalizability. Once each observation is weighted by its IPW, the weighted average of the 2 groups are differenced, which estimates the risk difference (RD). In our analysis, the IPW-adjusted estimand was the causal effect of smoking status on unemployment status.[22]

Before using IPWs to weight the observations, one must ensure that the 2 comparison groups do not have members that are completely dissimilar from the other group (ie, the groups share a common support). Design-based PS analysis starts with careful consideration of which observational units should be included in the study—using only preexposure covariates and specifically excluding any information about the outcome information. Thus, the design-based portion of a PS analysis is distinct from fitting the outcome model, which is not the immediate goal of the PS approach. One important feature of a PS design is that it identifies the set of observational units with overlapping PS values; positivity (ie, the probability of not smoking is strictly between 0 and 1) is a key assumption of the PS approach. Positivity enforces that (in one particular sense) the exposed group and the unexposed groups are not distinct in terms of their baseline covariates, thus avoiding complete confounding by baseline covariates.

To fulfill these criteria, we trimmed observations; that is, we identified and dropped observations with extreme PS values estimated using variables other than the outcome, following Crump et al.[26] It would not be totally incorrect to compare trimming in observational studies with the inclusion and exclusion criteria in randomized clinical trials. One guideline for trimming is that observations with PS values outside of the interval [0.1, 0.9] should be dropped.[26] Using both sets of PS values (ie, from nonsmokers and smokers), our trimming points were instead defined as the highest minimum and lowest maximum PS values (ie, 0.038 and 0.889 for the 5-covariate model; 0.124 and 0.903 for the 10-covariate model); hence, overlap was empirically determined using our real data, which closely aligns with the guideline for trimming. The full trimming-based procedure involves first estimating the PS model covariates on the full data set, trimming observations, and then re-estimating

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these covariates using the trimmed data set; the IPWs for the main analysis are then constructed using these final PS estimates.

Analyses were done in R statistical software (R Foundation for Statistical Computing) to estimate the PS through logistic regression using the glm package, and subsequently the IPW-adjusted RD for unemployment at 12 months for non-smokers with respect to smokers. The boot package was used to estimate the SE of the IPW-adjusted RD estimator. The primary PS was specified using a logit link function and a linear model that included a set of 5 covariates deemed most relevant to reemployment (ie, time out of work, age, education, race/ethnicity, perceived health status). We also conducted a basic sensitivity analysis comparing the primary PS results with those of a PS model that doubled the number of covariates, adding sex, housing stability, reliable transportation, criminal history, and prior treatment for alcohol or drug use. Including more covariates in a correct PS model with unknown predictors is generally expected to increase the accuracy of IPW estimators while decreasing precision. A related tradeoff is that including more covariates in the PS model tends to lead to less overlap between smokers and nonsmokers; the PS analyst must trim more, therefore reducing precision. The difference in the proportion of data trimmed between the primary and sensitivity analyses was 4-fold. Last, we used analysis of variance to test for group differences in hours worked and hourly wage by smoking status among those reemployed at 12 months.

Results

Baseline Characteristics

The full sample, 131 smokers and 120 nonsmokers, was 65.7% male (N = 165), with 96 white participants (38.2%), 90 black (35.9%), 24 Hispanic (9.6%), 18 Asian (7.2%), and 23 multiracial or other race (9.2%), with a mean (SD) age of 48 (11) years and mean (SD) body mass index (calculated as weight in kilograms divided by height in meters squared) of 26.7 (5.9); 129 were never married (51.4%), 99 were unstably housed (39.4%), 72 had received prior treatment for alcohol or drugs (28.7%) and 106 for psychological or emotional problems (42.2%), 52 had a criminal history (20.7%), 70 lacked reliable transportation (27.9%), 92 had a high school degree or less (36.7%), 81 had completed some college (32.3%), and 78had a college degree (31.1%).A majority (142 [56.6%]) of the participants were unemployed for more than 6 months; 62.0% (n = 157) reported a gross income in the past year of less than $20 000. The most common reason for leaving their last employer was that their contract ended or they were laid off (145 [57.8%]), followed by being fired (38 [15.1%]).

Table 1 compares baseline characteristics of smokers and nonsmokers. Compared with nonsmokers, smokers were significantly younger and less educated; more likely to be men, African American or multiracial, never married, unstably housed, and an urban resident; had a criminal history, unreliable transportation, and prior treatment for alcohol or drug problems; and reported poorer health. Mental health measures and body mass index did not differ by smoking status. Smokers were more chronically unemployed and reported lower past year income than did nonsmokers. Smokers were less likely than nonsmokers to be seeking employment in business; education and training; health science; marketing, sales,

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and service; and science, technology, engineering, or math. The reason for leaving their last employer did not differ by smoking status.

Smoking Characteristics

At baseline, smokers consumed a mean (SD) of 13.5 (8.2) cigarettes per day for a mean (SD) of 28 (12) years; 63 (48.1%) smoked only menthol cigarettes, 56 (42.7%) smoked only nonmenthol cigarettes, and 12 (9.2%) smoked both kinds. A majority (75 [57.3%]) of smokers reported relighting their extinguished cigarettes, with 33.6% (n = 44) doing so daily. Fagerström scores were a mean (SD) of 5.6 (1.5), indicating a moderate level of dependence; 99 of smoking participants (75.6%) smoked within 30 minutes of waking. Nearly half (62 [47.3%]) of those who smoked cigarettes used additional tobacco products in the past 30 days, including cigars (30 [22.9%]), e-cigarettes (16 [12.2%]), cigarillos (14 [10.7%]), blunts (10 [7.6%]), pipes (9 [6.9%]), chewing tobacco (5 [3.8%]), hookah (3 [2.3%]), and snus (3 [2.3%]), a form of smokeless tobacco. Few used nicotine replacement in the past 30 days, including patch (10 [7.6]%), gum (10 [7.6%]), lozenge (2 [1.5%]), and nasal spray (2 [1.5%]). Participants spent a mean (SD) of $6.49 ($4.35) per day (median, $5.00) on tobacco. Typical purchasing was by the pack (112 [85.5%]), with 21 [16.0%] purchasing cigarettes individually (ie, “loosies”), and 8 [6.1%] rolling their own cigarettes. At baseline, 61 smokers (46.6%) were in the precontemplation stage of change for quitting smoking, 44 (33.6%) in the contemplation stage, and 26 (19.8%) in the preparation stage.

Table 2 summarizes the prior attempts to quit smoking and abstinence expectancies of the sample.[18] Nearly all (119 [90.8%]) had made a 24-hour attempt to quit smoking in their lifetime and 85 [64.9%] had done so in the past year. Most (93 [71.0%]) were advised to quit smoking by a health care professional, yet few used evidence-based cessation approaches. Nearly half (59 [45.0%]) reported that an employer offered them a cigarette or encouraged them to smoke, 46 (35.1%) were criticized by an employer for smoking, and 11 (8.4%) were fired owing to tobacco use. Few smokers reported support for quitting smoking from an employer (9 [6.9%]) or career counselor (10 [7.6%]).

Table 3 summarizes ratings for smokers' discretionary spending priorities. Tobacco was ranked at the top (lowest score) ahead of basic needs and job-seeking necessities, such as transportation funds and cellular telephone costs. Nicotine replacement had the lowest mean rank. Heavier smoking was associated with a higher prioritization (lower score) of tobacco (Pearson r = –0.19; $P = .04$). Among the top-ranked items, 20 respondents (15.3%) selected tobacco as their first priority; 19 (14.5%) selected nutritious food, 14 (10.7%) transportation, and 13 (9.9%) cellular telephone costs.

Reemployment

A total of 217 participants (86.5%) completed 12-month surveys; 89 reported being reemployed (41.0%). An additional 6 participants (3 nonsmokers, 3 smokers) reported working less than 10 hours per week. Study retention was comparable for smokers (109[83.2%]) and nonsmokers(108 [90.0%]) ($\chi^2_{df=1}$, 2.47; $P = .12$). Among those completing the 12-month survey, 60 nonsmokers (55.6%) and 29 smokers (26.6%) were reemployed at 1 year. The un adjusted RD in reemployment is 0.29 (95% CI, 0.15-0.42).

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In our primary PS analysis, the PS was specified using a logit link function and a linear model that included the covariates of time out of work, age, education, race/ethnicity, and perceived health status. Observations with PS less than 0.047 or greater than 0.903 were trimmed from the original sample of 109 smokers and 108 nonsmokers. The trimmed sample contained 107 smokers and 102 nonsmokers (3.7% excluded). The RD of reemployment for nonsmokers vs smokers was 0.30 (SE = 0.09) (95% CI, 0.12-0.48). That is, after controlling for the 5 covariates of greatest concern and trimming to ensure common support, we estimate that if all participants in the study changed from being smokers to being nonsmokers then there would be a 30% increase in reemployment.

In the sensitivity analysis, the model with 10 covariates was fit on a trimmed sample with 82 smokers and 80 nonsmokers (25.3% excluded), yielding an RD estimate of 0.24 (SE = 0.08) (95% CI, 0.07-0.39). Qualitatively, this sensitivity analysis agreed with our primary analysis, and the 95% CIs also overlapped, indicating no significant difference in the estimates. A reduced effect size was found using the 10-covariate model, so additional confounders may have contributed to the observed difference in reemployment between smokers and nonsmokers.

Hours and Wages

Participants who were reemployed at 1 year worked a mean (SD) of 32 (22) hours per week, with no difference by smoking status ($F_{(1,82)} = 1.19$; $P = .28$). Among those reemployed at 1 year, the hourly wage for smokers was significantly lower (mean [SD], $15.10 [$4.68]) than for nonsmokers (mean [SD], $20.27 [$10.54]; $F_{(1,86)} = 6.50$; $P = .01$).

Stabilityof Smoking

Smoking status was generally stable over time: 6 smokers (5.7%) at baseline had quit at 12 months, while 8 baseline non-smokers (7.4%) were smoking (5 of 8 were former smokers at baseline). Among continued smokers, mean (SD) cigarettes per day declined significantly over time, from 12.6 (6.3) at baseline to 10.2 (7.4) at 12 months (paired samples $t_{df = 97} = 3.65$; $P < .001$). The reduction in cigarettes per day did not differ by reemployment status ($F_{1,98} = 0.05$; $P = .83$).

Discussion

Although tobacco use has been associated with unemployment in cross-sectional population-based studies in the United States and Europe, the mechanism and direction of that association has not been investigated prospectively. Our study examined the association of smoking with reemployment during a 12-month time frame. In our primary and sensitivity PS analyses adjusting for covariates of interest, nonsmokers had a significant advantage in reemployment at 12 months relative to smokers.

Had we randomized participants into groups of smokers or nonsmokers, then we would conclude that not smoking increased the probability of reemployment at 12 months by 12% to 48% on average. Given that nicotine is addictive and tobacco use is harmful, it would be unethical to randomize a participant to smoke vs not smoke. Instead we prospectively tracked the reemployment success of smokers and nonsmokers in the job-seeking market.

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That the groups were preexisting raises concern about residual confounding. We therefore conclude that there is suggestive evidence that a causal association may exist between smoking status and reemployment at 12 months.

Among smokers reemployed at 1 year, on average, their hourly income was $5 less relative to reemployed nonsmokers: $15.10 vs $20.27, a 25.5% difference. Averaging 32 hours per week, this is a deficit exceeding $8300 annually. Our findings, which were self-reported among job seekers, are comparable with wage estimates for nonsmokers ($20.71) and smokers ($17.48) reported by Berman et al[9], based on the US Bureau of Labor Statistics, adjusted to 2010 levels, and discounted at 15.6% for smokers per a report of the Medical Expenditure Panel Survey.[27] Combining our estimated wage gap with the sample's report of spending about $6.50 per day on tobacco (more than $2300 per year), the findings suggest a cost, on average, of more than $10 600 annually associated with tobacco use. With nearly 3 decades of smoking and evidence of very low rates of quitting during this 12-month observational study, the financial losses to smokers are significant.

An economically disadvantaged group, with most earning less than $20 000 gross in the past year (and residing in the San Francisco Bay Area), participants reported relighting extinguished cigarettes; a preference for menthol tobacco, which is often priced more cheaply; purchasing single cigarettes, which are illegal; and smoking cigars and cigarillos, which are taxed at a lower rate and are available for individual sale. Regulatory efforts to ban menthol, increase taxes, and enforce bans on individual sales of all forms of tobacco may help promote cessation among job-seeking smokers. Notably, smokers in our sample prioritized tobacco as more important than items relevant to job seeking, such as transportation costs, cellular telephone service, and grooming needs.

Study limitations included the exclusion criteria and sample size, which, while powered for the main outcome, did not allow for tests of association within career clusters. Participants were English-literate, not intending to relocate in the next 12 months, and residing in the San Francisco Bay Area, a geographical location with a very low smoking prevalence and probably unusually high stigma about smoking. As such, study findings may not be generalizeable to all job-seeking smokers in all regions. Although limited by its observational design, our study yielded novel findings.

Conclusions

Employment development departments are well placed for reaching tobacco users and addressing tobacco-related health and economic disparities. Our research team is now testing the effect of a tobacco cessation intervention on time to reemployment in a randomized controlled trial with job-seeking smokers. As a “one-stopshop” for employment resources, employment service agencies could raise awareness of tobacco-related costs, wage losses, health harms, and associations with lower reemployment success and serve as a connector to low-cost cessation services such as state quit-lines.

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References

1. Okechukwu C, Bacic J, Cheng KW, Catalano R. Smoking among construction workers: the nonlinear influence of the economy, cigarette prices, and antismoking sentiment. Soc Sci Med. 2012; 75(8):1379–1386. [PubMed: 22795358]
2. Prochaska JJ, Shi Y, Rogers A. Tobacco use among the job-seeking unemployed in California. Prev Med. 2013; 56(5):329–332. [PubMed: 23415765]
3. Khlat M, Sermet C, Le Pape A. Increased prevalence of depression, smoking, heavy drinking and use of psycho-active drugs among unemployed men in France. Eur J Epidemiol. 2004; 19(5):445–451. [PubMed: 15233317]
4. De Vogli R, Santinello M. Unemployment and smoking: does psychosocial stress matter? Tob Control. 2005; 14(6):389–395. [PubMed: 16319362]
5. Freyer-Adam J, Gaertner B, Tobschall S, John U. Health risk factors and self-rated health among job-seekers. BMC Public Health. 2011; 11:659. [PubMed: 21854611]
6. Max W. The financial impact of smoking on health-related costs: a review of the literature. Am J Health Promot. 2001; 15(5):321–331. [PubMed: 11502013]
7. Bunn WB III, Stave GM, Downs KE, Alvir JM, Dirani R. Effect of smoking status on productivity loss. J Occup Environ Med. 2006; 48(10):1099–1108. [PubMed: 17033509]
8. Goetzel RZ, Carls GS, Wang S, et al. The relationship between modifiable health risk factors and medical expenditures, absenteeism, short-term disability, and presenteeism among employees at Novartis. J Occup Environ Med. 2009; 51(4):487–499. [PubMed: 19337132]
9. Berman M, Crane R, Seiber E, Munur M. Estimating the cost of a smoking employee. Tob Control. 2014; 23(5):428–433. [PubMed: 23733918]
10. Asch DA, Muller RW, Volpp KG. Conflicts and compromises in not hiring smokers. N Engl J Med. 2013; 368(15):1371–1373. [PubMed: 23534547]
11. Palmer v Liggett & Meyers Co, 825 F2d 620 (1st Cir 1987).
12. Jones JW, Novick WM, Sade RM. Should a medical center deny employment to a physician because he smokes tobacco products? Ann Thorac Surg. 2014; 98(3):799–805. [PubMed: 25193184]
13. Brashear v Simms, ea 138 F Supp 2d 693 (SDCD Md 2001).
14. Brose LS, Tombor I, Shahab L, West R. The effect of reducing the threshold for carbon monoxide validation of smoking abstinence— evidence from the English Stop Smoking Services. Addict Behav. 2013; 38(10):2529–2531. [PubMed: 23773961]
15. Prochaska JJ, Sung HY, Max W, Shi Y, Ong M. Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. Int J Methods Psychiatr Res. 2012; 21(2):88–97. [PubMed: 22351472]
16. Fagerström K. Determinants of tobacco use and renaming the FTND to the Fagerström Test for Cigarette Dependence. Nicotine Tob Res. 2012; 14(1):75–78. [PubMed: 22025545]
17. Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: applications to addictive behaviors. Am Psychol. 1992; 47(9):1102–1114. [PubMed: 1329589]
18. Fiore, MC.; Jaén, CR.; Baker, TB., et al. Treating Tobacco Use and Dependence: 2008 Update. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service; 2008.

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19. Hendricks PS, Wood SB, Baker MR, Delucchi KL, Hall SM. The Smoking Abstinence Questionnaire: measurement of smokers' abstinence-related expectancies. Addiction. 2011; 106(4): 716–728. [PubMed: 21205053]

20. D'Agostino RB Jr. Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group. Stat Med. 1998; 17(19):2265–2281. [PubMed: 9802183]

21. Morgan, SL.; Winship, C. Counterfactuals and Causal Inference: Methods and Principles for Social Research. 2nd. New York, NY: Cambridge University Press; 2015.

22. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika. 1983; 70(1):41–55. DOI: 10.1093/biomet/70.1.41

23. Rosenbaum, PR. Observational Studies. 2nd. New York, NY: Springer; 2002.

24. Rosenbaum, PR. Design of Observational Studies: Springer Series in Statistics. New York, NY: Springer; 2010.

25. Rubin DB. Causal inference using potential outcomes: design, modeling, decisions. J Am Stat Assoc. 2005; 100(469):322–331. DOI: 10.1198/016214504000001880

26. Crump RK, Hotz VJ, Imbens GW, Mitnik OA. Dealing with limited overlap in estimation of average treatment effects. Biometrika. 2009; 96(1):187–199. DOI: 10.1093/biomet/asn055

27. Cowan B, Schwab B. The incidence of the healthcare costs of smoking. J Health Econ. 2011; 30(5):1094–1102. [PubMed: 21820747]

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Key Points

Question

Does reemployment success differ by smoking status?

Findings

In this 2-group, 12-month prospective study with 251 unemployed job seekers, nonsmokers were 30% more likely on average to be reemployed at 1 year relative to smokers. Among those reemployed at 1year, the average hourly wage was $5 higher for nonsmokers than smokers.

Meaning

Given the disparities in reemployment by smoking status, treatment of tobacco use in unemployment service settings is worth testing for increasing reemployment success and financial well-being.

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Table 1
Characteristics of Unemployed Job Seekers at Baseline

Characteristic	Value[a]		*P* Value
	Nonsmoker (n = 120)	Current Smoker (n = 131)	
Age, mean (SD), y	49.3 (11.9)	46.2 (10.8)	.03
Male sex	63 (52.5)	102 (77.9)	<.001
Ethnicity			
Non-Hispanic white	56 (46.7)	40 (30.6)	<.001
African American	23 (19.2)	67 (51.1)	
Hispanic	17 (14.2)	7 (5.3)	
Asian or Pacific Islander	16 (13.3)	2 (1.5)	
Multiracial or other	8 (6.7)	15 (11.5)	
County			
Suburban	62 (51.7)	32 (24.4)	<.001
Urban	58 (48.3)	99 (75.6)	
Marital status			
Never married or single	56 (46.7)	73 (55.8)	.01
Married or cohabitating	25 (20.8)	10 (7.6)	
Divorced, separated, or widowed	39 (32.5)	48 (36.6)	
Education, mean (SD), y	14.6 (2.7)	12.9 (2.6)	<.001
High school degree or less	27 (22.5)	65 (49.6)	<.001
Some college	36 (30.0)	45 (34.4)	
Completed college degree	57 (47.5)	21 (16.0)	
Housing			
Own, rent, or live with family	93 (77.5)	59 (45.0)	<.001
Transitional or unhoused[b]	27 (22.5)	72 (55.0)	
Lack of reliable transportation	22 (18.3)	48 (36.6)	.001
Criminal history	17 (14.2)	35 (26.7)	.01
Prior treatment for drug or alcohol use	18 (15.0)	54 (43.5)	.001
Prior mental health treatment	47 (39.2)	59 (46.1)	.27
Kessler 6 scale			
None or mild psychological distress	52 (43.3)	50 (38.2)	.28
Moderate psychological distress	56 (46.7)	59 (45.0)	
Severe psychological distress	12 (10.0)	22 (16.8)	
Perceived health status			
Poor or fair	15 (12.5)	37 (28.2)	<.001
Good	38 (31.7)	54 (41.2)	
Very good or excellent	67 (55.8)	40 (30.5)	
BMI, mean (SD)	27.3 (6.7)	26.1 (5.0)	.11

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Characteristic	Value[a]		*P* Value
	Nonsmoker (n = 120)	Current Smoker (n = 131)	
Chronicity of unemployment, mo			
0-3	51 (42.5)	21 (16.0)	<.001
>3-6	14 (11.7)	23 (17.6)	
>6-12	24 (20.0)	39 (29.8)	
>12	31 (25.8)	48 (36.6)	
Past year gross income, $			
<10 000	47 (39.2)	65 (49.6)	.03
10 000-20 000	20 (16.7)	25 (19.1)	
21 000-40 000	22 (18.3)	26 (19.8)	
>41 000	31 (25.8)	15 (11.5)	
Career clusters[c]			
Agriculture, food, and natural resources	8 (6.7)	16 (12.2)	.14
Architecture and construction	16 (13.3)	17 (13.0)	.93
Arts, audio and video technology, and communications	17 (14.2)	10 (7.6)	.10
Business, management, and administration	31 (25.8)	14 (10.7)	.002
Education and training	17 (14.2)	7 (5.3)	.02
Finance	11 (9.2)	5 (3.8)	.08
Government and public administration	15 (12.5)	9 (6.9)	.13
Health science	19 (15.8)	9 (6.9)	.02
Hospitality and tourism	15 (12.5)	28 (19.1)	.16
Human services	20 (16.7)	20 (15.3)	.76
Information technology	10 (8.3)	9 (6.9)	.66
Law, public safety, corrections, security	12 (10.0)	13 (9.9)	.98
Manufacturing	7 (5.8)	6 (4.6)	.65
Marketing, sales, and service	33 (27.5)	15 (11.5)	.001
Science, technology, engineering, math	9 (7.5)	1 (0.8)	.006
Transportation, distribution and logistics	16 (13.3)	13 (9.9)	.40
Other (eg, “would take any job”)	4 (3.3)	6 (4.6)	.61
Reason last employment ended			
Laid off or contract work ended	72 (60.0)	73 (55.7)	.36
Fired	14 (11.7)	24 (18.3)	
Quit	7 (5.8)	5 (3.8)	
Relocated	10 (8.3)	6 (4.6)	
Other (eg, medical, pregnant, legal)	17 (14.2)	23 (17.6)	

Abbreviation: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared).

[a] Data are presented as number (percentage) of participants unless otherwise indicated.

[b] Includes homeless, single residency occupancy, halfway house, or therapeutic community.

[c]Career clusters based on O *Net classifications, part of the American JobCenter Network.

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Table 2

Past Attempts to Quit, Encouragement to Quit, and Abstinence Expectancies of Current Smokers at Baseline

Characteristic	Value[a]
24-h Quit attempt	
Lifetime	119 (90.8)
Past year	85 (64.9)
Lifetime 24-h quit attempts, median (IQR), No.	4 (2-7)
Past year advice to quit	
Any health care professional	93 (71.0)
Physician	80 (61.1)
Co-worker	20 (15.3)
Social worker	18 (13.7)
Nurse	37 (28.2)
Mental health professional	17 (13.0)
Other medical professional	17 (13.0)
Friends	66 (50.4)
Family members	61 (46.6)
Significant others	19 (14.5)
Career counselor or caseworker	10 (7.6)
Employer	9 (6.9)
Work experiences with smoking[b]	
Discriminated against as a smoker	60 (45.8)
Harder to get a job because a smoker	38 (29.0)
Hide smoking	
At work	53 (40.5)
At home	28 (21.4)
Quit strategies	
Cold turkey	91 (69.5)
Gradual reduction	56 (42.7)
Nicotine replacement[c]	36 (27.5)
Quit smoking class or program[c]	18 (13.8)
E-cigarettes	14 (10.7)
Acupuncture	11 (8.4)
Hypnosis	6 (4.6)
Tobacco quitline[c]	5 (3.8)
Health professional counseling[c]	4 (3.1)
Bupropion[c]	4 (3.1)

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Characteristic	Value[a]
Varenicline[c]	2 (1.5)
Abstinence expectancies[d]	
Feel a sense of accomplishment	79 (60.4)
Would be more productive	54 (41.2)
Would be sick less often	53 (39.4)
Have more control over their life	54 (41.2)
Have less trouble finding work	35 (26.7)

Abbreviation: IQR, interquartile range.

[a]Data are presented as number (percentage) of participants unless otherwise indicated.

[b]Percentage who answered somewhat to extremely likely.

[c]Evidence-based approach recommended by US Tobacco Treatment Clinical Practice Guidelines.[18]

[d]Percentage who answered agree or strongly agree.

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Table 3
Discretionary Spending Priorities Among Job-Seeking Smokers

Item	Rank, Mean (SD)[a]	Median
Tobacco[b]	5.02 (3.32)	4
Nutritious food	5.24 (3.56)	4
Transportation funds (eg, gasoline, bus fare)[c]	5.65 (3.71)	5
Cellular telephone[c]	5.70 (3.57)	5
Grooming care (eg, shave, haircut)[c]	6.48 (3.48)	6
New clothing[c]	6.73 (3.43)	7
Entertainment (eg, movies, magazines)	7.22 (3.47)	7
Prescription medications	7.47 (3.92)	8
Dental appointments	7.66 (3.26)	8
Nonemergency medical appointments	8.01 (3.61)	9
Gifts for others	8.27 (3.33)	9
Alcohol or nonprescribed drugs	8.67 (3.74)	10
Nicotine replacement therapy[b]	8.87 (3.54)	9

[a]Possible rank values ranged from 1 (greatest priority) to 13 (lowest priority). Participants who were current smokers at baseline were asked to order items based on what they were most likely to purchase, assuming finite resources, using their discretionary funds, defined as money available after one's bills are paid. The items were presented in random order.

[b]Items directly related to smoking.

[c]Items directly related to job seeking.