Effect of Smoking Status on Productivity Loss

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Objective: *The objective of this study was to describe health-related productivity losses in nonsmokers, former smokers, and current smokers using a large, cross-sectional database of U.S. employees.* ***Methods:*** *Volunteers completed the Wellness Inventory, an instrument measuring productivity losses related to 11 health conditions affecting employee health. Results are aggregated, dollarized, and reported by smoking group.* ***Results:*** *Current smokers missed more days of work and experienced more unproductive time at work compared with former smokers and nonsmokers. The average annual cost for lost productivity for nonsmokers was $2623/year compared with $3246/year for former smokers and $4430/year for current smokers. More than half the costs were due to unproductive time at work.* ***Conclusion:*** *Current smokers incurred the highest productivity losses, which translated into higher costs to employers for current smokers. Costs were lower for former smokers and nonsmokers.* (J Occup Environ Med. *2006;48: 1099–1108*)

The impact of employee health on workplace productivity is a concern for employers in the United States. When employees make positive lifestyle changes such as smoking cessation, employers and society at large benefit as well. Although the negative effects of cigarette smoking on health have been clearly demonstrated, debate exists on the impact of smoking cessation on employee health.

This study describes the frequency and cost of health-related productivity losses due to absenteeism and presenteeism based on self-reported smoking status in a large, cross-sectional database of employees throughout the United States.

Background

In the United States, smoking was the number one modifiable risk factor for death in 2000.[1] In addition to the impact on mortality, the economic burden of smoking is substantial. The Centers for Disease Control and Prevention (CDC) estimates that the total cost of smoking in the United States exceeds $167 billion per year. This estimate includes $75 billion in direct healthcare costs[2] and $92 billion in lost productivity resulting from years of productive life lost due to premature death.[3]

Additional costs to employers include lost productivity resulting from illnesses and smoking breaks, increased accidents and workers' compensation costs, early retirement for disability, increased fires and fire insurance costs, increased facility costs for ventilation systems, maintenance, and cleaning, and the effects of environmental or second-hand smoke on other employees.

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Based on the National Health Interview Survey (NHIS), 44.5 million U.S. adults are current smokers.[4] This figure represents 21% of the adult population. The same survey found that 46.0 million adults consider themselves former smokers. Of the current smokers, 37.5 million report that they smoke everyday. Among those who smoke everyday, approximately 41% had stopped smoking for more than 1 day during the preceding year in an attempt to quit.[4]

The U.S. Surgeon General states that smoking cessation has significant and immediate health benefits for smokers with or without smoking-related disease and that former smokers live longer than continuing smokers in part because smoking cessation decreases the risk for cancer, heart attack, stroke, and lung disease.[5] A study of patients in a smoking cessation program found that those who remained abstinent for 1 year experienced positive changes in the scales for role limitations, social functioning, and general health of the MOS Short Form-36, a health status questionnaire.[6]

Previous studies of productivity by smoking status have been conducted. In terms of days of work missed, Halpern et al found that current smokers in a single employer setting missed 6.16 days of work during a year compared with 4.53 days for former smokers and 3.86 days for nonsmokers.[7] Tsai et al and Stewart et al found that the illness absence rates for former smokers were lower than for current smokers but higher than for those who never smoked.[8,9] In terms of workplace absences, evidence suggests that those who quit smoking may experience a short-term increase in the number of workplace absences. Over time, former smokers experienced fewer missed days of work than current smokers but still more than those who never smoked.[10]

Materials and Methods

The Wellness Inventory (WI) is a tool developed by the MEDSTAT group to assess the impact of worker absence and on-the-job productivity losses related to common health conditions. The WI captures days lost from work ("absenteeism") and unproductive time at work due to health conditions ("presenteeism"). The survey is based on the Work Productivity Short Inventory (WPSI) Instrument. A copy of the WPSI can be found in the appendix to the article by Goetzel et al describing the development and reliability of the instrument.[11]

The WI collects information on sex, age, smoking status, perceived health status, occupational classification, and hours worked per week. Employees are asked to specify the number of days during the year that they experienced any of the 11 common health conditions listed in the questionnaire, the number of days they missed work due to these conditions, and the typical number of hours they were unproductive on the days that they experienced these conditions. Employees are also asked about four conditions that are likely to impact productivity for workers who are functioning as caregivers to family members. The days missed from work and unproductive hours are collected for each of these four conditions. Finally, employees are asked about time missed due to other conditions affecting their own health. A 12-month recall period was used in this application of the WI. Survey output is aggregated and dollarized so that the employer sees both the time losses and monetary losses associated with productivity loss due to health conditions. No identifiable data are collected from employees. This article focuses on the productivity losses associated with health conditions experienced by the employee. Results from the caregiver responses will be presented in a future communication.

The data were derived from a series of surveys collected from employee volunteers at 147 companies representing a variety of organizational types from all regions of the United States. Survey data were collected from 2001 to 2005 by one of three methods: paper survey, scan form, or web site. From 2002 to 2005, the scan form was the primary method of data collection. The results were compiled by the MEDSTAT group, a third party vendor.

For this study, only those respondents with complete information for age, sex, and smoking status were included in the analysis. Respondents who reported age less than 16 years were also excluded. To control for outliers, all responses for days experienced were truncated at 300 days and days missed were truncated at 270 days.

Respondents were classified as nonsmokers, current smokers, or former smokers based on their answer to question 3 of the WI. The wording of question 3 is: "Which cigarette smoking pattern best describes your behavior?": "never smoked," "former smoker," or "current smoker." Using the WI, the smoking status for each respondent is based on their interpretation of the question. Respondents who consider themselves former smokers are not required to meet a defined minimum time since smoking cessation.

Demographic characteristics were compared between smoking status groups using analysis of variance for continuous variables (SAS GLM Procedure) and the χ^2 test for categorical variables (SAS FREQ Procedure). For perceived health status, a cumulative logit model (SAS GENMOD Procedure) was used to compare the cumulative odds ratios for the five levels of health self-assessment by smoking status with age and sex included in the model.

For respondents who experienced at least 1 day of a condition, general linear models (SAS GLM Procedure) were used to compare smoking groups for each sex on days of work missed and unproductive hours as well as total hours worked and total days missed. These models included age as a covariate. Least squares means were estimated for the three

TABLE 1
Demographics, Occupation Type, and Self-Reported Health Status by Smoking Status

Characteristic	Nonsmokers (N = 21,877)	Former Smokers (N = 8452)	Current Smokers (N = 4605)
Age in yr (mean ± standard deviation)§	41.46 ± 10.57*	45.24 ± 10.85†	41.22 ± 10.79*
Sex; n (column percentage)			
Male (n = 14,267)	8571 (39.2%)	3722 (44.0%)	1974 (42.9%)
Female (n = 20,667)	13,306 (60.8%)	4730 (56.0%)	2631 (57.1%)
Occupation type; n (column percentage)			
Managerial and administrative	3849 (17.6%)	1570 (18.6%)	544 (11.8%)
Professional, paraprofessional, and technical	8196 (37.5%)	2594 (30.7%)	943 (20.5%)
Sales and related	787 (3.6%)	287 (3.4%)	146 (3.2%)
Clerical and administrative support	4269 (19.5%)	1563 (18.5%)	934 (20.3%)
Customer service	1895 (8.7%)	808 (9.6%)	573 (12.4%)
Agricultural, forestry, fishing and related	106 (0.5%)	56 (0.7%)	33 (0.7%)
Production, construction, operating, maintenance, and material handling	2274 (10.4%)	1380 (16.3%)	1328 (28.8%)
Missing	501 (2.3%)	194 (2.3%)	104 (2.3%)
Health status; n (column percentage)			
Excellent	3296 (13.5%)	897 (9.3%)	271 (5.2%)
Very good	7976 (32.6%)	3001 (31.1%)	1295 (24.8%)
Good	9999 (40.9%)	4231 (43.9%)	2633 (50.4%)
Fair	2571 (10.5%)	1206 (12.5%)	852 (16.3%)
Poor	116 (0.5%)	64 (0.7%)	55 (1.1%)
Missing	494 (2.0%)	240 (2.5%)	120 (2.3%)

§Means with different symbols are significantly different, $P < 0.001$ (analysis of variance with general linear model). Example: rows with *, †, and ‡ mean that results for nonsmokers, former smokers, and current smokers are significantly different from the other groups. Rows with *, *, and † mean that the values for the two groups marked with * are significantly different from the value in the group marked with † but not significantly different from each other. Rows with only * mean that the only significant relationship exists between those two groups.

smoking status groups covaried for age. The interaction effect of sex and smoking status as well as the main effect of each were examined. Further sets of analyses also added occupation and self-reported health status separately as control variables.

All statistical analyses were performed using SAS for WINDOWS (version 8.0; SAS, Inc., Cary, NC).

Calculations were performed to estimate the mean annual dollar losses resulting from health-related absenteeism and presenteeism based on the methodology described by the developers of the WPSI.[12] To calculate the cost of absenteeism for health conditions, the mean days of work missed were multiplied by 8 hours and then multiplied by an imputed hourly compensation of $34.25/hour for salary and benefits (for more detail on the calculation of the $34.25/hour figure, see Goetzel et al)[13]. The number of hours of presenteeism was calculated by multiplying the mean calendar days the respondents reported experiencing the condition by a ratio of 236.5/365, subtracting the number of days absent with condition, and multiplying the mean number of unproductive hours spent at work as a result of the condition. The ratio of 236.5/365 is used to adjust for a 5-day workweek and time off for vacation and holidays and is cited by the developers of the WPSI.[12] The cost of presenteeism is calculated by multiplying the number of unproductive hours by $34.25/hour. Total cost of lost productivity was calculated by adding the cost of absenteeism to the cost of presenteeism.

Results

During the study period, a total of 45,630 respondents completed the WI. Due to missing data for smoking status, sex, or age or for age less than 16 years, 10,696 records were excluded.

The demographic characteristics, type of occupation, and perceived health status by nonsmoker, former smoker, and current smoker are shown in Table 1. Approximately 59% of respondents were female. Of male respondents, 60.1% reported that they were nonsmokers compared with 64.4% of female respondents.

Significantly higher percentages of males consider themselves either current or former smokers compared with females (former smokers: 26.1% vs 22.9%; current smokers: 13.8% vs 12.7%). Nonsmokers and current smokers were significantly younger compared with former smokers. Male respondents reported working more hours during the course of the year compared with female respondents (2163 hours vs 1970 hours).

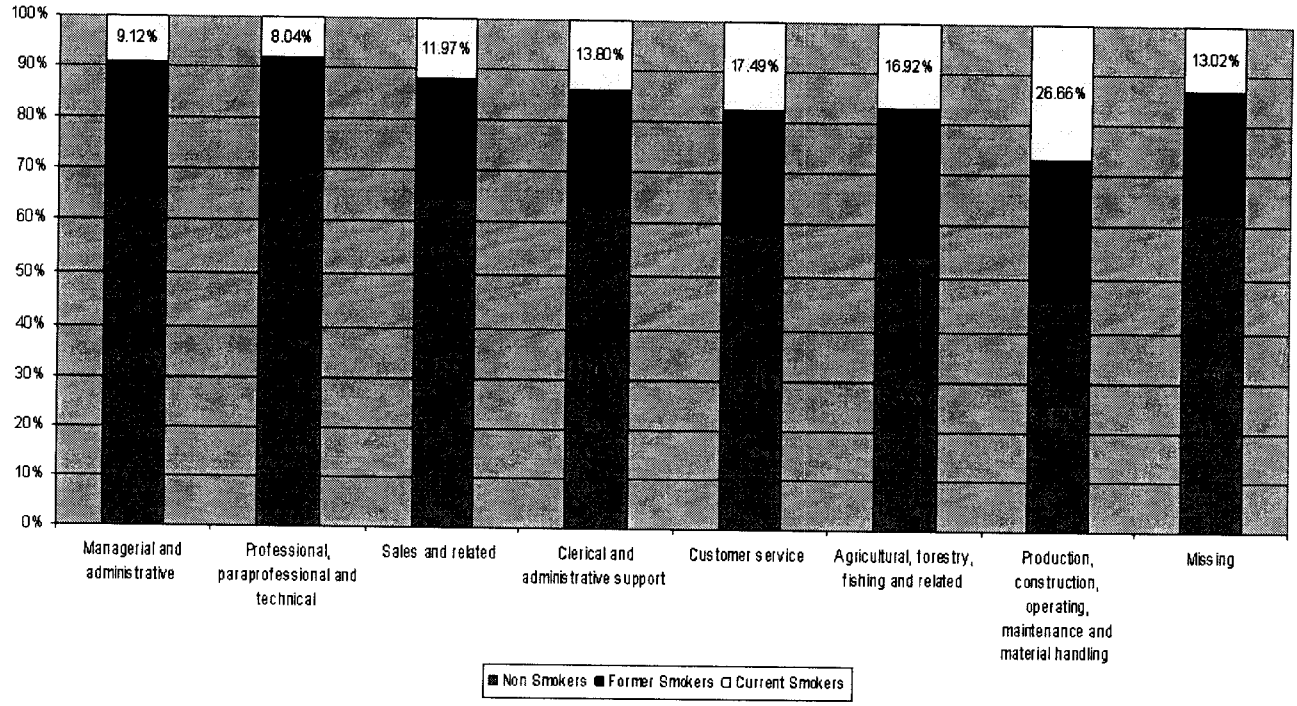

Fig. 1. Smoking rates by occupation type: nonsmokers, former smokers, and current smokers.

Smoking status and occupation were statistically associated based on the results of Cochran-Mantel-Haenszel χ^2 statistics for general association ($P < 0.0001$). The most commonly reported occupation type was professional, paraprofessional, and technical occupations. The least commonly reported occupation type was agricultural, forestry, fishing, and related occupations. This distribution of occupations reflects the types of institutions represented in this sample. Respondents in professional, paraprofessional, and technical operations occupations had the lowest percentage of current smokers. Customer service and production, construction, operating, maintenance occupations, and material handling occupations reported the highest percentage of current smokers. Figure 1 shows the percentage of nonsmokers, former smokers, and current smokers by occupation type.

Most respondents reported that their health status was good or very good (69.8%). Only 12.7% said their health status was fair or poor. Using a cumulative logit model to estimate the impact of smoking status on reported health status while controlling for age, odds ratios comparing the five levels of reported health status were calculated and compared. Nonsmokers were nearly twice as likely to report a better health status compared with current smokers (odds ratio [OR] = 1.99) and former smokers were more likely to report better health status than current smokers (OR = 1.55).

Current smokers reported that they worked significantly more hours during the previous year than both nonsmokers and former smokers (Table 2). For the mean total days missed from work due to health conditions, including conditions not specifically measured in the survey, nonsmokers and former smokers missed significantly fewer days compared with current smokers when controlling for age and sex ($P = 0.006$). Over the 1-year recall period, nonsmokers missed an average of 4.4 days compared with 4.9 days for former smokers and 6.7 days for current smokers.

The percent of respondents who report experiencing a condition for 1 or more days during the previous year are described in Table 3. For those respondents who experience a condition, mean days of work missed and mean hours of unproductive time per day experienced are reported. Significant relationships are noted based on the results of analysis of covariance using least squares means and controlling for age. Symbols are used to note the significant relationships between the three study groups. For example, for migraine in males, "*, †, and ‡" indicate that current smokers experienced significantly more missed workdays than former smokers and nonsmokers and that former smokers missed significantly more workdays than nonsmokers. When "*, *, and †" are used, one study group is significantly different than the other two, but the two groups with a "*" are not significantly different from each other. For example, for depression in both males and females, current smokers missed more workdays than nonsmokers and former smokers, but former smokers did not miss sig-

TABLE 2
Summary of Productivity Results

	Nonsmokers	Former Smokers	Current Smokers
Mean days missed from work due to health conditions	4.4* days per year	4.9† days per year	6.7‡ days per year
Mean hours worked§	2043.6* hr per year	2049.2* hr per year	2078.6† hr per year
Mean hours lost due to absenteeism (mean days × 8 hr)	35.2 hr per year	39.2 hr per year	53.6 hr per year
Mean hours lost due to presenteeism	42.8* hr per year	56.0† hr per year	76.5‡ hr per year
Mean total lost hours (absenteeism + presenteeism)	78.0 hr per year	95.2 hr per year	130.1 hr per year

§Mean hours worked per year was calculated based on respondents' estimation of the average number of hours worked per week and weeks worked per year, including overtime, but exclusive of vacation or paid time off.

Means with different symbols are significantly different, $P < 0.001$ (analysis of variance with general linear model). Example: rows with *, †, and ‡ mean that results for nonsmokers, former smokers, and current smokers are significantly different from the other groups. Rows with *, *, and † mean that the values for the two groups marked with * are significantly different from the value in the group marked with † but not significantly different from each other. Rows with only * mean that the only significant relationship exists between those two groups.

nificantly more days of work than nonsmokers.

For each condition, the mean number of days experienced is reported in the text by smoking group. The mean is calculated for the entire population and is used to estimate the cost of presenteeism.

Allergic rhinitis/hayfever was the most commonly experienced condition (Table 3). For males, former smokers and current smokers missed significantly more days of work compared with nonsmokers. Female nonsmokers and former smokers reported significantly fewer days of work missed for allergic rhinitis/hayfever compared with current smokers. Nonsmokers reported experiencing an average of 27.4 days of allergic rhinitis/hayfever over the course of the year, whereas former smokers reported 30.7 days and current smokers reported 27.1 days.

Both male and female nonsmokers and former smokers with anxiety disorder missed significantly fewer days of work compared with current smokers (Table 3). Nonsmokers with anxiety disorder reported experiencing the condition an average of 7.2 days over the course of the year, whereas former smokers and current smokers reported an average of 10.2 and 15.2 days per year.

For arthritis/rheumatism, current smokers missed more days of work compared with nonsmokers and former smokers when controlling for age (Table 3). Nonsmokers with arthritis/rheumatism reported that they experienced the condition 17.4 days/year. Former smokers reported experiencing the condition 29.2 days/year, and current smokers reported 26.2 days/year.

Fewer nonsmokers experienced asthma compared with former and current smokers (Table 3). Nonsmokers reported experiencing asthma for an average of 3.8 days/year. Former smokers experienced the condition 6.2 days/year and current smokers experienced asthma 5.1 day/year.

Nonsmokers were less likely to report depression compared with former smokers and current smokers (Table 3). Nonsmokers with depression experienced the condition for an average of 7.6 days in a year. Former smokers reported 11.9 days of depression and current smokers reported 16.5 days with depression in a year. Respondents reported between 45 minutes and an hour of unproductive time on days when they experienced depression.

For males, high stress was reported by a higher percentage of nonsmokers than former smokers or current smokers (Table 3). However, male nonsmokers with high stress reported significantly fewer missed days of work as a result of the condition compared with current smokers (0.80 days vs 2.39 days). For both sexes, nonsmokers experienced the condition for 23.2 days/year. Former smokers experienced the condition for 27.9 days/year and current smokers for 31.8 days/year.

A higher percentage of female respondents reported experiencing migraine across smoking groups (Table 3). Nonsmokers and former smokers experienced migraines for approximately 5 days per year. Current smokers experienced migraines for an average of 7.6 days per year. Males with migraine reported approximately 1 hour of unproductive time per day experienced. Females with migraine reported between 1.32 and 1.36 hours of unproductive time at work.

Respiratory illness was reported by twice as many female current smokers (26.5%) compared with male nonsmokers (12.5%) (Table 3). Nonsmokers and current smokers reported an average of 2.2 days with respiratory illness and former smokers reported an average of 3.2 days experienced.

Diabetes was the least commonly reported condition for all age and sex groups except for female current smokers who were least likely to report coronary heart disease (Table 3). Nonsmokers reported the fewest days of diabetes symptoms experienced (5.8 days/year vs 7.9 days/year for former smokers and 5.9 days/year for current smokers). For coronary heart disease, former smokers reported the highest mean number of days of coronary heart disease experienced (7.1 day vs 4.6 for nonsmokers and 5.9 for current smokers). Nonsmokers with hypertension ex-

TABLE 3
Results by Condition

	Percent of Respondents Who Reported Experiencing Condition for at Least 1 Day			Mean Days of Work Missed			Mean Hours of Unproductive Time		
	Nonsmokers	Former Smokers	Current Smokers	Nonsmokers	Former Smokers	Current Smokers	Nonsmokers	Former Smokers	Current Smokers
Allergic rhinitis/ hayfever									
Males	56.0%	54.3%	47.8%	1.88*	2.59†	2.82†	0.56	0.54	0.56
Females	59.5%	60.2%	57.0%	1.95*	1.81*	2.52†	0.67	0.63	0.67
Anxiety disorder									
Males	13.4%	15.6%	17.7%	3.28*	2.95*	6.54†	0.76*	0.71*	0.99†
Females	17.2%	20.3%	26.2%	2.20*	1.76*	3.66†	0.81	0.84	0.94
Arthritis/ rheumatism									
Males	17.4%	24.7%	23.4%	1.94*	2.98*	5.08†	0.46*	0.47	0.67†
Females	20.8%	26.9%	23.8%	1.97	1.81	2.99	0.48*	0.46*	0.64†
Asthma									
Males	9.1%	10.5%	10.0%	2.14*	2.03*	4.40†	0.46*	0.65†	0.57
Females	11.1%	13.3%	12.8%	2.03	2.62	2.90	0.61	0.61	0.69
Coronary heart disease									
Males	5.3%	7.5%	5.8%	3.95*	4.94*	9.46†	0.39	0.42	0.37
Females	4.1%	5.4%	4.9%	1.82*	3.25	6.78†	0.33	0.39	0.37
Depression									
Males	10.0%	12.5%	15.4%	2.34*	2.34*	5.26†	0.88	0.86	0.86
Females	15.4%	19.4%	23.3%	2.00*	1.93*	3.99†	0.90*	0.94	1.16†
Diabetes									
Males	3.7%	5.8%	5.6%	3.19*	4.09	6.62†	0.66*	0.44*	1.00†
Females	4.6%	5.2%	5.3%	2.63	2.26	2.30	0.65	0.58	0.65
High stress									
Males	38.1%	35.4%	33.9%	0.80*	1.23*	2.39†	0.53	0.51	0.61
Females	45.2%	47.4%	45.9%	0.85*	0.86*	1.84†	0.62*	0.63	0.74†
Hypertension									
Males	11.9%	16.7%	13.3%	2.53	2.60	4.56	0.29	0.28	0.43
Females	10.7%	12.9%	10.8%	1.17*	2.17	4.28†	0.27*	0.28*	0.51†
Migraine									
Males	18.7%	15.7%	19.0%	1.40*	2.46†	3.84‡	1.00	0.99	1.05
Females	32.9%	33.0%	34.8%	1.68	1.71	2.07	1.32	1.35	1.36
Respiratory illness									
Males	12.5%	13.2%	14.4%	2.54*	3.94†	5.58‡	0.84	0.89	0.91
Females	20.4%	23.3%	26.5%	2.52	2.86	3.27	1.15	1.08	1.25

Note: Least squares means adjusted for age. Different superscript letters mean that values for missed days or unproductive hr are significantly different for the specified smoking group ($P < 0.05$ based on analysis of variance with SAS GLM Procedure). Example: rows with *, †, and ‡ mean that results for nonsmokers, former smokers, and current smokers are significantly different from the other groups. Rows with *, *, and † mean that the values for the two groups marked with * are significantly different from the value in the group marked with † but not significantly different from each other. Rows with only a mean that the only significant relationship exists between those two groups.

perienced symptoms of the condition on an average of 15.2 days/year compared with 22.6 days/year for former smokers and 17.8 days/year for current smokers.

For all occupations, current smokers missed more days of work due to health conditions than former smokers and nonsmokers. Respondents who considered themselves in poor health missed more days of work than respondents with a better health status across all smoking groups. Current smokers in all health status groups missed more days of work than nonsmokers and former smokers. Table 4 reports the number of days of work missed due to health conditions by occupation and self-reported health status.

Current smokers cost employers more in terms of lost of productivity than both former smokers and nonsmokers. Using an average hourly rate of $34.25/hour, the average annual amount of health-related productivity loss for nonsmokers was estimated to be $2623. For former smokers, the average annual cost of lost productivity was $3246, and for current smokers, the estimated productivity loss was $4430. Table 5 reports the annual estimated cost of

TABLE 4
Least Square Means for Days of Work Missed by Occupation and Health Status

	Nonsmokers Days of Work Missed	Former Smokers Days of Work Missed	Current Smokers Days of Work Missed
Occupation			
Managerial and administrative	3.20	3.87	4.94
Professional, paraprofessional, and technical	3.79	4.32	5.78
Sales and related	3.68	3.06	9.63
Clerical and administrative support	5.24	5.34	6.17
Customer service	5.09	5.57	7.76
Agricultural, forestry, fishing and related	5.55	5.49	6.38
Production, construction, operating, maintenance, and material handling	5.68	6.43	7.52
Missing	2.86	5.46	6.88
Health status			
Excellent	2.47	2.34	2.81
Very good	3.27	3.42	4.77
Good	4.73	5.10	6.84
Fair	7.67	9.11	9.62
Poor	15.90	20.72	21.19
Missing	2.69	5.24	4.90

TABLE 5
Estimated Cost of Health-Related Productivity Losses*

	Nonsmokers	Former Smokers	Current Smokers
Mean cost of days missed for all health conditions per employee per year	$1156	$1329	$1811
Mean cost of presenteeism for the 11 measured health conditions per employee per year	$1466	$1917	$2619
Total cost of productivity due to health per employee per year	$2623	$3246	$4430

*Based on a cost per hour of $34.25 for salary and benefits.

productivity losses due to absenteeism, presenteeism, and the total productivity loss.

Discussion

Our data demonstrate that health-related productivity losses for absenteeism and presenteeism for employees who consider themselves former smokers are more similar to productivity losses of nonsmokers than current smokers. In this study, former smokers were older on average than both nonsmokers and current smokers. However, the average annual cost of health-related productivity losses was lower for former smokers than current smokers. Health-related productivity costs were the lowest for nonsmokers.

Across all health conditions, nonsmokers missed significantly fewer hours due to presenteeism than former smokers and current smokers. Former smokers missed significantly fewer hours compared with current smokers. A previously published, single-site study by Halpern et al found the same relationship between smoking groups for lost productivity at work, but the differences between groups was not significant. The authors suggested that their results could be related to study size.[7]

Using the WI, this study found that presenteeism costs represented more than 50% of total productivity losses compared with those due to absenteeism across all groups. Walters et al found that presenteeism accounted for 71% of total productivity loss.[9] Using the WPSI, the forerunner of the WI, Goetzel et al found that 61% of the total productivity costs were associated with presenteeism.[14] Using the Stanford Presenteeism Scale, Collins et al found that workers at Dow Chemical with at least one chronic health condition experienced greater productivity losses related to presenteeism than absenteeism.[15]

For this study, an estimate for hourly compensation of $34.25 per hour was used. This figure is based on a benchmarking study performed by The MEDSTAT Group[13] and is equal to the estimate for cost of lost productivity in the papers that describes the development and validation of the WPSI, the forbearer of the WI.[11,12] This estimate for hourly cost to employers is higher than the national average published by the U.S. Bureau of Labor statistics. For 2001, this figure was $23.15 per hour and also included average hourly wages and benefits for U.S. companies.[14]

This article focuses on the cost of lost productivity due to health-related absenteeism and presenteeism. Other costs borne by employers resulting from employees who smoke include direct medical costs associated with treating health conditions,[2] lost productive time due to smoking breaks,[16] increased number of accidents leading to higher worker compensation costs and disability,[17] and early retirement due to smoking-related health conditions.[2] Employers are likely to incur higher health costs associated with nonsmoking employees who are exposed to second-hand smoke at work.[18] Facilities where smoking is allowed are required to have better ventilation systems and incur higher maintenance and cleaning costs.[16] These facilities are also more likely to experience a

fire and/or have higher fire insurance costs.[16]

Limitations

The WI was administered to employees on a voluntary basis. Due to the large size of this study population, confirmation of the results with medical records was not possible, and no biochemical verification of smoking status was conducted. The results of this study are not intended to be an estimate of disease prevalence. The focus of this survey is to measure the employee's perspective on their own health and productivity. Other studies have found that using survey data to measure health-related productivity can effectively measure group differences without additional information.[19,20]

Another limitation of the study and other survey-based productivity studies is the dependence on respondent recall of their productivity and the presence or absence of a health condition. As a result, the WI may more accurately capture the productivity impact of acutely symptomatic conditions. The WI does not ask respondents if they are currently being treated for any of the conditions listed. Untreated conditions are likely to lead to higher productivity losses, which is not captured by this instrument.[12]

The prevalence of smoking in the United States has been estimated to be approximately 20% of the total adult population.[21] In this database, the self-reported prevalence of smoking is approximately 13%. This implies that respondents who smoke may be underrepresented in the study population. The questionnaire was offered to employees on a voluntary basis and current smokers may have been reluctant to complete the survey particularly if employers require current smokers to pay higher insurance premiums or participate in other cost-sharing arrangements for smokers. Although no identifying information was collected in the survey, smokers may have been reluctant to identify themselves as current smokers. Another possible contributor to the lower smoking rate in this population compared with the general population is the relative underrepresentation of respondents in fields that are likely to be considered blue collar. Approximately 16% of this study population reported a blue collar occupation type. Results from the NHIS have shown that blue collar workers have a higher prevalence of smoking compared with white collar workers.[22] Finally, because this study population was drawn from an employed population, adults over retirement age were underrepresented.

The WI does not stratify former smokers by time since smoking cessation. Other studies have found that time since smoking cessation has an impact on direct medical costs.[23–25] Another model suggests a more immediate return on investment.[26] A previous survey found that workplace absences were greatest for former smoker in the first 3 months after their quit date. Over time, absences for former smokers decreased and were lower than for current smokers. The authors of that study speculate that the peak in absences could be the result of poor health.[10]

Former smokers are not asked to provide their reason for quitting. Respondents who identify themselves as former smokers may be more likely to have experienced an adverse health event that encouraged them to quit smoking. In a retrospective study, Twardella et al found that diagnosis of a smoking-related disease was the strongest predictor of smoking cessation.[27] In this study, more former smokers reported experiencing coronary heart disease compared with nonsmokers or current smokers. The impact of time since smoking cessation and the primary reason for smoking cessation on lost productivity in a large U.S. population are important topics for future research.

Concluding Comments

Although employers may recognize the long-term benefits of smoking cessation, they may be reluctant to invest in smoking cessation interventions without evidence of effectiveness and a return on investment in a reasonable timeframe.[28] Investing in programs to encourage smoking cessation may benefit a variety of employer types. For example, companies that do not provide health benefits could incur cost savings from the increased productivity of employees even if they do not realize the benefits of lowered direct medical costs. Signs that payers see value in smoking cessation programs are becoming more visible. Currently, Medicare covers the cost of smoking cessation treatment for beneficiaries with conditions that are exacerbated by smoking.[29] The CDC recommends reducing the cost of smoking cessation therapies to increase the number of people attempting to quit as well as the number of successful quitters.[30] A better understanding of the complete cost of cigarette smoking, including both the direct and indirect health costs, will help insurers and employers make decisions about the value of smoking cessation programs.

Data suggest that employer-sponsored health promotion programs can reduce the number of disability days in employees.[31] Employers who choose to provide smoking cessation programs or access to smoking cessation medications have a variety of options in terms of total amount invested and employee cost-sharing. The CDC's Task Force on Preventive Services found that providing coverage or reimbursement for out-of-pocket costs for effective smoking cessation therapies, including counseling and smoking bans at work, were effective strategies for reducing tobacco use and exposure to tobacco smoke.[32] Curry et al found that employees were more likely to enroll in a smoking cessation plan if the employer covered all costs. In this study, the successful quit rate was higher in programs in which the costs were shared between employers and enrollees.[33]

All employers can benefit when smoking cessation by employees is successfully maintained. Employers can consider a wide range of interventions that could impact employee health and smoking behavior. For example, requiring a smoke-free workplace can reduce the prevalence of smoking by 6%.[34] A comprehensive health and wellness program can improve employee awareness and positively influence health behavior.[35] Goetzel et al recommend that employers customize their approach when considering cost reduction efforts for health care.[36]

Conclusion

In a large survey of U.S. employees, current smokers incurred the highest health-related productivity losses when compared with nonsmokers and former smokers. These productivity losses translate into higher costs to employers for current smokers and are substantially decreased for former smokers. Employers may reduce the cost of absenteeism and presenteeism by implementing initiatives that reduce tobacco use in their population.

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