Smoking and All-Cause Mortality among a Cohort of Urban Transit Operators

Carol B. Cunradi, MPH, PhD
Rob Lipton, MPH, PhD
Meng-Jinn Chen, MPH, PhD

Prevention Research Center,
Pacific Institute for Research and Evaluation,
Berkeley, CA

Introduction

This study assessed the contribution of smoking to all-cause mortality among a primarily minority cohort of urban transit operators. Relative to workers in white-collar and professional occupations, rates of smoking among transit and motor vehicle operators have been found to be elevated. Although it is well established that smoking is the main cause of lung cancer incidence and mortality, few studies have conducted longitudinal follow-up to assess all-cause mortality among blue-collar occupational cohorts in which the role of smoking and alcohol use are accounted for. Results from several general population studies suggest there may be important gender and racial/ethnic differences in mortality associated with smoking and level of alcohol consumption.

Methods

Sample and Data

The sample consists of urban transit operators who participated in the 1983-85 San Francisco MUNI Health and Safety Study. A total of 1,871 workers completed a self-reported health questionnaire that was obtained in conjunction with a mandatory biennial medical re-licensing examination. These data were then matched against state and national death records through the year 2000. Complete data were available for 1,785 workers. Sample characteristics are shown in Table 1. Approximately 61% of the study sample was African American, and 9% were female. At baseline, approximately 45% of the workers were current smokers, 30% were former smokers, and 25% had never smoked.

Analytic Strategy

Kaplan Meier survival analysis was conducted to assess probability of survival based on smoking status (current, former, never). Next, a multivariate proportional hazard model (Cox regression) was used to estimate the relative risk of death for each variable, taking into account all other covariates. Covariates included in the analysis were demographic factors (gender, age, race/ethnicity), years of smoking, and alcohol use (average number of drinks per week).

Table 1 Baseline Sample Characteristics (N=1785)

Characteristic	Number (%)
Mean Age (SD)	41.86 (7.76)
African American	1093 (61.2)
White	299 (16.8)
Hispanic	157 (8.8)
Asian/Pacific Islander/Filipino	212 (11.9)
Other	24 (1.3)
Male	1624 (91.0)
Female	161 (9.0)
Former Smoker	532 (29.8)
Current Smoker	800 (44.8)
Never Smoker	453 (25.4)
Mean Drinks per Week (SD)	2.59 (3.89)

Results

There were 198 deaths during the follow-up period. Kaplan Meier survival analysis (Figure 1) indicated that the probability of survival did not differ between former and current smokers, but was significantly lower compared to never smokers ($p < .001$). Data were further analyzed using Cox regression with age, gender, race/ethnicity, years of smoking, and average weekly alcohol use as predictors of mortality. The results (Table 2) showed that years of smoking significantly contributed to mortality (Hazard Ratio [HR] = 1.023; $p < .001$). Compared to Asian American transit operators, elevated mortality risk was observed for African American operators (HR=2.78, $p < .01$) and white operators (HR=2.93, $p < .01$). Gender and average weekly number of drinks were not significantly associated with mortality. Addition analyses (data not shown) indicated that there was no interaction between smoking and drinking.

Figure 1 Kaplan Meier Survival Analysis

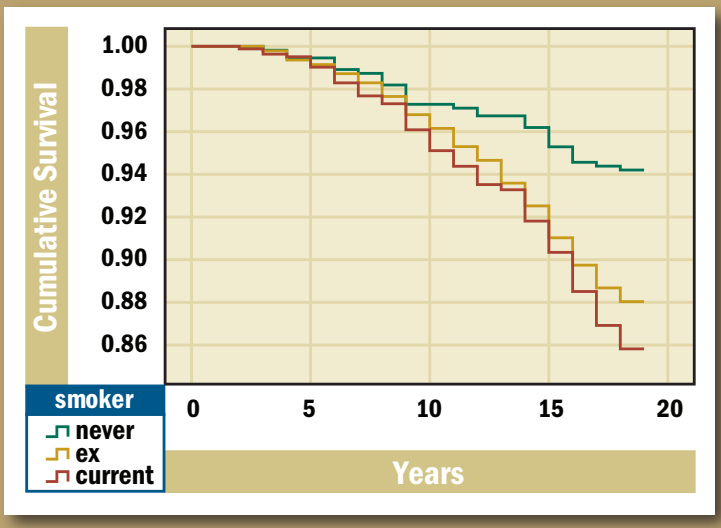

Table 2 Cox regression results, San Francisco transit operators

Category		B	SE	Wald	df	p-value	Hazard Ratio	95% Confidence Interval
Years smoked		.022	.006	13.109	1	.000	1.023	1.010, 1.035
Drinks per week		.023	.014	2.823	1	.093	1.024	0.996, 1.052
Age		.053	.010	29.352	1	.000	1.055	1.035, 1.075
Male gender		.381	.330	1.336	1	.248	1.464	0.767, 2.795
Race/ ethnicity:	Black	1.023	.346	8.717	1	.003	2.780	1.410, 5.482
	White	1.074	.368	8.518	1	.004	2.928	1.423, 6.025
	Hispanic	.423	.472	.804	1	.370	1.527	0.605, 3.851
	Other	1.385	.603	5.273	1	.022	3.992	1.225, 13.026

Conclusions

Previous research among bus drivers in the U.S., Europe, and Taiwan has found excess morbidity and mortality among this occupational group, including risk for ischemic heart disease, hypertension, prolapsed vertebral discs and cancer. Environmental risk factors, such as ergonomic strain, exposure to carcinogenic substances, and stressful psychosocial working conditions, have been implicated as contributing to excess morbidity and mortality. On an individual level, smoking is a key risk factor for ischemic heart disease, hypertension and cancer. Transit operators have been shown to have elevated rates of smoking compared to other white- and blue-collar occupations. For example, respondents who were classified as motor vehicle operators in the third National Health and Nutrition Examination Survey (NHANES III), conducted from 1988-1994, had an estimated smoking prevalence of 41.5%. In contrast, those classified as machine operators had an estimated smoking prevalence of 34.2%; freight, stock, and material movers had an estimated smoking prevalence of 25.2%, and the smoking prevalence of teachers was estimated at 12.2%. Although rates of smoking have declined over the past two decades among blue-collar workers, elevated prevalence of former smoking will likely continue to contribute to excess mortality among some blue-collar populations, such as urban transit operators.

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