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High cigarette and poly-tobacco use among workers in a dusty industry: New Jersey quarry workers

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Abstract

Objective—Tobacco use is high among US extraction and construction workers, who can also incur occupational dust exposure. Information on different types of tobacco use among quarry/mine workers is sparse.

Methods—During mandated training sessions, New Jersey quarry workers were surveyed about their tobacco use. Prevalence was calculated for single and multiple tobacco use by demographic and workplace characteristics; logistic regression was used to assess associations with smoking.

Results—240 (97.1%) workers completed surveys. Among respondents, 41.7% (95% CI 35.4, 48.3) currently used any tobacco product of whom 28.1% smoked cigarettes. In multivariate

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analysis, positive associations with smoking included working as a contractor vs. mine employee (OR 2.32, 95% CI 1.01, 5.36) and a usual job title of maintenance (OR 2.02, 95% 0.87, 4.94).

Conclusions—Industry-specific information may be helpful in developing targeted tobacco-cessation programs.

Introduction

Tobacco use is a leading cause of preventable morbidity and mortality in the United States.[1] While the overall prevalence of cigarette smoking has declined in the U.S., it remains higher among blue-collar workers.[2] Even among blue collar workers smoking rates vary, with the highest prevalence reported among workers in the extraction and construction.[3] A study of workers based on nationally representative survey data reported that the prevalence of cigarette smoking was significantly higher among extraction and construction workers (33,.1% and 34.9%, respectively), compared with other workers (23.8%).[4] Extraction and construction workers are also at increased risk of mortality and morbidity from exposure to respirable mineral dust.[5 6] Co-exposures to dust and cigarette smoke can have additive or synergistic potential for causing adverse respiratory health effects, including COPD and lung cancer.[7–10] Occupational dust exposure and tobacco use are the primary modifiable risk factors for respiratory disease among these workers.

Not only do blue collar workers have a higher prevalence of smoking than other workers, on average they smoke more cigarettes per day, have less access to workplace smoking prevention programs, have poorer quit success,[11 12] and are less likely to be employed in a workplace with policies that ban or restrict smoking.[13] Workplace smoking bans are a primary means of reducing exposure to tobacco smoke for smokers and nonsmokers. These policies have been successful in reducing the prevalence and intensity of smoking, increasing cessation attempts, reducing relapse among smokers attempting to quit, and eliminating or reducing exposure to environmental tobacco smoke in the workplace in a number of industries.[12 14 15]

Like cigarette smoking, smokeless tobacco (SLT) use is also more prevalent among extraction and construction workers compared with other workers,[16] as is concurrent use of both smoking and smokeless tobacco.[17] With increased adoption of smoke-free workplaces, concurrent use of SLT and cigarettes is of particular concern, as SLT can be substituted for cigarettes when smoking is prohibited at work.[18]

People who smoke cigarettes and also use other tobacco products (poly-tobacco use) may have more nicotine exposure and be less likely to stop using tobacco than single tobacco-delivery system users.[19] Poly-tobacco use increases exposure to harmful tobacco constituents and resulting adverse health effects. This is especially important as the epidemiology of tobacco use is rapidly changing. While smoking prevalence is declining, that of electronic cigarettes (e-cigarettes), cigars and cigarillos has been increasing in the general population.[20 21] Yet little is known about use of these tobacco products, either alone or concurrently with cigarettes, among extraction and construction workers.

Population-based national surveys provide important information regarding tobacco use in dusty industries,[22] but are limited in their ability to estimate events among relatively small populations, including specific sectors within industries. The category “extraction workers” comprises diverse groupings of industry subsectors such as surface and underground mining and petroleum extraction. Reports from national surveys of high tobacco use among workers in the extraction industry may not be relevant for specific industry subsectors. This information is essential for the development, implementation and evaluation of tobacco cessation programs. We report results from a brief survey on tobacco use and job information among New Jersey (NJ) surface miners and quarry workers (henceforth quarry/mine workers). The survey was designed and conducted as a collaborative effort between the NJ Department of Labor and Workforce Development (NJ-DOLWD), the NJ Department of Health and Rutgers University.

Methods

Study population

Participants in this cross-sectional survey were identified when they attended compulsory annual miner safety training.[23] In NJ, this training is offered to all quarry/mine operators, on behalf of their workers, by the NJ-DOLWD. Prior to training sessions a letter was sent to participating mine operators by Rutgers University investigators asking for permission to distribute the survey at the training. Verbal consent was then sought from the operators via telephone by study personnel. After the operator’s consent was obtained, the survey and participant informed consent were distributed to workers at the beginning of that operators’ next training session. Workers age 18 or older who could complete a written English- or Spanish-language survey were eligible.

Measures

The instrument was a one page (two-sided) survey designed to collected information on respondents’ demographics, employment, and tobacco use.

Demographics—The survey questions were designed to capture socio-demographic characteristics of respondents for comparison with those publically available from the National Institute for Occupational Safety and Health, 2012 National Survey of the Mining Population – Part I Employees (NSMP-I). Age was obtained in years and categorized into three groups determined from the distribution of age among current smokers (<=30, 30 to 49, and >=50 years). Educational level was elicited as a five-level check boxes (less than high school (HS) diploma; HS graduate or GED; some college, associate degree, or technical school; Bachelor’s degree or greater).

Employment—Questions about respondents’ work included using open text fields to ascertain the current job title which was then manually reviewed and grouped into four major categories as defined in the NSMP-I: administration/professional; maintenance; production; and, service/utility.[24] Check boxes were used to collect information on whether the respondent was employed full or part-time, whether they worked as a contractor, and the type of quarry/mining commodity extracted i.e. sand & gravel; stone; metal; other).

Tobacco use—Tobacco use questions were based on those in the 2012 National Survey on Drug Use and Health.[25] For cigarette smoking, we defined never smokers by a 'no' response to "Have you smoked at least 100 cigarettes in your entire life?" We differentiated former smokers from current smokers by defining the latter as respondents who answered 'yes' to: "During the past 30 days, have you smoked part or all of a cigarette?" For other tobacco products (e-cigarettes, cigars, pipes and/or smokeless tobacco) the screening question was "Have ever used [*the tobacco product*] in your entire life?" and then differentiated former and current users by any use in the past 30 days. We further defined any tobacco use as any use of cigarettes, cigars, pipes and/or smokeless tobacco. We defined three types of current dual use: concurrent use of cigarettes with SLT, e-cigarettes or cigars.

Additionally, the trainer who administered the questionnaires recorded information about each training session including the number of miners attending each session (to facilitate calculation of response rates) and the county-based region of NJ where the training was held, i.e. north, central, and south (Figure 1).

Statistical Analysis

Response rates and sample characteristics—Response rates were calculated for mine operators and for respondents. Prevalence and 95% confidence intervals were calculated for survey respondents by demographic including age, gender race/ethnicity, educational level, and workplace characteristics including job title, tenure, and employment full or part time. To assess the degree to which the characteristics of survey respondents were similar to those of quarry/mine workers nationally, respondents were compared with those from the NSMP-I working in the same type of quarry or mine. Summary NSMP-I data are available online, and include demographic (age, gender, ethnicity, race, and educational level) and work characteristics (job title, years working in a quarry/mine).[24]

The location of active NJ quarries and mines was mapped for 2014 using data from the US Department of Labor Mine Health and Safety Administration (MSHA) public access address/employment and mines data files available at http://www.msha.gov/OpenGovernmentData/OGIMSHA.asp#. Active mines were defined as those reporting any employee hours.

Tobacco use—Prevalence and 95% confidence intervals (95% CIs) were calculated for current and ever tobacco use, including: smoking, SLT, e-cigarettes, and any tobacco use. Prevalence and 95% CIs were calculated for current use only for dual- and poly-tobacco use. Prevalence rates were stratified by demographic and work characteristics for all tobacco-use behaviors except e-cigarettes, because the number of e-cigarette users was to too small to provide meaningful stratified prevalence estimates. Categorical variables for age and job tenure were created using approximate tertiles among current smokers. Current smoking rates for all employed non-Hispanic white men in NJ were obtained from the NJ Behavioral Risk Factor Surveillance System (BRFSS) via the NJ Department of Health's State Health Assessment Data System online data portal (https://www26.state.nj.us/doh-shad/query/selection/njbrfs/BRFSSSelection.html) and compared with smoking rates for a similarly defined group of respondents to the NJ miners survey by age group.

Logistic regression was used to assess associations between respondents' demographic and employment characteristics with current smoking, which was the tobacco-use behavior with the highest prevalence. Age, educational level, and NJ region were included in the model *a priori*. Other variables were retained in the model if their inclusion improved the middle fit, as indicated by the likelihood ratio test. Analyses were conducted using SAS© software (version 9.3, SAS Institute, Cary, NC).

Results

Response rates and sample characteristics

Participation rates were high, 6 out of 8 owner/operators agreed to participate, resulting in surveys being conducted at 19 training sessions in 14 facilities. One of the operators declined to participate because training for the year had already been completed; the other gave no reason. An average of 13 workers attended each session (range 3 to 28). Of the 247 workers attending, 240 (97.1%) completed surveys. Almost all respondents were male (97.9%), and most classified their race and ethnicity as non-Hispanic white (83.3%; Table 1). Respondents' average age was 44.2 years old (s. d. 13.3) and average years working in a quarry/mine was 11.2 (s.d. 11.6).

NJ survey respondents who currently worked in either a stone or sand & gravel quarry were similar to the NSMP-I respondents in terms of mean age and job tenure, as well as the distribution by gender and ethnicity (Table 2). However, they differed in terms of race and ethnicity; a higher proportion of NJ stone and sand & gravel workers were Hispanic and identified as a race other than white. As well, a higher proportion of NJ survey respondents had attended college compared with miners in those same commodities who participated in the NSMP-I.

Tobacco use

Three-quarters of respondents (75.8%; 95% CI 69.8, 81.1) reported ever using any tobacco product, and 41.7% (95% CI 35.4, 48.3) reported current tobacco use, including: 28.1% (95% CI 22.9, 34.4) who smoked cigarettes and 6.6% (95% CI 3.9, 10.3) who use e-cigarettes (Figure 2). Concurrent use of cigarettes and one or more other tobacco products was reported by 12.6% (95% CI: 8.7, 17.4); in addition to smoking cigarettes, 5.1% (95% CI: 2.8, 8.5) used chewing tobacco, 6.8% (95% CI: 4.1, 10.6) smoked cigars, and 4.9% (95% CI: 2.6, 8.3) used e-cigarettes.

Non-Hispanic survey respondents ages 18 to 64 had significantly higher current smoking rates compared to the same demographic of employed men from the NJ BRFSS, a population-based survey, (30.0%, 95% CI: 22.8, 34.5 vs. 21.6%, 95% CI: 18.8, 24.1, respectively; Figure 3).

The prevalence of cigarette smoking and smokeless tobacco was inversely related to age (Tables 3 and 4). In contrast, the prevalence of cigar smoking, while was higher among young workers was similar among all workers age 30 and older (Table 3). The prevalence of current cigarette smoking was significantly higher among workers who were non-Hispanic White compared with other race/ethnicity groups (p= 0.0336) while the prevalence of

current cigar smoking, 11%, was the same (p=0.98). The smoking prevalence was highest among sand & gravel workers and among workers in southern NJ. Sand & gravel quarries are located throughout NJ (Figure 3); in multivariate analysis, region within the state remained a significant predictor of smoking but type of commodity mined did not (Table 4). Occupational factors positively associated with smoking included being employed by a contractor rather than the mine operator and having a usual job title in maintenance (Table 4).

Discussion

We observed high rates of smoking (28.1%) and current use of any tobacco product (41.7%) in New Jersey quarry/mine workers, a subsector of the extraction industry. The prevalence of current cigarette smoking was consistent with that reported nationally among extraction and construction workers (29.5, 95% CI: 26.1, 32.8; 27.0 95% CI: 15.9, 38.2)[16] and significantly higher than that among working men with similar age and race/ethnicity in NJ. The prevalence of smokeless tobacco use observed in our study (12.3%, 95% CI: 8.5, 16.9) was also similar to that observed nationally among both extraction and construction workers (18.8%, 95% CI: 17.9, 29.7%, and 7.9, 95% CI: 6.0, 9.9, respectively).[16] Tobacco use contributes to respiratory disease in dust-exposed workers, [26 27] [7] workplace injury[28 29], absenteeism,[30] and may be associated with workplace stress [11]. Among construction workers, smoking has been associated with increased risk of occupational disability including that due to respiratory and cardiovascular disease.[31]

In 2012, there were over 100,000 miners working in either sand & gravel or stone mines in the US. In NJ there is a small but stable surface aggregate mining industry with an average of 85 operating mines a year, employing approximately 1,500 people. Almost all work in surface miners that extract stone or sand & gravel. These miners are often exposed to the respirable silica with the potential for the development of increased rates of malignant and non-malignant respiratory diseases including obstructive lung disease lung function impairment, silicosis and lung cancer.[6 32 33] In this survey of NJ quarry/mine workers, we not only found a high prevalence of cigarette smoking but also of other tobacco product use including e-cigarettes. E-cigarette use is rapidly increasing among US adults.[20] We observed higher rates of current (6.6%, 95% CI: 3.9, 10.3) and ever e-cigarette (21.4%, 95% CI: 16.3%, 27.3%) use than was observed among men from a study based on national survey data (4.2%, and 14.2%).[34] The authors of that study observed the highest prevalence of daily e-cigarette use among former smokers. In our survey the majority (11 of 15) of respondents who reported current e-cigarette use were current smokers, suggesting different usage pattern of e-cigarettes among these workers compared with the general population. A key tool in workplace tobacco control is the implementation of workplace smoking bans or restrictions. MSHA bans smoking in underground coal mines because of the risk of explosion, but has no such ban for surface mines like those in this study.[35] While 24 states have banned smoking in the workplace, a majority of these have not included e-cigarettes in their laws.[36] The New Jersey indoor and workplace smoking ban includes e-cigarettes, but coverage is limited to indoor workplaces only (P.L. 2009, c.182). Recommendations for including e-cigarettes in tobacco-free workplace policies have been proposed.[36 37] Understanding tobacco use patterns, including e-cigarette use, within industries is essential

for planning and evaluating workplace tobacco policies. Similarly, while much work has been done regarding targeting smoking cessation interventions for blue collar workers in general and in some specific sectors including construction workers, [38–40] the evidence base for the efficacy of smoking prevention policies for other tobacco products, and poly-tobacco use, is lacking.[41]

The prevalence of poly-tobacco use was high in this population (12.6%). Compared with single-tobacco product use, poly-tobacco use may increase nicotine exposure, dependence, and risk of tobacco-attributable disease and death.[42] Studies have reported higher rates of smokers who are poly-users among men, non-Hispanic whites, unemployed, and/or blue-collar workers.[19 43] The socio-demographic characteristics of quarry/mine workers overlap with some of these features but other characteristics unique to these industries may also be contributing to the high rate observed.

Limitations

There are several potential limitations to this study. The cross-sectional design means that inferences cannot be made regarding the temporality of observed associations. The convenience sampling and implementation in one state may limit the generalizability of the findings to workers in other states. We compared the demographics and work characteristics of our sample to those respondents from the NSMP who mined the same commodities. Overall they were similar, however our sample was more racially and ethnically diverse than those in the national study. In general in the US, cigarette smoking and SLT use are more prevalent among non-Hispanic white men and lower in the northeastern states where our survey was conducted. Consequently, our estimates of tobacco use among quarry/mine workers may underestimate those in other areas where smoking and SLT use are more prevalent, such as the southeast.[16]

Another possible limitation is that this survey was conducted using a convenience sample of miners attending mandatory annual training provided by the NJ-DOLWD. The NJ-DOLWD estimates between 50 and 60 percent of all NJ mine operators complete their miner training requirements using their program. Participating mine operators and their employees may differ from those who chose not to participate in terms of tobacco-use behaviors.

Conclusions

This study provides a snapshot of tobacco use among quarry workers, one sub-sector of US extraction workers. Cigarette smoking and other tobacco use was high among these workers who may also be exposed to toxic mineral dust. Additionally, many of the workers in our study used a variety of tobacco products in combination with cigarettes which may increase health risks. The complexity of tobacco-use behaviors, including non-cigarette tobacco products, in these workers needs to be addressed when planning and evaluating workplace-tobacco policies and interventions.

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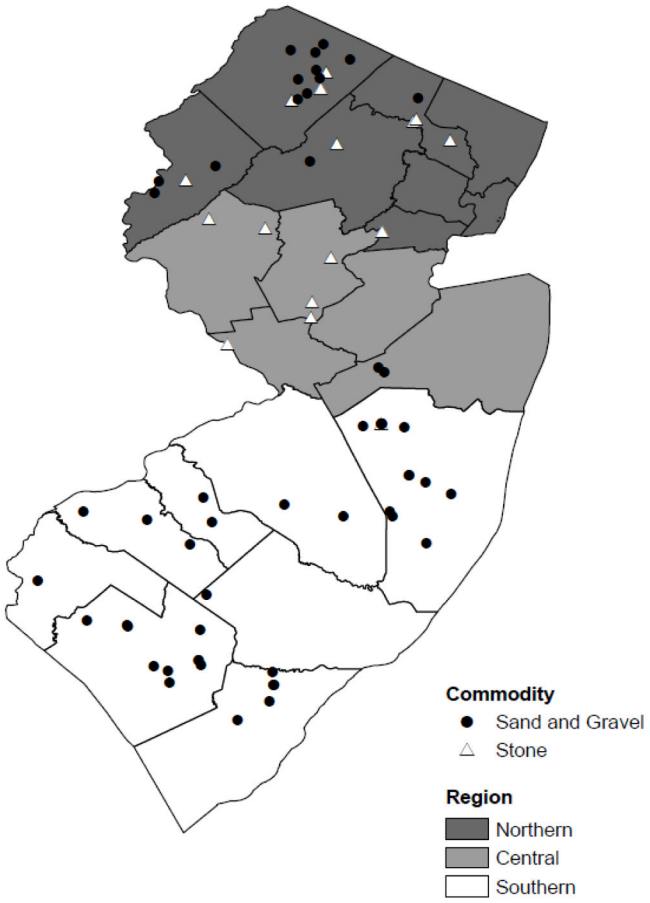

Figure 1.

Active mines[1] in New Jersey; MSHA Address/Employment and Mines data 2014[2]

1. Active mines were determined by any mine reporting >0 total employee hours for that calendar year (N=84)

2. Data available at http://www.msha.gov/OpenGovernmentData/OGIMSHA.asp; accessed September 9th, 2015

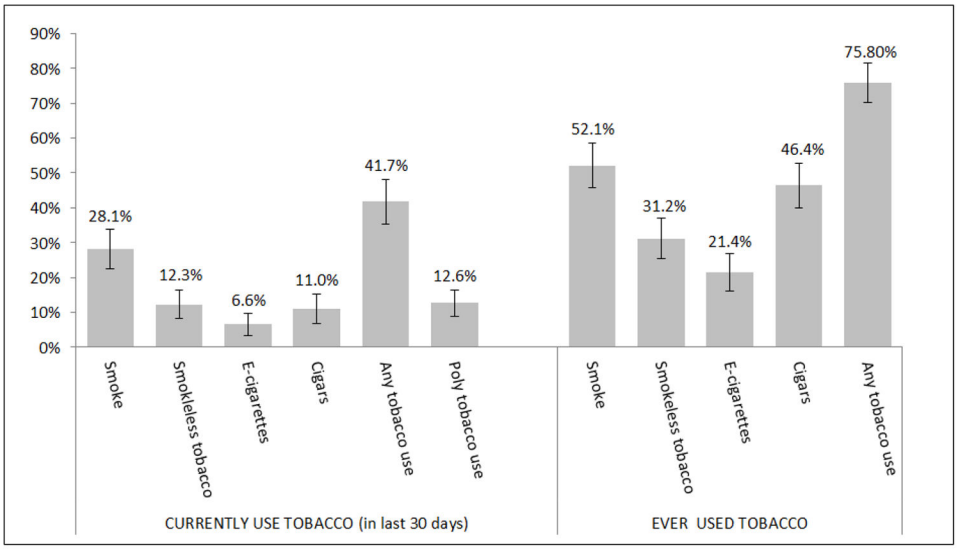

Figure 2.

Prevalence of selected tobacco use among quarry workers and other miners;[1] New Jersey 2015 (n=240)

1. Error bars display 95% confidence intervals

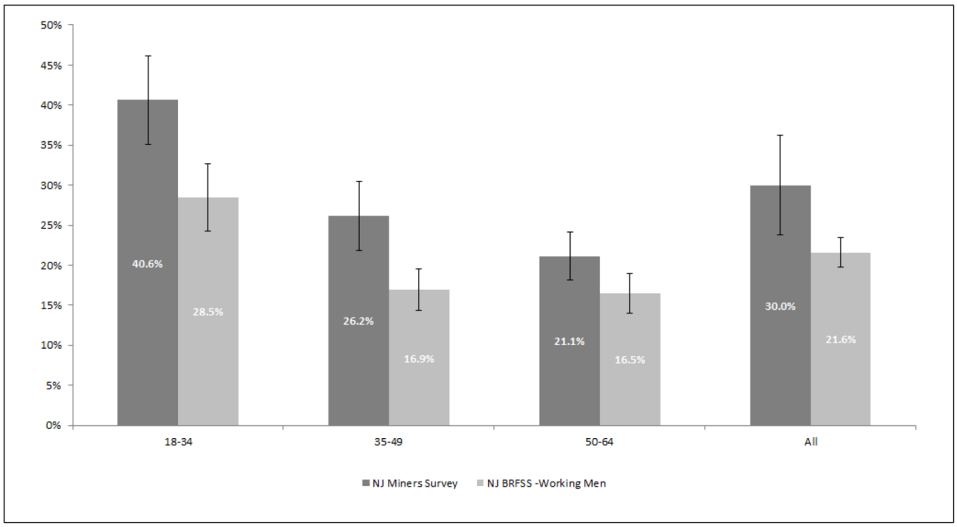

Figure 3.

Prevalence of current smoking among employed non-Hispanic white men, age 18 to 64, enrolled in the NJ miners survey the New Jersey Behavioral Risk Actor Surveillance System (BRFSS; 2012)[1] by age group[2]

1. BRFSS = Behavioral Risk factor Surveillance System
2. Error bars display 95% confidence intervals

Table 1

Demographic and work characteristics of respondents to the New Jersey Miners' Survey

Characteristics	n (240)	%
Demographics		
Gender		
Male	233	97.9
Female	5	2.1
Age group (years)		
<=30	50	21.1
30 to 49	87	36.7
>=50	100	42.1
Race/Ethnicity		
NH White	200	83.3
Other	40	16.7
Education		
< HS Grad/GED	33	13.8
HS Grad/GED	94	40.0
Any college	111	46.6
Work characteristics		
New Jersey Region		
Northern	33	13.8
Central	112	46.7
Southern	95	39.6
Usual work		
Sand & Gravel	57	24.8
Stone	113	49.1
Other	60	26.1
Employment status		
Full time	145	63.3
Part time	84	36.7
Employed by		
Mine/quarry operator	114	47.7
Contractor	98	41.0
Other	27	11.3
Job category		
Maintenance	113	51.1
Production	59	26.7
Administration	19	7.9
Worked in a quarry/mine		
≤1 year	66	28.5
2 to 10 years	72	31.0
≥11 years	94	40.5

Table 2

Demographic and work characteristics of survey respondents and from the 2012 National Survey of the Mining Population: Part I Employees (NSMP-I)[1]

	SAND & GRAVEL				STONE			
	NJ (n=117)		NIOSH National Estimates		NJ (n=60)		NIOSH National Estimates	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	%	95% CI
Age (years)	43.5	(41.1, 46.1)	44.0	(43.0, 45.1)	41.4	(37.2, 5.5)	43.8	(42.9, 44.7)
Work tenure (years)								
Current job title	9.8	(7.9, 11.6)	7.4	(6.2, 8.6)	11.5	(7.8, 15.2)	7.8	(7.2, 8.3)
Work in mine/quarry	12.2	(9.8, 14.6)	10.3	(9.5, 11.2)	12.2	(8.9, 15.5)	12.5	(11.7, 13.3)
	NJ (n=117)		NIOSH National Estimates		NJ (n=60)		NIOSH National Estimates	
Characteristic	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Gender - male	95.4	(90.0, 98.3)	92.1	(90.0, 94.2)	100.0	(92.2, 100.0)	93.4	(92.3, 94.4)
Ethnicity - Hispanic	13.0	(7.3, 20.8)	17.5	(9.3, 25.6)	20.5	(9.3, 36.5)	13.6	(9.1, 18.1)
Race - White[2]	83.3	(79.4, 89.5)	94.1	(92.1, 96.1)	69.2	(52.4, 83.0)	93.8	(91.5, 96.0)
Education								
< 9th grade	4.7	(1.5, 10.6)	4.8	(1.1, 8.4)	0	(0, 7.6)	4.7	(2.5, 6.9)
9th -12th (no diploma)	18.7	(11.8, 27.4)	14.7	(10.3, 19.1)	7.9	(2.1, 20.0)	12.4	(9.6, 15.1)
HS Grad or GED	39.3	(30.0, 49.2)	59.9	(54.0, 65.9)	50.0	(33.4, 65.6)	62.0	(56.9, 67.1)
Any college[3]	27.1	(19.0, 36.6)	17.2	(14.4, 19.9)	34.1	(20.5, 50.2)	15.3	(12.6, 18.1)
≥ 4-year college degree	10.3	(5.2, 17.6)	3.5	(2.3, 4.6)	7.9	(2.1, 20.0)	5.6	(4.2, 6.9)

[1] McWilliams LJ. National Survey of the Mining Population; Part I Employees. In: Health and Human Services, National Institute for Occupational Safety and Health, ed. Pittsburg: NIOSH Publication No 2012-152, 2012

[2] P-value for race = “White” for sand and gravel workers in the NJ survey compared with NSMP-I: Sand and gravel = 0.001; stone <0.0001

[3] P-value for education = “Any college” for sand and gravel workers in the NJ survey compared with NSMP-I: Sand and gravel = <0.0001; stone = 0.040

[4] P-value for education = “> 4-year college degree” for sand and gravel workers in the NJ survey compared with NSMP-I = <0.020

Table 3

Prevalence of current tobacco use by demographic and work characteristics among NJ quarry/mine workers

	CURRENT TOBACCO USE											
	Cigarettes				Smokeless Tobacco				Cigars			
Characteristic	**n**	**%**	**95% CI**	**p-value**	**n**	**%**	**95% CI**	**p-value**	**n**	**%**	**95% CI**	**p-value**
All	67	28.1	(22.9, 34.4)		29	12.3	(8.5, 16.9)		26	11.0	(7.5, 15.4)	
Age (years)												
<=30	21	42.9	(30.2, 59.9)		13	26.0	(15.3, 41.9)		9	18.0	(9.0, 32.6)	
30 to 49	24	28.2	(16.1, 41.0)		10	11.6	(4.0, 21.5)		8	9.2	(2.9, 19.3)	
>=50	21	21.2	(20.2, 44.1)	<0.0001	5	5.1	(4.7, 21.9)	0.0003	9	9.2	(3.5, 3.5)	0.1507
Ethnicity/race												
Non-Hisp. White	59	30.4	(24.0, 37.4)		27	13.9	(9.4, 19.6)		22	11.2	(7.2, 16.5)	
Other	6	16.2	(6.2, 32.0)	0.0336	2	5.3	(0.6, 17.8)	0.1402	4	11.1	(3.1, 26.1)	0.9842
Education												
< High School	12	37.5	(21.1, 56.3)		4	12.9	(3.6, 29.8)		6	18.8	(7.2, 36.4)	
HS Grad or GED	22	24.7	(16.2, 35.0)		11	12.0	(6.1, 20.4)		5	5.4	(1.8, 12.2)	
Any college	31	28.7	(20.4, 38.2)	0.5864	14	13.0	(7.3, 20.8)	0.9754	15	14.0	(8.1, 22.1)	0.0568
New Jersey Region												
Northern NJ	7	21.2	(9.0, 38.9)		6	18.2	(7.0, 35.5)		4	12.1	(3.4, 28.2)	
Central NJ	25	22.5	(15.1, 31.4)		12	10.9	(5.8, 18.3)		9	8.2	(3.8, 15.0)	
Southern NJ	33	37.9	(27.7, 49.0)	0.0269	11	12.4	(6.3, 21.0)	0.5406	13	14.6	(8.0, 23.7)	0.3547
Type of mine/quarry												
Sand and gravel	31	28.2	(20.0, 37.6)		13	11.7	(6.4, 19.2)		13	11.6	(6.3, 19.0)	
Stone	12	20.3	(11.0, 32.8)		11	18.3	(9.5, 30.4)		4	6.8	(1.9, 16.5)	
Other	19	33.3	(21.4, 47.1)	0.3363	5	8.9	(3.0, 19.6)	0.2837	9	16.1	(7.6, 28.3)	0.2936
Yrs. mine/quarry work												
≤1 years	23	35.4	(24.5, 47.5)		16	24.2	(15.1, 35.6)		10	15.2	(8.0, 25.4)	
2 to 10 years	22	31.0	(21.1, 42.4)		8	11.6	(5.5, 20.8)		11	15.5	(8.4, 25.3)	
≥11 years	20	21.7	(14.2, 21.0)	0.0063	5	5.3	(0.2, 11.3)	0.0005	5	5.4	(2.0, 11.6)	0.0446
Current Employer												
Contractor	34	35.1	(25.6, 45.4)		8	8.3	(3.6, 15.6)		15	15.5	(8.9, 24.2)	

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	CURRENT TOBACCO USE											
	Cigarettes				Smokeless Tobacco				Cigars			
Characteristic	**n**	**%**	**95% CI**	**p-value**	**n**	**%**	**95% CI**	**p-value**	**n**	**%**	**95% CI**	**p-value**
Mine/quarry operator	26	24.5	(16.7, 33.8)		16	14.8	(8.7, 22.9)		9	8.4	(3.9, 15.4)	
Other	5	18.5	(6.3, 38.1)	0.0932	5	19.2	(6.6, 39.4)	0.2022	2	7.4	(0.9, 24.3)	0.2246
Employment status												
Full time	33	24.3	(17.3, 32.4)		17	12.3	(7.3, 19.0)		12	8.8	(4.6, 14.8)	
Part time	29	34.5	(24.5, 45.7)	0.1807	12	14.3	(7.6, 23.6)	0.6732	13	15.5	(8.5, 25.0)	0.1259
Current job title												
Maintenance	34	31.2	(22.7, 40.8)		14	12.5	(7.0, 20.1)		14	12.5	(7.0, 20.1)	
Production	15	25.9	(15.3, 39.0)		8	13.8	(6.2, 25.4)		7	12.1	(5.0, 23.3)	
Administration	2	11.1	(1.4, 34.7)		2	11.8	(1.5, 36.4)		0	0.0	(0.0, 18.5)	
Other	14	30.4	(17.7, 45.8)	0.5496	5	11.1	(3.7, 24.1)	0.9813	5	11.4	(3.8, 24.6)	0.4745

Table 4

Results from the most parsimonious logistic regression models of the association between socio-demographic and workplace characteristics with current cigarette smoking and any type of tobacco use

Variable	Odds ratio	95% Confidence Limits	p-value
Age (10 years)	0.64	(0.49, 0.83)	0.0010
Education (ref.= Any college)			
No HS or GED	2.60	(0.88, 7.63)	0.0026
HS grad or GED	0.84	(0.42, 1.92)	0.7735
New Jersey region (ref.=North & Central)			
South	3.60	(1.68, 7.73)	0.0010
Current Job Title (ref = all other)			
Production	1.78	(0.64, 4.93)	0.2716
Maintenance	2.02	(0.87, 4.94)	0.0982
Contractor (ref = employed by operator)	2.32	(1.01, 5.36)	0.0488
Type of quarry/mine (ref. = Stone/Sand and gravel)			
Other	1.56	(0.67, 3.59)	0.3006