declined with increasing wear from 10.16 to 7.76 mm s^{-1} ($P < 0.00001$). Discussion: Increasing bit wear was associated method for estimating binaural hearing impairment and whole person impairment; (2) the model of the International Organization for Standardization (ISO) for estimating both age related and noise r distribution of HPD use from the activity card/dosimetry measures, with nearly 80% of workers reporting either almost never or almost always using HPDs. Fair agreement (kappa = 0.38) was found between the survey and activity card/dosimetry HPD use measures. Logistic regression models identified site, trade, education level, years in construction, percent of shift in high noise, and five HPM components as important predictors of HPD use at the individual level. Site safety climate factors were assoc È õ7 UÁn ui 0.38)pTT4 1 Tf .224 0 T 1 Tf .224 0 TD .0019 Tc (HPDs.)Tj /TT1 1 Tf 2.4765 0 TD 0 Tc <00

(154 firefighters and 769 operating engineers) who completed a survey and audiometric tests as part of a hearing loss prevention intervention study. Approximately 40% of both groups reported tinnitus; 34% of firefighters and 59% of operating engineers showed hearing loss at noise sensitive frequencies (4 kHz and 6 kHz). Firefighters with high frequency hearing loss (odds ratio [OR] = 2.31; 95% confidence interval [CI] = [1.05, 5.11]) and those with perceived impaired hearing status (OR = 3.53; 95% CI = [1.27, 9.80]) were significantly more likely to report tinnitus. Similarly, operating engineers who had hearing loss at both low (OR = 2.10; 95% CI = [1.40, 3.15]) and

control groups showed significant increase in their reported installation, furniture refinishing, health care clinics, janitorial floor waxing service, landscaping, lawn maintenance, tree service, road construction, stone countertop fabrication, truck bed lining, warehouse and cold storage, and wood floor finishing. Targeted health hazards included worker exposure to airborne contaminants, noise, and bloodborne pathogens typical of the industry. Method and effectiveness of control of health hazards were evaluated by counting work sites with violations associated with engineering control, personal protective equipment, hearing conservation, or training. Results are presented by industry for the number and percentage of work sites that failed to provide required protection. Poor control of health hazards was generally found across all inspected industries. Follow up inspections and self reports of abatement found that more than 85% were able to successfully control the hazards and abate the violations. The results are further discussed as they relate to methods of control and risk and identifying existing and emerging high health hazard industries. Based on employment data and the poor hazard control that was found, most if not all the industries can be described as high health hazard, small employer industries. The results can be used for the planning of interventions in other regions and industries.

Lofgren, D. J., et al. (2004). "Silica and noise exposure during installation of fiber cement siding." J effectiv(ETc (resu

significantly higher estimated exposure levels even without including their firearms exposure than did non r shooters. When compared with the high levels of occupational noise found in construction, non r occupational noise exposures generally present little additional exposure for most workers. However, they may contribute significantly to overall exposure in the subset of workers who frequently participate in selected noisy activities.

Neitzel, R., et al. (2004). "Nonoccupational noise: exposures associated with routine activities." J Acoust Soc Am 115(1): 237 r245.

Efforts to characterize nonoccupational noise exposures have focused primarily on infrequent, episodic events. Few studies have assessed noise levels resulting from routine daily activities. In the current study, 112 construction workers wore datalogging noise dosimeters and simultaneously completed activity logs during two phases of data collection. The 81 subjects monitored in phase 1 received logs listing numerous preselected occupational and nonoccupational activities, while the 31 subjects monitored in phase 2 used free r field logs and reported nonoccupational activities in greater detail. Nearly all of the 221,439 1 r min intervals of nonoccupational L(eq) level and activity reporting were below 70 dBA; only a small percentage exceeded 80 dBA. The primary contributor to nonoccupational noise exposure was traveling in a car or bus, while time at home contributed the least. One hundred seventy 24 r h L(eq) levels were computed from the 1 r min noise level data. The percentage of phase 2 workday L(eq(24)) levels which exceeded 80 dBA was higher than that of the nonworkday levels. The mean L(eq(24)) level of phase 2 workdays was higher than that of nonworkdays, and the difference was statistically significant. Routine nonoccupational noise exposures contributed much less studies whilinhg L(eq(2596 0wTiDl <0003>Tj /TT4 1 Tf .224 0 TD .0034003 several long term exposure estimates for cohort members. METHODS: We followed cohort members between 1999 and 2009 and interviewed them approximately annually to obtain a detailed work history for the previous subject interval while also collecting tests of hearing sensitivity. Over the same period, we also collected a sample of full shift average noise measurements and activity information. We used data from these two sources to develop various exposure estimates for each subject for specific subject intervals and for the duration of the study. These estimates included work duration, trade mean (TM) equivalent continuous exposure level (L(EQ)), task based (TB) L(EQ), a hybrid L(EQ) combining TB and subjective information, and an estimate of noise exposure 'peakiness'. RESULTS: Of the 456 subjects enrolled in the study, 333 had at least 2 interviews and met several inclusion criteria related to hearing sensitivity. Depending on the metric used, between one third and three quarters of 1310 measured full shift noise exposures exceeded permissible and recommended exposure limits. Hybrid and TB exposure estimates demonstrated much greater variability than TM estimates. Work duration and estimates of exposure peakiness showed poor agreement with average exposures, suggesting that these metrics evaluate different aspects of exposure and may have different predictive value for estimating NIHL. CONCLUSIONS: Construction workers in the cohort had subject interval and study average exposures which present a substantial potential risk of NIHL. In a subsequent paper, we will use these estimates to evaluate the exposure response relationship between noise and NIHL.

Rasmussen, S., et al. (2009). "Construction noise decreases reproductive efficiency in mice." J Am Assoc Lab Anim Sci 48(4): 363 370.

Excessive noise is well known to impair rodent health. To better understand the effect of construction noise and to establish effective noise limits during a planned expansion of our vivarium, we analyzed the e[illegible]

CONCLUSIONS: Six months after tasks were performed, construction workers were able to accurately recall the percentage time they spent at various tasks. Estimates of noise exposure based on long term recall (questionnaire) were no different from estimates derived from daily activity cards and were strongly correlated with dosimetry measurements, overestimating the level on average by 2.0 dBA.

Ringen, K., et al. (2014). "S a f e t y

This study explored Latino construction workers' experiences with occupational noise and hearing protection to provide qualitative data to be used in designing an intervention to prevent noise-induced hearing loss. An ecological framework provided the theoretical foundation for this study. Fifteen Latino construction

the cohort's work history to explore the importance of these alternative metrics in estimating risk of noise induced damage.

Seixas, N. S., et al. (2005). "Prospective noise induced changes to hearing among construction industry apprentices." Occup Environ Med 62(5): 309-317.

AIMS: To characterise the development of noise induced damage to hearing. METHODS: Hearing and noise exposure were prospectively monitored among a cohort of newly enrolled construction industry apprentices and a comparison group of graduate students, using standard pure tone audiometry and distortion product otoacoustic emissions (DPOAEs). A total of 328 subjects (632 ears) were monitored annually an average of 3.4 times. In parallel to these measures, noise exposure and hearing protection device (HPD) use were extensively monitored during construction work tasks. Recreational/non-occupational exposures also were queried and monitored in subgroups of subjects. Trade specific mean exposure L(eq) levels,

attitudes, beliefs, and behavioral intentions associated with healthy hearing behaviors – especially those associated with appropriate hearing protector use. The goal was to directly address the key issues and overcome the barriers identified during the formative research phase. The survey was finalized using factor analysis methods and repeated pilot testing. It was designed to be used with the training as an evaluation tool and thus could indicate changes over time in attitudes, beliefs, and behavioral intentions regarding hearing loss prevention. Finally, the training program was fine tuned with industry participation so that its delivery would integrate seamlessly into the existing health and safety training provided to apprentice carpenters. In phase 2, reported elsewhere in this volume, the training program and the survey were tested through a demonstration project at two sites.

Stephenson, M. R., et al. (2011). "Hearing loss prevention for carpenters: part 2 – demonstration projects using individualized and group training." Noise Health 13(51): 122–131.

Two demonstration projects were conducted to evaluate the effectiveness of a comprehensive training program for carpenters. This training was paired with audiometry and counseling and a survey of attitudes and beliefs in hearing loss prevention. All participants received hearing tests, multimedia instruction on occupational noise exposure/hearing loss, and instruction and practice in using a diverse selection of hearing protection devices (HPDs). A total of 103 apprentice carpenters participated in the Year 1 training, were given a large supply of these HPDs, and instructions on how to get additional free supplies if they ran out during the 1-year interval between initial and follow-up training. Forty-two participants responded to the survey a second time a year later and completed the Year 2 training. Significant test-retest differences were found between the pre-training and the post-training survey scores. Both forms of instruction (individual versus group) produced equivalent outcomes. The results indicated that training was able to bring all apprentice participants up to the same desired level with regard to attitudes, beliefs, and behavioral intentions to use hearing protection properly. It was concluded that the health communication models used to develop the educational and training materials for this effort were extremely effective.

Trabeau, M., et al. (2008). "A comparison of "Train-the-Trainer" and expert training modalities for hearing protection use in construction." Am J Ind Med 51(2): 130–137.

BACKGROUND: Few assessments have been conducted on the impact of a "Train-the-Trainer" (T3) approach for training delivery. The present study compared the effectiveness of a noise induced hearing loss (NIHL) prevention training delivered using "Train-the-Trainer" and expert trainer modalities. METHODS: Participating construction companies were assigned to the Train-the-Trainer or expert trainer modalities. Workers were recruited from each company and then trained. The effectiveness of the modalities was assessed through the use of surveys. The was been 8(SU) .2(LTS: 1 through

Waitzman, N. and K. Smith (1999). "Unsound Conditions: Work Related Hearing Loss in Construction, 1960–75." CPWR Report.

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