

### Deaths and DALYs from Occupational Injuries (in thousands)

Region	Deaths	DALYs
EME	14	540
FSE	10	405
IND	15	655
CHI	20	1,039
OAI	12	566
SSA	10	550
LAC	9	429
MEC	9	461
World	99	4,645

A United States burden of disease study which will include an analysis of occupational injuries and diseases is underway.

### Session 6: Nonfatal Injuries in Construction

#### ✓ Construction Injury Rates May Exceed National Estimates: Evidence from the Construction of Denver International Airport (DIA)—Glazner JE, Borgerding JA, Lowery JT, Bondy J, Kreiss K

**Aim.** To describe occupational injury rates and workers' compensation (WC) payment rates on a major construction project.

**Background.** Most injury rate estimates rely on survey data (Bureau of Labor Statistics (BLS)), analysis of WC claims, emergency room surveillance and proportionate mortality studies. These may suffer from underreporting and/or imprecise estimates of the number of workers at risk. Construction of DIA, with 31 million person hours on 2,843 contracts held by 769 contractors, provided a unique opportunity to describe the magnitude of injury on a major construction project.

**Methods.** The airport owner implemented a project-wide WC insurance plan for all on-site workers involved in airport construction. All claims were recorded in a centralized database, as was payroll according to job classification. Injuries were treated at an on-site clinic operated by a designated medical provider; claims were generated whenever treatment was rendered. Using a computer file with all claims, payroll by contract (allowing calculation of hours at risk), and company characteristics, we calculated injury and payment rates by construction sector, company size, and year.

**Results.** DIA's total injury rates were over twice BLS's rates for the construction industry for each year of construction. Lost-work-time (LWT) injury rates were more comparable, but DIA's were slightly higher. The order of injury rates by SIC code was the same in both data sets, with SIC 17 (special trades) having the highest rates. Total injury rates for DIA's small contractors (1-19 employees) were three times BLS's reported rates and at least twice BLS's rates for all other company size categories. Injury rates declined significantly after the first year of DIA construction, coincident with a several-fold increase in project safety personnel. DIA's total WC payment rate of \$7.06 per \$100 payroll was 11 percent higher than expected loss rates reported by the National Council on Compensation Insurance, in contrast to the two-fold differential between injury occurrence at DIA and BLS survey data.

**Conclusion.** Complete reporting, facilitated by the existence of a single WC plan, an on-site medical clinic and designated medical

providers, produced injury rates significantly higher than previously reported. The relatively small difference between payment rates and expected loss rates suggests that underreporting is concentrated in the area of minor injuries, which we found to be associated at the contract level with major injuries. Our results suggest that underreporting of WC claims occurs and may result in sizable underestimates of the burden of injury in construction.

#### Risk Factors for Injury Among Construction Workers on the Denver International Airport (DIA) Project—Lowery JT, Borgerding JA, Zhen B, Glazner JE, Bondy J, Kreiss K

**Aim.** To identify risk factors for work-related injury on the Denver International Airport construction project, which generated over 31 million person-hours, employing 32,000 workers from 769 companies to complete 2,843 contracts.

**Methods.** We obtained workers' compensation claims data from an administrative database established under the project's owner-controlled insurance plan, which covered all on-site employees and provided on-site medical care through designated providers. We calculated injury rates by contract and over contract strata of interest by linking claims data with employee demographic information, company and contract characteristics, and contract payroll. We determined that injury rates among contracts held by the same company were independent using generalized estimating equations, enabling us to examine contract-specific factors in relation to total injuries, lost-work-time (LWT) injuries, and non-LWT injuries in Poisson regression models. To control for inherent risk of work in the model, we included expected loss rates (ELRs), which we calculated for contracts using Colorado-specific ELRs provided by the National Council on Compensation Insurance for each job classification. We used logistic regression to determine the association between LWT and non-LWT injuries on a contract level, controlling for person-hours at risk and ELRs.

**Results.** Injury rates were highest during the first year of construction, at the beginning of contracts and among older workers. Risk for total and non-LWT injuries was elevated for building construction contracts, contracts for special trades companies (SIC 17), contracts with payroll over \$1 million and those with overtime payroll greater than 20 percent. Risk for LWT injuries, on the other hand, was increased for site development contracts and contracts starting in the first year of construction. Large companies (250+ employees) had significantly lower risk for all injuries.

Contracts experiencing one or more minor injuries were four times as likely to have at least one major injury [OR=4.0, 95%CI(2.9,5.5)].

**Conclusion.** Our finding of increased risk of LWT injury for contracts starting in the first year of the project suggests that enhancement of the project's safety infrastructure during the second year of construction was effective in reducing serious work-site injuries. The absence of correlation between injury rates among contracts belonging to the same company suggests that targeting of safety resources at the level of the contract may be an effective approach to injury prevention. Interventions focused on contracts with considerable overtime work, contracts of special trades companies (SIC 17), and those belonging to small and mid-sized companies may yield reductions in injury rates. Furthermore, efforts to provide adequate site-specific training to workers new to a construction site or new to a contract may also reduce injury burden on large construction sites. The joint occurrence of minor and major