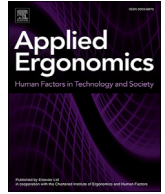




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Understanding causes of fall and struck-by incidents: What differentiates construction safety in the Arabian Gulf region?

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ABSTRACT

Rapid growth in the Arabian Gulf region has fueled an explosive pace of construction and a rise in risks of occupational injury. Scarcity of pertinent data, however, makes it hard to determine whether accident characteristics, causal factors and remedial interventions identified elsewhere apply to the Gulf in comparable ways. This difficulty stems from unusual construction sector characteristics, notably a heterogeneous mix of expatriate laborers and firms working without a common language, work culture or labor practices. Does this change the mix of accident types or the ranking of main causes and priority remedies?

To answer this question, a sample of 519 incident records was analyzed to determine whether accident types and frequencies are comparable to elsewhere. Site safety experts were then interviewed to determine whether rankings of factors and interventions should be similar. Findings are that types are indeed comparable, but the rankings of factors and interventions may not be. Main factors have to do with worker skills and training, experience, use of safety gear and risk perception. The overarching safety issue, however, is that firms and governments do not have strong incentive to address these factors.

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1. Introduction

Assurance of occupational health and safety is a major challenge in all societies. Certainly, the problem of safety is sufficiently startling to warrant sustained attention and intervention. The International Labor Organization (ILO) estimates that, globally, there are 2.3 million fatal occupational accidents and diseases every year, 160 million non-fatal work-related diseases and 317 million non-fatal occupational injuries (ILO, 2013). That is, four workers die from workplace accidents or diseases every minute, 300 suffer non-fatal work-related diseases and 600 experience non-fatal accidents.

Assuring safety is especially difficult when there is inadequate basic information available to chart effective intervention, such as incident rates, sectors in which they occur, occurrences of different types of accident, causal factors and available mitigation strategies. North America and Western Europe are blessed with what seems

like unlimited knowledge. Many nations elsewhere are less fortunate. The six member countries of the Gulf Cooperation Council (GCC), an intergovernmental political and economic union of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE), referred to hereafter as the Gulf region, are among them. With minor exception, there are no published comprehensive country-level data on occupational accidents and diseases, only a handful of studies of accident types and little sign of robust regulation and enforcement. Limited data imply difficulty in determining magnitude and types of accidents in the Gulf and, perhaps more important, causal factors and priority intervention areas.

Of course, occupational accidents and their causes are not unique to place. Knowledge gleaned in data- and research-abundant regions can be used in data- and research-scarce regions. Accident factors and interventions, however, and their priority ranking in data-poor and data-rich places may or may not be similar. Questions of whether they are similar arise especially for Gulf nations because of unusual; some might say unique characteristics of their labor markets, and because of recurrent media reports of high accident rates (e.g., ITUC, 2014).

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To try to answer these questions, a two-stage study was initiated during 2012–14 to tease out relevant information specifically on construction accidents, on causal factors associated with falls and struck by moving, flying or falling objects at building sites, and on prospective preventive measures. To determine whether incident patterns are similar to elsewhere, the first stage was analysis of data extracted from incident reports obtained from a sample of contracting firms. The second stage, to help determine whether causal factors and corresponding priority interventions in the Gulf region are also the same as elsewhere, involved interviewing a sample of building site safety experts from these and other firms and then applying Rasch analysis of rank-ordered data (Linacre, 2006).

Setting context, presentation of the study begins with a look at occupational accident rates proposed for the Gulf, attributes of the region's construction sector and of forces propelling expectation of high accident rates, and a review of the relevant literature on accidents and their causes. Following this is discussion of results from analysis of incident report data, findings from interviews with the safety experts, and then the research conclusions.

1.1. Construction accidents in the Arabian Gulf region

Hämäläinen et al. (2009) estimate that fatal occupational accident rates in Gulf countries ranged from 5.9 to 9.8 per 100,000 employed individuals in 2003, the most recent date for which estimates are available, while non-fatal rates requiring at least 3 days' absence were between 5570 and 9250 per 100,000. These rates are considerably higher than the authors' estimates for the UK, respectively at 0.8 and 7650 per 100,000, although comparable to Canada's 7.6 and 7110 per 100,000. Estimates for the Gulf are speculative, however, because they derive from models that rely on data from Tunisia and Turkey, quite different economies, adjusted somewhat for Bahrain.

Clearer is that whatever the actual figures might be, a large share of occupational accidents are in the construction sector. Gulf nations are among the richest in the world. Wealth, measured by GDP per capita in 2014 ranged from \$25,010 in Oman to \$96,640 in Qatar (IMF, 2014). Workforces here do not engage much in agriculture, fishing or mining, the primary accident sectors in most countries. What they do engage in, much more than elsewhere, is construction of buildings and physical infrastructure.

Four factors point to construction as a main locus of accidents. One is breathless speed and enormous volume of building that accompanied economic and demographic growth in recent times. Fueled by expansion of hydrocarbon exports, the region's Gross Domestic Product (GDP) expanded rapidly over the past 15–20 years, to US \$1.38 trillion and GDP per capita of \$33,000 (IMF, 2011). Accompanying this growth has been a construction boom valued between \$1.1 trillion by Zawya (2012) and \$1.78 trillion by Commercial Bank Qatar (CBC, 2012) and Qatar National Bank (QNB, 2012), and exponential demographic growth of 5.9% annually during 2004–2008 and 3.2% in 2009–2013. The population in 1975 was 9.7 million, of which 90% were native-born citizens. By 1990, because of in-migration, the population had doubled, reaching 22.5 million, with 63% citizens. Through 2010, the populace almost doubled again to 41.1 million, of which 57% were citizens (Fargues, 2011). Latest data gathered by the Gulf Labour Markets and Migration programme (GLMM, 2016) indicate that the expatriate share of the current population of almost 50 million, 33% in Saudi Arabia and 72% elsewhere in the Gulf, is extraordinary. It is 9% for the Middle East and North Africa as a whole (Raghu and Sartawi, 2012).

The second factor is the scale of building sites. These are

sometimes entire new cities, rivaling anything in North America or Europe (Davis and Hayashi, 2007). Everywhere in the Gulf there is constant activity associated with highways, airports, seaports, power stations, museums, oil facilities, rail networks, cement and petro chemical factories, stadiums, hotels, malls, and the list goes on. At some sites, more than 10,000 vehicles pass through project entry gates every day, with more than 20,000 workers moving back and forth in three daily shifts.

A third factor implicit in the previous mention of expatriate immigration, is heterogeneity of construction workers and firms. Building accounts for 11% of total regional employment (QNB, 2012). This labor comes almost entirely from contract labor imported mainly from India, Nepal, Pakistan, Egypt, Yemen, Bangladesh, Philippines, Sudan, Sri Lanka, Jordan, Palestine, Indonesia, Syria and Iran. They work for an equally diverse mix of large and small foreign contracting firms that communicate in languages that most do not understand.

The International Monetary Fund reports that during 2000–2010 about 7 million new jobs were created in the Gulf, more than 5 million filled by expatriates (IMF, 2011). Most construction jobs done by these expatriates, usually temporary, are relatively low skill and low paying, although some are highly trained professionals, such as architects, engineers, construction tradesmen and supervisors. In effect, foreigners dominate the construction sector, as noted in Baldwin-Edwards's (2011) study indicating that shares of foreign workers in total employment range from 27% in Saudi Arabia to 87% in Qatar. It is thus common on building sites to have workforces that do not share a common language, common building practices and habits, safety procedures, safety standards related to construction activities, understanding of technology or labor management practices.

This kind of situation, left unattended, can engender more accident risk than in homogeneous labor forces (Anumba and Kamara, 2012). Experiences elsewhere suggest that temporary workers are at higher risk of accident than others (Seo et al., 2015), as are workers who do not speak or understand the dominant construction site language (Alsamadani et al., 2013; Trajkovski and Loosemore, 2006). In large international projects involving managers, contractors and workers from different countries, i.e., projects that resemble construction sites in the Gulf region, safety suffers further from conflicts among participants regarding appropriate safety standards to adopt and implement (Mahalingam and Levitt, 2007).

Lowering such risk is hard. Construction anywhere is a complex amalgam of dynamic activities and relationships. In the Gulf, much of this complexity turns on managing work sites, some huge in scale. Expatriate firms dominate these, and workers from myriad cultures must navigate varied technologies, construction types, contractor building standards that may or may not accommodate validated international specifications, industry best practices, extant local building codes and specifications of property developers and owners (McCrary et al., 2006). Identifying ways to reduce accidents in such milieus becomes harder still when there is need to account not only for individual project scale but also for the number of concurrent projects going up at once without any coordination or sharing of daily lessons learned across different sites. Then there is the non-negligible confounding matter that detailed accident data are scarce. What scattered data do exist, mainly gathered by construction firms for internal purposes are not available for public use. Learning curves to develop more effective occupational safety regimes in this setting are unlikely to be short.

Directly influencing the pace of progress, the fourth factor, is the political economy within which construction operates. It is not

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