



# Tracking safety performance in construction: A focused approach to the measurement of fatal and non-fatal injuries, 2003–2012



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## ARTICLE INFO

### Article history:

Received 15 May 2015

Received in revised form 20 April 2016

Accepted 23 April 2016

### Keywords:

Cost models

Fatality cost measurement

Injury cost measurement

Cost trends

## ABSTRACT

This analysis develops a Basic Model focusing on the loss of productive time resulting from death or injury as of prime importance in measuring trends in the safety environment supplemented by a Financial Model measuring loss in dollar terms. This provides two views of the impact of death and injury in the construction industry in the 41 states for which comparable fatality and injury data were available for the period 2003 through 2012. This period is significant in that it includes periods of boom, bust and recovery. In undertaking this study we developed a state-by-state measure of lost work-life expectancy due to fatalities.

Traditional approaches to costing have tended to focus on medical costs, workers' compensation employment cost and other cost elements as well as victim productivity. In this analysis the impact of death and injury on the individuals involved is the focus with other factors treated as secondary.

Applying the Basic and Financial Models to the 2003–2012 period results in findings showing notable improvement in construction safety.

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## 1. Introduction

The ten year period from 2003 to 2012 was one of dramatic change in the construction industry. It began with a substantial expansion to 2007 as measured by industry employment, followed by a significant decline to 2010 and a subsequent period of relative stability. In viewing this historical period we have set out to examine the impact of this cycle on industry safety outcomes. Specifically, the objectives are these:

1. To provide a focused alternative to the traditional measure of injury cost.
2. To illustrate the relative importance of fatal and non-fatal losses in construction.
3. To show the cost trends in construction over the period.

It is our observation that measurement is the key to understanding the changes taking place in construction safety. In this sense it is most important to pay the greatest attention to what is happening to those in the construction work place at the most basic level. If it is possible to show that over time there is a change in injury and fatality inputs per unit of employment this can be taken as a significant indicator of a change in safety.

### 1.1. Background

For many decades the National Safety Council (NSC) has published voluminous statistics on the cost of unintentional injuries. Since at least 1992 these data have taken essentially their current form which reports “economic” losses in several categories as well as so-called “quality of life costs”. Table 1 is an example of the costs as reported by NSC for 2012 (NSC, 2014).

Data is also reported covering just occupational deaths and injuries.

In the first decade of the century several publications addressed the economic costs associated with fatalities and/or injuries in the construction sector. In 2004, Elyce Anne Biddle (Biddle, 2004) published “The Economic Cost of Fatal Occupational Injuries in the United States, 1980–97.” Using the same methodology, in September of 2006 the Center for Disease Control (CDC, 2006) published a report covering the period from 1992–2002 for construction alone. Shortly thereafter Waehrer et al. (2007a) published “Costs of Occupational Injuries in Construction in the United States” for 2002. There were both similarities and differences in these reports. On the one hand the Biddle and the CDC articles covered only fatalities and reported on totals for the multi-year period as a whole with no annual breakdown, thus trends were not evident. The Waehrer et al. effort included both fatal and non-fatal events, but the data covered only one year – 2002. These efforts were similar, however, in the use of a like model reflecting the composition of total cost.

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**Table 1**  
National safety council estimate of total cost of unintentional injuries, 2012.

Economic costs (in billions)	
Wage and productivity losses	\$380.3
Medical expenses	\$211.5
Administrative expenses	\$124.4
Employer's uninsured costs	\$21.8
Motor vehicle damage	\$43.4
Fire loss	\$12.4
Total economic costs	\$793.8
Quality of life loss (in billions)	\$4176.0
Comprehensive cost total (in billions)	\$4969.8

### 1.2. The traditional cost model

Based on the NSC approach and a number of other studies what might be called a “Traditional” cost model has emerged, partitioning estimated costs into three categories: direct, indirect, and quality of life. Here is a breakdown of these categories:

- (1) Direct costs
  - Payments for medical services (hospitals, physicians, rehabilitation, home health, equipment, emergency transport, etc.)
- (2) Indirect costs
  - (a) Victim productivity losses (wages, household production)
  - (b) Employer productivity losses (recruiting and training replacements for injured workers)
  - (c) Administrative costs (administering workers' compensation programs)
- (3) Quality-of-life costs
  - Pain and suffering by victims and families.

In addition to the studies mentioned above, a number of other studies have applied similar cost measurements to occupational issues, for example, across industries (Leigh et al., 2004), across states (Waehrer et al., 2004) and across trades (Waehrer et al., 2007b). In fact, many cost studies do not report on all three categories of cost; but focus on one or more key cost elements related to the specific underlying health and safety issues being addressed.

While granting the relevance of the Traditional Cost Model in a variety of circumstances, it is possible that it may, at least in some contexts, be misleading. In the first place the critical facts which trigger the measurement exercise, injuries and deaths, are buried as part of a sub-category labeled “indirect costs”. It is the focus of this study that these “life and death events” should be at the heart of the analysis and other measures of cost regarded as derivative or secondary. Secondly, the dynamic element in the measurement of change in health and safety is the traumatic event itself, not a so-called “direct cost” of medical care. Third, many of the derivative elements tend to be relatively stable (such as fringe benefits and medical costs) and can be estimated, if desired, more or less routinely as a percentage of the primary cost. Finally, we believe that little purpose is served by including the category “Quality of Life Costs” in a cost analysis. The conceptual and factual basis for such estimates is questionable. For 2012 the NSC has estimated that the “Quality of Life Costs” were over 5.2 times as great as all other costs taken together. Inclusion of these costs simply distorts the cost picture provided by the more objective measure related to the initiating elements – death and injury. There also appears to be great uncertainty about the concept itself. In her review of the literature dealing with the “value of life” Ruth Ruttenberg (Ruttenberg, 2013) points out that “Economists use several different methods of estimating this cost and estimates have a wide range (p. 9).” She illustrates variability by citing per capita estimates ranging in magnitude from \$5.6 to \$12.2 million in

2012 dollars. Further reflecting the ambiguities of the “quality of life” or “value of life” concept are the differing approaches used, for example, by Waehrer et al. (2007a) who applied a lawsuit “jury verdict” concept in non-fatal injury situations and a “willingness to pay” standard for fatalities.

### 1.3. An injury-focused cost model

In order to embrace the costs arising from both fatal and non-fatal circumstances, we take as our basic unit of measurement, time. In the case of fatalities, we measure impact in terms of years of work-life expectancy lost (converted to equivalent days). For non-fatal incidences the measure is work days lost. Totaled, these two time measures constitute what we will call the “Basic Model” focusing on the primary impact of injury on the individuals affected.

The Basic Model outputs can easily be expanded into the more familiar form of cost estimation of death and injury as a “Financial Model” in which costs are measured in terms of dollars rather than time.

In contrast to the Traditional Cost Model outlined above; an “Injury-Focused Cost Model” would look like this:

- (1) Primary Costs: The loss of productive employment as a result of premature death or injury measured in terms of time loss (the Basic Model) or wage loss (the Financial Model).
- (2) Secondary Costs: An Augmented Financial Model measured in dollar terms and including some or all of the following categories:
  - (a) Employer financed fringe benefits
  - (b) Household production losses
  - (c) Payments for medical services

The value of the approach suggested here is manifold.

1. The underlying data compiled by the major continuing sources of injury data, the CFI and the SOII can be treated initially as a single type entry – loss of time.
2. This primary data can be displayed in either dollars or units of time.
3. The trends in the primary data can be rather easily captured and inferences made relative to trends in health and safety outcomes.
4. To the extent there is interest in secondary costs, these can be approximated in dollar terms by the use of relatively static multipliers.

### 1.4. A caution

While it is our intent in this study to be as accurate as possible, it is important to note that underlying all of the reported information there is an element of uncertainty. Assumptions are often required in establishing some of the important data and some of the data sources themselves are lacking. As economist Thomas Piketty has stated in a different context:

“We should be careful not to make a fetish of the published figures. When a country's national income per capita is said to be 30,000 euros, it is obvious that this number, like all economic and social statistics, should be regarded as an estimate, a construct, and not a mathematical certainty. It is simply the best estimate we have. (These estimates) ... should be regarded as a limited and imperfect research tool, a compilation and arrangement of data from highly disparate sources.”

[[Piketty, 2014]]

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