

# Zero-Injury Workdays

*An effective metric?*

By P.L. Clemens

MUCH HAS APPEARED in recent occupational safety literature concerning the practice of adopting a zero-injury rate as a practical, attainable safety program goal. Sherman, for example, presents often-seen arguments which can be interpreted as showing that such a goal is truly achievable (Sherman). Conversely, recognized authors such as Manuele and Tarrant have challenged this position, arguing that a zero-injury rate is impractical and unattainable (Manuele; Tarrant). Landmark studies as early as 1939 showed that setting a goal such as zero ultimately proves to be demoralizing (Dollard, et al). In addition, the mathematics of probability establish that well-recognized precepts are violated by adopting a zero goal for such a phenomenon as injury rate (Ash). Revered management expert W. Edwards Deming condemned the zero-goal practice as well (Deming). (See Clemens for an alternative goal-setting method.)

Some SH&E practitioners have extended the concept that a zero-injury rate goal is achievable by viewing the summation of successive zero-injury days as a valid metric for gauging program performance. This practice has enjoyed such growth that awards are now conferred on workforces that have experienced lengthy, uninterrupted zero-injury periods (e.g., NMAPC).



Certainly, it is a laudable achievement for a workforce to record a protracted period of consecutive workdays with no injuries. Such an achievement is especially praiseworthy for a large workforce when experienced over a very long period.

The purpose here is not to dispute the virtue of such an achievement. Instead, the purpose is to call attention to an easily overlooked defect in the zero-injury-day metric. It is a flaw that blunts the effec-

tiveness of a simple count of successive injury-free workdays as a valid indicator of safety program performance. It surely warrants consideration if such a count is to be taken as a measure of accomplishment.

## **Zero-Injury Workdays as a Program Metric**

Occupational injuries suffered by a workforce of any size are distributed randomly with time. That is, one is unable to predict their moment of occurrence just as one cannot predict the outcome of the roll of a pair of dice. The same can be said of the broad realm of all those phenomena that are recognized as "accidents." These are readily observable statements. Were it not so, loss prevention strategies could be adjusted to the advantage of greater success at preventing not only injuries but loss events of all kinds.

Owing to the randomness of injury distribution, a simple count of consecutive injury-free days cannot characterize safety program effectiveness. While a mathematical proof for this can be offered, it lies beyond the scope of this brief commentary. Instead, a simple set of examples is used to illustrate the point. While these examples use small, easily pondered numbers of injuries and brief spans of zero-injury days, the principles demonstrated apply using fields of numbers of any magnitude.

Figure 1 shows the injury distribution records for four hypothetical workforces,

each having the same worker population. Each has recorded three OSHA-recordable injuries during a period of 27 consecutive workdays. Workforce A has achieved four brief periods of zero-injury workdays, each having a duration of only six days. Workforce B has fared better with three eight-day zero-injury periods.

Better still, C has had two even longer zero-injury periods of 12 days each. Workforce D has recorded one sustained zero-injury period of 24 workdays. (Notice that this would have been an even longer zero-injury span of 26 days if all three injuries had occurred on either the first or the last day of the 27-day period.)

Now consider this question: "Based on the comparative records of zero-injury workdays, which one of these four workforces has the most effective safety program?" The question is unanswerable. It is randomness that has produced the injury occurrence distributions seen in Figure 1.

Without seeing the effect that distribution can have, it is tempting to conclude that workforce D has the superior safety program. (As noted earlier, this same phenomenon would be observable if longer spans of time were to be used.)

As noted, the workforce populations in all four examples are equal. All four will, therefore, have earned the same OSHA-recordable injury rate for the period shown. For example, if each workforce had 678 people, then each of the four would have an OSHA-recordable injury rate of 4.1 for the period of 27 workdays.

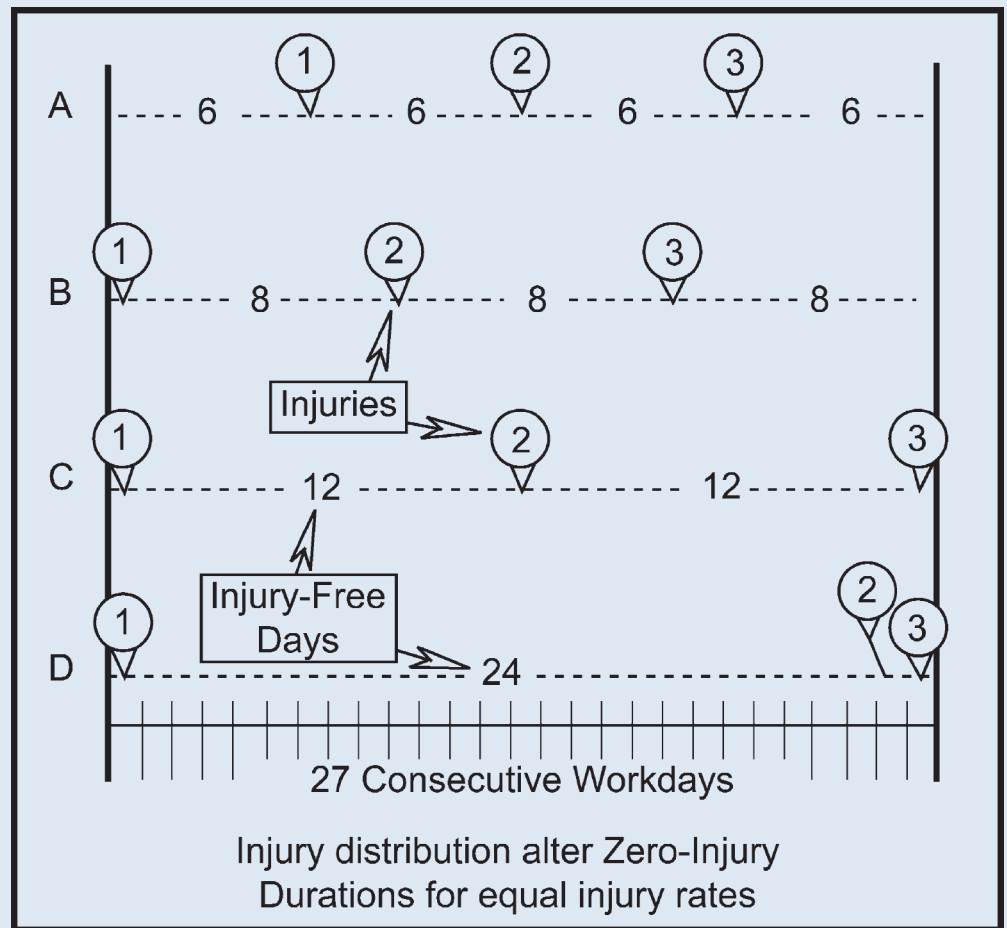
To take yet another viewpoint, notice that the meantime between injuries for the 27-workday period is at the same value of eight days for each of the four workforces.

## Conclusion

Differences in the distribution of injury occurrences can have profound effects on the counts of zero-injury days. These effects are unrelated to safety program performance—they are imposed by inexorable randomness. This phenomenon is not immediately apparent and goes easily unrecognized. Those who would seek to use a count of zero-injury workdays as a metric to gauge safety program performance would do well to take this peculiarity into account. Reliance on long-term injury rate as a performance metric is a preferred approach.

**Figure 1**

## Injury Distribution Records for Four Hypothetical Workforces



This in no way disparages the virtue of achieving lengthy injury-free periods. The conclusion to be drawn, however, is that a count of consecutive zero-injury workdays cannot be expected to represent a safety program's effectiveness in controlling injury. Even a lengthy zero-injury period is as likely to have been influenced by simple randomness as it is to represent improved program performance.

As a viable alternative to the zero-injury-day concept, a measure of actual long-term injury rate using the well-established OSHA definition for recordable injuries provides a far more effective measure of performance. If, in fact, a lengthy period of zero-injury days has been experienced, use of the recordable injury rate metric for that period will indeed provide a "zero" result.

Alternatively, if a lengthy period of experiencing no injuries is interrupted midway by a single injury, use of the recordable injury rate metric will impose a no-more-than-fair penalty on the observed result. The zero-injury-day metric would show a far different outcome for this case.

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