RETHINKING SAFETY METRICS

Using Time Between Incidents to Improve Business Insight

By Daphne Ku

For decades, total incident rate (TIR) has been a core metric for tracking safety performance across industries. TIR is used to compare the frequency of work-related incidents in relation to the standardized number of 200,000 labor hours, which represents the number of hours worked by 100 full-time employees in a year.

This normalization allows for comparisons across different sites, teams or time periods regardless of their size or structure (BLS, 2024; OSHA, 2024). While TIR provides a valuable baseline for safety benchmarking and regulatory compliance, its communication limitations are increasingly evident in the workplace. In safety team meetings, executive reviews and department updates, it is not uncommon to hear questions such as, "Is 55 high or low?" "What does that mean for my team?" or worse, "Does that mean 55% of our employees were injured?"

These misinterpretations often stem from a lack of intuitive context. While EHS professionals may be trained to interpret TIR precisely, most business partners—including operations leaders, supervisors and support teams—do not interact with this metric regularly. When the numbers feel abstract or confusing, the intended message behind them is lost. Furthermore, TIR does not account for severity, risk profile or operational nuance. A team with ten minor first-aid cases could report the same TIR as a team with several serious injuries. Without additional context, TIR can flatten the reality of safety performance and leave decision-makers unsure of what to prioritize.

This article introduces a supplemental metric called time between incidents (TBI). This metric reframes TIR data into a time-based interval that is more aligned with how business leaders naturally think and make decisions. Instead of stating how many incidents occurred per 200,000 hours, TBI explores how often incidents happen in a facility. Future enhancements may explore incorporating incident severity into TBI calculations to provide an even more complete picture of safety performance.

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The Communication Challenge

Despite being a regulatory staple, TIR often fails to connect with non-EHS stakeholders in a meaningful way. The concept of incidents per 200,000 hours may be mathematically sound, but to business partners unfamiliar with occupational safety terminology, it can feel abstract if not misleading.

One of the most common misunderstandings is interpreting TIR as a percentage of injured employees. For example, if a team reports a TIR of 30, it is not uncommon for someone to ask if this number means that 30% of employees were hurt. This misinterpretation not only creates confusion but also leads to mistrust in the data. As a result, safety professionals often find themselves needing to translate the metric in real time during meetings.

This communication breakdown becomes even more problematic in high-level settings, where time is limited and data must speak for itself. In these scenarios, leaders may skim dashboards or review executive summaries without the benefit of real-time clarification. If the numbers are not intuitively clear, they may be ignored or misused in decision-making.

Moreover, because TIR does not reflect the actual number of affected individuals or the time between incidents, it lacks immediacy. Business leaders often want to know how often something goes wrong—a natural, time-based framing that mirrors how they manage operations, staffing and scheduling.

By identifying this gap in communication, an opportunity exists to bridge understanding with a more intuitive metric. TBI was developed not to replace TIR, but to supplement it with a view that better resonates with a broader audience.

Developing the TBI Metric

To address the communication gaps surrounding TIR, the TBI metric was developed as a complementary approach. Rather than focusing on the number of incidents per 200,000 work hours, TBI inverts the formula to express how much time typically passes between each incident. This time-based framing helps operational leaders intuitively understand how frequently incidents are occurring in their environment.

The formula is simple:

$$TBI = 200{,}000 / TIR$$

For example, if a team's TIR is 55, then:

$$TBI = 200{,}000 / 55 \approx 3{,}636 \; hours$$

This means that, on average, an incident occurs every 3,636 work hours. To make this more relatable, the number can be further converted into days by dividing by the average daily work hours for the group or division. If that group logs 100 work hours per day, then:

$$3{,}636 / 100 = 36.36 \; days$$

This tells the team that an incident is happening approximately every 36 days. That framing is much easier for many leaders to internalize and react to. It provides a sense of rhythm—how often something bad happens—without the abstraction of a normalized rate per 200,000 hours. The metric still honors the logic and consistency of OSHA's framework but shifts the perspective. TIR is a rate. TBI is an interval. Together, they offer a more complete and accessible picture of safety performance. While TBI is calculated in hours, converting it to days based on daily work hours can help the team better visualize the gap between incidents.

It is worth noting that TBI is not intended to replace TIR. Regulatory bodies and safety benchmarking organizations will continue to rely on TIR. However, in internal conversations, dashboards and executive updates, TBI provides a language that more closely aligns with how decisions are made and priorities are set.

FIGURE 1

COMPARISON OF TIR & TBI FOR DEPARTMENTS WITH IDENTICAL TIR

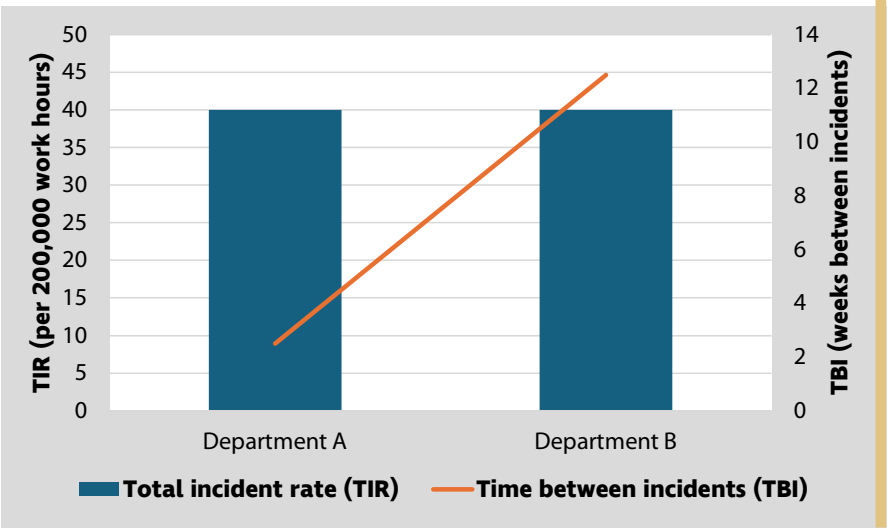

TABLE 1

SUMMARY COMPARISON BETWEEN TIR & TBI

This table offers a side-by-side comparison of TIR and TBI across several factors, highlighting the added value TBI provides for business interpretation.

	Total incident rate	Time between incidents
Unit	Incidents per 200,000 hours	Average hours between incidents
Primary focus	Frequency of incidents	Time gap between incidents
Business interpretation	Not intuitive (especially when presented as rate)	More intuitive (gap between events)
Visualization style	Bar chart or score	Can be plotted over time or alongside TIR
Insight type	Risk level snapshot	Operational breathing room (time gap between Incidents)
Rolling calculation	Yes	Can be applied the same way
Common misunderstanding	Interpreted as percent of people injured	Rarely misunderstood once explained

Case Example

To illustrate the difference between TIR and TBI in action, consider two departments: Department A and Department B. Both departments report a TIR of 40 over the past year. On paper, they appear to have the same level of safety performance. However, a closer look at their work conditions reveals two very different pictures.

Department A is part of operations and logs approximately 2,000 work hours per week. Department B is a corporate support team that logs only 400 work hours per week. With the same TIR, both departments would be interpreted as equally safe or risky depending on the stakeholder's perspective.

Now, apply the TBI metric:

$$TBI = 200{,}000 / 40 = 5{,}000 \; hours$$

For Department A, 5,000 hours corresponds to about 2.5 weeks of work:

$$5{,}000 / 2{,}000 = 2.5 \; weeks$$

For Department B, the same number of hours would take more than 12 weeks to accumulate:

$$5{,}000 / 400 = 12.5 \; weeks$$

This time-based lens provides a clearer interpretation. While both departments have the same TIR, the frequency of incidents relative to their operational tempo is quite different. Department A sees an incident roughly every 2.5 weeks, while Department B experiences one every 12.5 weeks.

This case example underscores the added insight that TBI brings. For decision-makers who must prioritize safety resources or investigate trends,

TBI highlights not just the rate of incidents, but the pace and exposure that contextualize them. As illustrated in Figure 1, even when departments have identical incident rates, their TBI values can reveal different operational realities.

By reframing frequency into intervals, leaders can better judge operational risk and make informed comparisons across groups—even when those groups differ dramatically in size, function or exposure. Provide guidelines for when to use TBI and where it might fall short (e.g., low incident volume, extreme variability). Reiterate its role as a complement—not replacement—to TIR. Table 1 summarizes the key differences between TIR and TBI to help safety professionals and business leaders understand when and how each metric can be most useful.

Implementation Considerations

Integrating the TBI metric into existing safety reporting frameworks requires thoughtful planning. While the formula itself is straightforward, presenting it in a clear and actionable way involves more than just math. One key decision is whether to display TBI alongside TIR or in place of it. In most cases, presenting both is ideal, as TIR maintains regulatory familiarity while TBI enhances interpretability. Dashboards, reports and presentations can benefit from placing these metrics side by side with brief descriptions to clarify each metric's intent.

It is also important to be transparent about the assumptions and limitations of TBI. Because it is derived from TIR, any gaps or inconsistencies in incident reporting or work hour tracking affects both metrics. Users must trust the underlying data before they can rely on either metric for insight.

Another consideration is scale. For larger organizations or business units with thousands of work hours logged daily, TBI is naturally more stable. For smaller teams, however, TBI may vary dramatically with just a few incidents. This is no different from TIR fluctuations in small populations, but it may warrant extra attention to how the metric is presented. Adding confidence bands or including rolling averages (e.g., trailing 12-month TBI) can help stabilize interpretations.

Finally, framing matters. Safety professionals introducing TBI to new audiences should prepare to explain what it is and what it is not. TBI is not a replacement for severity analysis, root-cause investigation or preventive action planning. It is a communication tool designed to bring clarity to how often incidents occur in a way that resonates more naturally with operational leaders. As with any metric, the goal is to not just track performance, but drive understanding and action. When implemented well, TBI can do just that.

Future Enhancements

While the TBI metric offers a fresh way to communicate safety performance, there is still room for evolution. One enhancement under consideration is the integration of incident severity into the calculation. Currently, TBI treats all incidents equally, regardless of whether they are minor first-aid cases or more serious injuries. This mirrors the same limitation seen in traditional TIR.

A potential next step could be a severity-adjusted TBI, where more severe incidents are weighted more heavily. For example, lost time or medical treatment cases could shorten the calculated time interval more than minor injuries. This allows organizations to factor in both frequency and seriousness when evaluating safety trends.

Another promising area is predictive modeling. By analyzing historic TBI trends along with operational or environmental variables such as temperature, department workload or shift timing, organizations may be able to forecast high-risk periods before they happen. This kind of proactive insight could transform TBI from a retrospective key performance indicator into a decision-making tool that helps prevent incidents altogether.

Finally, education and communication continue to be critical. As more teams adopt the TBI metric, sharing best practices on how to interpret and apply it will be essential. The more intuitive and action-oriented a metric becomes, the more likely it is to make a real impact on safety performance and culture.

TBI is not a silver bullet, but it opens the door for more relatable, time-based safety metrics. Its simplicity, adaptability and potential for enhancement make it a strong candidate for modern safety reporting. **PSJ**

PRACTICAL TIPS FOR USING TBI

- **Clarify the purpose of each metric.** Present TIR and TBI side by side with brief explanations to help stakeholders understand that TIR is a rate and TBI is an interval.
- **Translate TIR into relatable time frames.** Convert TBI hours into days or weeks based on actual work hours to help leaders visualize how often incidents occur.
- **Set expectations about limitations.** Communicate that TBI can fluctuate sharply in small teams or low-incident environments and should be interpreted with context.
- **Ensure data quality first.** Verify that incident reporting and work-hour tracking are accurate, since TBI inherits the same data strengths and weaknesses as TIR.
- **Use TBI to enhance, not replace.** Pair TBI with severity assessments, root-cause reviews and operational insights to guide resource allocation and decision-making.
- **Provide consistent framing.** Introduce TBI as a communication tool, emphasizing what it shows (frequency over time) and what it does not (incident severity without additional adjustment).

Disclaimer

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References

Bureau of Labor Statistics. (2024). Injuries, illnesses and fatalities. www.bls.gov/iif

OSHA. (2024). Injury and illness recordkeeping and reporting requirements. www.osha.gov/recordkeeping

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