Predictive SOLUTIONS

Predict & Prevent Workplace Injuries

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INDUSTRIAL SCIENTIFIC

Predictive SOLUTIONS

Agenda

I. Overview
   – Why employ Predictive Analytics in Safety?

II. Predictive Analytics
   – How did we start?
   – What did our research find?
   – What are the implications for Safety Management?
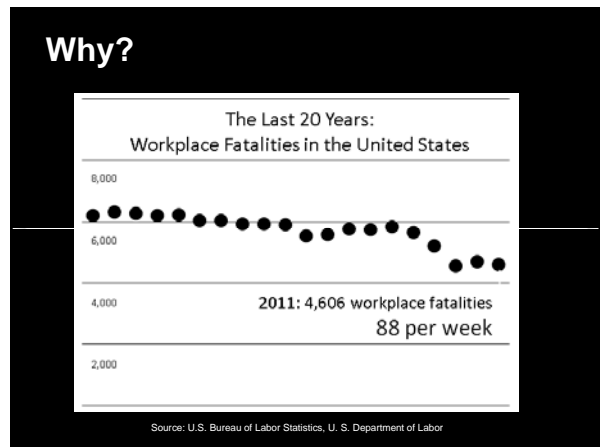
III. Actual case examples

IV. Q&A

Predictive SOLUTIONS

Start with WHY

🇺🇸	**~4,500**
🌎	**~125,000**

Why?

The Last 20 Years:
Workplace Fatalities in the United States

2011: 4,606 workplace fatalities
88 per week

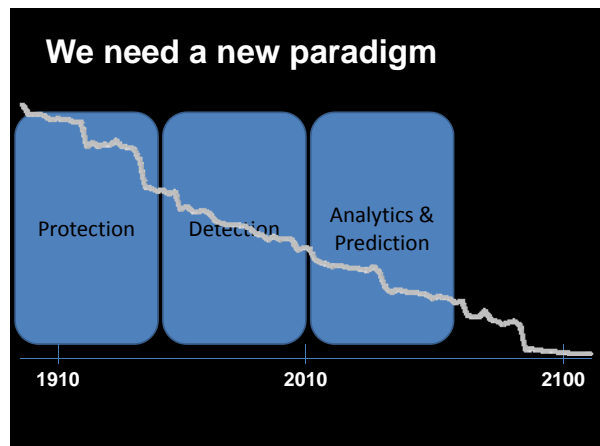Source: U.S. Bureau of Labor Statistics, U. S. Department of Labor

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"A statistical **plateau** of worker fatalities is not an achievement, but evidence that this nation's effort to protect workers is stalled. These statistics call for nothing less than a **new paradigm** in the way this nation protects workers."

- ASSE President Terrie Norris

We need a new paradigm

Protection | Detection | Analytics & Prediction

1910 | 2010 | 2100

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Key to predictive analytics?
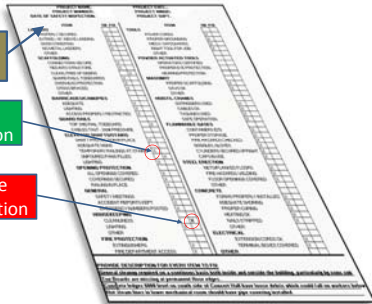
Data

Safety inspection & observation data

What does a safety inspection look like?

Inspection

Safe Observation

Unsafe Observation

Why do we do make safety observations?

Heinrich's Pyramid

1 Major Injury

29 Minor Injury

300 Incidents (near miss)

US Occupational Fatal & Non Fatal Incidents

OCCUPATIONAL FATALITIES AND NONFATALITIES
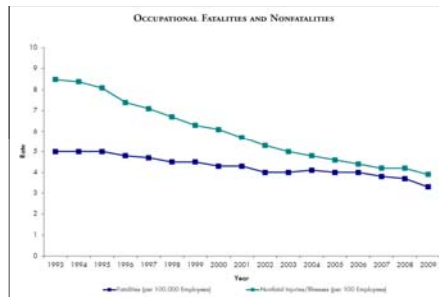
Source: New Findings On Serious
Injuries &Fatalities
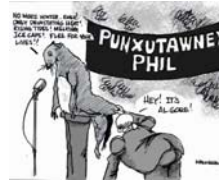
Has Heinrich's Pyramid Collapsed?

300
Incidents
(near miss)

Two Questions?

Question-1: Can we predict incidents from safety inspection data?

- if we can predict we can prevent

→ Has been right 39% of the time in predicting the end of winter

Two Questions cont…

Question 2: What can we learn from the world's largest store of inspection data?

Partnership

Our partners at the Language Technology Institute, Carnegie Mellon University

Two questions

- Question-1: Can we predict incidents from safety inspection data?

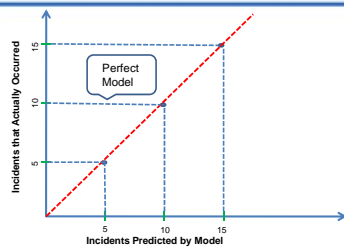- Question 2: What can we learn from the world's largest store of inspection data?

Model details

- Data used from a four year period - January 2005 and December 2008
  - 313 Worksites
  - 38,121 Inspections
  - 2,492,920 Observations
  - 7,033 Incidents

- Train on 80% of the projects (selected randomly) and test on remaining 20%

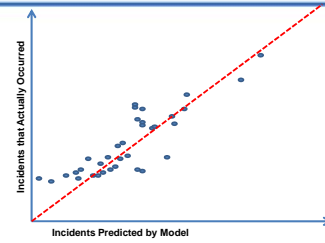- Averaged results over 10 such runs
  - Captured broad commonalities

How good is the model?

- Predictions from a perfect model would lie on the red line

How good is the model cont…

- Accurate over 85% of the time
- R^2 of 0.75

Two questions

- Question-1: Can we predict incidents from safety inspection data?

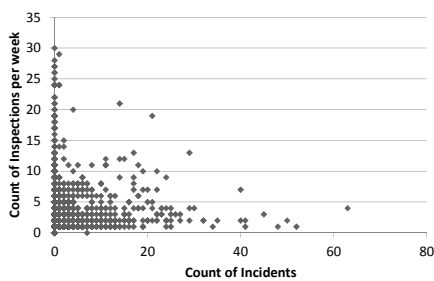- Question 2: What can we learn from the world's largest store of inspection data?

From prediction to understanding

- Are there patterns in inspection data that reveal risk of an increase in incidents?
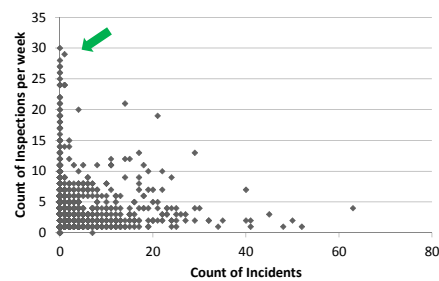 – Yes! We found four simple safety truths that organizations with good safety outcomes do

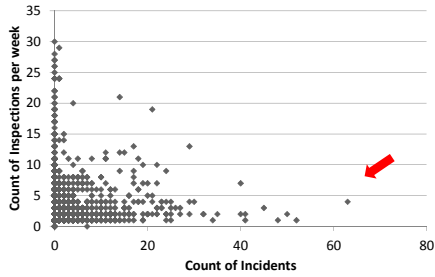## Safety truth #1: More Inspections result in safer outcomes

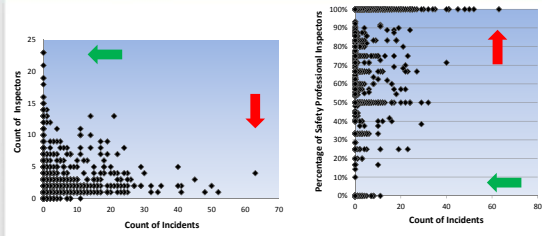## Safety truth #1: More Inspections result in safer outcomes
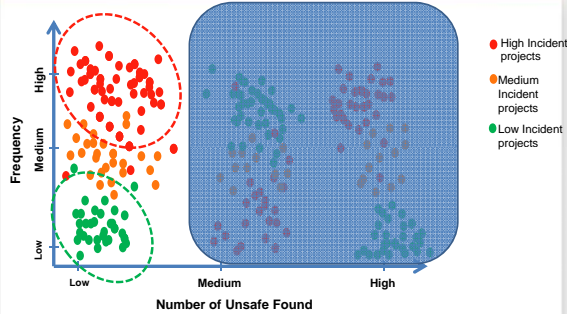
Safety truth #1: More Inspections result in safer outcomes

Safety truth #2: More quantity and diversity in safety inspectors result in safer outcomes

Widespread involvement performs best

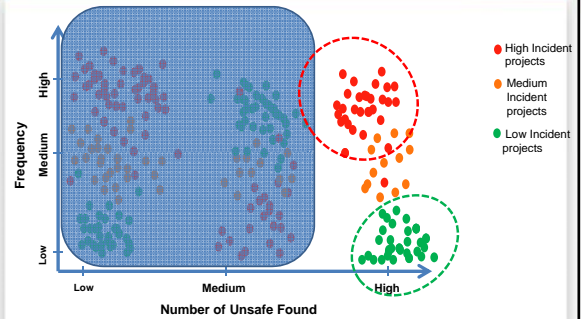Safety truth #3: Too few unsafe observations indicate a poor safety outcome

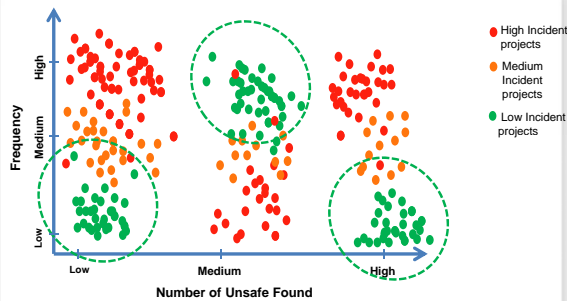Safety truth #4: Too many unsafe observations indicate an unsafe outcome
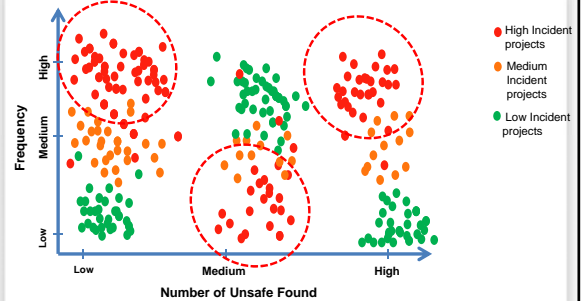

Safe clusters
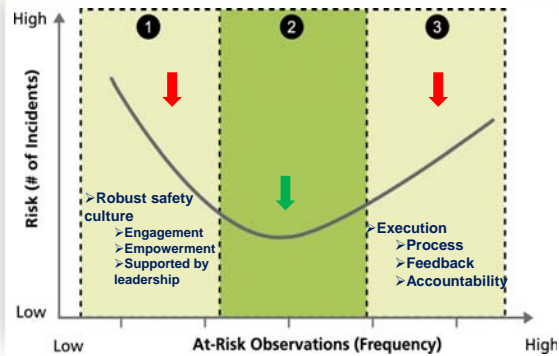

Unsafe clusters

The risk curve

Safety truths overview

- Do a large quantity of inspections

- Involve a wide & diverse population

- Empower to report unsafes

- Fix unsafe issues at the root cause

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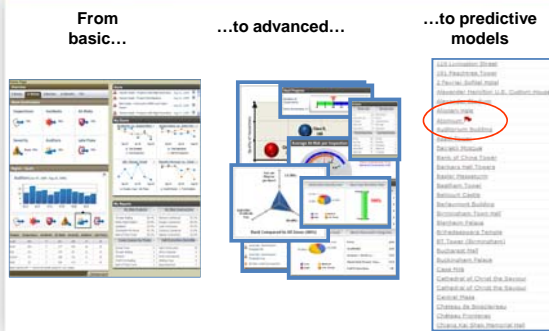
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How companies predict and prevent

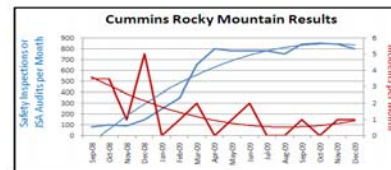**Predictive SOLUTIONS**

How organizations predict

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Case Example: Manufacturer

BEFORE
- Low levels of participation
- Lagging data focused
- Basic analytics
- Unclear as to where to focus resources
- Inconsistent results

AFTER
- 700% increase in inspections
- 3,000 leading indicator data points vs 21 lagging data points
- Advanced/predictive analytics
- Targeted improvement opportunities
- Consistent results
  - 76% decrease in TCIR
  - 88% decrease in DART
  - 97% decrease in Days Away

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Case Example: Utility Company

BEFORE	AFTER
• Low levels of participation	• 646% increase in inspections
• Lagging data focused – focused on zero incidents	• Now focused on managing observable behaviors
• Basic analytics	• Advanced/predictive analytics
• Unclear as to where to focus resources	• Targeted improvement opportunities
• Inconsistent results	• Consistent results
	– 54% decrease in TCIR

Southern Company Results

Predictive SOLUTIONS

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There are many examples

Incident/Injury Reduction

Predictive SOLUTIONS

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WHY

  ~4,500

  ~125,000

Thank you and Questions

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For additional information
1. Our website www.predictivesolutions.com
   – Whitepaper and videos on Four Safety Truths
   – Case studies (with videos) of both Cummins and Southern Company
   – Other information on advanced/predictive analytics in safety
2. How to find "Start with why"…do an internet search for "Simon Sinek start with why"

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