WISCONSIN SAFETY COUNCIL

81ST ANNUAL CONFERENCE

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What's the Deal with Safety Data?

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Presentation Objectives

- Challenge assumptions and validity of OSHA recordkeeping and incidence rates
- Demonstrate patterns in safety performance
- Recommend approach for continuous improvement

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What is Safety?

How do you do Safety?

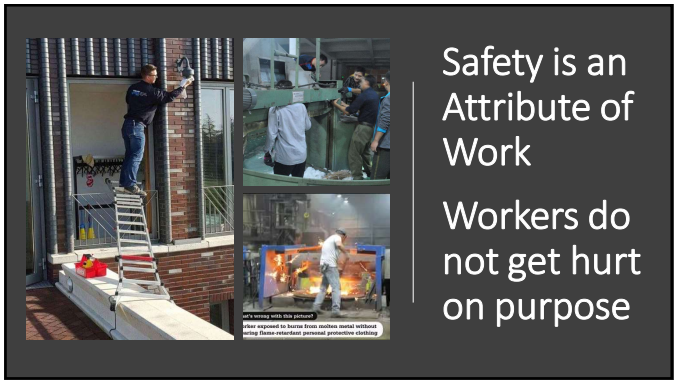
3


What ?
Where ?
How ?
Root Cause
GOAL:
Prevent/Reduce Accidents & Reoccurrences
Who ?
Why ?

4


Values
Rules and Procedures
Communication
SAFETY CULTURE
Self-verification
Leadership
Ownership
Recognition

5


Safety is an Attribute of Work
Workers do not get hurt on purpose

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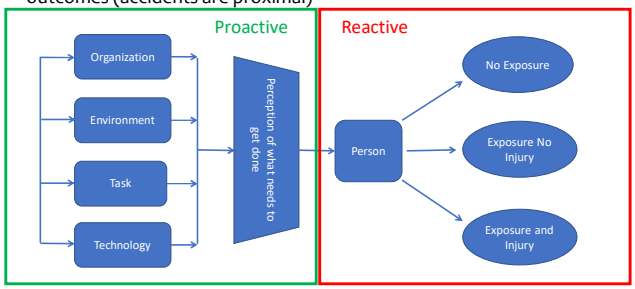
Work System Model

System deficiencies increase exposures and failures to reach desired outcomes (accidents are proximal)



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Why do we blame workers for injuries?

Attribution Bias

1. Fundamental Attribution Error – over estimating the impact of internal attributions on an individuals behavior.
2. Actor-observer bias - attributing one's own behavior to external (situational) causes and the behavior of others to internal (personal) factors.
3. Self-serving bias - attribute success to internal (personal) factors and failures to external (situational) factors.

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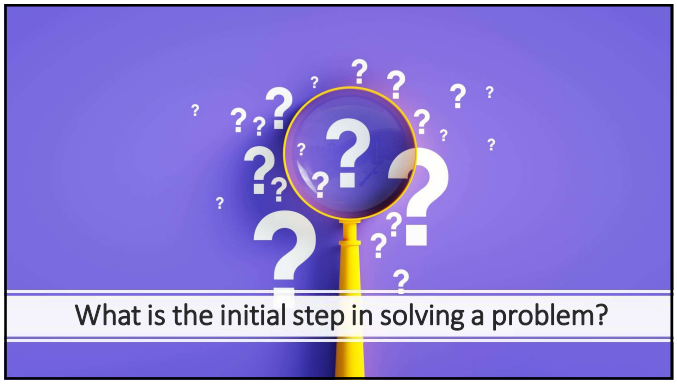

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Safety Metrics or Injury Records?

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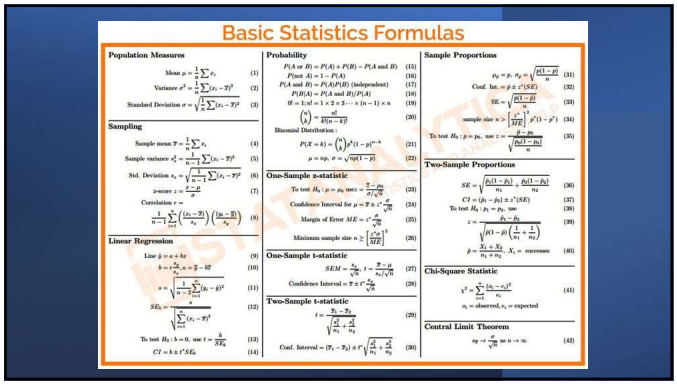

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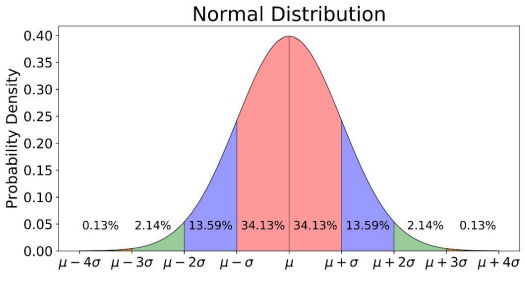
Assumptions of Normality



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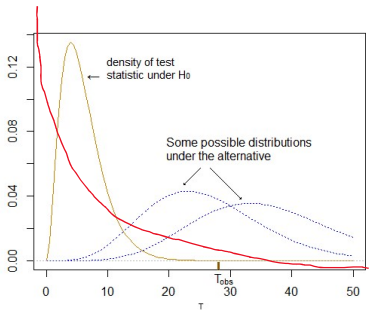
Semi-Asymptotic Distribution



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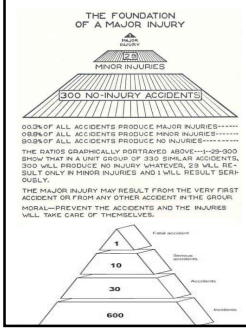
H.W. Heinrich & F.E. Bird Accident Triangles



- SIF folks contend that there is no relationship between near-miss and major injuries
- My contention is that "exposures" need to be investigated and mitigated or accidents will continue
- Equal ratios per 600 near misses
  - Heinrich: 2 major injures + 58 minor injuries
  - Bird: 1 major injury + 10 minor injuries
- If near-misses are not related, likelihood of severity has increased over time
  - Heinrich: 2 major injuries to 58 minor injuries
  - Bird: 1 major injury to 10 minor injuries

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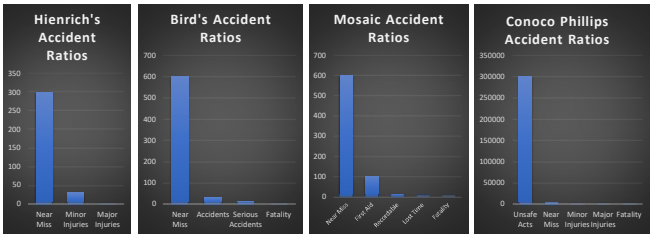
Convert Triangles to Distributions



- A distribution represents the ratio of outcomes, given a consistent or assumed occurrence of exposures. ***What's the probability of a severe outcome?***

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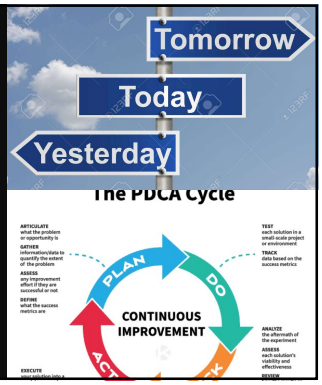
Continuous Improvement requires Continuous Learning

- Study the **past** (what measures/data we collected? what did we learn?),
- As it attempts to effect/change the **present** (how will our actions today lead to desired outcomes?)
- To gain change/improvement for the **future** (what are our short-term/long-term goals? How are we defining and measuring status or progress?)



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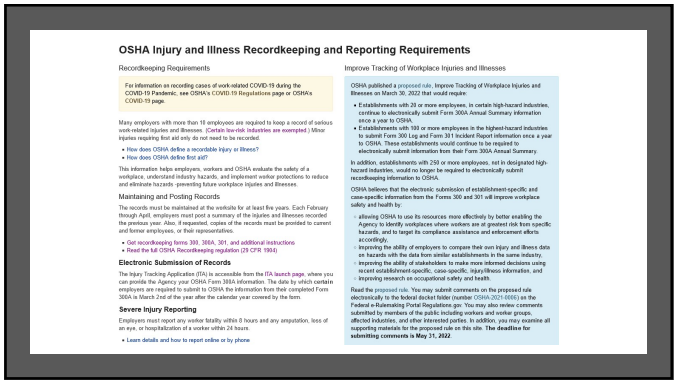

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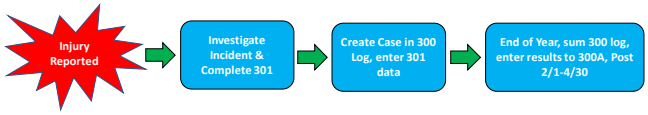
29 CFR 1904 Recordkeeping Forms

- **1904.29(a)*Basic requirement.*** You must use OSHA 300, 300-A, and 301 forms, or equivalent forms, for recordable injuries and illnesses.
  - The **OSHA 300** form is called the **Log of Work-Related Injuries and Illnesses**,
  - The **300-A** is the **Annual Summary of Work-Related Injuries and Illnesses**,
  - The **OSHA 301** form is called the **Injury and Illness Incident Report**.



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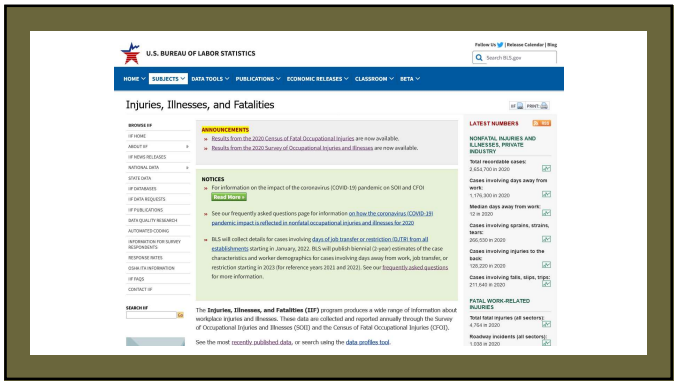

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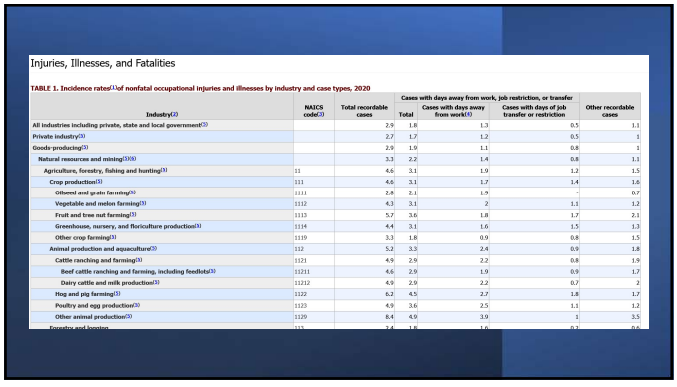

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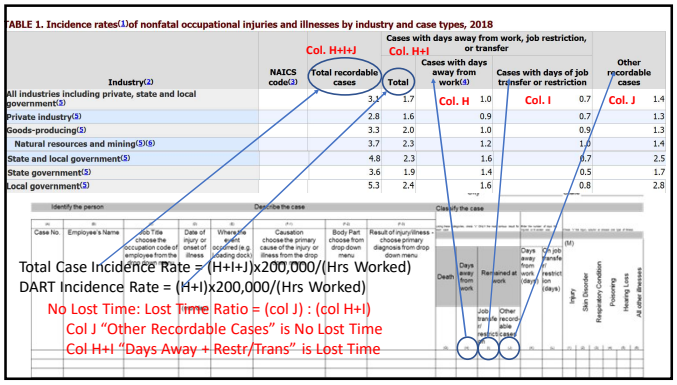

TABLE 1. Incidence rates[1] of nonfatal occupational injuries and illnesses by industry and case types, 2018

Industry[2]	NAICS code[3]	Total recordable cases	Cases with days away from work, job restriction, or transfer: Total	Cases with days away from work[4]	Cases with days of job transfer or restriction	Other recordable cases
All industries including private, state and local government[3]		3.1	1.7	1.0	0.7	1.4
Private industry[3]		2.8	1.6	0.9	0.7	1.3
Goods-producing[3]		3.3	2.0	1.0	0.9	1.3
Natural resources and mining[3][6]		3.7	2.3	1.2	1.0	1.4
State and local government[3]		4.8	2.3	1.6	0.7	2.5
State government[3]		3.6	1.9	1.4	0.5	1.7
Local government[3]		5.3	2.4	1.6	0.8	2.8

Col. H+I+J

Col. H+I

Col. H

Col. I

Col. J

Total Case Incidence Rate = (H+I+J)x200,000/(Hrs Worked)

DART Incidence Rate = (H+I)x200,000/(Hrs Worked)

No Lost Time: Lost Time Ratio = (col J) : (col H+I)

Col J "Other Recordable Cases" is No Lost Time

Col H+I "Days Away + Restr/Trans" is Lost Time

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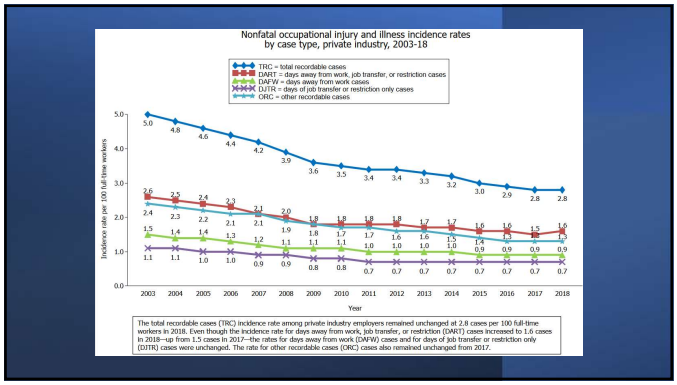

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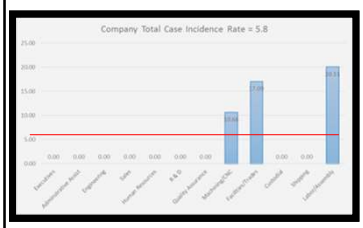
Incidence Rate Issues, from start to BLS Report



- Under-recording on 300 logs
- Under-reporting to BLS
- Incidence rate does not account for high-hazard vs. low-hazard hours
- Company-wide does not account for difference between departments, jobs, or tasks
- BLS calculates incidence rates by estimating "total cases" and "total hours worked" **by group, not by averaging by company**

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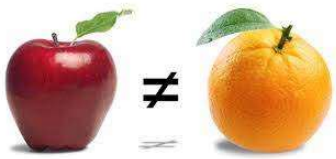
Comparison of Company to Industry is not Valid



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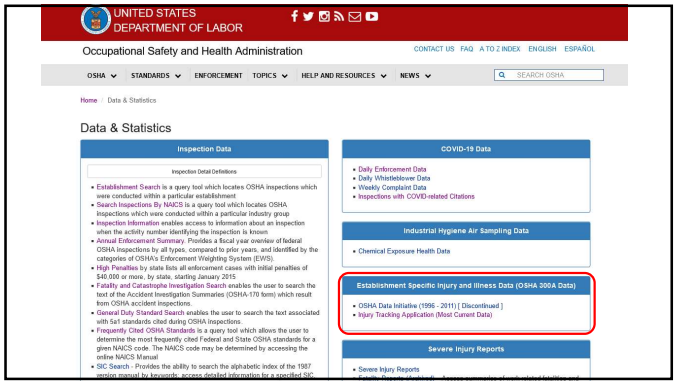

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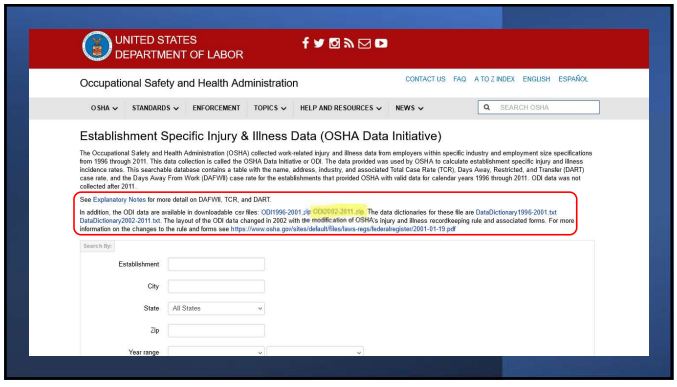

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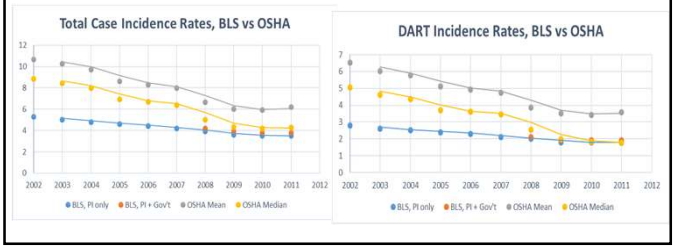
OSHA Data Initiative (2002-2011, adjusted)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
N (count)	61,646	66,604	64,382	63,496	66,750	61,519	78,516	64,198	67,424	51,814	646,349



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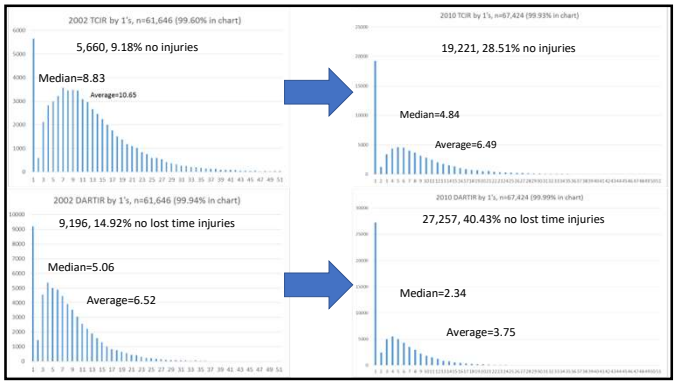

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Are IRs (by company) Normally Distributed?

	TCR			DART		
Year	*Skewness (SE)	*Kurtosis (SE)	**K-S Stat (Sig)	*Skewness (SE)	*Kurtosis (SE)	**K-S Stat (Sig)
2002	1.765 (.010)	6.184 (.020)	.118 (.000)	1.996 (.010)	8.590 (.020)	.149 (.000)
2003	1.775 (.009)	6.148 (.019)	.123 (.000)	1.999 (.009)	7.995 (.019)	.159 (.000)
2004	1.744 (.010)	5.840 (.019)	.126 (.000)	2.053 (.010)	9.004 (.019)	.163 (.000)
2005	1.756 (.010)	5.670 (.019)	.138 (.000)	1.908 (.010)	6.405 (.019)	.174 (.000)
2006	1.789 (.009)	6.378 (.019)	.135 (.000)	2.038 (.009)	9.097 (.019)	.170 (.000)
2007	1.933 (.010)	7.796 (.020)	.138 (.000)	2.022 (.010)	8.109 (.020)	.171 (.000)
2008	2.136 (.009)	9.528 (.017)	.162 (.000)	2.540 (.009)	14.73 (.017)	.201 (.000)
2009	2.108 (.010)	8.613 (.019)	.189 (.000)	2.468 (.010)	12.05 (.019)	.228 (.000)
2010	2.069 (.009)	7.997 (.019)	.192 (.000)	2.454 (.009)	12.13 (.019)	.232 (.000)
2011	2.174 (.011)	8.738 (.022)	.198 (.000)	2.555 (.011)	13.01 (.022)	.238 (.000)

*Zim (2013) indicates that for samples > 300, absolute skew value > 2 or a kurtosis > 7 indicate substantial non-normality
**Kolmogorov-Smirnov test, Null hypothesis assumes normal distribution, significance violates null (not normal)

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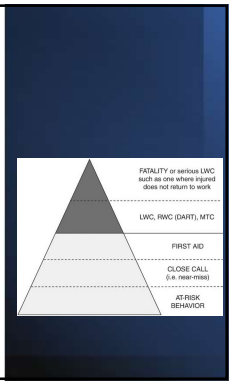
Injury Ratios

- ZERO reports = No Data = No Improvement?

- Best: Zero reports **(but is it?)**
- Very Good: All ORC (no DAFW, DJTR)
- Good: ORC > DAFW+DJTR (10 to 1, Bird)
- Average: ORC = DAFW+DJTR (BLS Avg)
- Bad: ORC < DAFW+DJTR (more severe)
- Worst: No ORC, All DAFW, DJTR



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Using Injury ratios, as percent, per company

	Best condition	Worst condition	Very good	Avg	Bad condition	Good condition
Year	% zero inj	% No NLT	% No LT	% NLT=LT	% Ratio >1	% Ratio <1
2002	9.18%	20.40%	5.74%	2.73%	38.39%	23.57%
2003	10.45%	19.73%	7.37%	3.09%	34.83%	24.53%
2004	11.12%	19.42%	7.46%	3.14%	34.83%	24.03%
2005	12.20%	18.61%	8.21%	3.29%	34.47%	23.22%
2006	11.99%	19.29%	8.04%	3.28%	34.26%	23.14%
2007	11.85%	19.74%	8.01%	3.44%	34.07%	22.89%
2008	16.50%	21.00%	10.33%	3.50%	27.19%	21.48%
2009	27.98%	21.06%	11.38%	3.28%	20.90%	15.40%
2010	28.51%	20.51%	11.92%	3.25%	20.24%	15.57%
2011	29.44%	21.00%	12.16%	3.09%	19.00%	15.31%
% Change 10-yr	*320.6%*	*102.9%*	*212.0%*	*113.2%*	*49.5%*	*65.0%*

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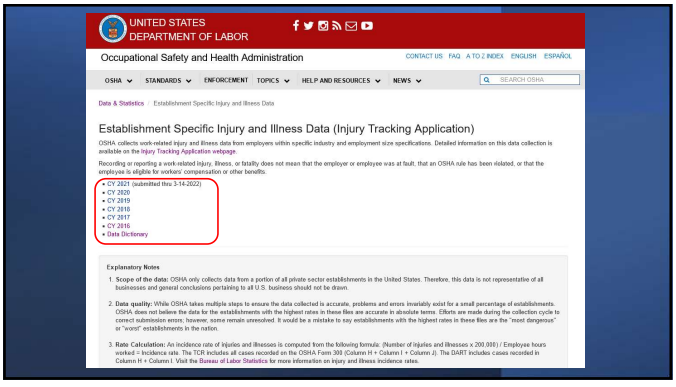

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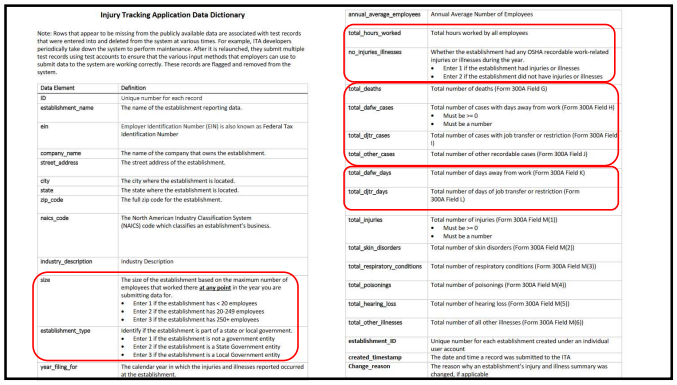

Injury Tracking Application Data Dictionary

Note: Rows that appear to be missing from the publicly available data are associated with test records that were entered into and deleted from the system at various times. For example, ITA developers periodically take down the system to perform maintenance. After it is relaunched, they submit multiple test records using test accounts to ensure that the various input methods that employers can use to submit data to the system are working correctly. These records are flagged and removed from the system.

Data Element	Definition
ID	Unique number for each record
establishment_name	The name of the establishment reporting data.
ein	Employer Identification Number (EIN) is also known as Federal Tax Identification Number
company_name	The name of the company that owns the establishment.
street_address	The street address of the establishment.
city	The city where the establishment is located.
state	The state where the establishment is located.
zip_code	The full zip code for the establishment.
naics_code	The North American Industry Classification System (NAICS) code which classifies an establishment's business.
industry_description	Industry Description
size	The size of the establishment based on the maximum number of employees that worked there at any point in the year you are submitting data for. • Enter 1 if the establishment has < 20 employees • Enter 2 if the establishment has 20-249 employees • Enter 3 if the establishment has 250+ employees
establishment_type	Identify if the establishment is part of a state or local government. • Enter 1 if the establishment is not a government entity • Enter 2 if the establishment is a State Government entity • Enter 3 if the establishment is a Local Government entity
year_filing_for	The calendar year in which the injuries and illnesses reported occurred at the establishment.
annual_average_employees	Annual Average Number of Employees
total_hours_worked	Total hours worked by all employees
no_injuries_illnesses	Whether the establishment had any OSHA recordable work-related injuries or illnesses during the year. • Enter 1 if the establishment had injuries or illnesses • Enter 2 if the establishment did not have injuries or illnesses
total_deaths	Total number of deaths (Form 300A Field G)
total_dafw_cases	Total number of cases with days away from work (Form 300A Field H) • Must be >= 0 • Must be a number
total_djtr_cases	Total number of cases with job transfer or restriction (Form 300A Field I)
total_other_cases	Total number of other recordable cases (Form 300A Field J)
total_dafw_days	Total number of days away from work (Form 300A Field K)
total_djtr_days	Total number of days of job transfer or restriction (Form 300A Field L)
total_injuries	Total number of injuries (Form 300A Field M(1)) • Must be >= 0 • Must be a number
total_skin_disorders	Total number of skin disorders (Form 300A Field M(2))
total_respiratory_conditions	Total number of respiratory conditions (Form 300A Field M(3))
total_poisonings	Total number of poisonings (Form 300A Field M(4))
total_hearing_loss	Total number of hearing loss (Form 300A Field M(5))
total_other_illnesses	Total number of all other illnesses (Form 300A Field M(6))
establishment_ID	Unique number for each establishment created under an individual user account
created_timestamp	The date and time a record was submitted to the ITA
Change_reason	The reason why an establishment's injury and illness summary was changed, if applicable

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Cal Year	Total n	Total Deaths	Total DAFW	Total DJTR	Total ORC	Total DAFW days	Total DJRT days	TCIR	DART IR	NLT/LT
2016	214978	608	311838	316647	428045	11427294	15405035	2.73	1.62	0.68
2017	259757	736	380628	366768	469072	15466481	21806093	2.63	1.62	0.63
2018	289533	785	424194	414715	527911	15422619	24114990	2.92	1.79	0.63
2019	290474	793	431540	419902	521279	15749414	24893467	1.31	0.81	0.61
2020	293391	1501	645345	343584	433160	20872446	20743857	2.79	1.94	0.44

Cal Year	No Injuries	% No Injuries	Zero DAFW days	Zero DJRT days	Zero TCIR	Zero DART	>100 TCIR	>100 DART	Zero Hours Worked	<2000 Hours worked	<20000 Hours worked	Max Hours
2016	73887	34.37%	126518	125878	72460	97170	677	424	1485	2557	26865	1655865404
2017	88187	33.95%	138577	137382	87950	118105	958	612	372	5271	31814	1963929729
2018	98553	34.04%	169440	168739	97978	130467	928	588	624	5639	34844	1886060000
2019	96571	33.25%	168215	167114	96368	128488	758	509	350	3840	32578	803781980.58
2020	112858	38.47%	173280	184647	111960	139842	897	641	1029	6729	37830	1056833333

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Cal Year	Zero DAFW days	Zero DJRT days	Zero TCIR	Zero DART	>100 TCIR	>100 DART	Zero Hours Worked	<2000 Hours worked	<20000 Hours worked
2016	58.85%	58.55%	33.71%	45.20%	0.31%	0.20%	0.69%	1.19%	12.50%
2017	53.35%	52.89%	33.86%	45.47%	0.37%	0.24%	0.14%	2.03%	12.25%
2018	58.52%	58.28%	33.84%	45.06%	0.32%	0.20%	0.22%	1.95%	12.03%
2019	57.91%	57.53%	33.18%	44.23%	0.26%	0.18%	0.12%	1.32%	11.22%
2020	59.06%	62.94%	38.16%	47.66%	0.31%	0.22%	0.35%	2.29%	12.89%

Cal Year	< 20 ee's	20-249 ee's	> 250 ee's	Not Gov't	State Gov't	Local Gov't
2016	16.49%	70.85%	12.66%	83.90%	0.70%	1.67%
2017	15.94%	72.63%	11.44%	81.44%	1.76%	2.69%
2018	15.27%	73.50%	11.23%	80.10%	1.47%	2.93%
2019	13.94%	74.48%	11.58%	94.58%	1.54%	2.86%
2020	17.20%	71.85%	10.95%	94.68%	1.73%	2.95%

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2016	TCIR	DART IR
Avg	15.32	8.88
Median	2.75	0.86
Max	600000	400000
Min	0.00	0.00
Zero	72460	97170
None	1488	1488
>100	677	424

2017	TCIR	DART IR
Avg	19.99	9.43
Median	2.90	0.95
Max	2000000	400000
Min	0.0	0.0
Zero	87950	118105
None	376	376
>100	958	612

2018	TCIR	DART IR
Avg	15.68	7.95
Median	2.90	0.99
Max	600000	400000
Min	0	0
Zero	97977	130466
None	629	629
>100	928	588

2019	TCIR	DART IR
Avg	15.21	6.69
Median	2.88	1.08
Max	1000000	200000
Min	0	0
Zero	96368	128488
None	351	351
>100	758	509

2020	TCIR	DART IR
Avg	13.02	9.02
Median	2.33	0.62
Max	371429	185714
Min	0	0
Zero	111960	139842
None	1029	1029
>100	897	641

Cal Year	Total n	TCIR	DART IR	NLT/LT
2016	214978	2.73	1.62	0.68
2017	259757	2.63	1.62	0.63
2018	289533	2.92	1.79	0.63
2019	290474	1.31	0.81	0.61
2020	293391	2.79	1.94	0.44

Compare TCIR and DARTIR between Overall averages and average of individual rates.

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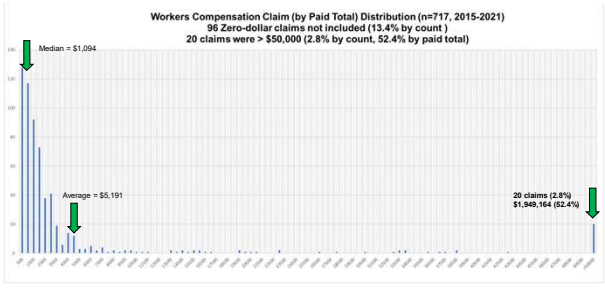
What about WC data?



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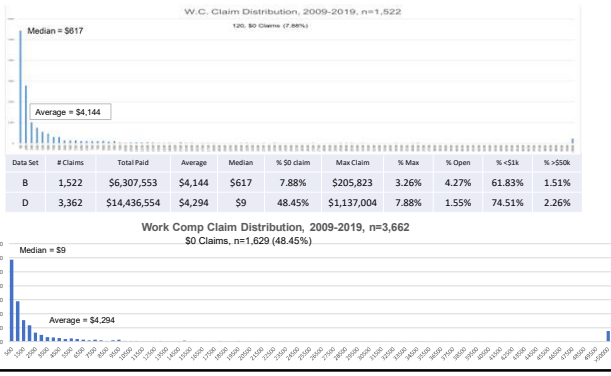

Data Set	# Claims	Total Paid	Average	Median	% $0 claim	Max Claim	% Max	% Open	% <$1k	% >$50k
B	1,522	$6,307,553	$4,144	$617	7.88%	$205,823	3.26%	4.27%	61.83%	1.51%
D	3,362	$14,436,554	$4,294	$9	48.45%	$1,137,004	7.88%	1.55%	74.51%	2.26%

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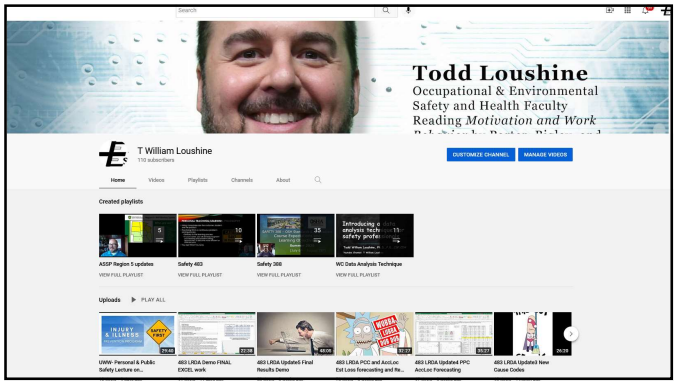

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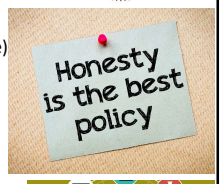
Let's review…

- Injury/accident data is **non-normal** (can't trust avg)
- Comparison of company to BLS data is **not good**
- Consider **ratios and trending over time** (self-improve)
- **Remove "blaming the worker"** from reporting and investigation
  - Develop trusting relationships with workers
  - Focus on positive, or framing safety in a positive/opportunistic way
  - Improve the job or task, first seek to understand then strive to improve
- ***As injury-related data becomes less frequent, need to find new sources and forms of data***



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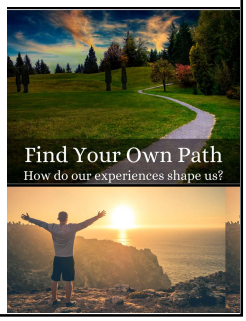
Study the work, Engage with workers

- **Pursue a Learning Culture**
- What conditions, approaches, or attitudes tend to minimize risk or hazardous exposures?
- What conditions, approaches, or attitudes tend to foster effective work and work satisfaction?
- What if we measured:
  - % days workers went home satisfied and happy
  - % days workers came work in a good mood
  - # of positive interactions btw mgmt & workers
  - # of smiles you observe on supervisor's faces
  - # times management thanked workers for reporting an issue, or doing a good job



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Examples of measures in my everyday work

- Monitor course website activity, share on a regular basis to motivate without accusing or singling-out anyone
- Make professional courtesy and hand-written notes a large portion of the course grade, reviewed twice per semester, in a one-on-one meeting with instructor
- Frequent (low credit) quizzes for lesson reviews, and no study exams (bring study sheet to discuss topics)
- Allow students to share their frustrations and issues without correcting or calling them out, but to acknowledge and support them
- Set expectations high, and allow the students to figure it out, forcing them outside their comfort-zone and build useful skills
- **Follow the Three C's: Curious, Caring, and Commitment to helping**

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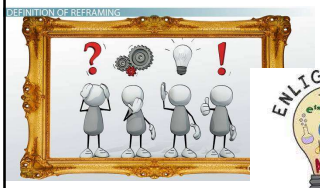
Reframe how you perceive and measure safety



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