AIHA:
ACCELERATING ADVANCEMENTS IN OUR SCIENCE, PRACTICE, AND STANDARDS OF CARE

YUMA Pacific – Southwest Section 48th Annual Meeting:
"Scientific Accountability-Challenging Scientific Status Quo"
January 20, 2023

HEALTHIER WORKPLACES
A HEALTHIER WORLD

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AIHA: ACCELERATING ADVANCEMENTS IN OUR SCIENCE, PRACTICE, AND STANDARDS OF CARE

Agenda:

- AIHA Improving OEHS Science and Practice Initiatives – Progress and Plans
- Challenging the Status Quo: Reflections on Facilitating Change
- Q and A

AIHA IMPROVING OEHS SCIENCE AND PRACTICE INITIATIVES

A WORLD WHERE ALL WORKERS AND THEIR COMMUNITIES ARE HEALTHY AND SAFE

ADVANCING OUR SCIENCE AND PRACTICE TO BETTER PROTECT WORKERS AND COMMUNITIES

Four Exciting Initiatives:

Initiative	Purpose
AIHA – ACGIH Defining the Science	Advance our science to improve the ability of practitioners to protect workers and communities.
Standards of Care	Define minimum practice performance expectations for ensuring acceptable worker protection.
State of the Art vs. Practice	Implement a continuous improvement strategy to close gaps between current practice and the state of the art and minimum standards of care.
AIHA – ACGIH Improving Exposure Judgements	Accelerate adoption of the use of IH statistical and other tools to improve the accuracy of worker exposure assessments.

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AIHA - ACGIH INITIATIVE:
DEFINING THE SCIENCE

Making Research Work for Practitioners to Improve Protection for Workers and Communities

1. Identify research initiatives needed to advance the state of OEHS science to address gaps in effective and efficient practice.
2. Identify areas of practice that do not hold up to current OEHS scientific findings so that AIHA, ACGIH, and other stakeholders may improve practice through focused outreach, promotion, and training.

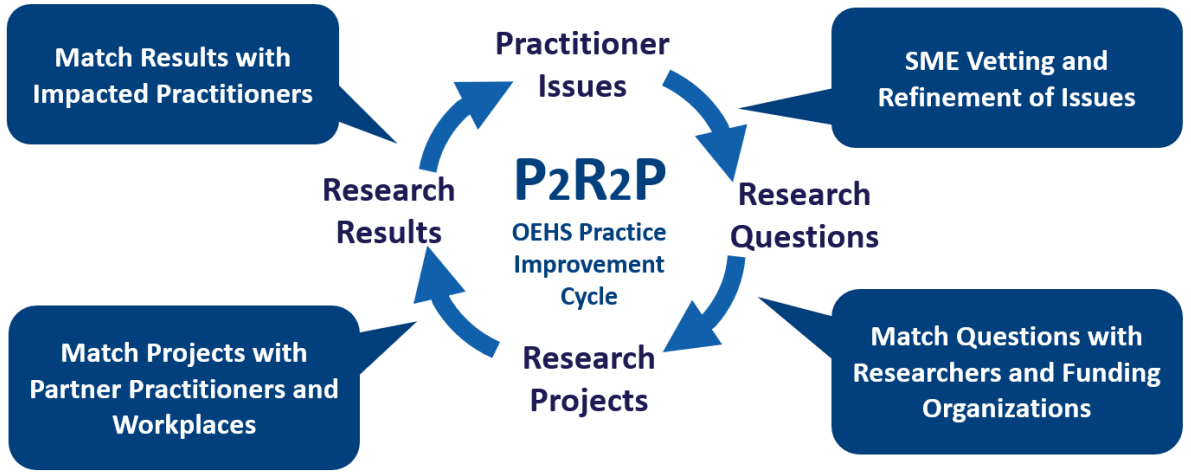
Learn More Here

Practice-To-Research-To-Practice™

Research Agenda - Inaugural Edition*

- Reflects the needs of AIHA and ACGIH members as well as the OEHS Profession.
- Intended to stimulate ideas among academic, government, and private researchers.
- AIHA and ACGIH will use to advocate for OEHS research.
- Follows the Research to Practice to Research (R2P2R) model.
- Based on ideas suggested through the DTS submission process.
- New versions will be issued as new ideas are submitted, reviewed, and prioritized.

Practice-To-Research-To-Practice™



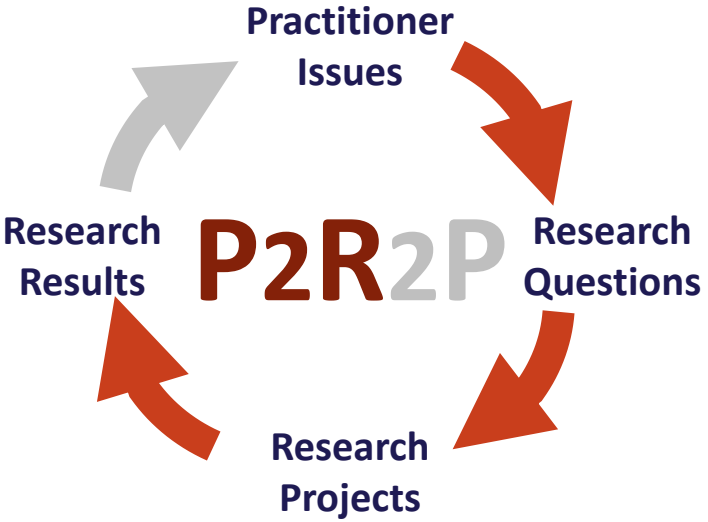
*Draft Currently Under Review by Volunteer Groups

PRACTICE TO RESEARCH:

RESEARCH REQUIRED TO ADDRESS BARRIERS TO PRACTICE DUE TO A LACK OF KNOWLEDGE

- Improving Occupational Safety and Health Surveillance
- Quantifying the Health and Economic Burden of Occupational Disease
- Improving Exposure Surveillance
- Improving Exposure and Risk Assessments
- Improving Decision-Making Using Monitoring Data
  - Worker Self-Monitoring
  - Aerosol Mixtures
  - Bioaerosol Monitoring
  - Commercial availability of high-flow inhalable samplers
  - Define Appropriate Bayesian Priors

Practice-To-Research-To-Practice™



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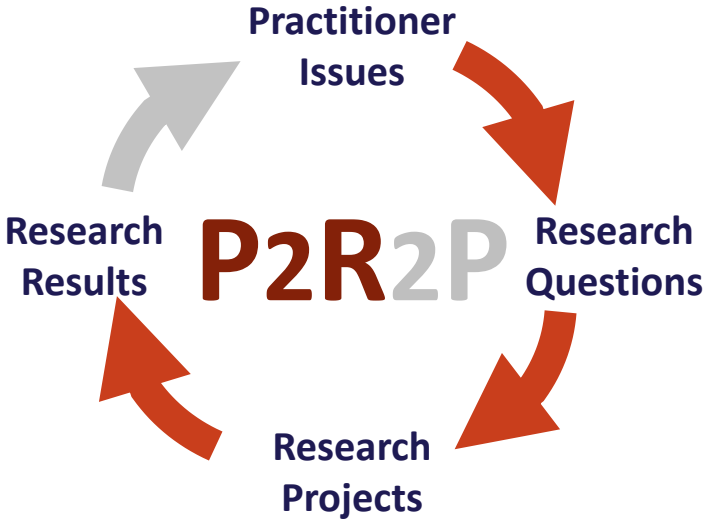


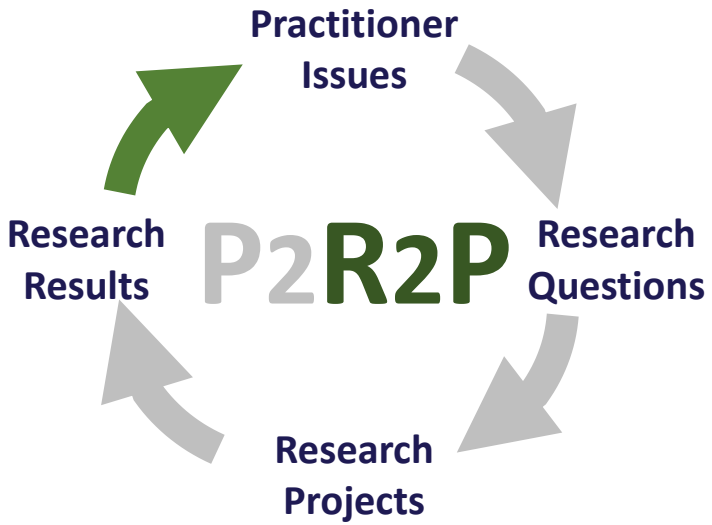
- Validating Controls
  - Techniques for Validating the Predictability of Control Options
  - Developing Ventilation Systems for Welding and Cutting
  - Validation of WELL Health-Safety Rating for Buildings
  - PPE and Respiratory Protection
  - Validating the Efficacy and Safety of New Infection Control Technologies
- Characterizing the Need for Well Trained OEHS Professionals
- Improving Decision-Making When Exposure Monitoring Data Are Not Available
  - Improve Qualitative Judgement Accuracy
  - Exposure Predictor Model Development
  - Exposure Model Validation
- Ensuring Effective Respiratory Protection for Bioaerosols During a Pandemic

RESEARCH TO PRACTICE:

THE DISSEMINATION OF NEW KNOWLEDGE WITH THE POTENTIAL TO IMPROVE INDUSTRIAL HYGIENE PRACTICE

- Routine Use of Statistical Tools
- Exposure Predictor Model Development
- Heat Stress Management
- Total Worker Health Inclusivity of Psychosocial Disorders and Mental Health

Practice-To-Research-To-Practice™



ADVANCING OUR SCIENCE AND PRACTICE TO BETTER PROTECT WORKERS AND COMMUNITIES

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STANDARDS OF CARE (SOC)

Purpose

- Document vital OEHS professional practices that reliably and effectively protect workers and communities from unacceptable risks.
- Provide a common vision of effective risk management practices for all OEHS professionals.
- Elevate the performance of all OEHS programs by providing a set of uniform program and performance targets that can be used in continuous improvement activities.

Approach

- Organized by OEHS area of practice, or domain, and include "soft skills" (non-technical skills for OEHS practitioners).
- For each area of practice, the SOC AG works very closely with relevant subject matter experts from AIHA volunteer groups and other partners to document risk-critical SOC and best practices.

SOC Currently Under Development

Round 1:

- Noise and Hearing Conservation **IN PROCESS**

Round 2:

- Exposure Assessment **COMPLETE!**
- Respiratory Protection Program
- Control Banding
- Management

Public Web Page

SOC USES AND LIMITATIONS

- Reasonable for all OEHS practitioners around the world.
- Targets for continuous improvement strategies to meet or exceed over time.
- Implementation speed will vary (depends on size of the gap, resources available, etc.).
- For use by single organization practitioners and by consultants advising multiple clients.
- Include best practice criteria to inspire continuous improvement efforts.
- Time-sensitive: based on practices documented at the time of publication.
- Not comprehensive or complete. No rigorous review was conducted of every guidance, standard, and regulation around the world.
- Not a consensus of AIHA or the profession.
- Not intended as legal expectations, “requirements of practice”, or “standards”.
- Not equivalent to “minimum acceptable practice” which is primarily driven by regulatory requirements.
- There may be alternate approaches more efficient and effective than those in the SOC.

** This document does not define or establish a legal or community standard, nor is it intended to be used to create a presumption of a breach of a legal duty, or form the basis for civil liability**

SOC SUGGESTED IMPLEMENTATION STRATEGY

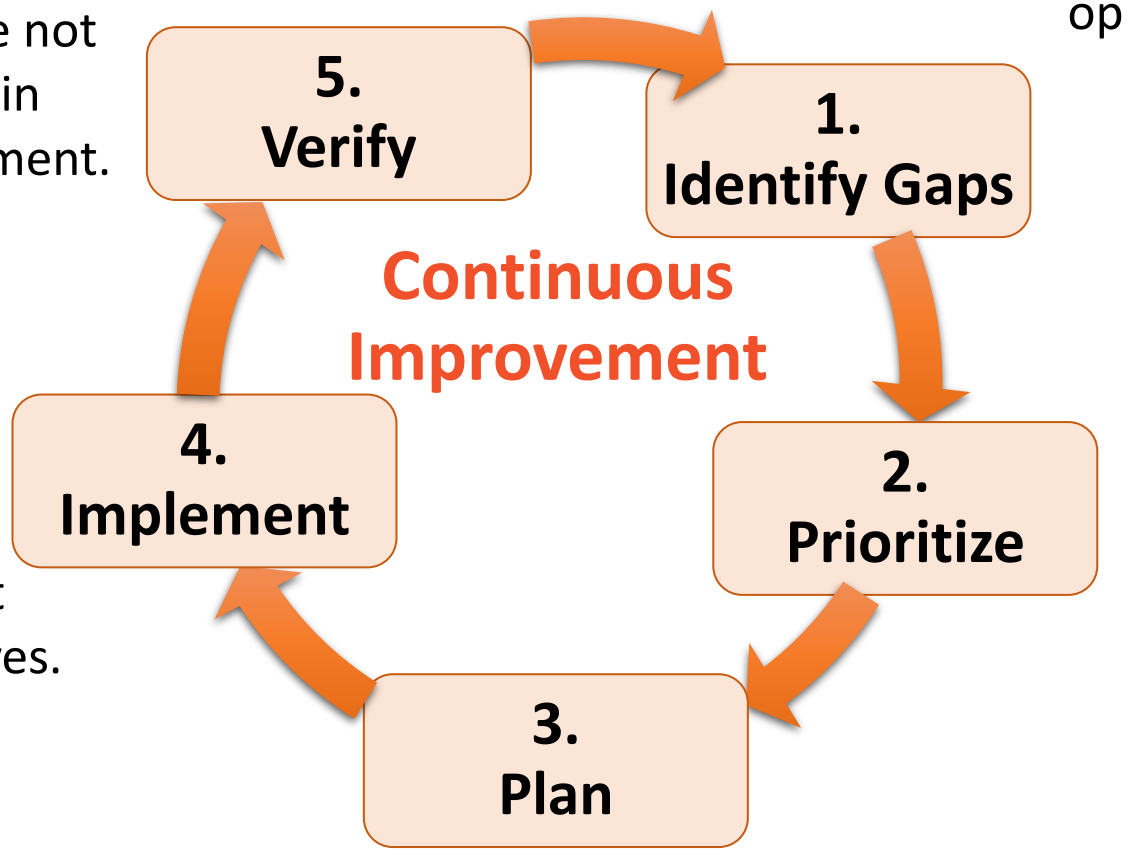
1. Compare the SOC to your current practices to identify opportunities for improvement.

2. Prioritize the opportunities for improvement.

3. Develop a plan with SMART objectives to close the higher priority gaps.

4. Implement the plan and track progress against the plan's SMART objectives.

5. Verify implementation progress and effectiveness. Identify where plan objectives were not fully met for consideration in the next round of improvement.



OCCUPATIONAL EXPOSURE ASSESSMENT SOC

Sections:

- Scope & Objectives
- Program Management
- Basic Characterization
- Occupational Exposure Limits
- Similar Exposure Groups (SEGs)
- Exposure Judgments
- Monitoring Practices
- Non-Recurring Operations
- Health Hazard Controls
- Medical Surveillance
- Communication & Training
- Reassessments
- Control Banding
- Performance Measurement
- Recordkeeping

OCCUPATIONAL EXPOSURE ASSESSMENT SOC

KEY CONTENT:

SOC Section	Selected Key Content
Scope & Objectives	• Assess and control all chemical, physical and biological exposures for all workers across all workdays
Program Management	• Written program • Under direction of an industrial hygienist experienced and trained in exposure assessment
Basic Characterization	• Critical information for characterizing exposures is documented for the workplace
Occupational Exposure Limits	• Authoritative or internal OELs are used for exposure judgments • Regulatory OELs are used if lower than authoritative or internal OELs
SEGs	• The workforce is stratified into similar exposure groups (SEG).
Exposure Judgments	• Exposure are acceptable if the 95th percentile is less than the OEL with 70% confidence (95% confidence best practice) • An AIHA Exposure Control Category (ECC) and certainty rating are selected for each air contaminant and noise SEG • The exposure profile for each SEG is judged acceptable or unacceptable

OCCUPATIONAL EXPOSURE ASSESSMENT SOC

KEY CONTENT:

SOC Section	Selected Key Content
Monitoring Practices	• 3+ baseline samples are collected for each SEG initially rated ECC of 2 or 3 • Baseline sample data are analyzed using statistics to update the exposure category and the certainty rating • 3+ additional baseline samples are collected for SEGs with updated ECC of 2 or 3 having low or medium certainty
Non-recurring Ops	• Non-recurring operations are anticipated, prospectively assessed, and controlled
Health Hazard Controls	• Initially, SEGs judged unacceptable (ECC = 4) are quickly controlled • Enhanced permanent controls (higher on the hierarchy) are sought in a prioritized manner
Med. Surveillance	• Med. surveillance is provided to workers in ECC 3 and 4 where protocols are available
Com. & Training	• Findings and recommendations are reported in an effective and timely fashion
Reassessments	• Management of change procedures are established to provide notification of newly planned changes in the workplace, workforce, or environmental agents
Control Banding	• Control banding approaches are considered in the exposure assessment process
Perf. Meas.	• Performance measures are identified, tracked, and communicated to stakeholders
Recordkeeping	• Exposure assessment records are maintained indefinitely

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CONTINUOUS IMPROVEMENT: STATE OF THE ART VS. PRACTICE

2022-24 AIHA ENTERPRISE STRATEGIC PLAN

Mission - *Empowering and advancing those who apply scientific knowledge to protect all workers and their communities from occupational and environmental hazards*
Vision – *A world where all workers and their communities are healthy and safe*
Value Proposition - *AIHA members are scientists and professionals who protect the health and safety of workers and communities by reducing risks and safeguarding operations to help organizations operate efficiently and without interruption.*

Integrity of Professional Practice

AIHA will … engage with allied professional organizations to work towards achieving common goals.	… and safety (OEHS) by increasing awareness of the value of the profession and growing the organization and profession.	… disseminate cutting-edge educational, technical, and career enrichment resources to advance the OEHS	**Integrity of Professional Practice** AIHA will identify, develop, continuously improve, and advance excellence in OEHS practices.	**Advocacy** AIHA will influence the actions of the public, government, and organizations to advance worker and community health and safety.
			1. Implement a continuous improvement strategy to identify and address gaps between current and state of the art (best in class) OEHS practice. 2. Advance competency in specialty areas through laboratory accreditation, proficiency programs., and registry programs. 3. Develop recognized leading metrics and best practices for worker and community health and safety, including organizational social responsibility.	1. As thought leaders, build awareness of the OEHS profession and the value of the professionals' impact on businesses and communities to influence stakeholders, the public, and policymakers at all levels of government. 2. Empower AIHA members and the public to contact their policymakers in support of AIHA public policy positions and issues.

1. Implement a continuous improvement strategy to identify and address gaps between current and state of the art (best in class) OEHS practice.

IDENTIFY AND ADDRESS GAPS BETWEEN CURRENT AND STATE OF THE ART (BEST IN CLASS) OEHS PRACTICE.

1. Determine state of the art / best practices (Standards of Care Initiative).
2. Survey practitioners regarding risk-critical practices.
   - Document current practices and how they differ from best practices
   - Identify existing barriers to achieving best practice performance
3. Define and implement plans to address barriers and empower practitioners to close practice gaps and achieve best-in-class performance.

Learn More Here

Pilot Survey of Practitioners in 2023

- Occupational Exposure Assessment
- Noise and Hearing Conservation

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AIHA / ACGIH INITIATIVE:

IMPROVING EXPOSURE JUDGEMENT ACCURACY

Improve Practice to Align with Current Science

Drive a significant shift in the OEHS practice paradigm: from one where tools and activities to improve exposure judgment accuracy and interpretation are rarely or sporadically used, to one where their use is routine and expected.

Public Web Page

IMPROVING EXPOSURE JUDGEMENT ACCURACY
WHY IMPORTANT?

What if Our Exposure Assessment is Wrong?

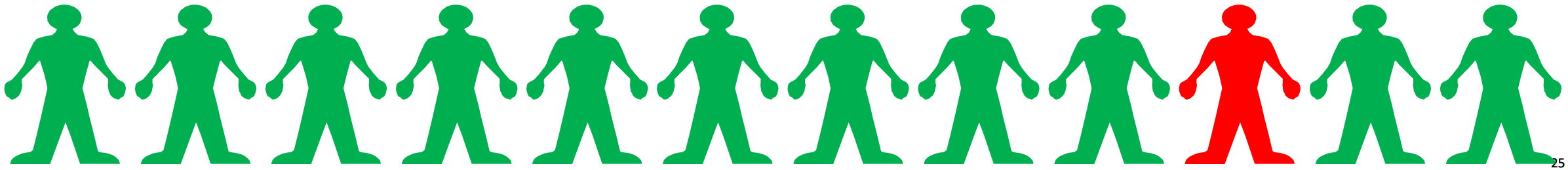
If We Underestimate the Exposure?

- Increased Risk to Employees

If We Overestimate the Exposure?

- Unnecessary Constraints for Employees and Production
- Unnecessary Expenditures for Controls

Well-Designed Exposure Risk Management Strategy	
We Want:	**We Don't Want:**
Good Data	Bad Data
To Be Effective	To Not Be Protective
To Be Efficient	To Waste Resources
No Biases	Biases (High or Low)
Low Uncertainty	High Uncertainty
Correct Decisions	**Wrong Decisions**



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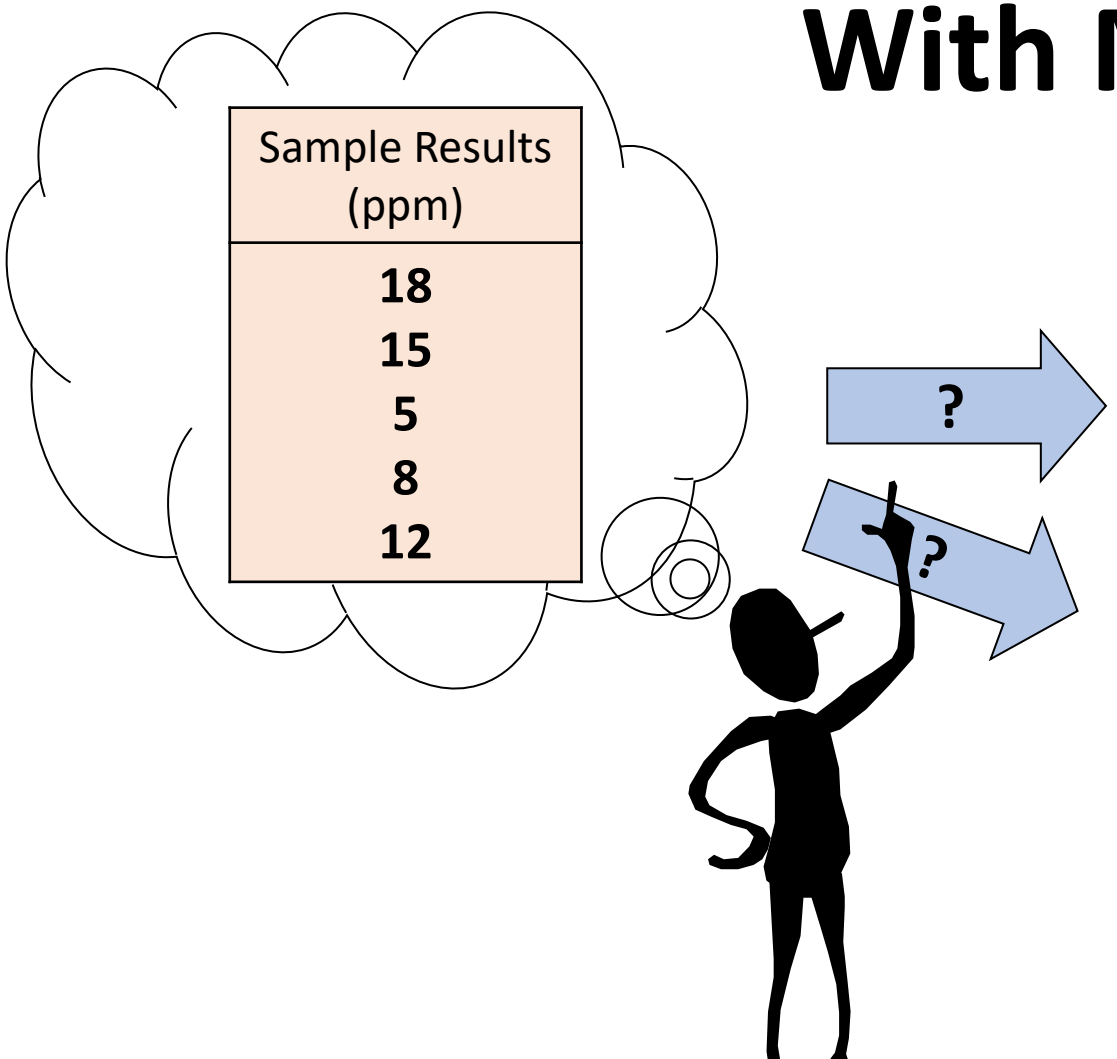
Exposure Risk Decisions: How Accurate Are We?

With Monitoring Data . . .



	Exposure Rating Category**	Recommended Control
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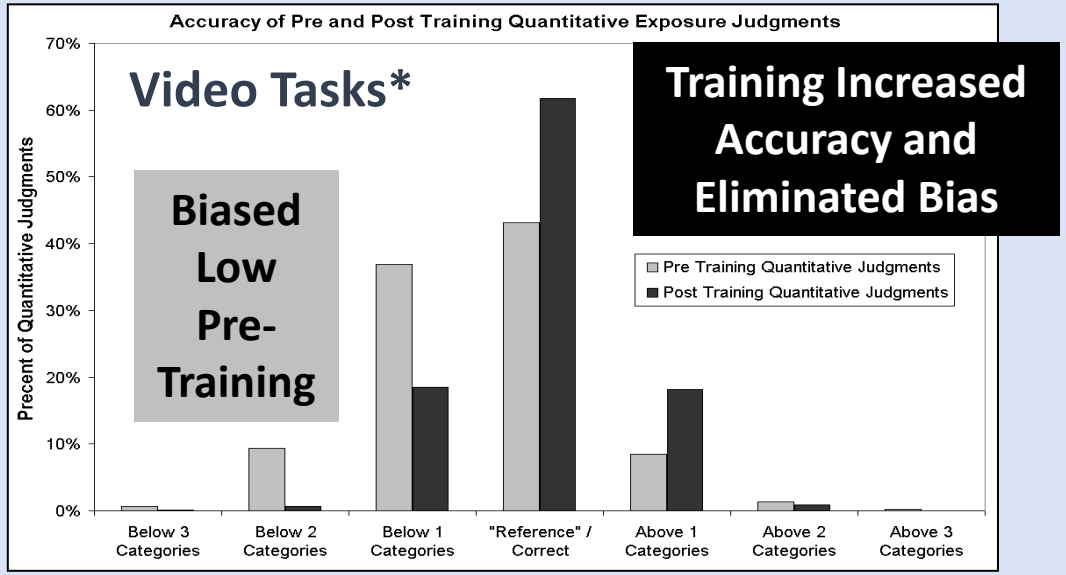
	Multiples of OEL (>500% of OEL or others based on respirator APF)	+Immediate Engineering Controls or Process Shut Down, Validate Acceptable Respirators

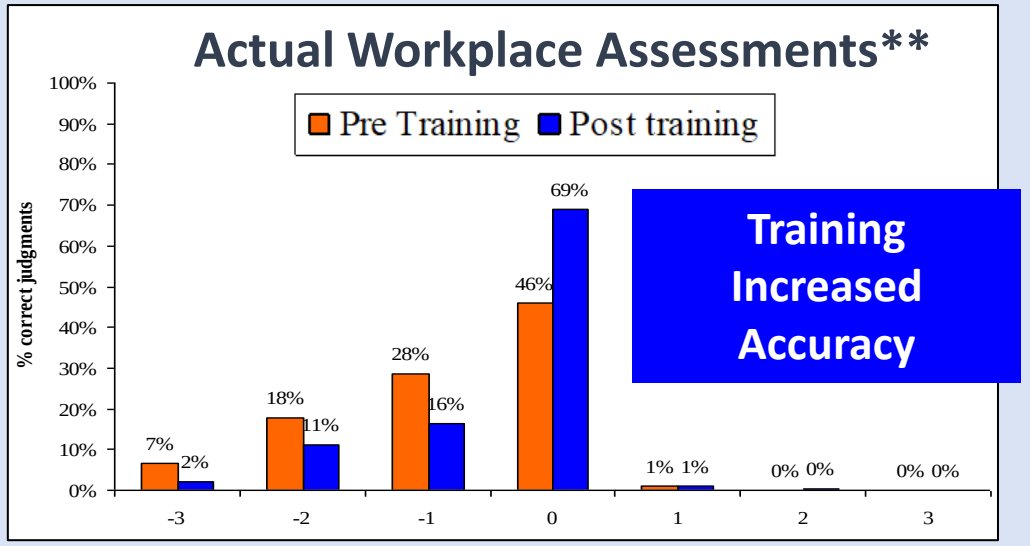
** Decision statistic = 95th percentile

Monitoring-Based Exposure Judgments

- Bad News
  - Often incorrect
  - Biased Low
- Good News
  - Simple statistical training improves judgments

Before Statistical Training:
Poor Accuracy & Underestimation Bias



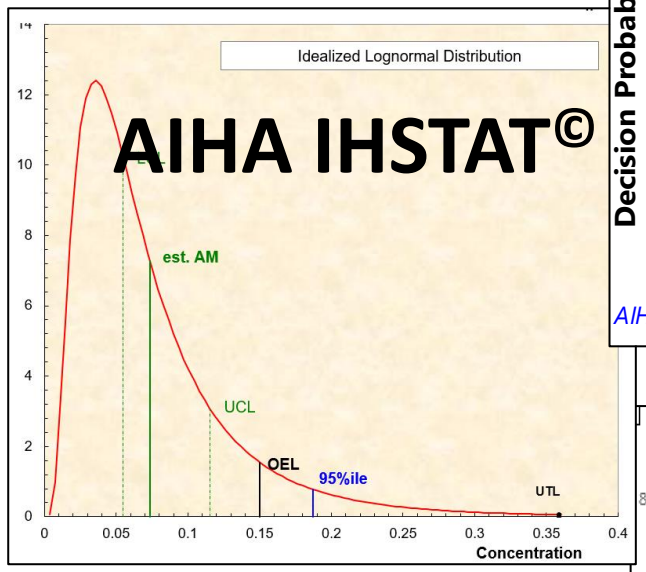


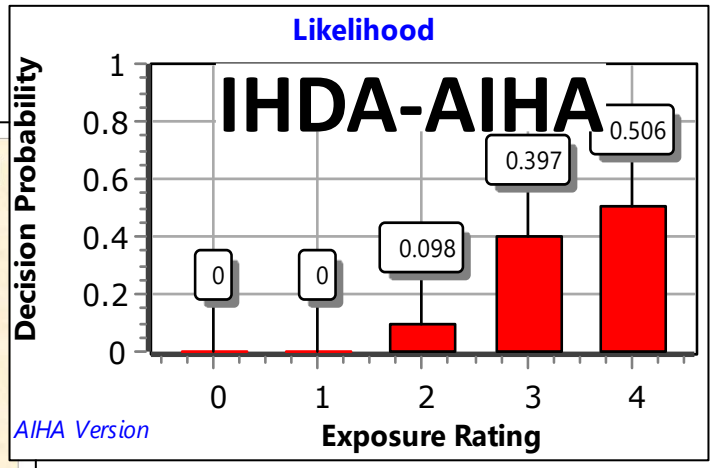
* P. Logan, G. Ramachandran, J. Mulhausen and P. Hewett "Occupational Exposure Decisions: Can Limited Data Interpretation Training Help Improve Accuracy?". Annals of Occupational Hygiene - 2009

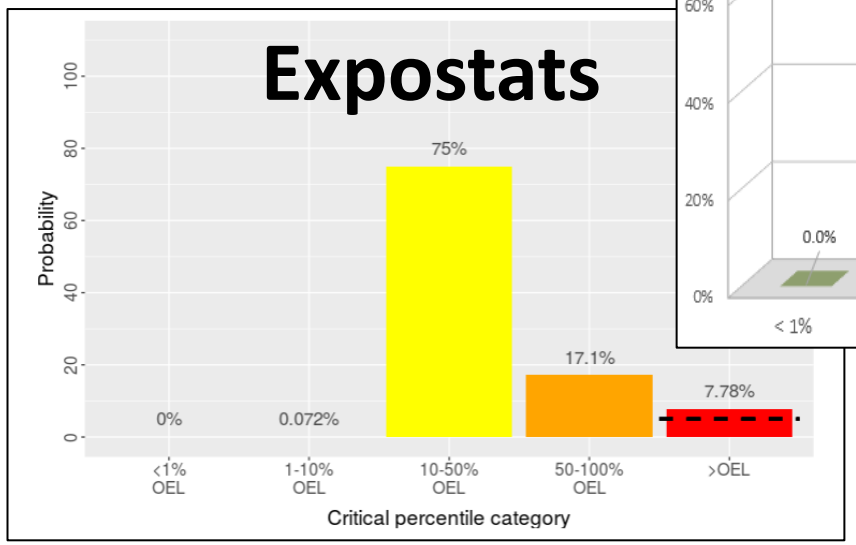
**Vadali, Ramachandran, Mulhausen & Banerjee (2012): "Effect of Training on Exposure Judgment Accuracy of Industrial Hygienists", Journal of Occupational and Environmental Hygiene, 9:4, 242-256

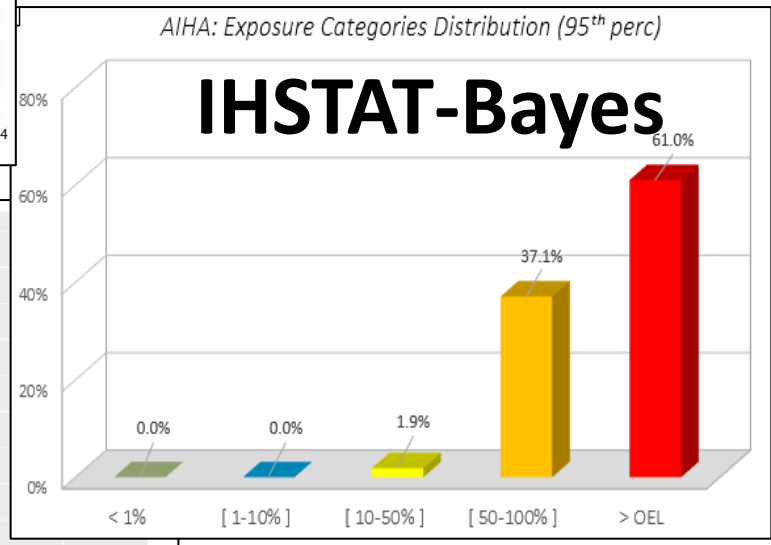
Monitoring-Based Exposure Judgments

- Bad News
  - Often incorrect
  - Biased low
- Good News
  - Simple statistical training improves judgments
- GREAT NEWS!!!
  - Using the FREE statistical tools when we make monitoring-based exposure judgments will greatly improve accuracy









Statistical Approaches to Understanding the Exposure Profile

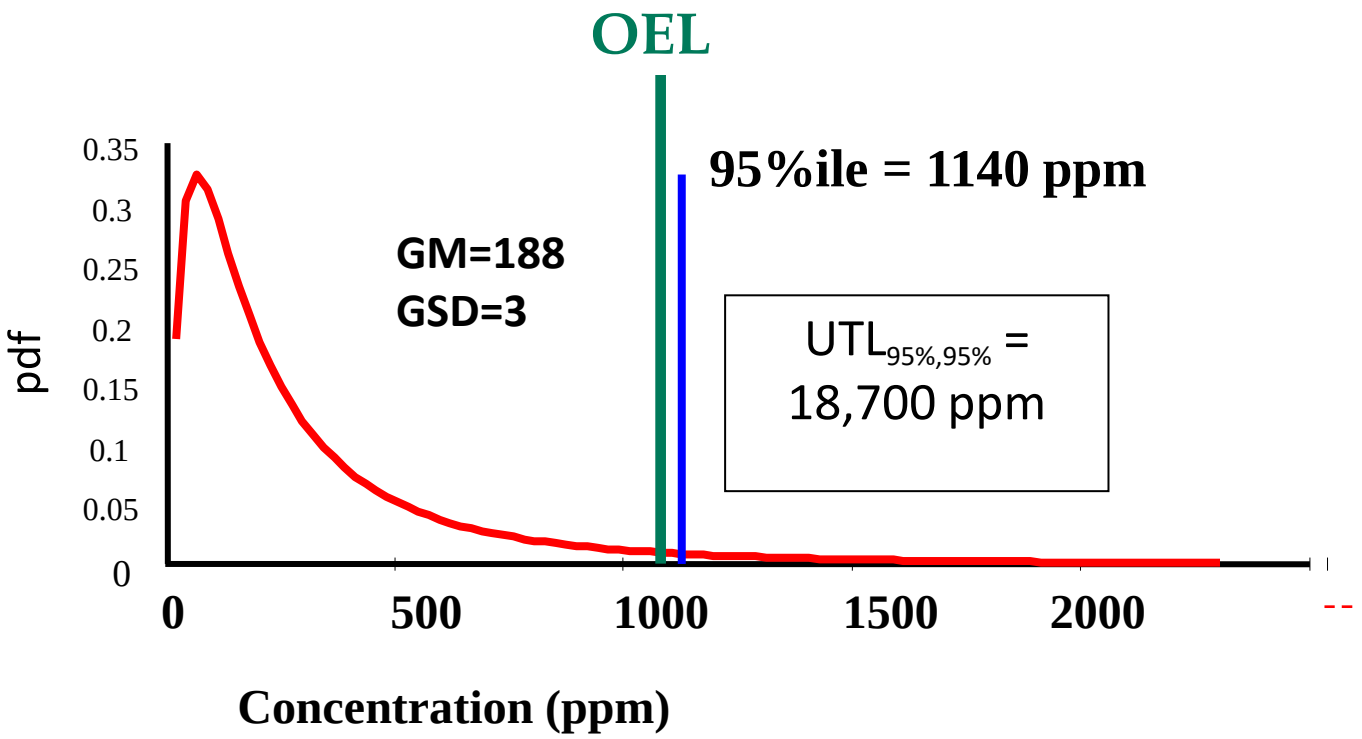
Ethanol

OEL = 1000 ppm

Monitoring Results:

215 ppm
52 ppm
395 ppm
700 ppm
75 ppm

Traditional IH Statistics



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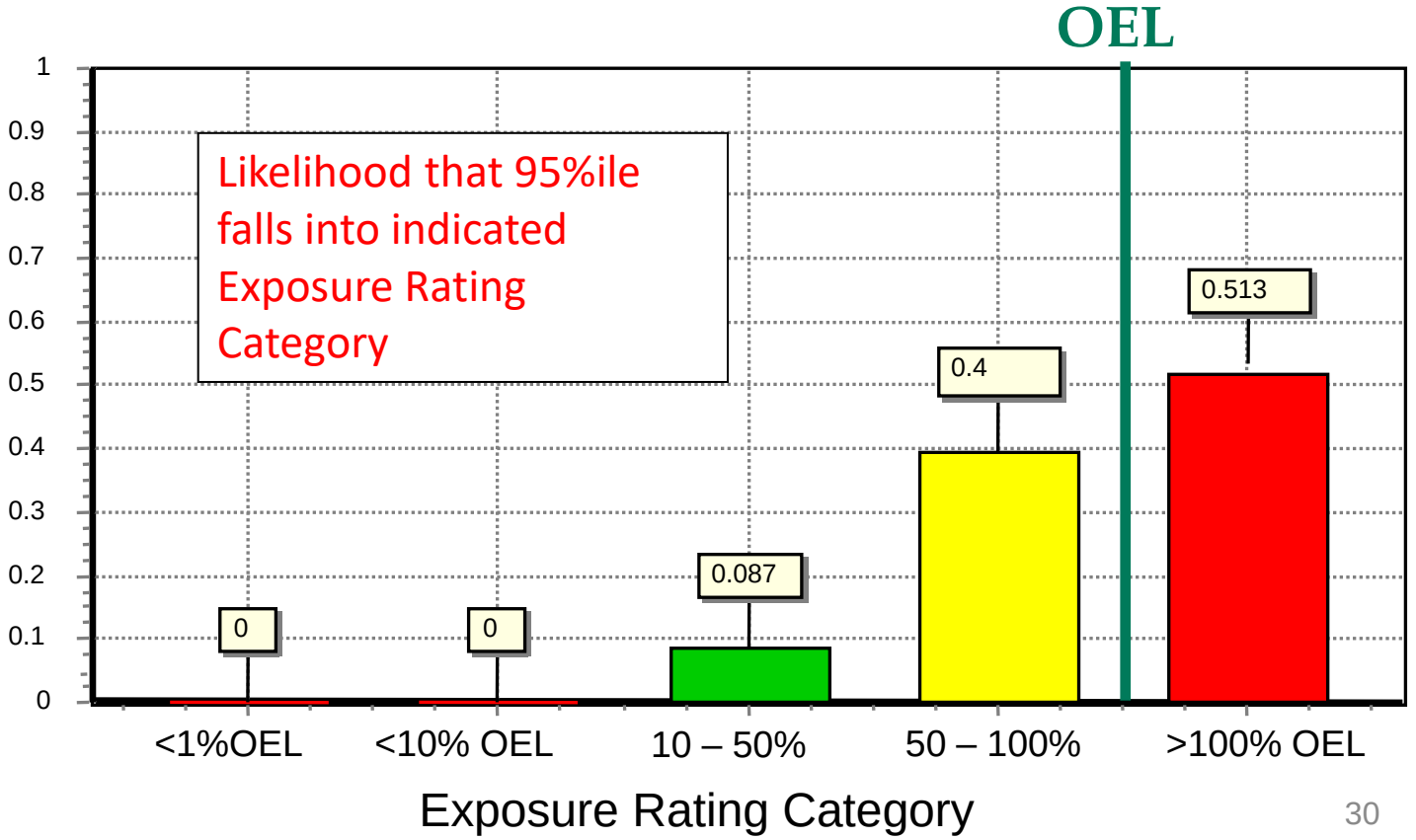
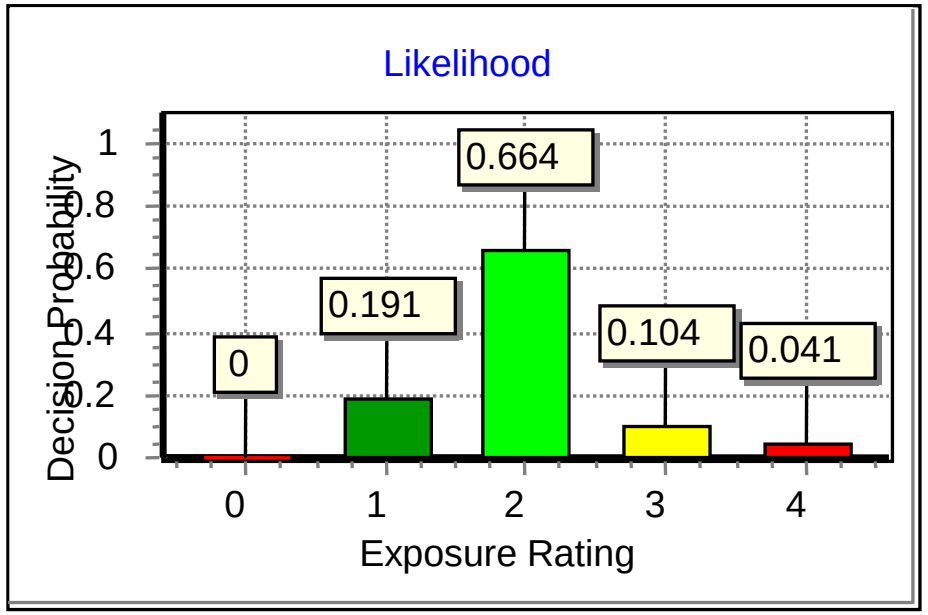
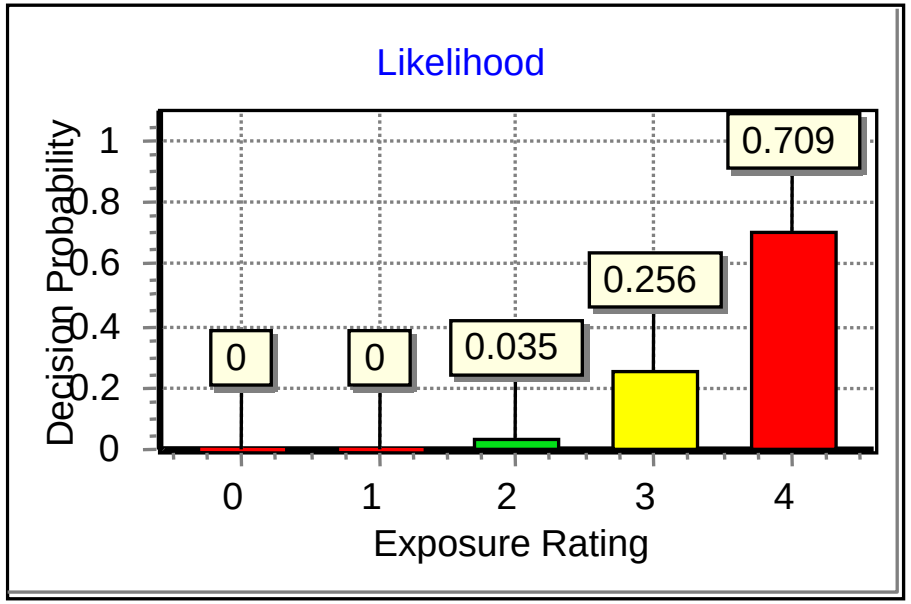
Bayesian Decision Analysis (BDA)

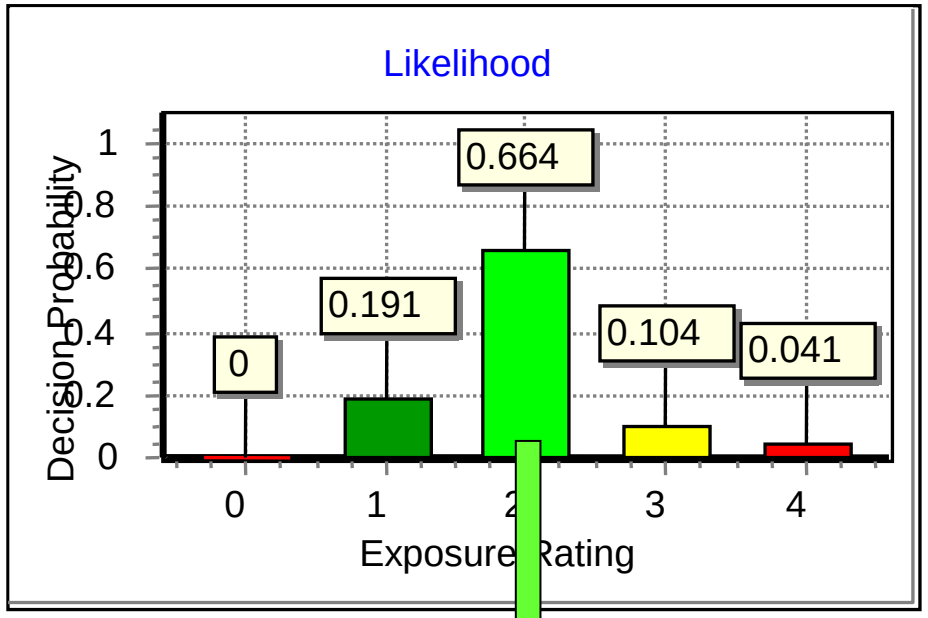


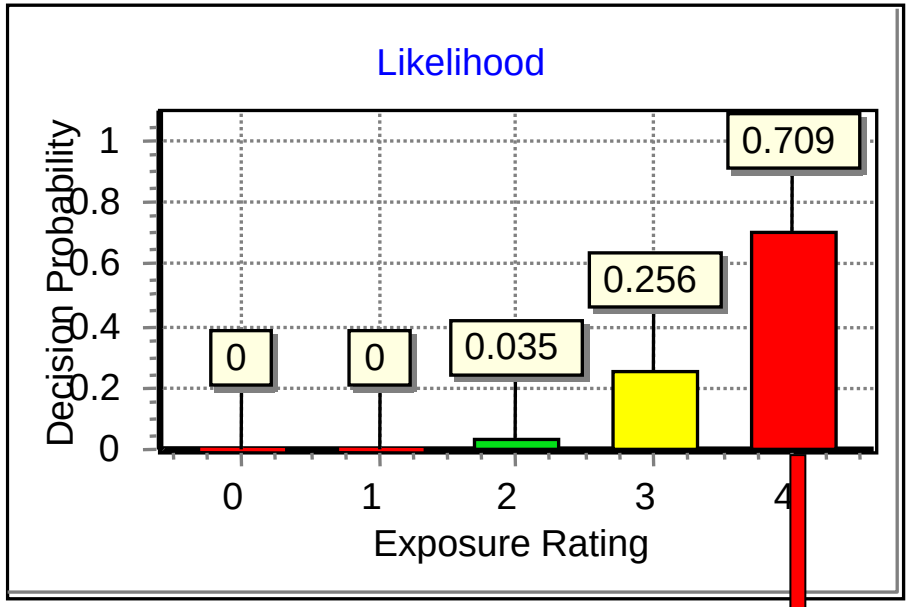




Easier to Interpret!
Easier to communicate!

- BDA output gives probabilities - easier for people to understand than traditional confidence intervals
- The uncertainty associated with small data sets shows up clearly so risk can be better communicated





Follow-up is Straightforward

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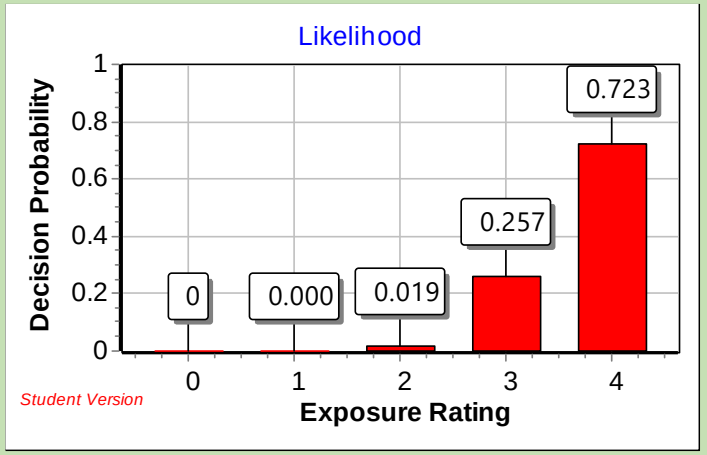
Advantages of Bayesian Statistics

- More Intuitive Depiction of Exposures and Uncertainty than Traditional Statistics
- Direct Alignment with AIHA Exposure Rating and Control Categories
- Easy to Communicate
- Great for small monitoring data sets . . . Including n=1
- Elegant Handling of Censored Data (Non-Detects) . . . Including Fully Censored Data

Sample Size n=1

OEL = 1 ppm

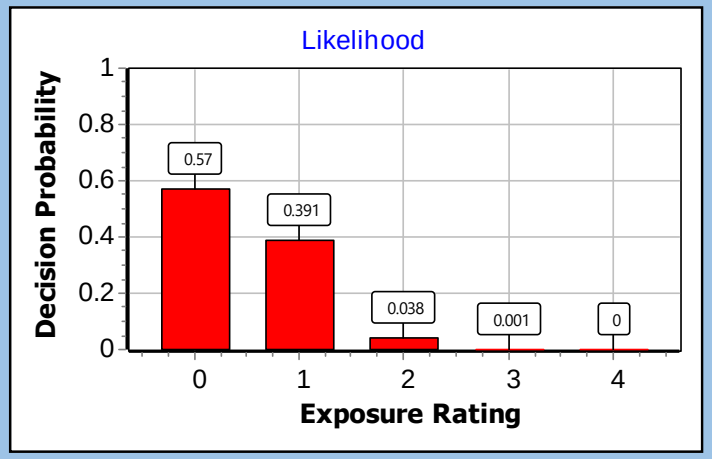
Sample Results (ppm)
0.65



Fully Censored Data

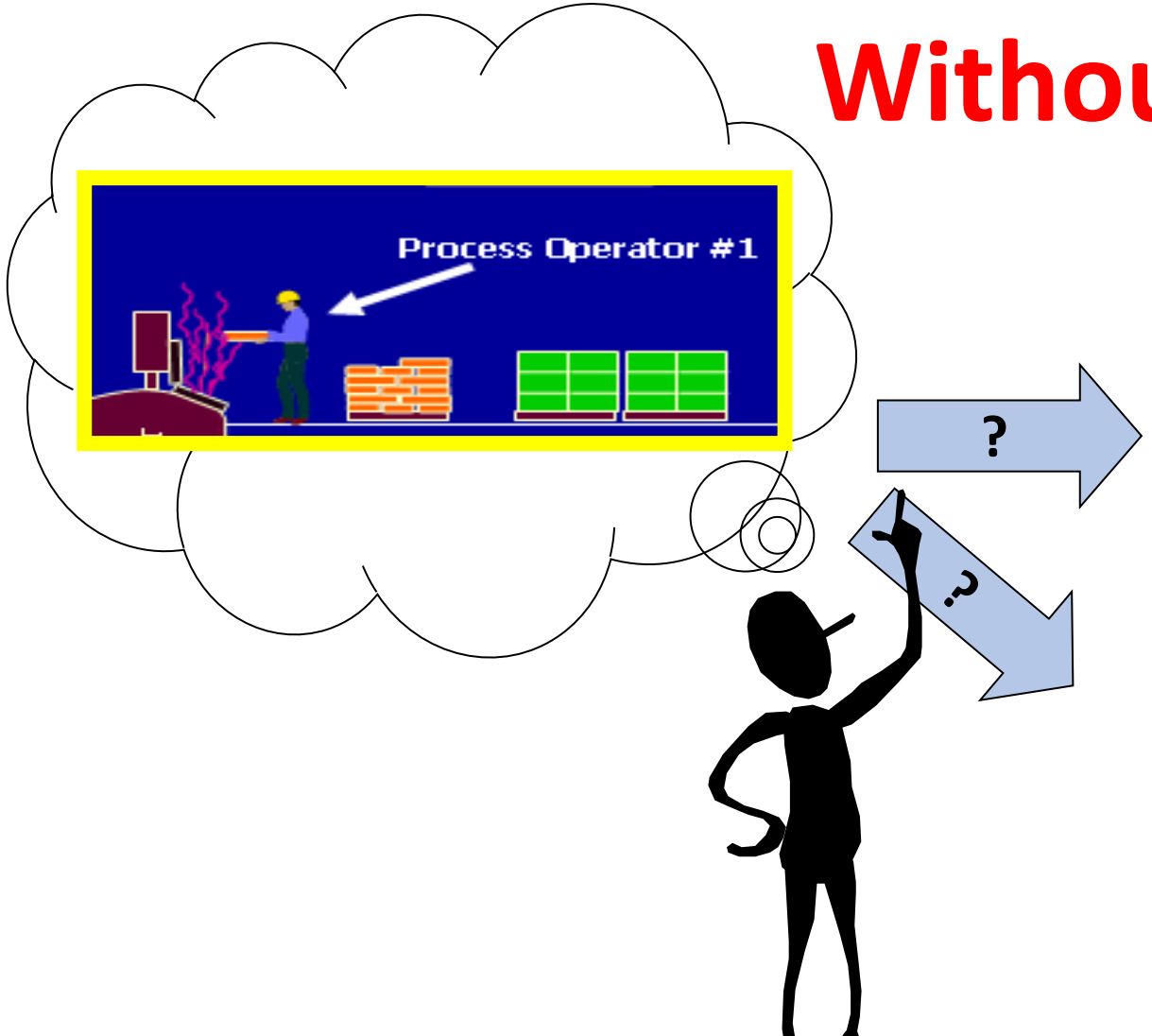
OEL = 100 ppm

Sample Results (ppm)
<5
<3.3
<12
<9



Exposure Risk Decisions: How Accurate Are We?

Without Monitoring Data . . .



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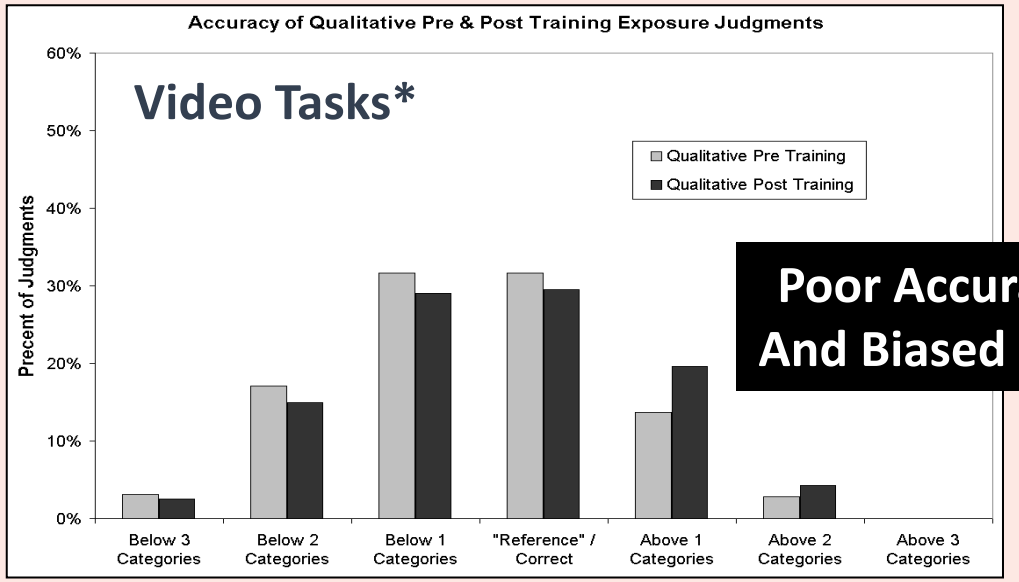
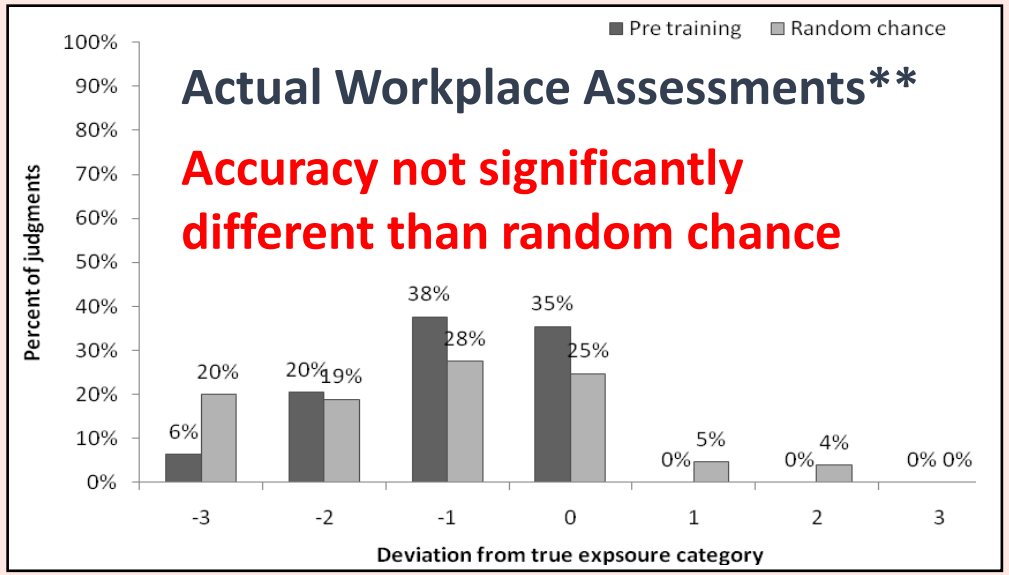
Poor Accuracy & Underestimation Bias





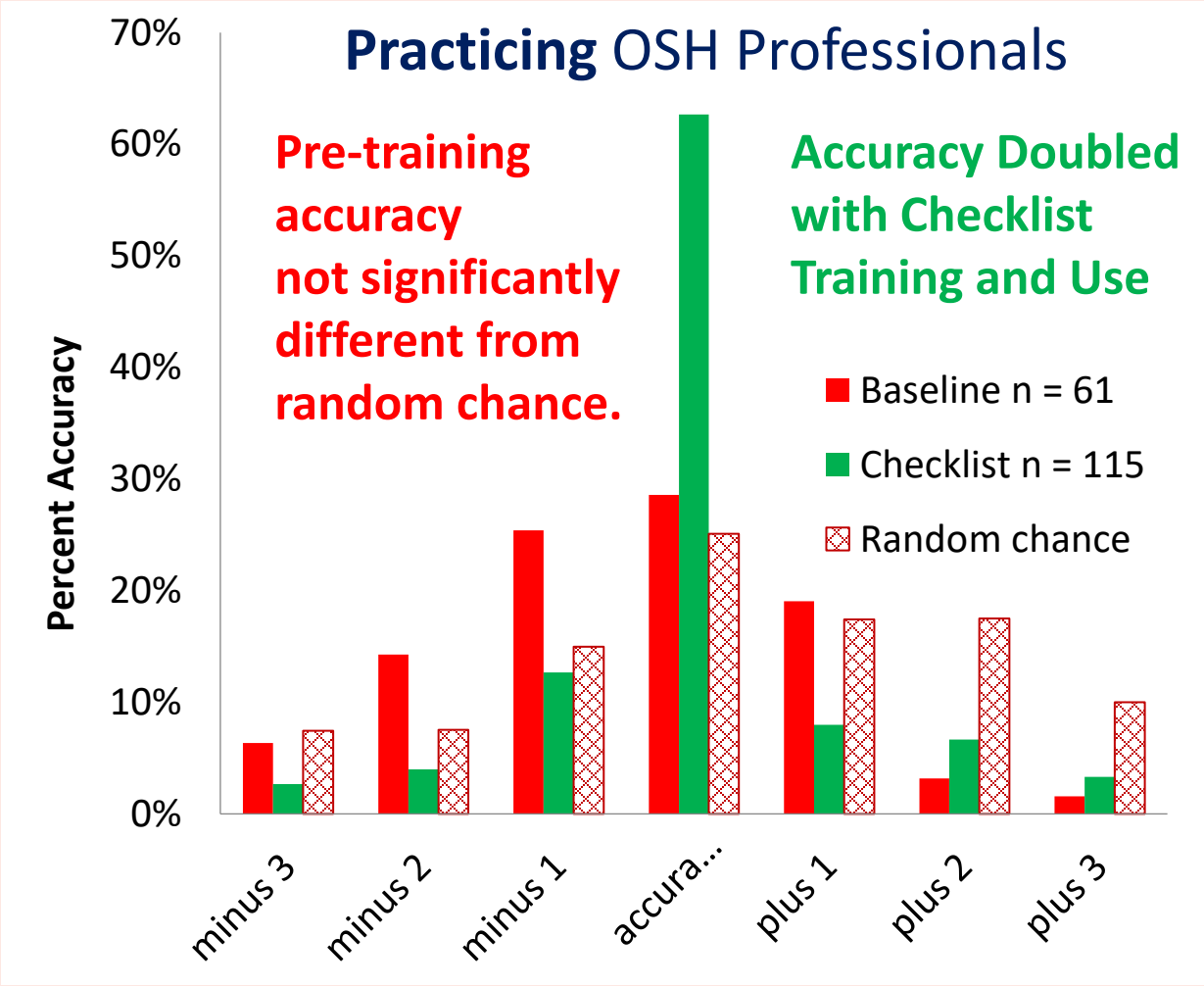
* P. Logan, G. Ramachandran, J. Mulhausen and P. Hewett "Occupational Exposure Decisions: Can Limited Data Interpretation Training Help Improve Accuracy?". Annals of Occupational Hygiene - 2009

**Vadali, Ramachandran, Mulhausen & Banerjee (2012): "Effect of Training on Exposure Judgment Accuracy of Industrial Hygienists", Journal of Occupational and Environmental Hygiene, 9:4, 242-256

Exposure Judgments Without Monitoring Data

- Bad News
  - Often incorrect
  - Biased low
- Good News
  - Use of systematic approach improves accuracy

Checklist Tool Training and Use Improved Accuracy*

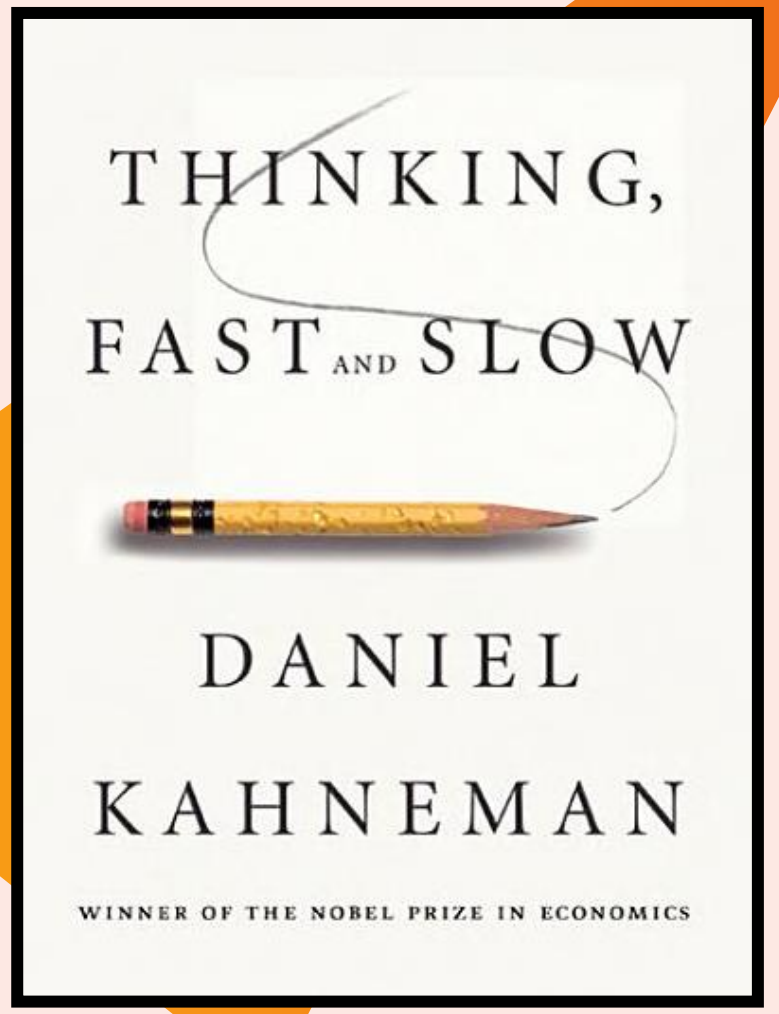


* Susan F. Arnold; Mark Stenzel; Daniel Drolet; Gurumurthy Ramachandran; "Using Checklists and Algorithms to Improve Qualitative Exposure Judgment Accuracy", *Journal of Occupational and Environmental Hygiene* 2016, 13, 159-168.

Exposure Judgments Without Monitoring Data

- Bad News
  - Often incorrect
  - Biased low
- Good News
  - Use of systematic approach improves accuracy
- GREAT NEWS!!!
  - Improvements provided by systematic approach predicted by cognitive psychology decision-making research
  - We can use those techniques!

Learn From Our Colleagues in Cognitive Psychology . . .



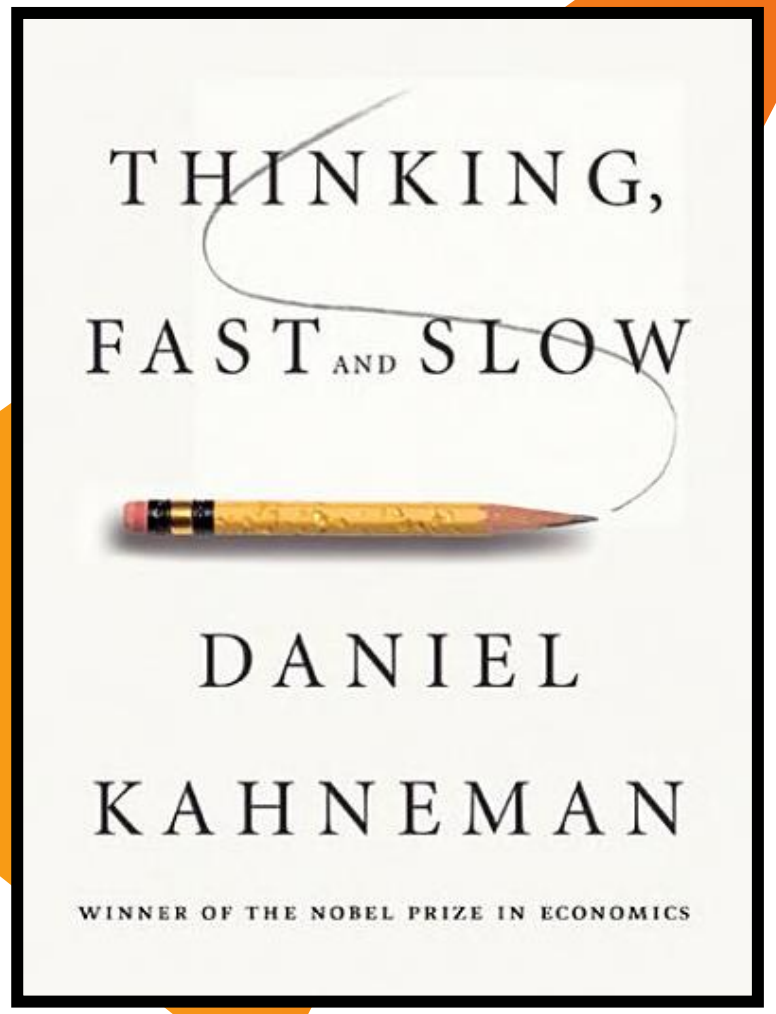
Making Decisions: Thinking Fast and Slow

Fast Thinking

- Reflexive, quick, emotion-driven and instinctive.
- Good for the many routine decisions that we make every day.
- **Reliance on emotion and individual experiences can lead to biases and faulty decision making**.

Slow Thinking

- Deliberate and logical.
- Requires energy and conscious focus.
- **Serves us well when we have important decisions to make.**



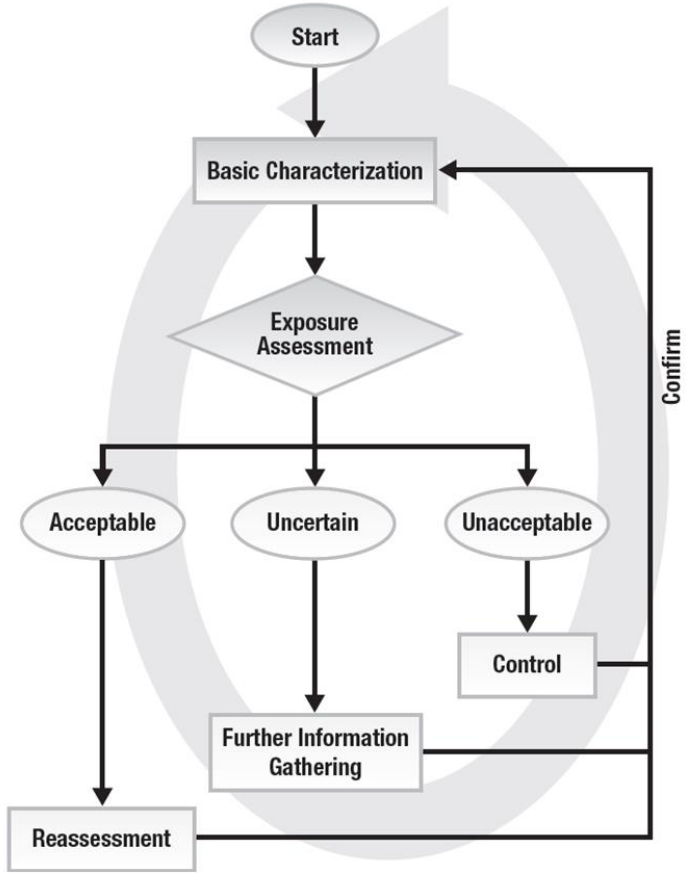
Driving Slow Thinking and Expertise:

Setting Ourselves Up to Make Accurate Exposure Risk Decisions

Learning from our friends in psychology . . .

Use a Structured Approach

- Systematic and transparent processes
- Clear decision rules
- Break judgments into component parts
- Questions and data in a logical order
- Document facts and assumptions
- Discuss with colleagues
- Document decision
- Provide reasons for the decision
- Focused training, coaching, and practice
- Accurate feedback mechanisms



A Strategy for Assessing and Managing Occupational Exposures 4th Edition

FREE RESOURCES
TOOLS

Free IH Statistical Analysis Tools

- **Traditional Statistics**
  - **AIHA IHSTAT©** - Excel application that calculates various exposure statistics, performs goodness of fit tests, and graphs exposure data.
- **Bayesian Statistics**
  - **IHDA-AIHA –** Stand-alone application for the analysis and interpretation of exposure monitoring datasets using traditional and Bayesian statistics.
  - **Expostats** -Toolbox of web applications for the interpretation of IH measurements using Bayesian statistics.
  - **IHSTAT-Bayes** – Excel-based application that calculates various exposure statistics using a Bayesian model.

All available from AIHA: HERE

Free AIHA Exposure Assessment Tools

- **IH/OEHS Exposure Scenario Tool (IHEST)**
  Excel tool to aid Basic Characterization (BC)
- **IHSkinPerm©**
  Excel tool for estimating dermal absorption.
- **Basic Exposure Assessment (EA) and Sampling Spreadsheet**
  Excel template for entering EA/BC and sampling data.
- **Toxico-kinetic Extended Shift OEL Adjustment**
  Excel tool for adjusting OELs using the Hickey and Reist approach.
- **Structured Deterministic Model 2.0 (Formerly "Checklist Tool")**
  Excel tool for estimating potential airborne exposures.
- **IHMOD 2.0©**
  Excel-based mathematical modeling spreadsheet

https://www.aiha.org/public-resources/consumer-resources/apps-and-tools-resource-center/aiha-risk-assessment-tools

FREE RESOURCES
TRAINING

FREE WEBINAR ON STATISTICAL ANALYSIS TOOLS

Making Accurate Exposure Risk Decisions

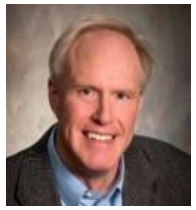
FREE!

Taught by Leading Experts

9 Contact Hours !!

Paul Hewett Ph.D, MS, CIH, FAIHA
Developed IH Data Analyst (IHDA) for Bayesian statistical analysis of monitoring data

Jérôme Lavoué Ph.D., MS
Led the development of Expostats for Bayesian statistical analysis of monitoring data



John Mulhausen Ph.D., MS, CIH, CSP, FAIHA
Authored the initial version of IHSTAT® for traditional statistical analysis of monitoring data

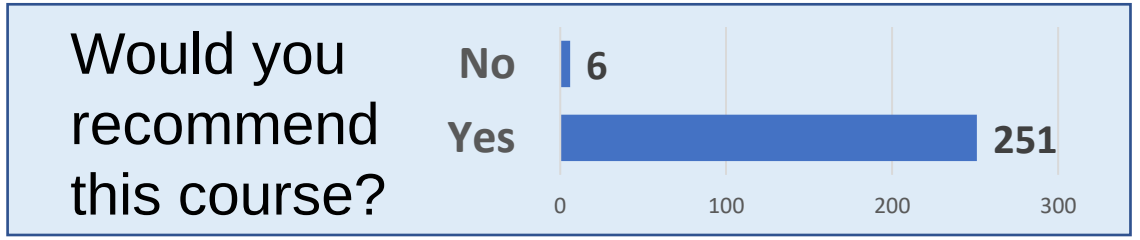
Andrew D. Perkins MS, CIH, CSP, COHC
Experienced in the application of statistical tools in accordance with the AIHA Exposure Assessment Strategy

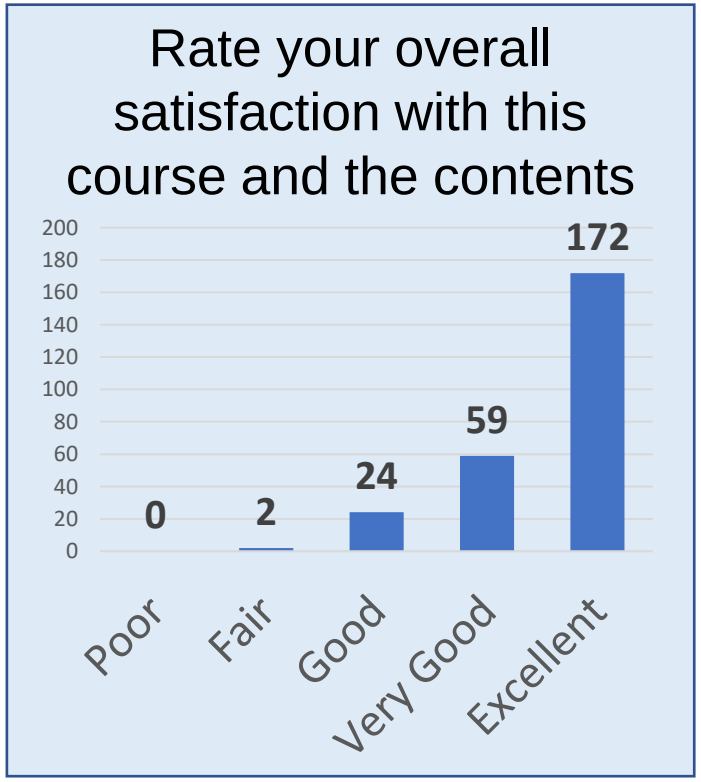
https://www.aiha.org/education/elearning/online-courses/making-accurate-exposure-risk-decisions

FREE WEBINAR ON STATISTICAL ANALYSIS TOOLS

2022 Participant Feedback: 54% Response Rate (257/480)

"Statistics made simple – this should be a prerequisite for all industrial hygienists!"





"With this course, the light bulb went off. I have never liked/used statistics until I took this course."

"The course takes us (IHs) to the next level. It's where we should be at in our practice."

"A great overview of IH data analysis- a must for anyone charged with the interpretation of sampling results!"

"One of the easiest-to-understand offerings on this subject; ideal for individuals with little background or natural aptitude for the concepts."

"Great course. Every IH professional needs to take this course. This rubric should become part of the CIH exam."

FREE RESOURCES
COMPETENCY ASSESSMENT

Exposure Decision Analysis: Competency Assessment

Registered Specialist
Exposure Decision Analysis

AIHA Registry Programs®

Exposure Decision Criteria
- Allowable Exceedance
- Needed Confidence
- Use of Exposure Categories

Traditional Industrial Hygiene Stats
- Properties of a lognormal distribution
- Upper percentile estimate calculation & interpretation
- Tolerance Limit calculation & interpretation

Bayesian Decision Analysis (BDA)
- Properties of a lognormal distribution
- Upper percentile estimate calculation & interpretation
- Tolerance Limit calculation & interpretation

Data and Similar Exposure Groups (SEGs)
- Rules for combining data
- Indications that a SEG may need refining

Decision Heuristics and Human Biases
- Common sources of bias in data interpretation and exposure assessment
- How to avoid bias in data interpretation

Exposure Data Interpretation
- Most likely exposure category given data
- Meet the certainty requirement given data

Techniques for Improving Professional Judgments
- Feedback loops (quantitative judgment > monitoring > qualitative judgment)
- Group judgment sessions
- Documentation of rationale
- Break decisions into aggregate parts (Modeling)

Learn More Here

AIHA Registry PROGRAMS™

FREE

Demonstrate Competency and Performance

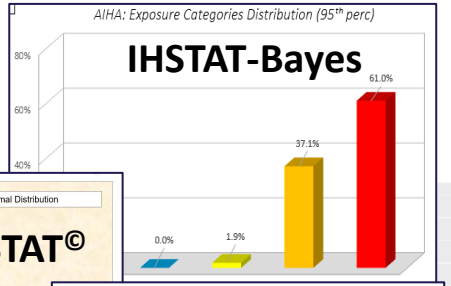
IMPROVING EXPOSURE DECISION ACCURACY: COMPLETE RESOURCE PACKAGE

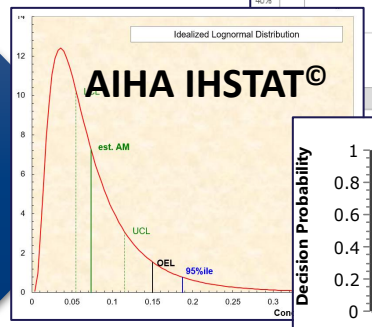
Registered Specialist
Exposure Decision Analysis

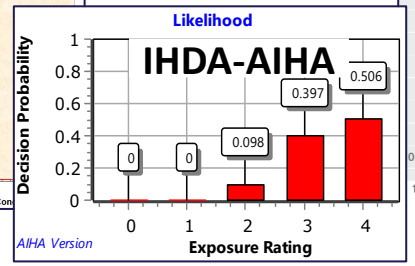
#116674

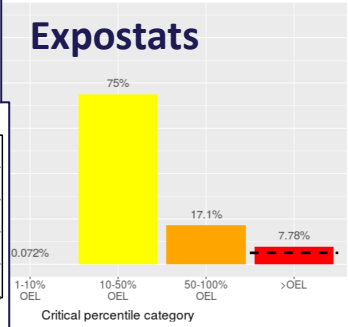
AIHA Registry Programs®

Tools









FREE

Assessment of Competency and Performance

Training

AIHA™

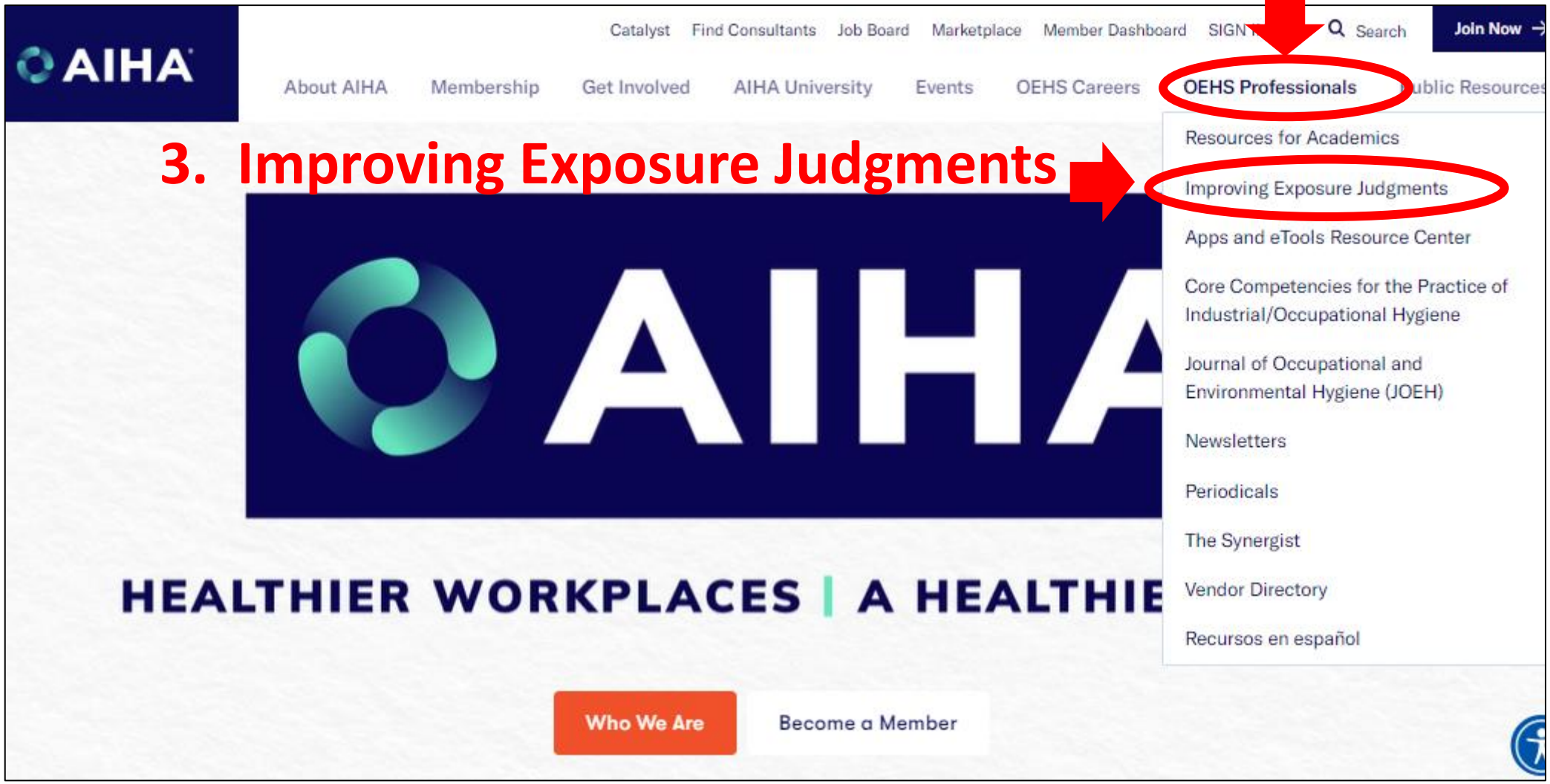
FREE RESOURCES
ANYONE CAN ACCESS

Accessing the Free Tools and Training Materials

1. aiha.org

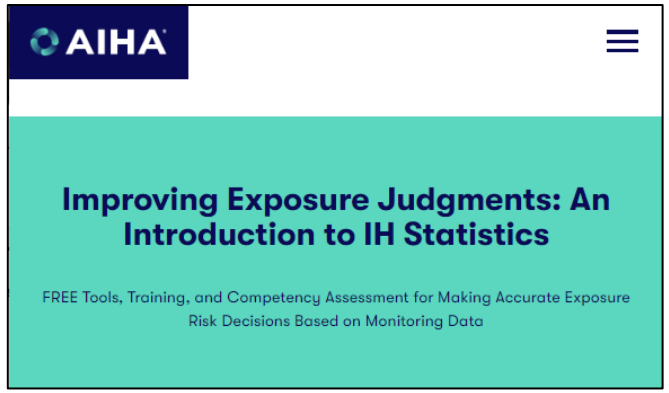
2. OEHS Professionals

3. Improving Exposure Judgments



Free Tools and Training Materials

Improving Exposure Judgments: An Introduction to IH Statistics



Click Here

What's Included:

- **Free Powerful and Easy-To-Use Statistical Tools.**
  - Access tools: click here.
- **Free Stand-Alone Online Webinar.**
  - Access webinar
  - Access topical outline of webinar
- **Free Online Independent Validation of Competency and Performance via the AIHA Exposure Decision Analysis Registry Exam.**
  - Exposure Decision Analysis Registry Program Information Pamphlet
  - Access Registry
- **Free Training Materials for Use by Anyone Conducting Virtual or In-Person Training.**
  - "Making Accurate Exposure Risk Decisions" webinar slides and resources
  - "Improving IH Exposure Judgments: Train-the-Trainer" PDC slides & resources
- **Four Roadmaps on How to Use the Free Materials**

Free Tools and Training Materials

Improving Exposure Judgments: An Introduction to IH Statistics

Four Roadmaps on How to Use the Free Materials

Roadmap #1: Self-study using the standalone online training and assessment

https://www.aiha.org/public-resources/aiha-academic-portal/roadmap-1-self-study-using-the-standalone-online-training-and-assessment

Roadmap #2: Instructor assigned independent study using the standalone online training and assessment

https://www.aiha.org/public-resources/aiha-academic-portal/roadmap-2-instructor-assigned-independent-study

Roadmap #3: Integration of the materials into virtual or in-person classroom lecture programs

https://www.aiha.org/public-resources/aiha-academic-portal/roadmap-3-integration-of-training-materials-and-assessment-into-virtual-or-in-person-lecture-programs

Roadmap #4: Hybrid approach that mixes self-study with focused in-person lecture programs

https://www.aiha.org/public-resources/aiha-academic-portal/roadmap-3-mixed-online-and-in-person-training-and-assessment

Free Tools and Training Materials

Improving Exposure Judgments: An Introduction to IH Statistics

ROADMAP #4: Mixed Online and In-Person Training and Assessment

1. **Teachers** review the free training materials from the webinar and from the Train-the-Trainer PDC.
2. **Teachers** select appropriate materials that emphasize key points and reinforce critical learning objectives for incorporation into their limited focus lecture and discussion program.
3. **Teachers** create an assignment for learners to complete steps 4 through 7 by a certain due date.
4. **Learners** download (and install if necessary) software for performing statistical analysis of data.
5. **Learners** complete the free “Making Accurate Exposure Risk Decisions” Webinar.
6. **Learners** complete the free “Practice Exam” associated with the webinar.
7. For missed practice exam questions, **learners** review the correct exam answers along with the appropriate sections in the webinar and provided worked examples to reinforce correct learning.
8. **Teachers** conduct lecture program focused on reinforcing key learnings from the webinar.
9. **Learners** use successful completion of the free Exposure Decision Analysis Registry Exam as a demonstration of learning objective competency and proficiency.
10. **Teachers** confirm demonstration of competency and proficiency via AIHA Registry list of Registered Specialists - Exposure Decision Analysis. Upon successful completion of the exam, learner’s name will be featured on the AIHA Registry List of Registered Specialists: Exposure Decision Analysis.

LEARN MORE

Learn More:

Papers - Bayesian Analysis :

- Hewett, P., Logan, P., Mulhausen, J., Ramachandran, G., and Banerjee, S.: “Rating Exposure Control using Bayesian Decision Analysis”, Journal of Occupational and Environmental Hygiene, 3: 568–581, 2006
- Jérôme Lavoué, Lawrence Joseph, Peter Knott, Hugh Davies, France Labrèche, Frédéric Clerc, Gautier Mater, Tracy Kirkham, “Expostats: A Bayesian Toolkit to Aid the Interpretation of Occupational Exposure Measurements”, Annals of Work Exposures and Health, Volume 63, Issue 3, April 2019, Pages 267–279

Papers – Improving Exposure Decision Accuracy

- Logan P., G. Ramachandran, J. Mulhausen, S. Banerjee, and P. Hewett “Desktop Study of Occupational Exposure Judgments: Do Education and Experience Influence Accuracy?” Journal of Occupational and Environmental Hygiene, 8:12, 746-758, 2011.
- Logan P., G. Ramachandran, J. Mulhausen, and P. Hewett:” Occupational Exposure Decisions: Can Limited Data Interpretation Training Help Improve Accuracy?” Annals of Occupational Hygiene, Vol. 53, No. 4, pp. 311–324, 2009.
- Vadali, M. G. Ramachandran, J. Mulhausen, S. Banerjee, "Effect of Training on Exposure Judgment Accuracy of Industrial Hygienists”. Journal of Occupational & Environmental Hygiene. 9: 242–256, 2012.
- Arnold S., M. Stenzel, D. Drolet, G. Ramachandran; Journal of Occupational and Environmental Hygiene, 13, 159-168, 2016

Learn More:

- **Books:**
  - A Strategy for Assessing and Managing Occupational Exposures. 4th Ed. AIHA Press. 2015.
- **Opinion:**
  - Mulhausen, J. “Faulty Judgment” President’s Message. The Synergist. (November 2021). Access HERE
  - Mulhausen, J. “How to Improve Exposure Judgments” President’s Message. The Synergist. (December 2021). Access HERE
  - Mulhausen, J. “Standards of Care: Competence PLUS Performance” President’s Message. The Synergist. (January 2022). Access HERE
  - Mulhausen, J. “Acknowledging and Addressing Our Blind Spots” President’s Message. The Synergist. (March 2022). Access HERE
  - Martin, K., Murphy, M. and Taruru S. “How “Professional” Is Professional Judgment?” Viewpoint. The Synergist. (December 2022). Access HERE
- **Video Webinar:**
  - Mulhausen, J. “Top 10 Imperatives for the AIHA Exposure Risk Management Process.” Free from AIHA HERE

CHALLENGING THE STATUS QUO
REFLECTIONS ON FACILITATING CHANGE

REFLECTIONS ON FACILITATING CHANGE

AIHA Initiative	3M Program

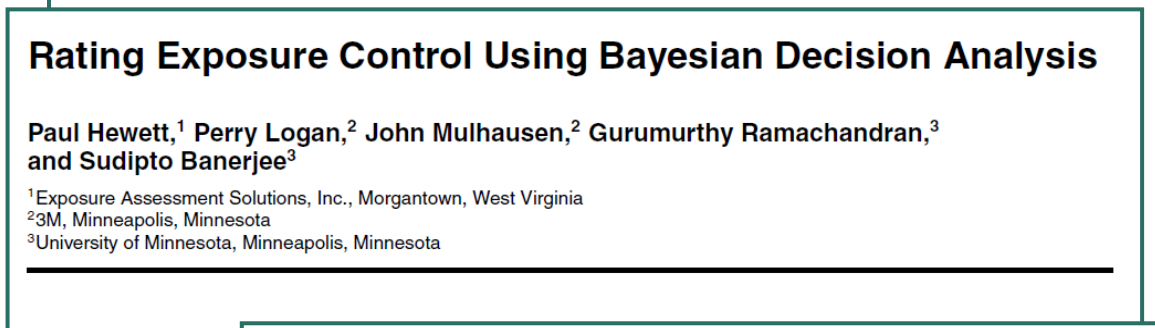
REFLECTIONS ON FACILITATING CHANGE

AIHA Initiative	3M Program
AIHA – ACGIH Defining the Science	P2R2P Partnerships to Advance Our Science: 3M <-> U of MN <-> AIHA <-> NIOSH

Desktop Study of Occupational Exposure Judgments: Do Education and Experience Influence Accuracy?

Perry W. Logan,[1,2] Gurumurthy Ramachandran,[1] John R. Mulhausen,[1,2] Sudipto Banerjee,[3] and Paul Hewett[4]

[1]Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Minneapolis, Minnesota
[2]3M Company, St. Paul, Minnesota
[3]Division of Biostatistics, School of Public Health, University of Minnesota, Minneapolis, Minnesota
[4]Exposure Assessment Solutions, Inc., Morgantown, West Virginia



Rating Exposure Control Using Bayesian Decision Analysis

Paul Hewett,[1] Perry Logan,[2] John Mulhausen,[2] Gurumurthy Ramachandran,[3] and Sudipto Banerjee[3]

[1]Exposure Assessment Solutions, Inc., Morgantown, West Virginia
[2]3M, Minneapolis, Minnesota
[3]University of Minnesota, Minneapolis, Minnesota

Effect of Training on Exposure Judgment Accuracy of Industrial Hygienists

Monika Vadali,[1] Gurumurthy Ramachandran,[1] John R Mulhausen,[2] and Sudipto Banerjee[3]

[1]Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Minneapolis, Minnesota
[2]3M Company, St. Paul, Minnesota
[3]Division of Biostatistics, School of Public Health, University of Minnesota, Minneapolis, Minnes

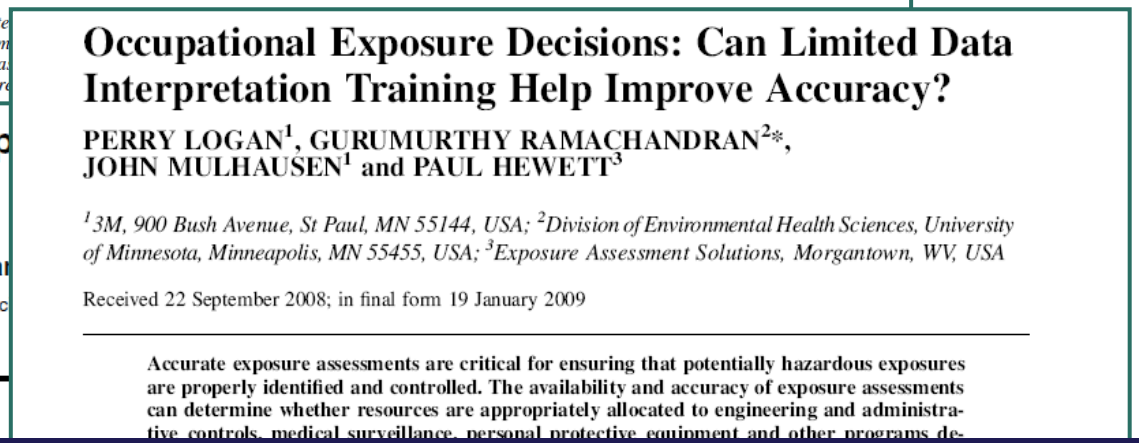
Results are presented from a study that investigated the

INTRODUCTION

Exposure Modeling in Occup Decision Making

Monika Vadali,[1] Gurumurthy Ramachandra

[1]University of Minnesota, Division of Environmental Health Sc Minneapolis, Minnesota
[2]3M Company, St. Paul, Minnesota



Occupational Exposure Decisions: Can Limited Data Interpretation Training Help Improve Accuracy?

PERRY LOGAN[1], GURUMURTHY RAMACHANDRAN[2]*, JOHN MULHAUSEN[1] and PAUL HEWETT[3]

[1]3M, 900 Bush Avenue, St Paul, MN 55144, USA; [2]Division of Environmental Health Sciences, University of Minnesota, Minneapolis, MN 55455, USA; [3]Exposure Assessment Solutions, Morgantown, WV, USA

Received 22 September 2008; in final form 19 January 2009

Accurate exposure assessments are critical for ensuring that potentially hazardous exposures are properly identified and controlled. The availability and accuracy of exposure assessments can determine whether resources are appropriately allocated to engineering and administrative controls, medical surveillance, personal protective equipment and other programs de-

REFLECTIONS ON FACILITATING CHANGE

AIHA Initiative	3M Program
AIHA – ACGIH Defining the Science	P2R2P Partnerships to Advance O 3M <-> U of MN <-> AIHA <-> NIC
Standards of Care	**Global Safety and Health Plan**

Global Safety and Health Plan (GSHP)

- Worldwide Minimum Heath and Safety Program Requirements
- Foundational Standard of Care Wherever 3M Operates
- Annual Self Assessment
- Safety and Health Audits Performed Against the GSHP Requirements*

  *Including validation of facility's self-assessment scores

Consistent Expectations for Improvement
Manufacturing, Warehouse, Offices, R&D

GSHP Elements

Location Safety and Health Plan
Leadership Attributes
Performance Appraisal
Safety and Health Committee
Staffing and Qualifications
Orientation and Training
Self-Surveys and Evaluations
Safety and Health Records
Employee Involvement and Ownership
Evaluation and Control of Hazards
Life Safety Leading Indicators
24-Hour Safety and Health
Chemical Exposure Management
Process Hazard Management
Ergonomics
Emergency Preparedness
Incident Reporting and Follow-up
Contractor Safety and Health
Medical Surveillance
Biosafety
Medical Records / Confidentiality
Clinical Health Services
Return to Work
Hazard Communication
Respirators
Electrical Safety
Ionizing Radiation
Non-Ionizing Radiation
Powered Industrial Vehicles
Fire Protection and Prevention
Vehicle Safety
Lockout/Tagout
Machine Guarding
Noise Control & Hearing Conservation
Hoist Systems
Fall Protection
Confined Space Entry
Flammable Liquid Handling / Storage
Personal Protective Equipment
Ventilation for Contaminant Control

REFLECTIONS ON FACILITATING CHANGE

AIHA Initiative	3M Program
AIHA – ACGIH Defining the Science	P2R2P Partnerships to Advance Our Science: 3M <-> U of MN <-> AIHA <-> NIOSH
Standards of Care	Global Safety and Health Plan
State of the Art vs. Practice	**EHS Management System**

EHS Management System

- Worldwide Facility / Division / Country EHS Planning Process
- Gap Analysis and Prioritization
- Annual Improvement Plan Development and Implementation
- Quarterly Scorecard Reporting

Global Framework for Continuous Improvement in EHS Performance

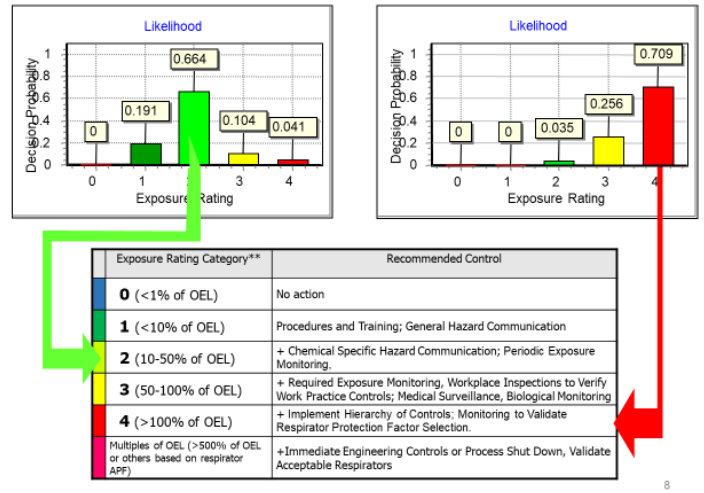
REFLECTIONS ON FACILITATING CHANGE

AIHA Initiative	3M Program
AIHA – ACGIH Defining the Science	P2R2P Partnerships to Advance Our Science: 3M <-> U of MN <-> AIHA <-> NIOSH
Standards of Care	Global Safety and Health Plan
State of the Art vs. Practice	EHS Management System
AIHA – ACGIH Improving Exposure Judgements	**Enterprise-Wide Exposure Assessment and Mgmt. System**

Enterprise-Wide Exposure Assessment and Management System

- Consistent Global Process
- Standardized Risk Decision Criteria
- Reliable Calibration & Risk Prioritization
- Effective & Efficient Risk Management
- Accountability for Improvement

Sustainable Health and Safety:
Process-Based, Not Champion-Based



REFLECTIONS ON FACILITATING CHANGE

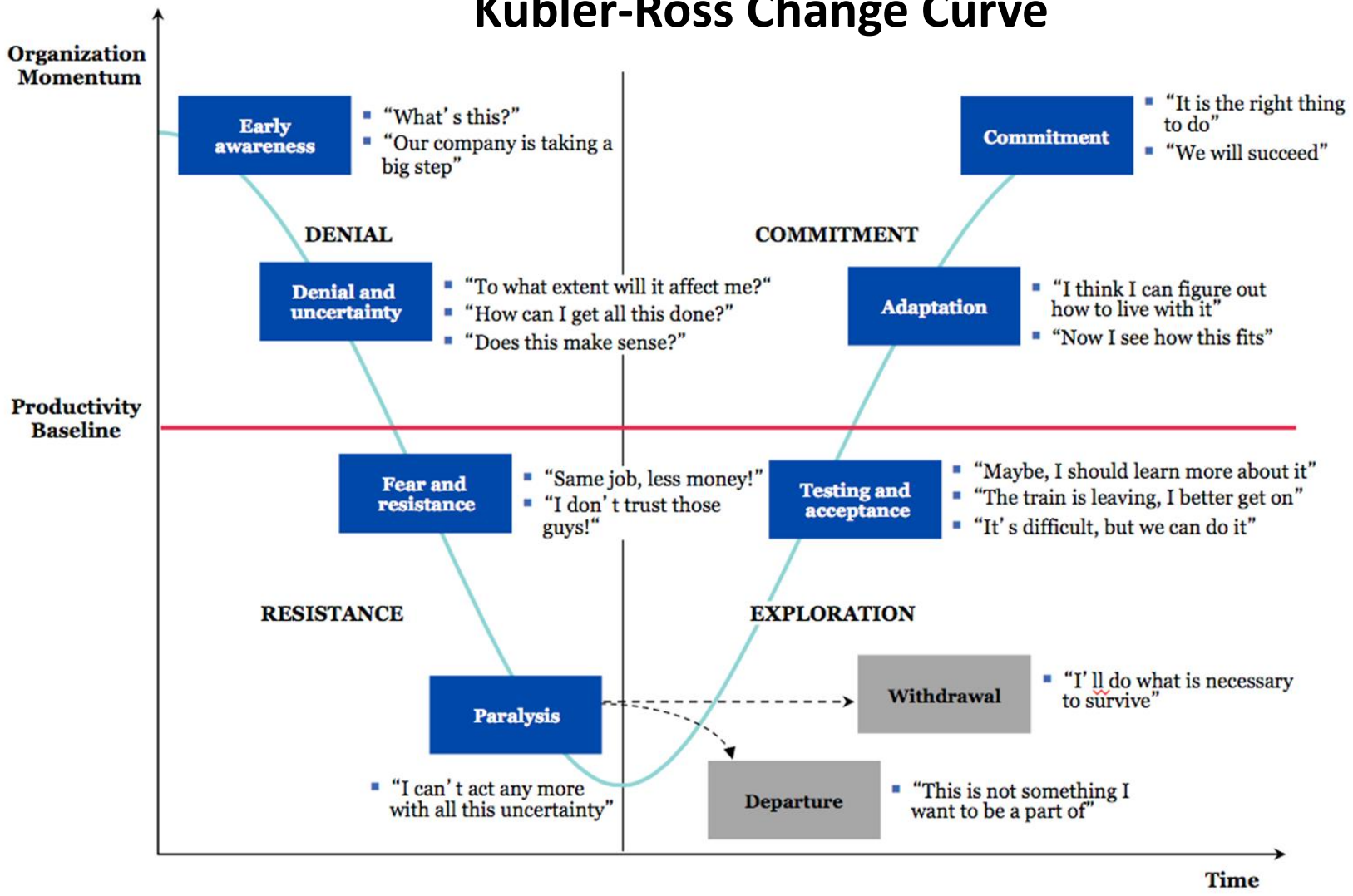
Lessons Learned:

- Change is Threatening
- WIIFM
- Find and Reduce the Barriers
- First Followers
- Continuous Improvement
- Calibration
- Catch 22
- 73 Times

CHANGE IS THREATENING

- Misunderstanding the Need for Change
- Disruptive
- Fear of the Unknown
- Fear of Failure
- Loss of Control
- More Time / Work
- New Process
- New Language

Kubler-Ross Change Curve



Designed while at Deloitte Consulting

WIIFM (WHAT'S IN IT FOR ME???)

- **Why do you do what you do?**
- **How well do you want to do it?**

A WORLD WHERE ALL WORKERS AND THEIR COMMUNITIES ARE HEALTHY AND SAFE

Benefits - As a Professional and as Part of Our Profession

- Better Protect Workers
- Effective and Efficient Risk Management
- Science-Driven Programs to Deliver Shop-Floor Performance
- Improved Credibility
- **We're in this Together - Motivated and Energized!**

WIIFM (WHAT'S IN IT FOR ME???)

WIIFM Reminder:

Industrial Hygiene is a Moral and a Scientific Endeavor

IH Practice: A Combination of Technical and Ethical Decisions.

- Ethical Decisions:
  - Whose risk and benefit?
  - What types of risks and benefits?
- Technical Decisions:
  - Science to better protect workers must be implemented to be effective.

- **Know that many current practices have high likelihood of systematic error . . .**
- **Know that error results in excess risk or cost . . .**
- **Know how to fix it . . .**

FIND AND REDUCE THE BARRIERS

Ask, Listen, Learn, . . . Repeat!

Develop and Implement

- Tools
- Training
- Templates
- Communication Tips and Techniques

IMPORTANCE OF FIRST FOLLOWERS

First Follower:
Leadership Lessons from Dancing Guy

- It is NOT about the leader. It is about the community and the movement.
- It is the first followers that transform a lone nut into a leader.
- Follow and show others how to follow.

- Derek Sivers https://sive.rs/ff

IMPORTANCE OF FIRST ~~FOLLOWERS~~ PARTNERS

First Follower:
Leadership Lessons from Dancing Guy

- It is NOT about the leader. It is about the community and the movement.
- It is the first followers that transform a lone nut into a leader.
- Follow and show others how to follow.

- Derek Sivers https://sive.rs/ff

We don't need a Dancing Guy. We need a Listening Guy. We need a Relational Gal. We need a Curious Guy. We need a person who says, "I've got an idea, but I hope you can make it better." **We need good teachers who aren't out there only doing a high-stepping solo. They're teaching others to dance — and how to dance together."**

- Larry Ferlazzo The Problem with Dancing Guy

IMPORTANCE OF FIRST ~~FOLLOWERS~~ PARTNERS

Please . . . Engage as a First Partner!

Learn to dance, teach others to dance — and how to dance together!

- Earn the Exposure Decision Analysis Registered Specialist Designation
- Submit Science Improvement Needs to the DTS Portal
- Engage with Your Local OEHS Training Programs
- Engage Others in Your Organization
- Present at Your Local Section
- Write a Synergist Article
- Present at AIHce
- Develop a PDC
-
-

YOUR NAME HERE

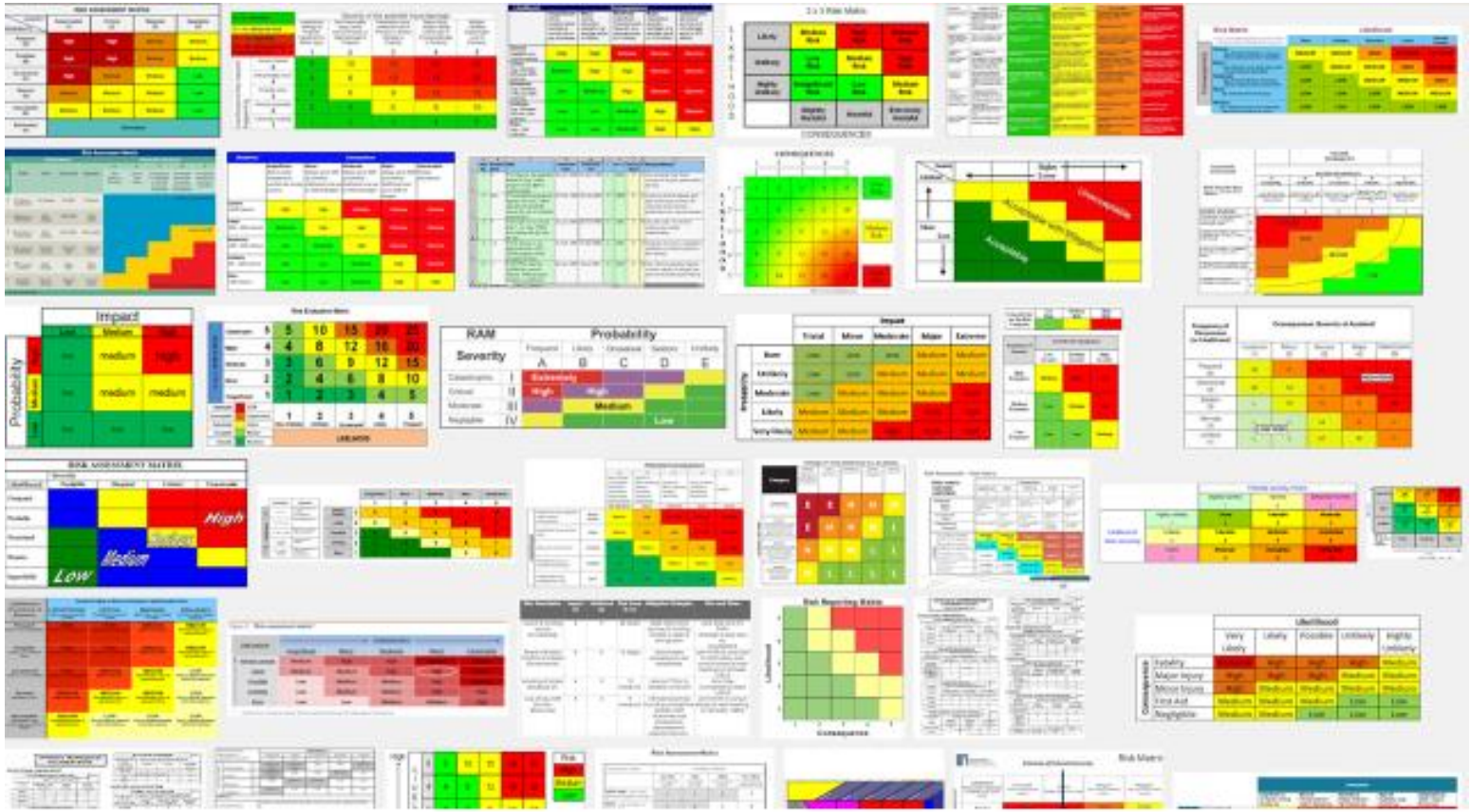
COMMIT TO CONTINUOUS IMPROVEMENT VS. PERFECTION

- Break Into Manageable Pieces
- Multiple Prioritization Steps
- Seek Quick Wins
- Phased-In Implementation
- Leverage Organization Strengths
- Anticipate Set-Backs - Understand That Change is often Messy
- Build in Opportunities for Sharing, Learning and Discussion
- Celebrate Successes

CALIBRATION

Are our risk decisions consistent? Calibrated?

Severity	Likelihood				
	V. High	High	Medium	Low	V. Low
V. High					
High					
Medium					
Low					
V. Low					



Impact	Catastrophic	Probability	Frequent	Almost Certain	Very High
Consequence	Critical	Likelihood	Probable	Likely	High
Hazard Category	Serious	Frequency	Occasional	Possible	Medium
Severity	Moderate		Remote	Seldom	Low
	Negligible		Improbable	Unlikely	Very Low
	Minor			Rare	

CALIBRATION

Are our risk decisions consistent? Calibrated?

Employee performs a job 100 times per year. If you collected full-shift personal samples on the employee all 100 times, how many times is it acceptable for exposures to exceed the Occupational Exposure Limit (OEL) without a respirator?

39%	1. 0 samples
7%	2. 1 sample
35%	3. 5 samples
17%	4. 10 samples
2%	5. 25 samples
0%	6. 50 samples

46 Responses

How much assurance?

9%	1. 100% Sure
11%	2. 99% Sure
74%	3. 95% Sure
6%	4. 90% Sure
0%	5. 75% Sure
0%	6. 50% Sure

47 Responses

AIHA™

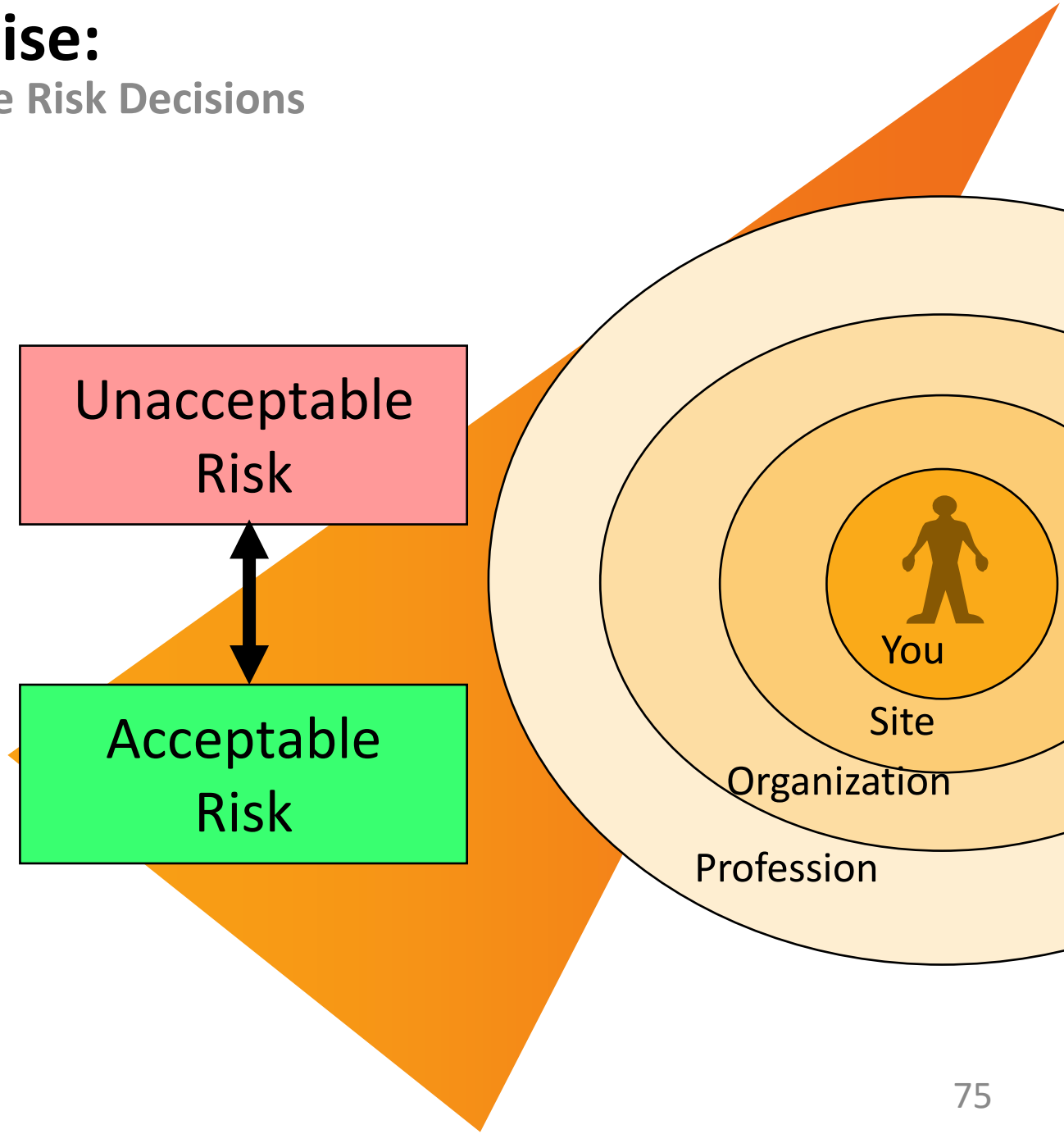
Driving Slow Thinking and Expertise:

Setting Ourselves Up to Make Accurate Exposure Risk Decisions

Learning from our friends in psychology . . .

Use a Structured Approach

- Systematic and transparent processes
- Clear decision rules
- Break judgments into component parts
- Questions and data in a logical order
- Document facts and assumptions
- Discuss with colleagues
- Document decision
- Provide reasons for the decision
- Focused training, coaching, and practice
- Accurate feedback mechanisms



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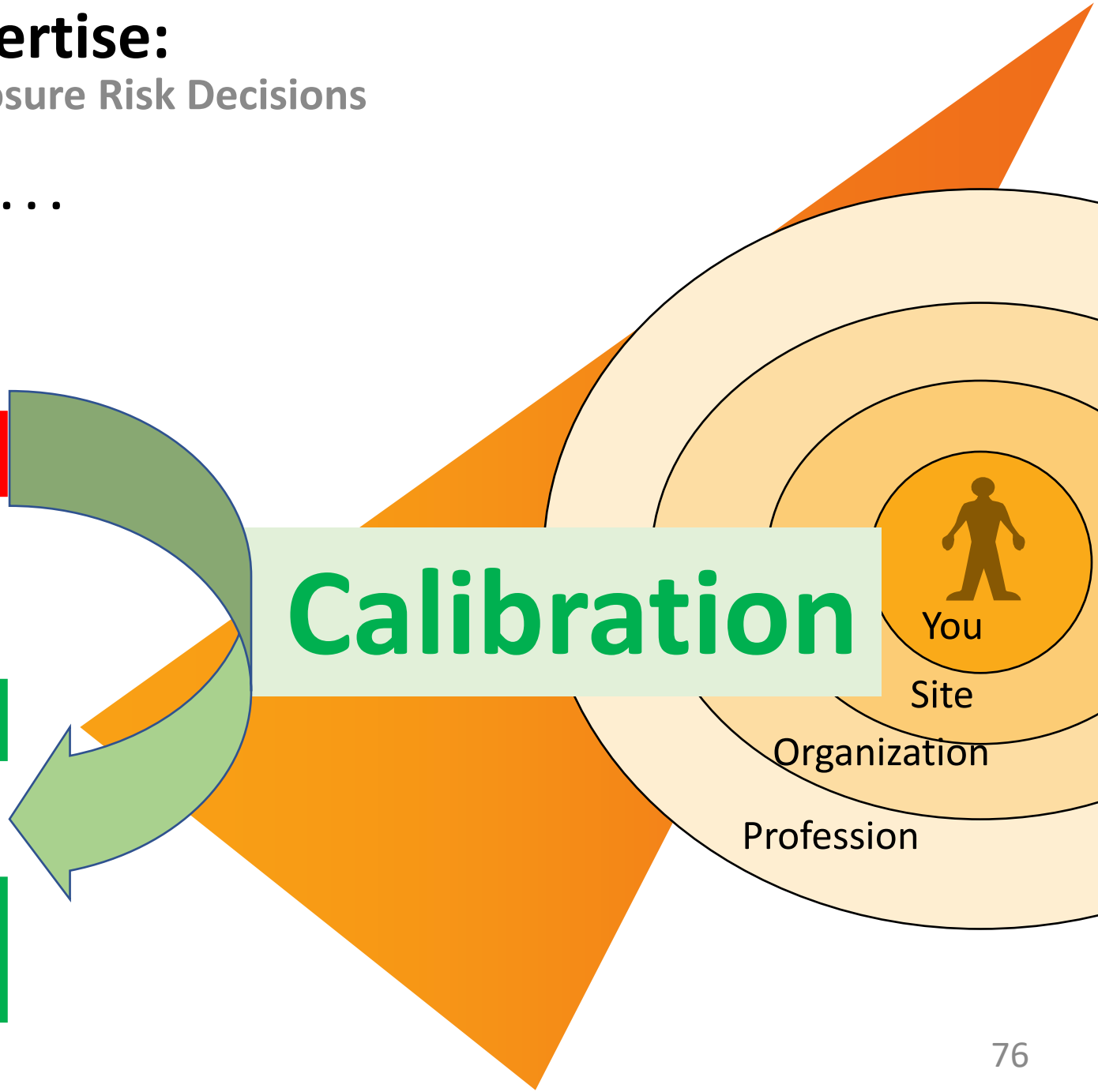


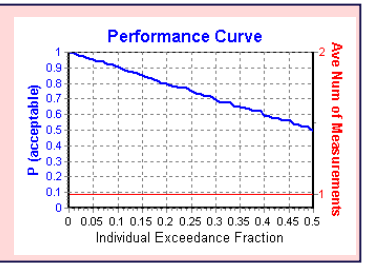
CALIBRATION

Processes and Programs Must Deliver Required Performance

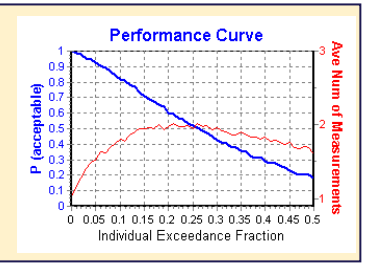
Example Unacceptable Operation:
Exposures Exceed OEL
25% of the Time.

Strategy Performance

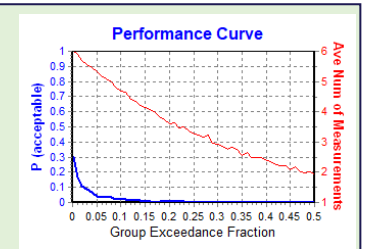
OSHA Strategy
"Acceptable" 75% of the time



NIOSH Action Level Strategy
"Acceptable" 20% to 65% of the time,
depending on GSD



AIHA Strategy
95% confident that 95%ile less than OEL
"Acceptable" <1% of the time



THE CATCH 22 OF ESTABLISHED PROFESSIONAL CULTURE

- **Entrenched Procedures**
- **Training Programs**
- **Accreditation and Certification Requirements**

Complicates Implementation of Needed Changes

e.g.- Exposure Decision Quality Control
- Occ. Exposure Banding (OEB)
- Statistical Analysis of Monitoring Data

(SAY IT) 73 TIMES

Repeat, Repeat, Repeat, Repeat, . . .

Marketing “Rule of 7” X 10 . . . plus a few more

Compelling Message Repeated Often and in Different Ways

“If you’re getting tired of delivering your message,
then good for you. That means you’re doing your job.”
- David Grossman

(SAY IT) 73 TIMES

Spreading the Word: Professionals and Professional Bodies

- AIH Board: 2010
- ABIH Board: 2010
- Academic SIG: 2010
- Academic Advisory Committee: 2010
  (ABET Requirements)
- PDC at NIOSH: 2008 and 2022
- IOHA Presentations: 2022
- Numerous PDCs & Presentations: 2000 to 2023
  AIHce, PCIH, Local Sections, Korea, Singapore, UK, Brazil,
  So. Africa, India, Australia, Canada

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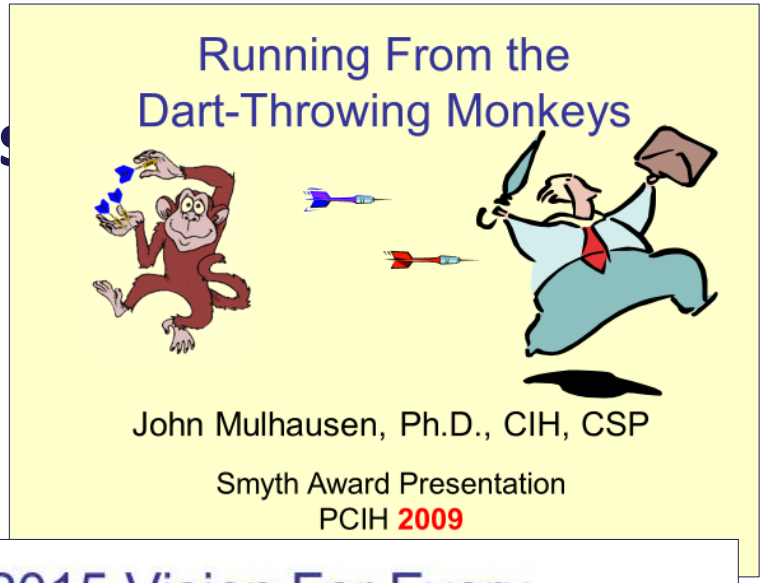

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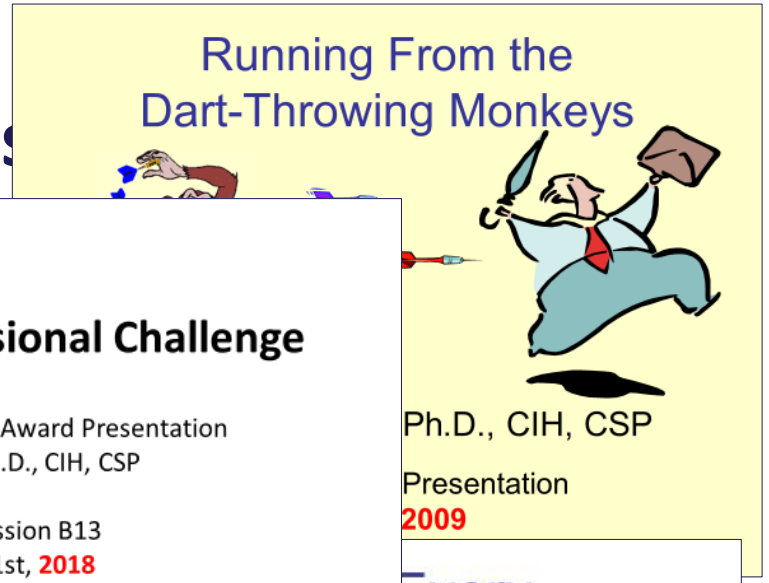
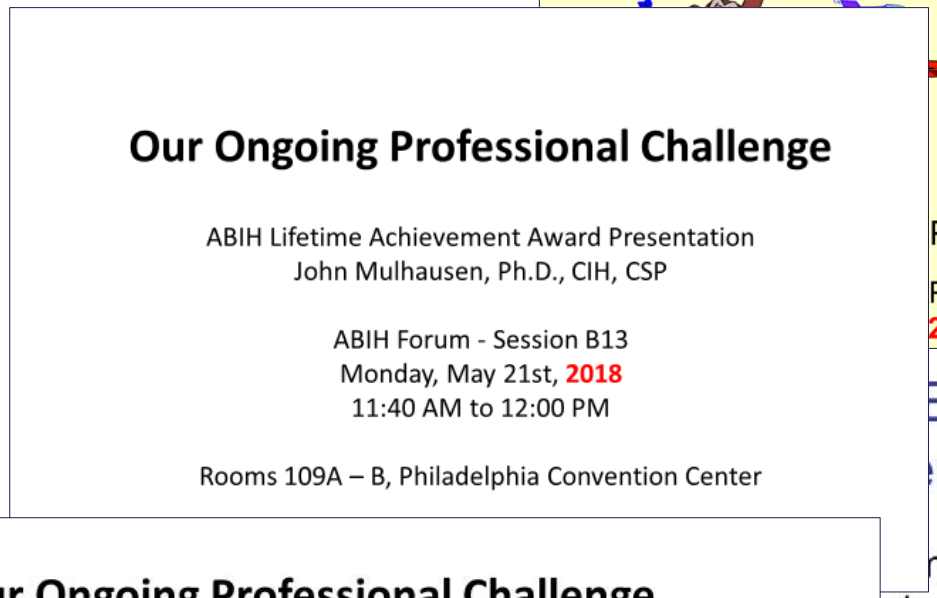




(SAY IT) 73 TIMES

Spreading the Word: Professionals and Profes

PRESIDENT'S MESSAGE

Making Research Work for Practitioners

PRESIDENT'S MESSAGE

Standards of Care: Competence *Plus* Performance

PRESIDENT'S MESSAGE

Faulty Judgment

BY JOHN MULHAUSEN, AIHA PRESIDENT

PRESIDENT'S MESSAGE

New Tools for Exposure Judgments

BY JOHN MULHAUSEN, AIHA PRESIDENT

PRESIDENT'S MESSAGE

Occupational Exposure Banding: No More Excuses

PRESIDENT'S MESSAGE

Acknowledging and Addressing Our Blind Spots

BY JOHN MULHAUSEN, AIHA PRESIDENT

PRESIDENT'S MESSAGE

How to Improve Exposure Judgments

BY JOHN MULHAUSEN, AIHA PRESIDENT

PRESIDENT'S MESSAGE

A Culture Change for OEHS

BY JOHN MULHAUSEN, AIHA PRESIDENT

r Ongoing Professional Challenge

ABIH Lifetime Achievement Award Presentation
John Mulhausen, Ph.D., CIH, CSP

ABIH Forum - Session B13
Monday, May 21st, 2018
11:40 AM to 12:00 PM

Rooms 109A – B, Philadelphia Convention Center

Professional Challenge

2020 ~~2015~~ Vision For Every Industrial Hygienist

- Use statistical tools every time we make exposure judgments based on monitoring.
- Participate in at least one activity every year to improve judgment accuracy.

Running From the Dart-Throwing Monkeys

Ph.D., CIH, CSP

Presentation
2009

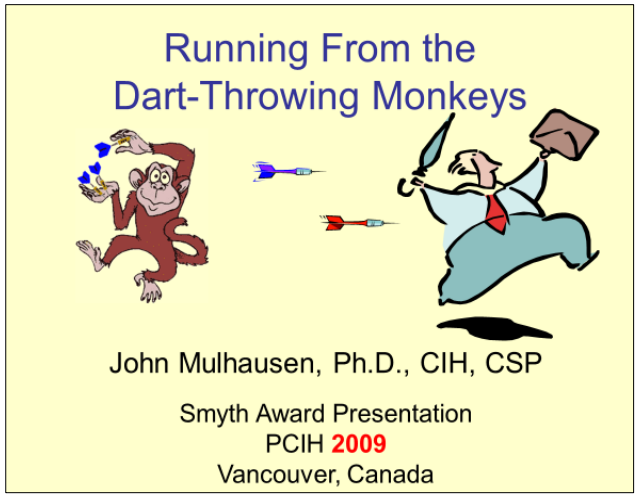
Every
nist

ne we make
ed on monitoring.
activity every
accuracy.

AIHA – 2022 TO 2024 STRATEGIC PLAN

Initiative	Purpose
AIHA – ACGIH Defining the Science	Advance our science to improve the ability of practitioners to protect workers and communities.
Standards of Care	Define minimum practice performance expectations for ensuring acceptable worker protection.
State of the Art vs. Practice	Implement a continuous improvement strategy to close gaps between current practice and the state of the art and minimum standards of care.
AIHA – ACGIH Improving Exposure Judgements	Accelerate adoption of the use of IH statistical and other tools to improve the accuracy of worker exposure assessments.

A world where all workers and their communities are healthy and safe



Brainstorming just a few opportunities . . .

AIHA

- Tools Development
- Proficiency Data Interpretation (PDI) Program . . . Like PAT program
- International Affairs – Outreach to International practitioners and organizations
- AIHA Committees: Mechanisms to improve Judgment Accuracy in various technical niches

Local Sections

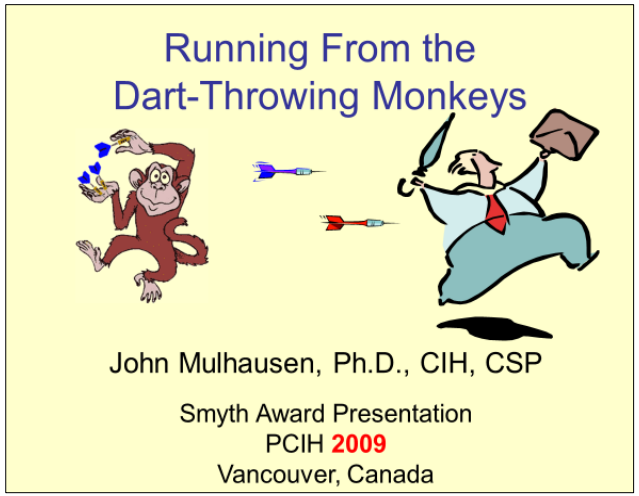
- Training Programs
- Facilitate “Decision Criteria” Discussion

ACGIH

- Promote expectation for accurate judgments and data interpretation as part of good science when using TLVs

AIH

- Lead role for coordinating efforts
- ABET Accreditation Requirements
- Specific ethics training
- Core Competency Rigor



Brainstorming just a few opportunities . . .

ABIH
- Ongoing judgment training requirements for CIH. . . ethics

NIOSH
- Re-write yellow book
- Research
- Tool development
- Put into practice with HHEs
- R2P → Promote Solutions
- Training Programs - Review during ERC grant application process

OSHA
- Generic Exposure Assessment Standard
- Incorporate into revised PEL regulation or legislation
- Discussion point when reviewing company programs
- VPP requirement

Universities
- Incorporate into training programs - Academic SIG

Q&A

"It always seems impossible until it's done.“

- Nelson Mandela

THANK YOU

HEALTHIER WORKPLACES

A HEALTHIER WORLD

JOHN MULHAUSEN, PH.D., FAIHA

jrmulhausen@gmail.com

Certified Industrial Hygienist

CSP

#116674

Registered Specialist
Exposure Decision Analysis

AIHA Registry Programs®