# Assessment of contractor safety (ACES) through prequalification organizational surveys

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http://acesprequal.org/
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# Many organizational safety prequalification surveys exist

- Need for evaluating contractors safety
  - Choosing the right contractors matters
- Utilize an organizational survey
  - Validation of surveys have not been described
  - Many rely on lagging indicators
    - Injuries, EMR, OSHA performance
  - Can they capture culture?

# Aims of ACES:

Aim 1: Starting with existing survey, develop a new pre-qualification assessment survey that captures contractors' health and safety culture

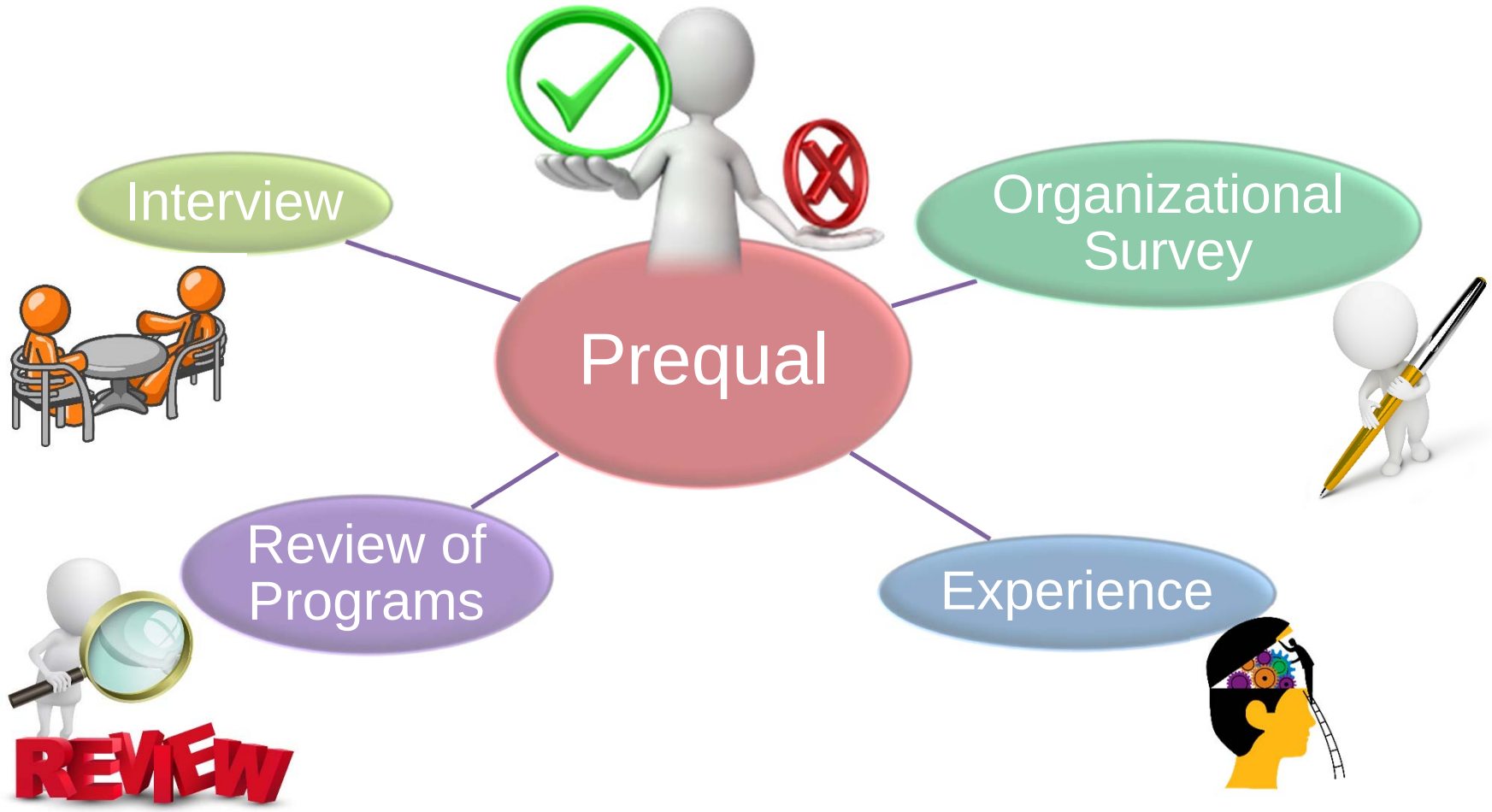
1) *quantitative analysis* of existing survey with > 2000 companies
2) *qualitative evaluation* and review of current surveys

Aim 2: Evaluate the performance of Aim 1's assessment tool on 25 projects.

# Outline

- What do folks do (everything)
- What organizational surveys exist?
- One survey predicts lagging indicators
- Organizational factors for better safety culture
- Development and testing of a new survey

# Prequalification Information



# What's out there?

- Talked to Folks to hear what processes do they do and what tools do they use?
  - Most use Construct Secure (our bias)

- Searched for surveys
  - Internet search
  - Literature search
  - Network referrals


Liu et al *New Solutions* in revision

# What do they do?

- “We hope that the GCs use the *Construct Secure* scores like we do…to work with subs with lowered scores… interview them… ask them to justify…its not happening effectively.”
- “If company balks at insurance, usually a red flag.”
- “You can tell (safety) by job site cleanliness” “Condition of on site vehicles.”

# What do they do?

- “It’s all up to the [general] contractors – we do what they want us to do.”
- “Sites vary greatly – I can tell how a site will perform based on the [site] supervisor.”
- “The foreman and the crew I send out make a huge difference.”

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# What surveys exist?

## We found 52 surveys with 112 items questions

| Source of Prequalification survey | Number | Percent |
|---|---|---|
| Construction Company (GC or CM) | 28 | 53% |
| Transportation (owner) | 8 | 15% |
| Energy Company (owner) | 6 | 12% |
| Academic Institutions (owner) | 5 | 10% |
| Public Agency (owner) | 3 | 6% |
| Third Party Service | 2 | 4% |
| Total | 52 | 100% |

Liu et al *New Solutions* in revision

# Framework for surveys ($I^2P^2$)

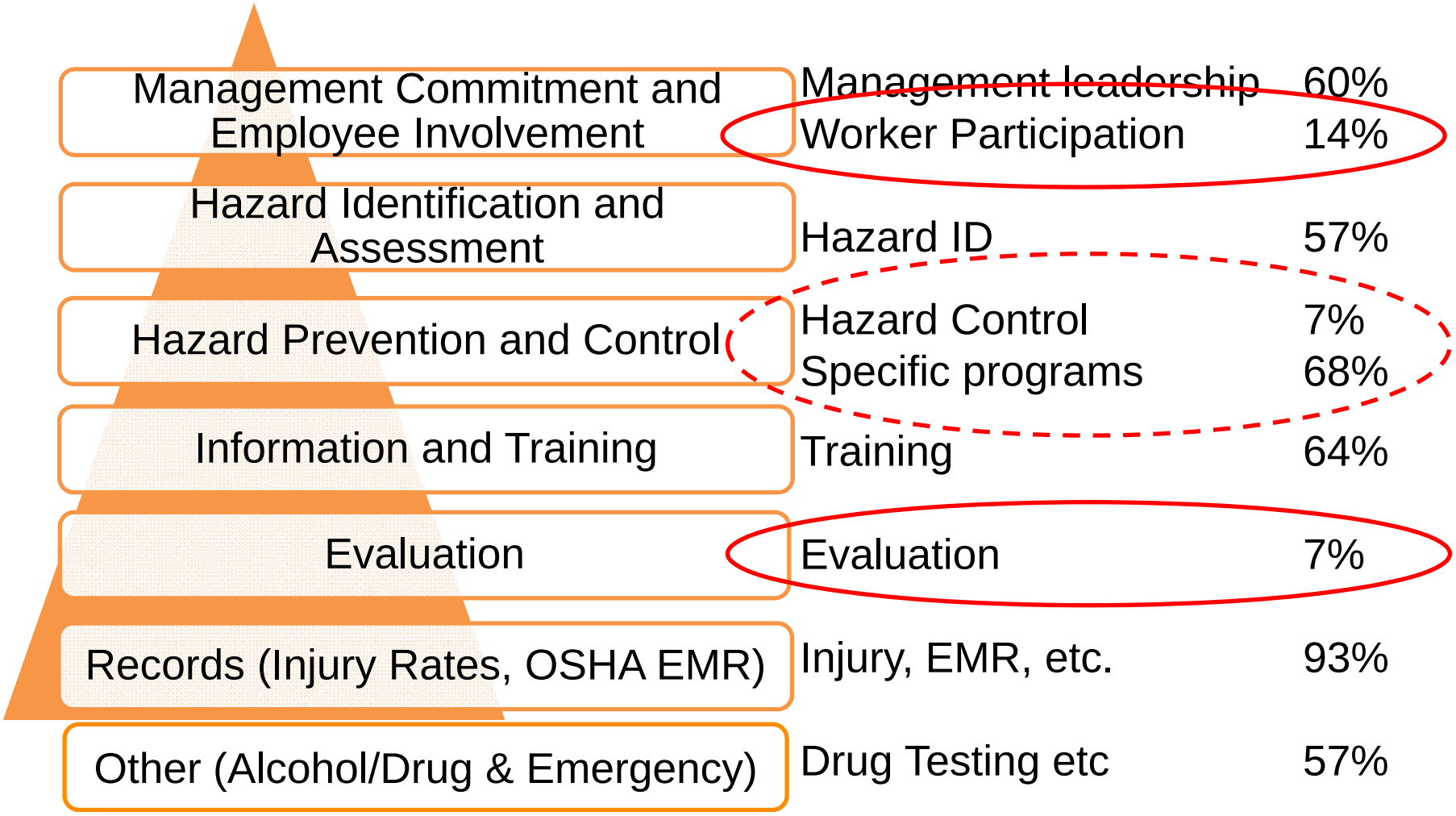

Liu et al *New Solutions* in revision

# 28 Tools from construction companies Framework to help organize ($I^2P^2$)


| | | |
|---|---|---|
| Management Commitment and Employee Involvement | Management leadership | 60% |
| | Worker Participation | 14% |
| Hazard Identification and Assessment | Hazard ID | 57% |
| Hazard Prevention and Control | Hazard Control | 7% |
| | Specific programs | 68% |
| Information and Training | Training | 64% |
| Evaluation | Evaluation | 7% |
| Records (Injury Rates, OSHA EMR) | Injury, EMR, etc. | 93% |
| Other (Alcohol/Drug & Emergency) | Drug Testing etc | 57% |

Liu et al *New Solutions* in revision

# 28 Tools from construction companies Framework to help organize ($I^2P^2$)




Liu et al *New Solutions* in revision

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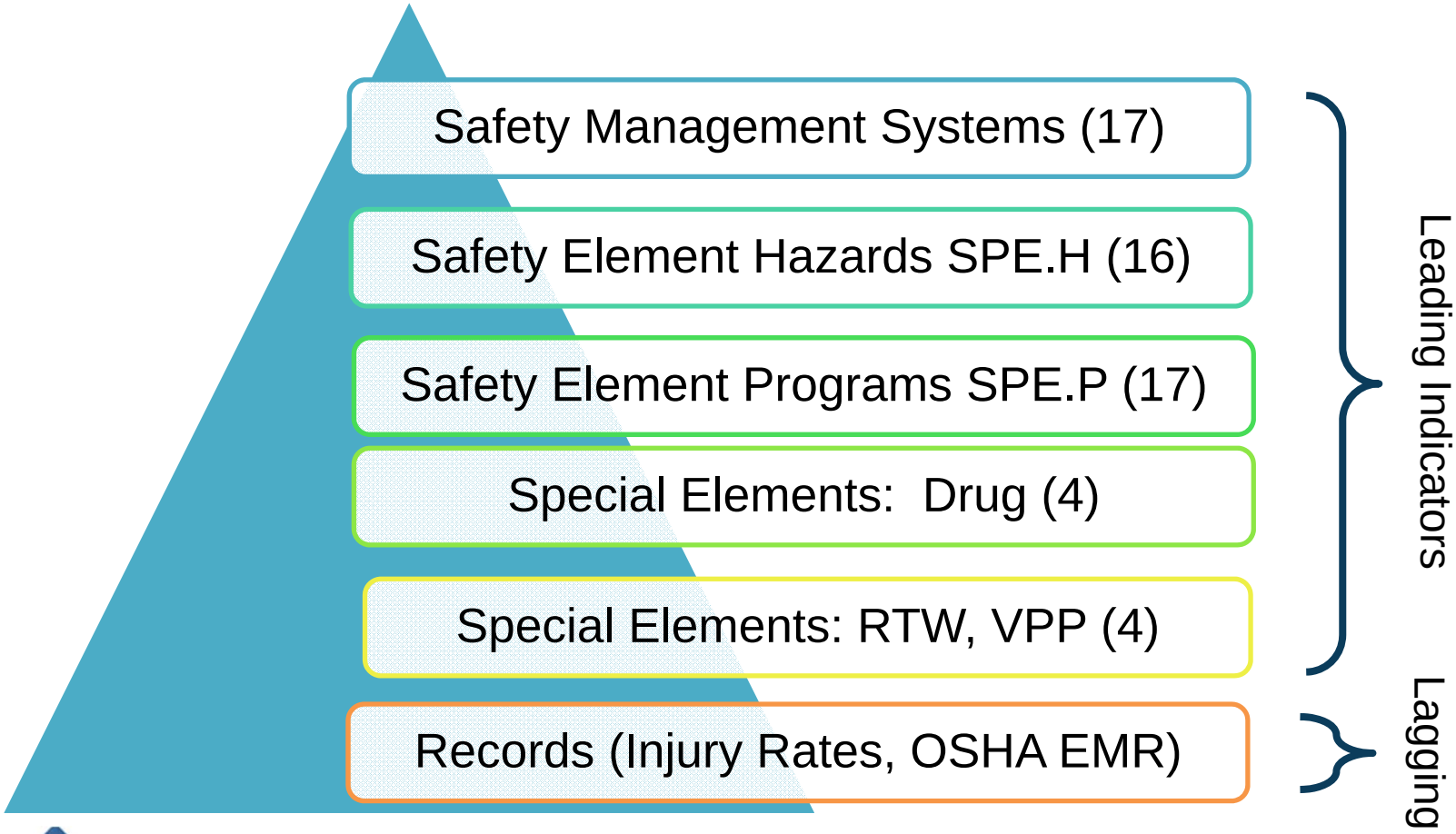
# Construct Secure




ConstructSecure

# Quantitative Analysis (N=2148)

| Table 1: Descriptive Statistics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Statistic (n = 2148) | Maximum Pos Score | Mean | St. Dev. | Min | 25th | 50th | 75th | Max |
| Safety Management System (SMS) | 17 | 14.2 | 3.0 | 0 | 13.0 | 15.0 | 16.2 | 17.0 |
| Safety Program Elements Hazards (SPE.H) | 16 | 4.6 | 4.0 | 0 | 1.1 | 4.0 | 7.0 | 17.0 |
| Safety Program Elements Programs (SPE.P) | 17 | 14.3 | 2.4 | 0 | 13.9 | 15.0 | 16.0 | 16.0 |
| Special Elements (SE) | 4 | 1.1 | 0.9 | 0 | 1.0 | 1.0 | 1.0 | 4.0 |
| Special Elements Drug & Alcohol Screening (SE.D) | 4 | 3.0 | 1.2 | 0 | 2.0 | 4.0 | 4.0 | 4.0 |
| OSHA Citations | 3 | 0.4 | 0.9 | 0 | 0.0 | 0.0 | 0.0 | 3.0 |
| Recordable Cases (RC) per 100FTEs | | 3.0 | 4.4 | 0 | 0.0 | 1.5 | 4.2 | 61.3 |
| Days Away Restricted Transferred (DART) per 100FTEs | | 1.8 | 2.9 | 0 | 0.0 | 0.6 | 2.5 | 32.3 |

Manjourides and Dennerlein, *NOIRS* 2018
Manjourides and Dennerlein, *AJIM* Revision Submitted

# Quantitative Analysis (N=2148)

- Hypothesis/Question
  - Do the leading indicators predict the lagging indicators in the construct secure data base?


- Cross-sectional data analysis with 2015 data.
  - Zero-Inflated Poisson (ZIP) models

Manjourides and Dennerlein, *NOIRS* 2018
Manjourides and Dennerlein, *AJIM* Revision Submitted

# Quantitative Analysis

## Recordable Injury Rates

| Count Model (RRs) | Count Model (RRs) | | Inflation Model (ORs) | |
|---|---|---|---|---|
| **SMS** | **0.95** | **(0.92, 0.98)** | **0.81** | **(0.66, 0.99)** |
| SPE Hazards | 0.99 | (0.97, 1.01) | | * |
| SPE Programs | 1.00 | (0.97, 1.04) | | * |
| SE RTW VPP | 0.98 | (0.88, 1.09) | | * |
| **SE Drug and Alcohol** | **0.83** | **(0.78, 0.89)** | **0.45** | **(0.27, 0.76)** |

*Adjusted for trade and previous OSHA performance*

Manjourides and Dennerlein, *NOIRS* 2018
Manjourides and Dennerlein, *AJIM* Revision Submitted

# Quantitative Analysis (N=2148)

## DART Injury Rates

| Count Model (RRs) | Count Model (RRs) | | Inflation Model (ORs) | |
|---|---|---|---|---|
| **SMS** | **0.93** | **(0.90, 0.96)** | 0.90 | (0.74, 1.09) |
| SPE Hazards | 0.98 | (0.96, 1.00) | | * |
| SPE Programs | 1.03 | (0.99, 1.08) | | * |
| SE RTW VPP | 0.97 | (0.86, 1.10) | | * |
| **SE Drug and Alcohol** | **0.82** | **(0.77, 0.87)** | **0.53** | **(0.29, 0.97)** |

*Adjusted for trade and previous OSHA performance*

Manjourides and Dennerlein, *NOIRS* 2018
Manjourides and Dennerlein, *AJIM* Submitted

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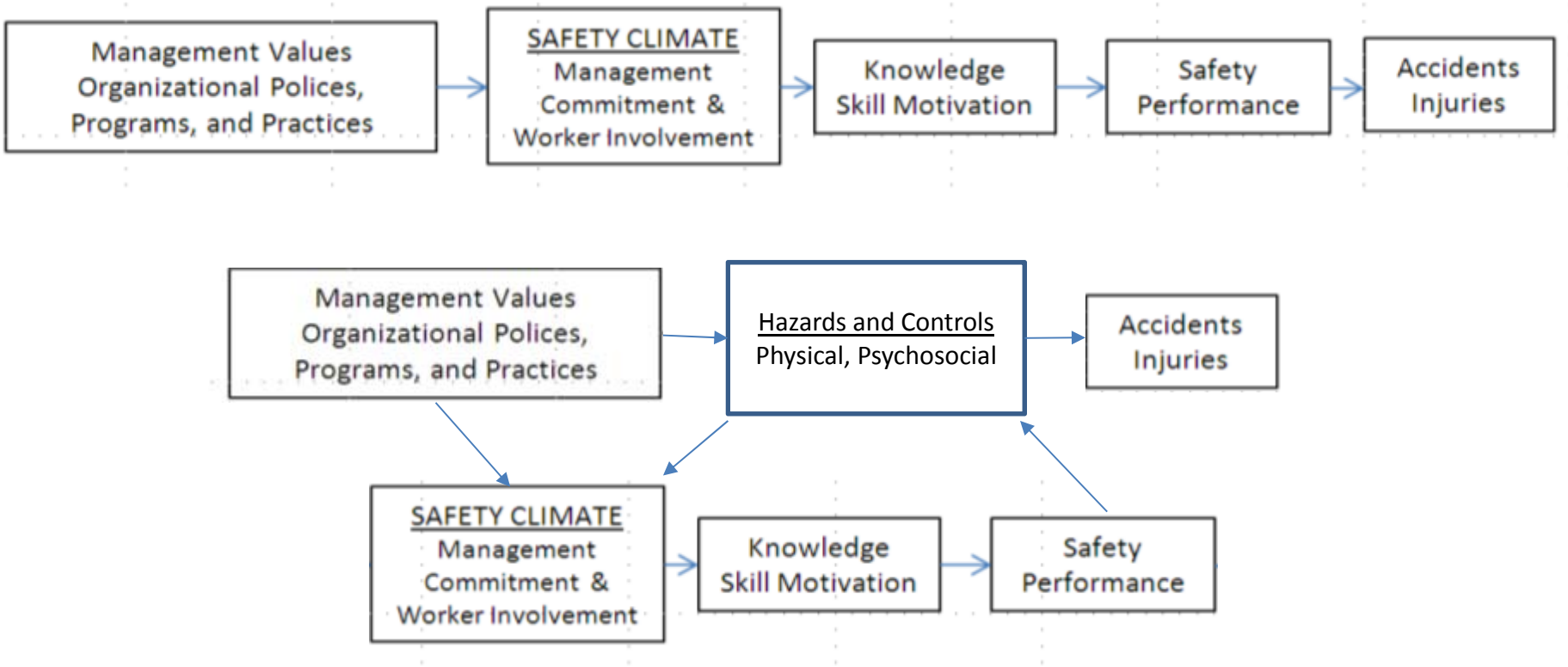
- When we talk about safety culture, what we're talking about are occupational safety and health programs and getting companies to adopt these programs
  - Chris Trahan Cain June 2018

CPWR

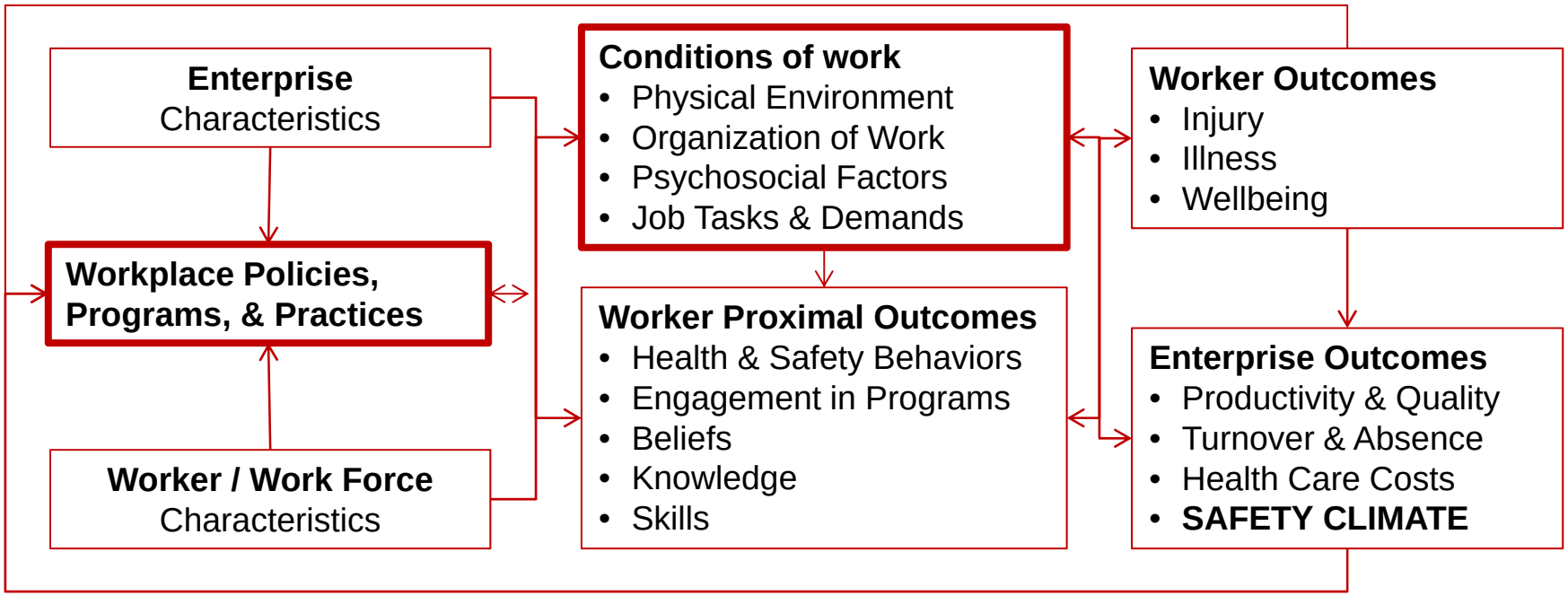
# Models for safety climate




Neal Griffin 2006
Grant, M. *PhD Thesis.* 2016
Marin, Luz *PhD. Thesis*. 2014.
Sparer et al *Scand J Work Environ Health*, 2016 42(4):329-37

# Models for safety climate

HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH | CENTER FOR WORK, HEALTH, & WELL-BEING




Sorensen et al. *Prev Med*. 2016 Aug 12;91:188-196

# Models for safety climate

- All these models start with (1) organizational policies, programs and practices within the (2) context of a political social environment

- To improve climate we need to change both – prequalification helps us
  - It sets up a social expectation
  - It assesses organizational policies, programs, and practices

Susan S. Silbey (2009) Taming Prometheus: Talk About Safety and Culture. *Annu. Rev. Sociol*. 35:341–69

# Safety Climate Assessment Tool
## for Small Contractors

1. Demonstrates Management Commitment to Safety
2. Promotes and Incorporates Safety as a Value
3. Ensures Accountability at All Levels
4. Improves Supervisory Leadership
5. Empowers and Involves Employees
6. Improves Communication
7. Provides Training at All Levels
8. Encourages Owner/Client Involvement

https://www.cpwr.com/research/s-cat-sc-small-contractors

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ACES ASSESSMENT OF CONTRACTOR SAFETY

# Building a Culture of Health

**Six key characteristics of effective interventions**
**Workplace Integrated Safety and Health Assessment**

1. Leadership commitment
2. Participation (Employees and Organized Labor)
3. *Policies, programs, and practices that foster supportive working conditions*
4. Comprehensive and collaborative strategies
5. Adherence
6. Data-driven change

http://centerforworkhealth.sph.harvard.edu/guidelines
Sorensen et al. *JOEM* 2018 Jan 31 [Epub ahead of print] PMID: 29389812


David Michaels

ACES
ASSESSMENT OF CONTRACTOR SAFETY

# OSHA $I^2P^2$

- Management Commitment and Employee Involvement
- Hazard Identification and Assessment
- Hazard Prevention and Control
- Training and Information
- Communication and Evaluation
- Records (Injury Rates, OSHA EMR)

Leading Indicators

Lagging


David Michaels

ACES
ASSESSMENT OF CONTRACTOR SAFETY

Harvard Business Review

# 7 Ways to Improve Operations Without Sacrificing Worker Safety

by David Michaels

1. **Start at the top (Management Commitment)**
2. **Use the right incentives – (Safety Climate)**
3. **Don't blame workers for injuries.**
4. **Rethink how you think about injury rates**
5. **Focus on leading indicators**
6. **Embrace a safety and health management system**
7. **Welcome a regulator as a "cheap consultant."**

https://hbr.org/2018/03/7-ways-to-improve-operations-without-sacrificing-worker-safety

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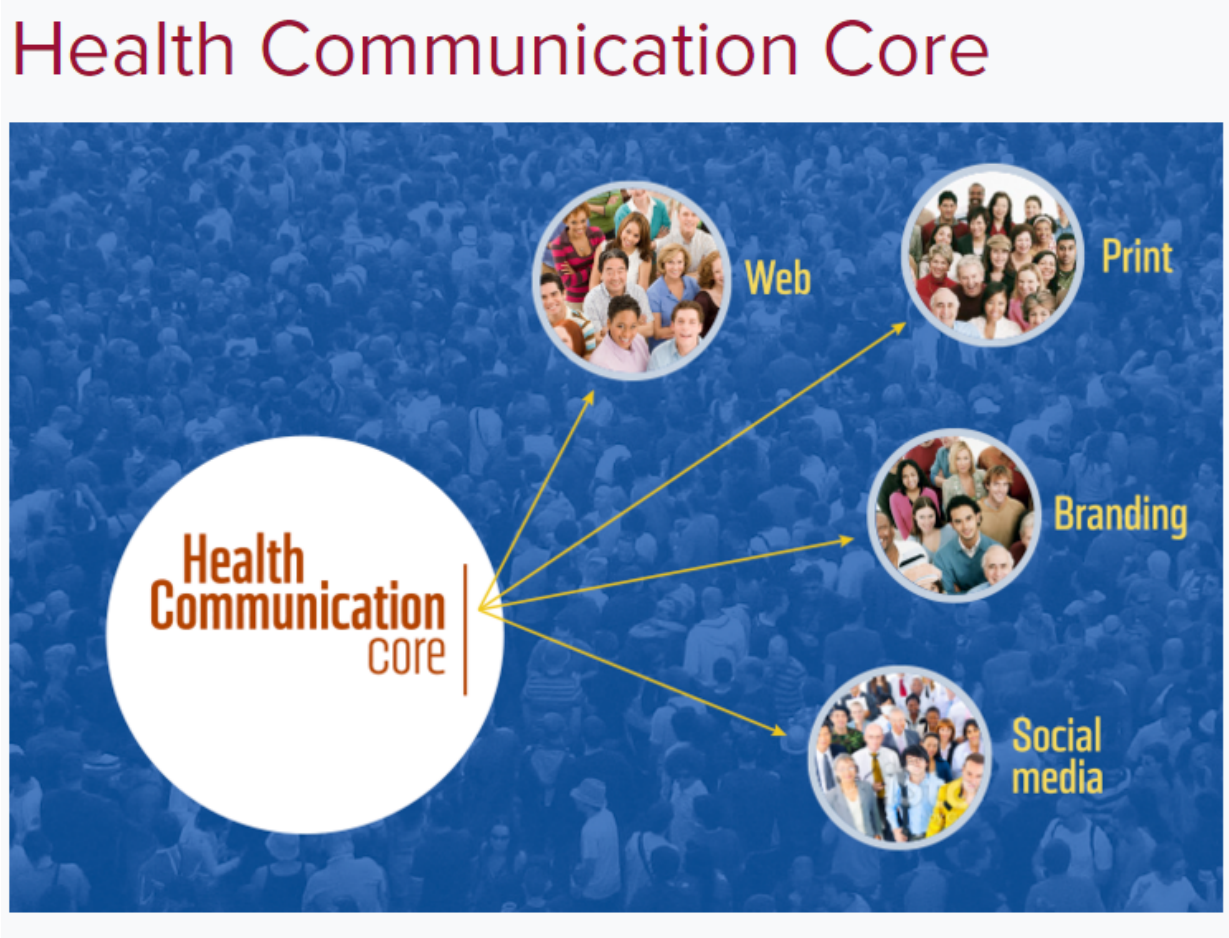
# Integrated these into a tool

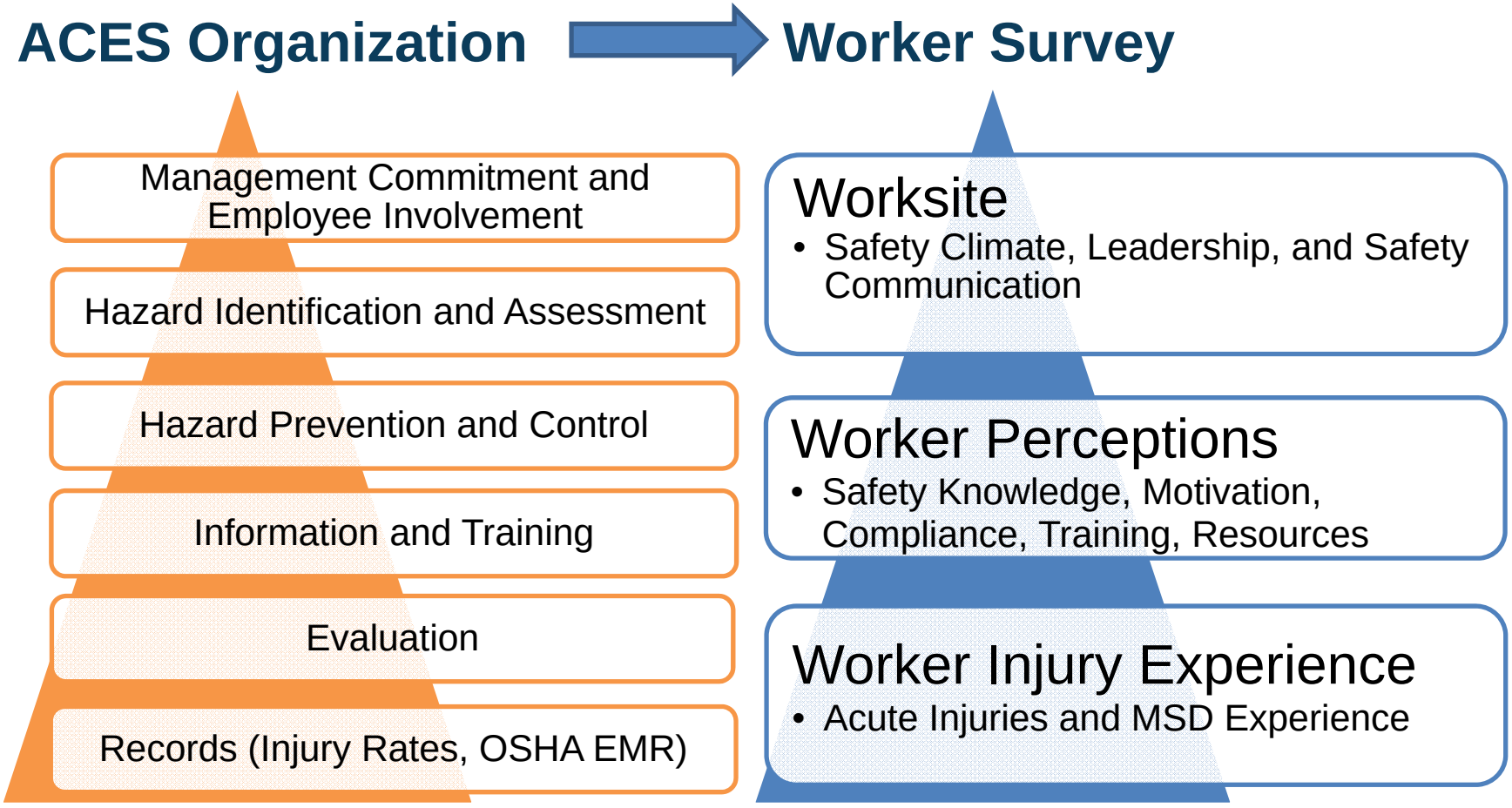
# ACES ($I^2P^2$) – 77 items

| | |
|---|---|
| Management Commitment and Employee Involvement | 18 items |
| Hazard Identification and Assessment | 12 items |
| Hazard Prevention and Control | 16 items → OSHA compliance |
| Information and Training | 12 items → Includes language |
| Evaluation | 7 items |
| Records (Injury Rates, OSHA EMR) | 12 items |
| Other (Alcohol/Drug & Emergency) | 8 items |

# Evolution:
# Cognitive Testing (3 rounds)



# Evaluation:
# Cross-sectional study



# Evaluation:
# Cross-sectional study

**ACES Organization** → **Worker Survey**

- Also look at two other organizations of the ACES Survey.
  - S-CAT
  - WISH
- We'll group questions from ACES into the constructs from S-CAT and WISH and test associations too.

# Evaluation: Cross-sectional

- Cross-sectional analysis of data
  - Does the ACES predict safety climate and or worker injury experiences.
- On 25 sites identify subcontractors and survey workers from these subs.
  - 25 Sites/Projects
  - 1346 worker surveys collected
  - 110 subs identified with enough worker surveys
    - 63 Sub contractors completed ACES (getting more)

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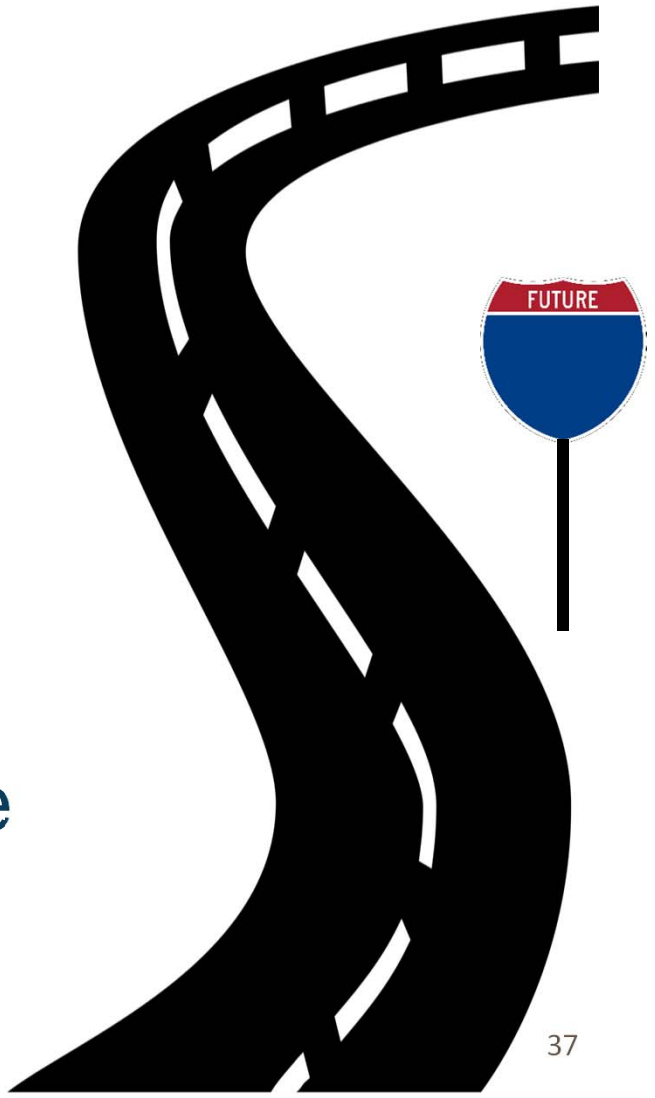
# The Future

- ACES website design is up and running
  - http://acesprequal.org/
  - ACES Tool to be added this winter
    - Paper version and directions on how to apply ACES Tool
    - Electronic version.
- Publishing and presenting the results of the evaluation



# Assessment of contractor safety (ACES) through prequalification organizational surveys.


http://www.northeastern.edu/ergonomics/

**Justin Manjourides, Lauren Murphy, Deborah McLellan, Jamie Tessler, Alvin Liu, Dan Weinstein, Hao Trieu, Ying Loo, Lauren Bigger, Whitney Huyh**

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