

University of Toronto **Engineering**



UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Longitudinal Study of Safety Climate in Ontario Construction Industry

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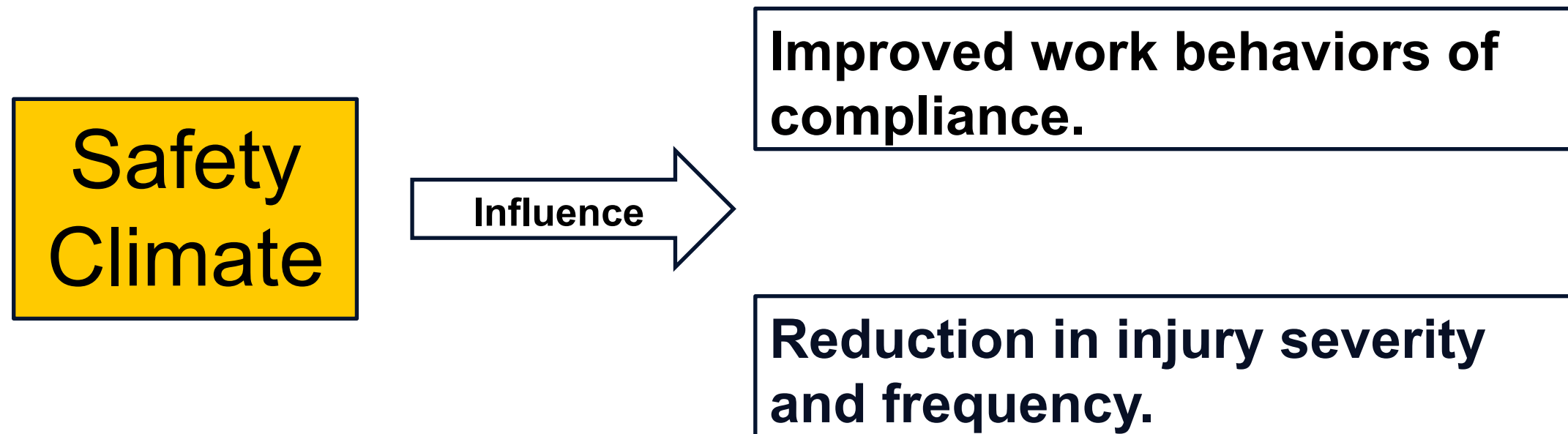
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Safety Climate



Safety climate refers to the perceptions that employees share about their working environments (Zohar 1980).

Stone Example

People have different attitudes when facing problems.

1. Not aware



2. Avoid



3. Improve



Stone Example

- **Site A: 90% of the workers chose “Avoid”.**

2. Avoid



**Negative
safety climate**

- **Site B: 90% chose “improve”.**

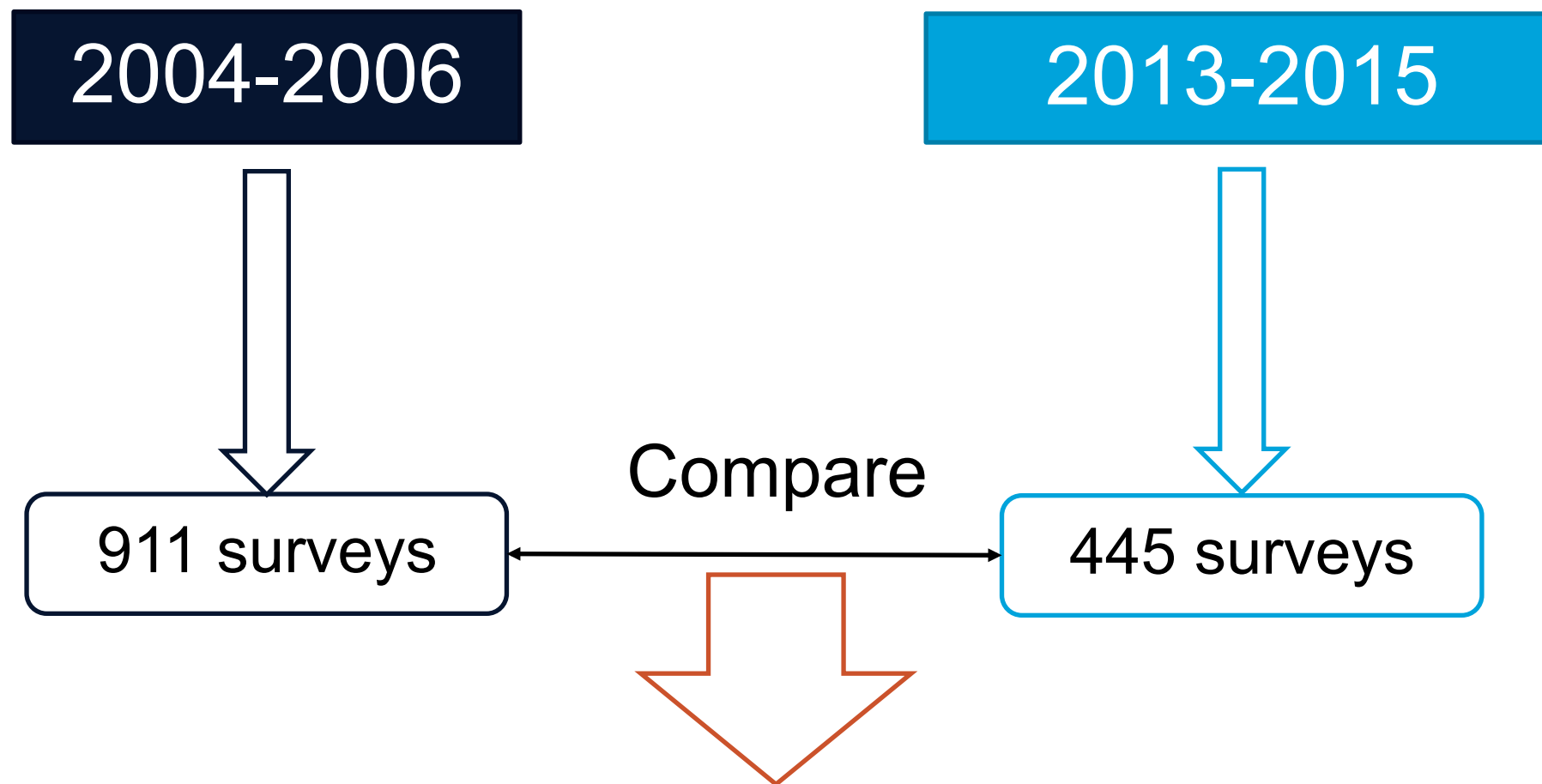
3. Improve



**Positive
safety climate**



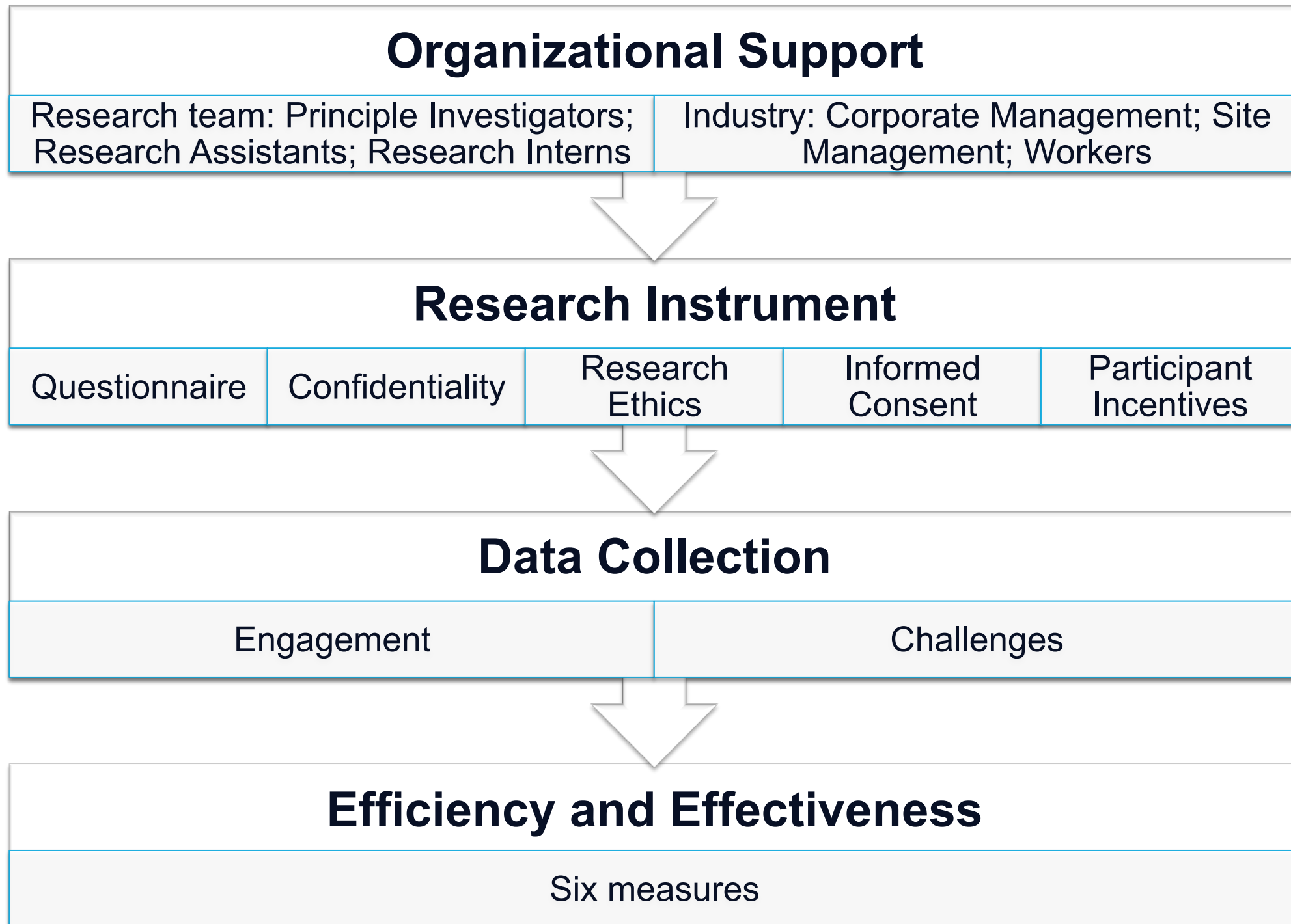
Research Project



Have workers' attitudes toward safety and incidents changed?



Data Collection Framework



Data Collection Efficiency

| Measures | Value |
|--|-------|
| Number of surveys collected | 445 |
| Number of sites contacted | 73 |
| Number of sites participated in the research | 23 |
| Total contact/schedule time (hours) | 1812 |
| Site participation rate | 31.5% |
| Average number of surveys per site | 19 |
| Actual-to-expected surveys | 76% |
| Recruitment time per survey (hours) | 4.1 |
| Sample representativeness | 56% |
| Survey completeness | 94.9% |



Survey Sample

GENERAL INFORMATION:

1. Gender: (circle) Male Female
2. Age: _____
3. What is your trade? _____
4. How long have you worked in mining? _____ YEARS
5. How long have you worked for this employer? _____ YEARS

Three parts are measured:

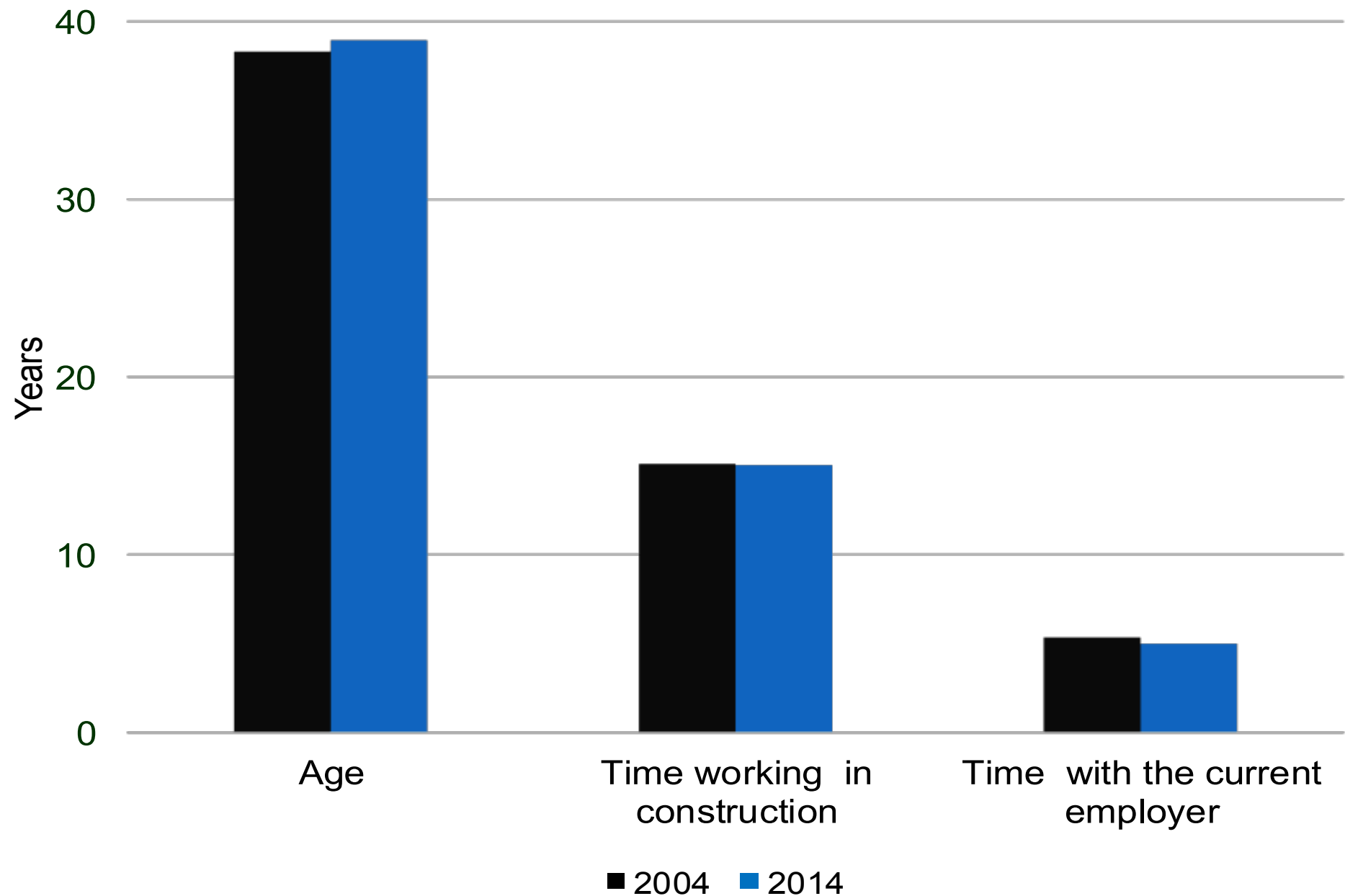
- Workforce demographics
- Attitudes toward safety
- Safety incidents

| | Strongly disagree | Disagree | Uncertain | Agree | Strongly agree |
|---|-------------------|----------|-----------|-------|----------------|
| 24. If I worry about safety all the time I would not get my job done | 1 | 2 | 3 | 4 | 5 |
| 25. I cannot avoid taking risks in my job | 1 | 2 | 3 | 4 | 5 |
| 26. Accidents will happen no matter what I do | 1 | 2 | 3 | 4 | 5 |
| 27. I can't do anything to improve safety in my workplace | 1 | 2 | 3 | 4 | 5 |
| 28. I always wear the protective equipment or clothing required on my job | 1 | 2 | 3 | 4 | 5 |
| 29. I do not use equipment that I feel is unsafe | 1 | 2 | 3 | 4 | 5 |
| 30. If I find some safety issues in my job, I will not continue the work until the problem is fixed | 1 | 2 | 3 | 4 | 5 |
| 31. I inform management of any potential hazards I notice on the job | 1 | 2 | 3 | 4 | 5 |
| 32. I know what procedures to follow if a worker is injured on my shift | 1 | 2 | 3 | 4 | 5 |
| 33. I would know what to do if an emergency occurred on my shift | 1 | 2 | 3 | 4 | 5 |

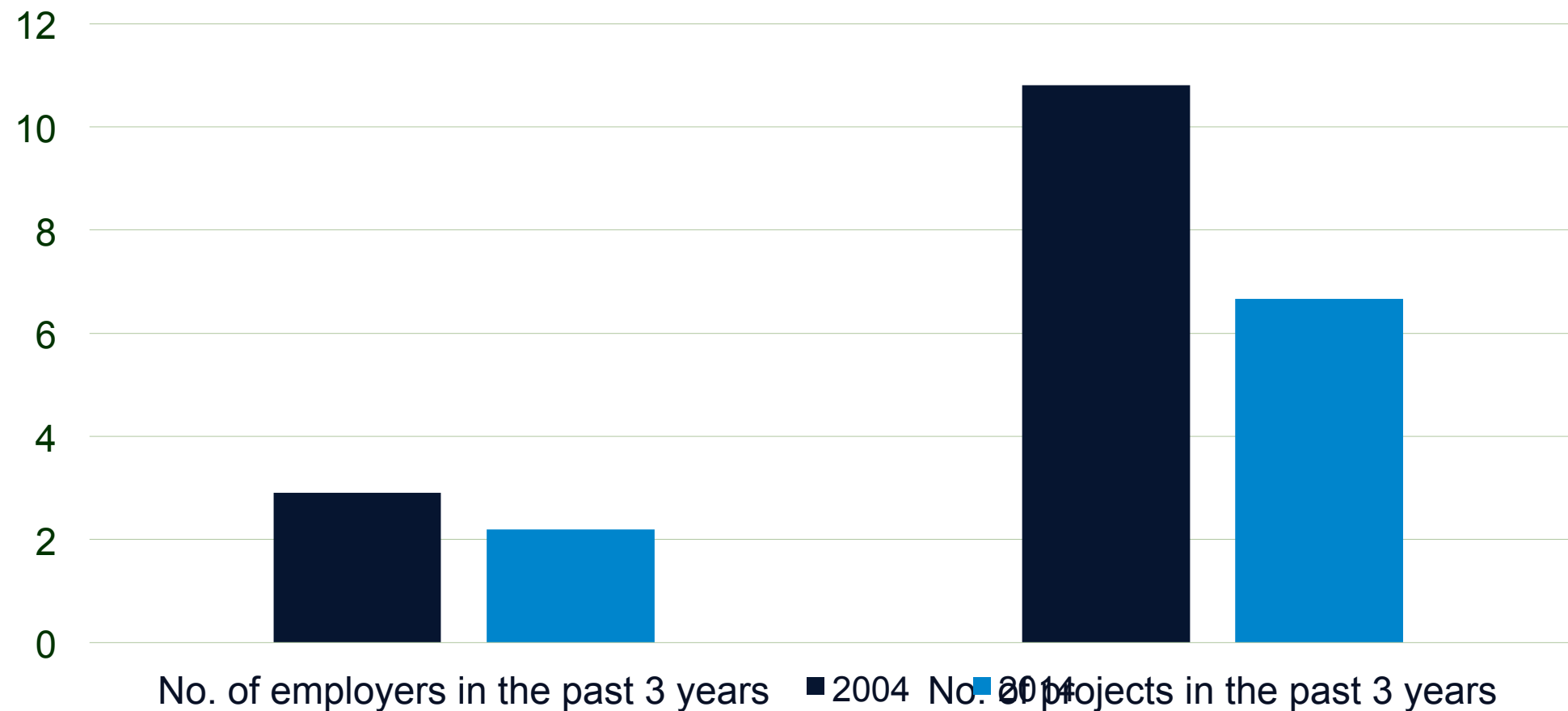
Self-administered surveys:
Worker
Supervisor



Worker Demographics



Worker Demographics (cont.)



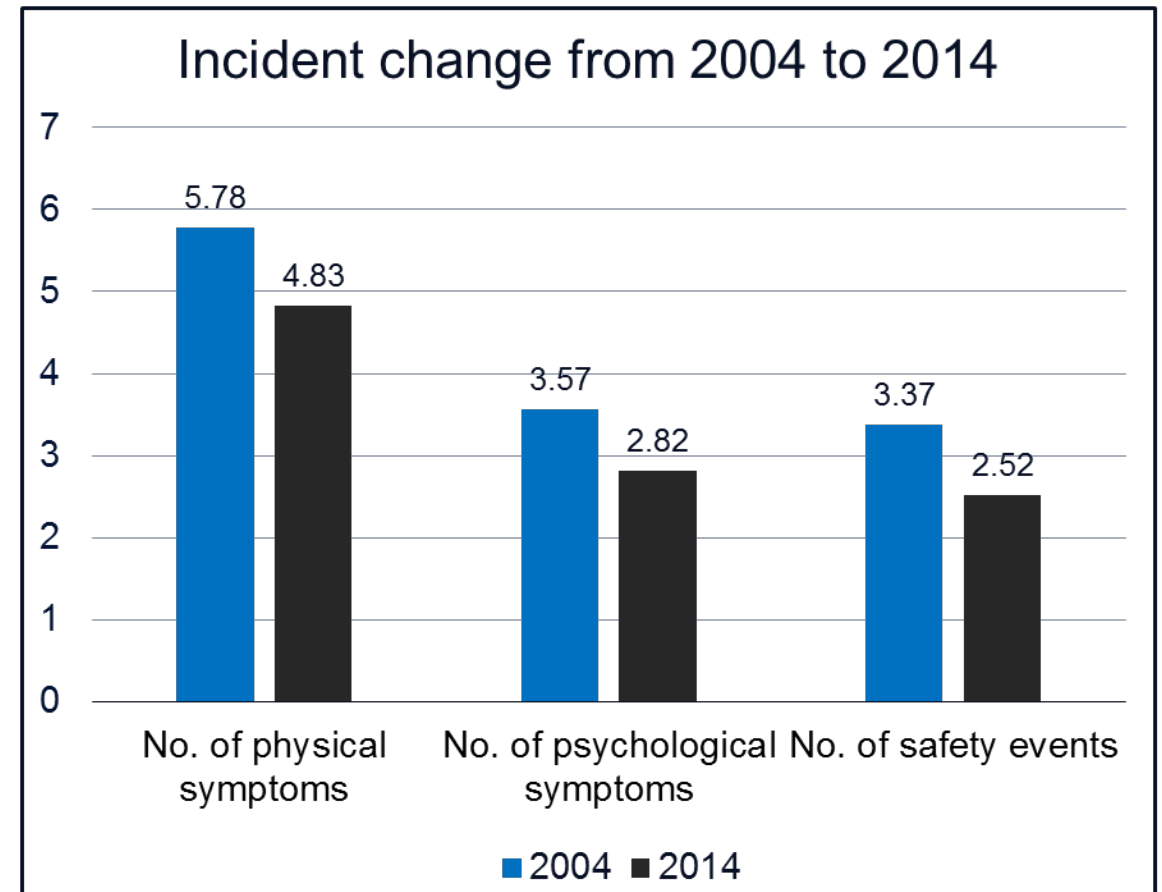
| Year | No. of employers in the past 3 years | | |
|------|---|-----|-----|
| | 1 | 2 | >=3 |
| 2004 | 46% | 24% | 30% |
| 2014 | 51% | 25% | 24% |

| Year | No. of projects in the past 3 years | | |
|------|--|-----|-----|
| | 1-3 | 4-5 | >=6 |
| 2004 | 30% | 24% | 46% |
| 2014 | 48% | 21% | 31% |



Attitude & Incident Changes

- Safety climate has improved by 3.6% - 7.5% (11 out of 13 factors)
- Incidents have decreased, as shown in the figure.



Safety climate and incidents have changed in a positive way



Workers Reporting at Least One Incident

Workers reporting at
least one physical
symptom (%)

Workers reporting at
least one psychological
symptom (%)

Workers reporting at least
one safety event (%)

| | | | |
|------|------|------|------|
| 2004 | 80.8 | 53.9 | 65.5 |
| 2014 | 67.8 | 45.3 | 50.7 |



Conclusion

- Data collection of safety climate research is challenging because safety tends to be a sensitive topic associated with liability.
- Recruitment time per survey is a surprisingly high 4.1 hours.
- Safety climate of Ontario construction sites has been improved in a positive way in the past decade.
- Future research will focus on the driving force of safety climate improvement.



Thanks! | Questions?



| Factor | Group | Mean | Mean Difference | Independent sample T test | Non-parametric (Mann-Whitney Test) |
|----------------------|-------|------|-----------------|---------------------------|------------------------------------|
| Conscientiousness | 2004 | 3.88 | .29 | * | * |
| | 2014 | 4.17 | | | |
| Fatalism | 2004 | 2.47 | -.13 | * | * |
| | 2014 | 2.34 | | | |
| Safety consciousness | 2004 | 4.13 | .15 | * | * |
| | 2014 | 4.28 | | | |
| Leadership | 2004 | 3.73 | .21 | * | * |
| | 2014 | 3.94 | | | |
| Role overload | 2004 | 2.33 | -.07 | / | / |
| | 2014 | 2.26 | | | |
| Work pressure | 2004 | 2.35 | -.14 | * | * |
| | 2014 | 2.21 | | | |



| Factor | Group | Mean | Mean Difference | Independent sample T test | Non-parametric (Mann-Whitney Test) |
|-------------------------|-------|------|-----------------|---------------------------|------------------------------------|
| Conscientiousness | 2004 | 3.88 | .29 | * | * |
| Job safety | 2004 | 2.32 | -.03 | / | / |
| | 2014 | 2.29 | | | |
| Co-worker safety | 2004 | 3.47 | .23 | * | * |
| | 2014 | 3.70 | | | |
| Supervisor safety | 2004 | 3.85 | .18 | * | * |
| | 2014 | 4.03 | | | |
| Management safety | 2004 | 3.79 | .25 | * | * |
| | 2014 | 4.04 | | | |
| Safety program | 2004 | 3.95 | .15 | * | * |
| | 2014 | 4.10 | | | |
| Interpersonal conflicts | 2004 | 1.85 | -.07 | / | * |
| | 2014 | 1.77 | | | |
| Job involvement | 2004 | 3.92 | .26 | * | * |
| | 2014 | 4.18 | | | |

