

Using safety climate trends in the coal industry to improve the identification and use of leading indicators



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Presentation objectives

- Is there a difference safety climate perceptions among mining subsectors?
 - What can we learn from any differences?
- Research-informed ways to improve aspects of health and safety management systems in coal mines, using NIOSH safety climate results



Safety climate

Safety climate is an assessment and analysis of **individuals'** shared **perceptions** of the **values, attitudes, beliefs, and/or behaviors** that pertain to an organization's safety and health program **at a specific moment in time**.

Health and safety management systems (HSMS)

“A set of institutionalized, interrelated, and interacting elements strategically designed to establish and achieve occupational health and safety (H&S) goals and objectives.”

- ANSI/AIHA Z10, 2012

Occupational goals of an HSMS

- ✓ Injury prevention
- ✓ Illness prevention
- ✓ Loss prevention



More traditional safety culture assessments in the industry are surveys that offer a combined score

Barriers to this approach...

- Don't know what's working, what's not, and how to improve perceptions and performance (*proactivity and compliance*)
- No emphasis on leading indicators
- Hard to track root causes of lagging indicators
- Little that is tangible to focus on within a health and safety management system (HSMS)



An organization's safety climate is a product of the strategic HSMS implemented within a company – but safety climate can be measured and influenced regularly



Organizational Health and Safety Survey

The purpose of this survey is to understand what may have the biggest impact on the health and safety of employees at this mine operation. Please think about your work experiences and behaviors during a typical week when responding.

- Mark your answers directly on the survey by filling in, circling, or checking the box.
- Return your survey answer sheet to us when you are done.

To protect your identity:

- Your supervisors will not see your individual responses.
- These forms will not be made available to any management personnel.
- We will combine the data from everyone into one large group to summarize the results.

Please mark the number below each statement or question that best describes your opinion using the following scale.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6

Thank you in advance, for your participation!

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Exp. Date 02/28/2019

58 question safety climate survey, 6-point scale



Leading indicators used within organization's HSMSs were identified from other high-hazard industries

Organizational

- **Organizational H&S Support**
- **Supervisor H&S Support**
- **Supervisor H&S Communication**
- **Coworker H&S Communication**
- **Worker Engagement/ Involvement**
- **H&S Training Adequacy**

Personal

- **Adaptability on the job**
- **Risk tolerance/avoidance**
- **Thoroughness on the job**
- **Sense of control on the job**
- **H&S Motivation**
- **H&S Knowledge**

H&S Performance (Execution of Leading Indicators)

- **Proactivity**
- **Compliance**

Outcome

- **Near Misses, Incidents**

Collected surveys at 40 mines throughout 18 states.

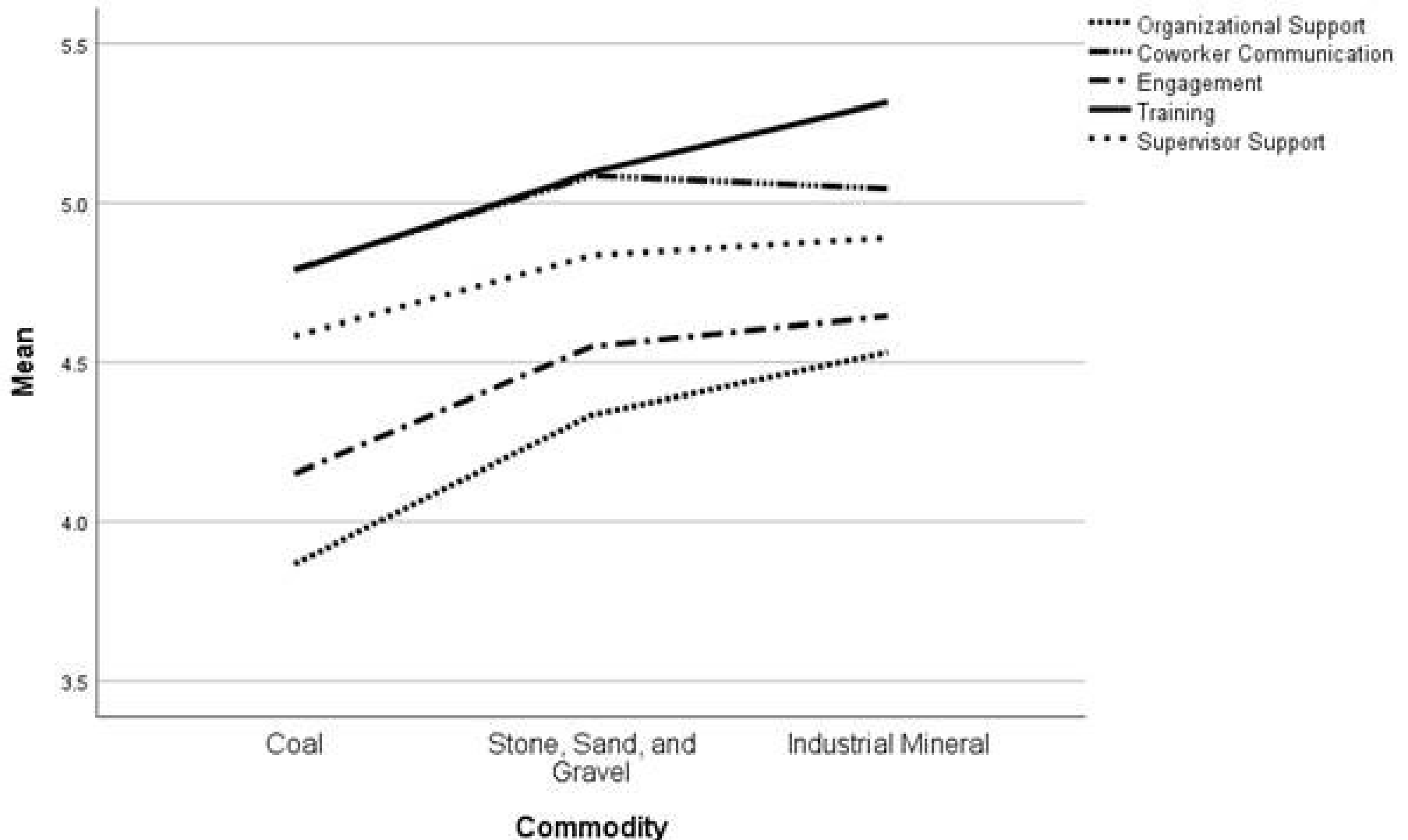
620 surveys were from coal mines (21% of sample)



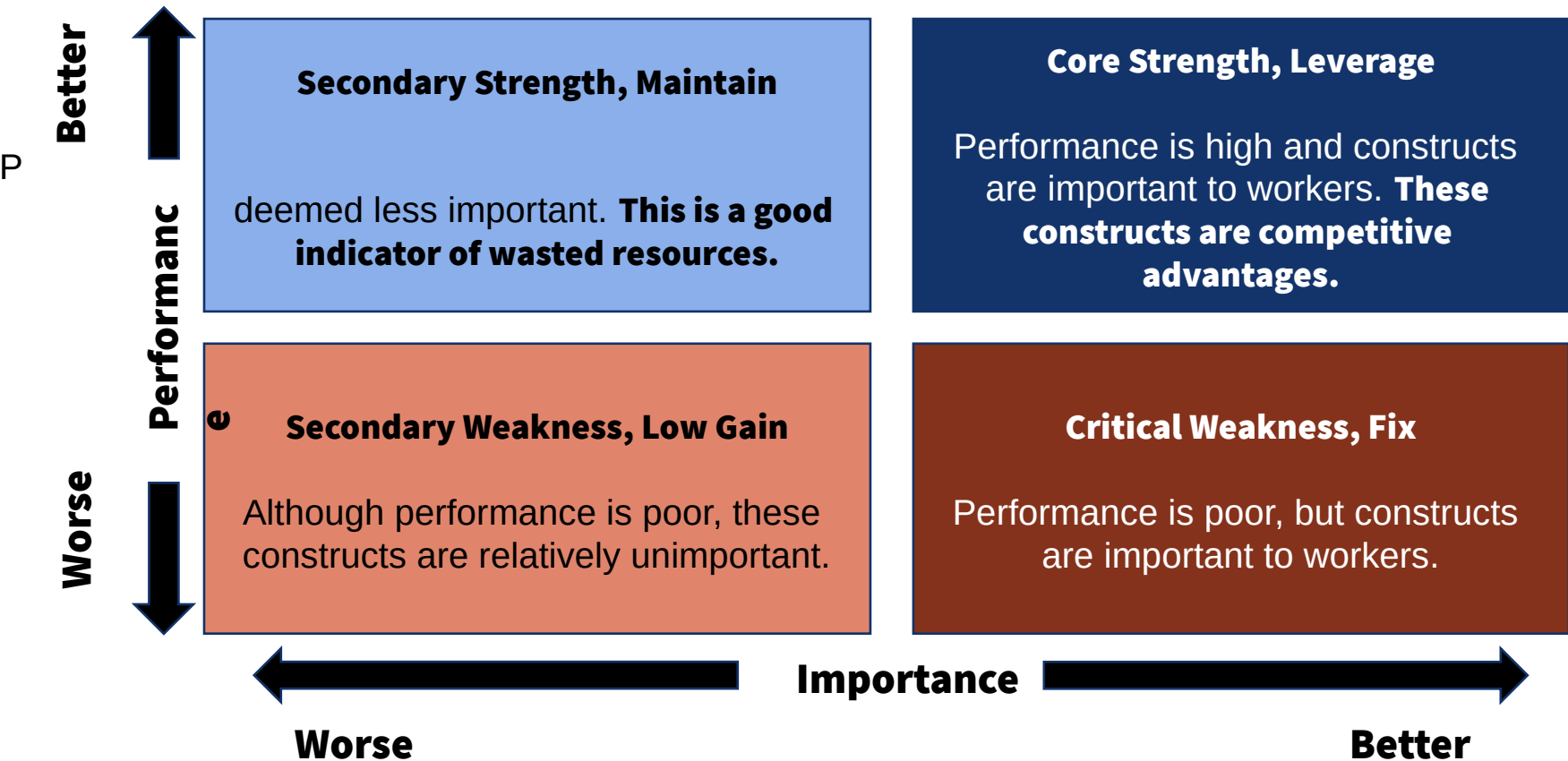
Stone, sand, and gravel (48%); Industrial minerals (31%)

Why are there differences among subsectors?

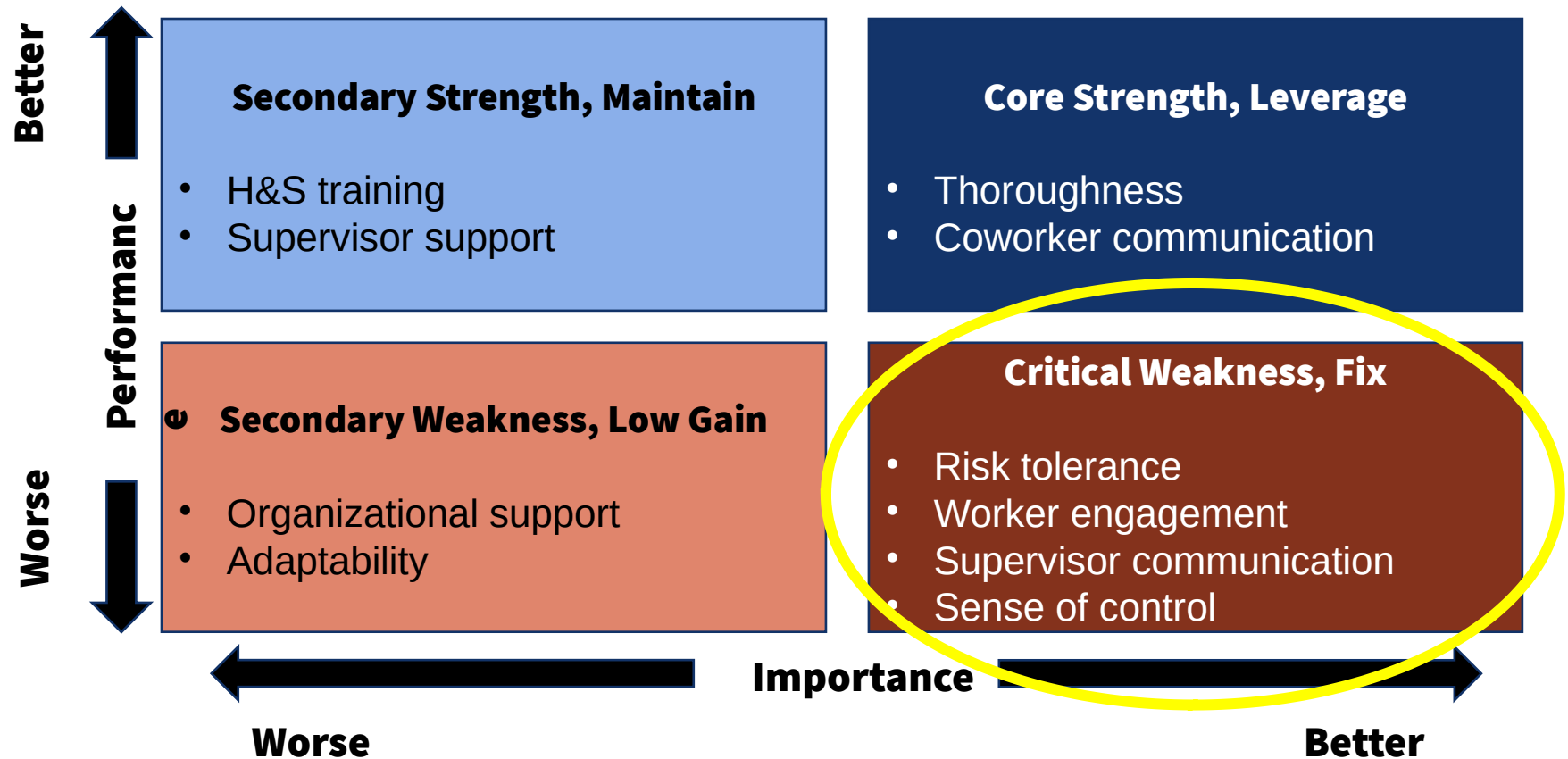
Do the differences matter?



Analysis showed the relative importance of each construct to help coal organizations understand key drivers to worker performance



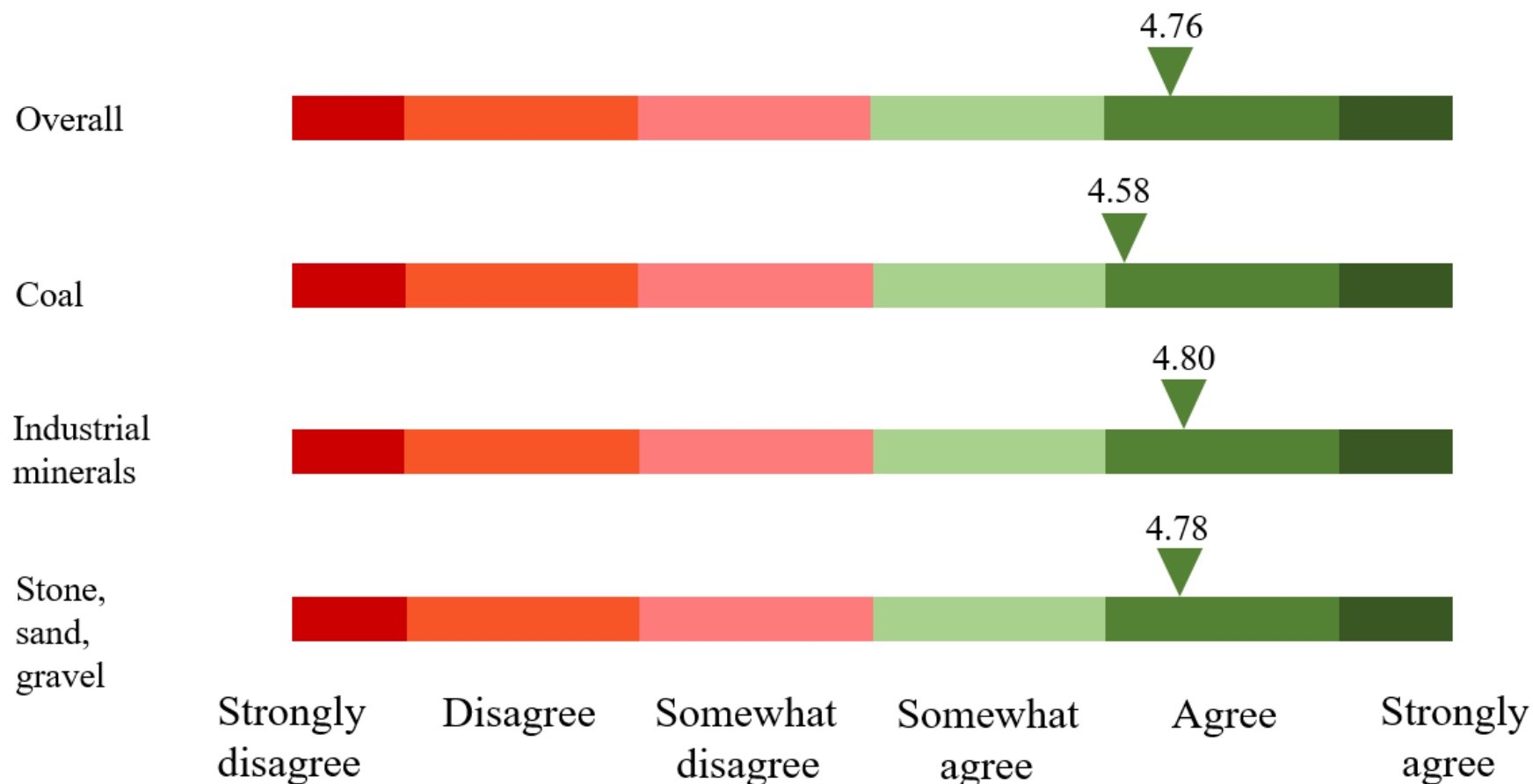
Organizations identified critical areas to improve within their HSMS



Comparing coal to other mining sectors



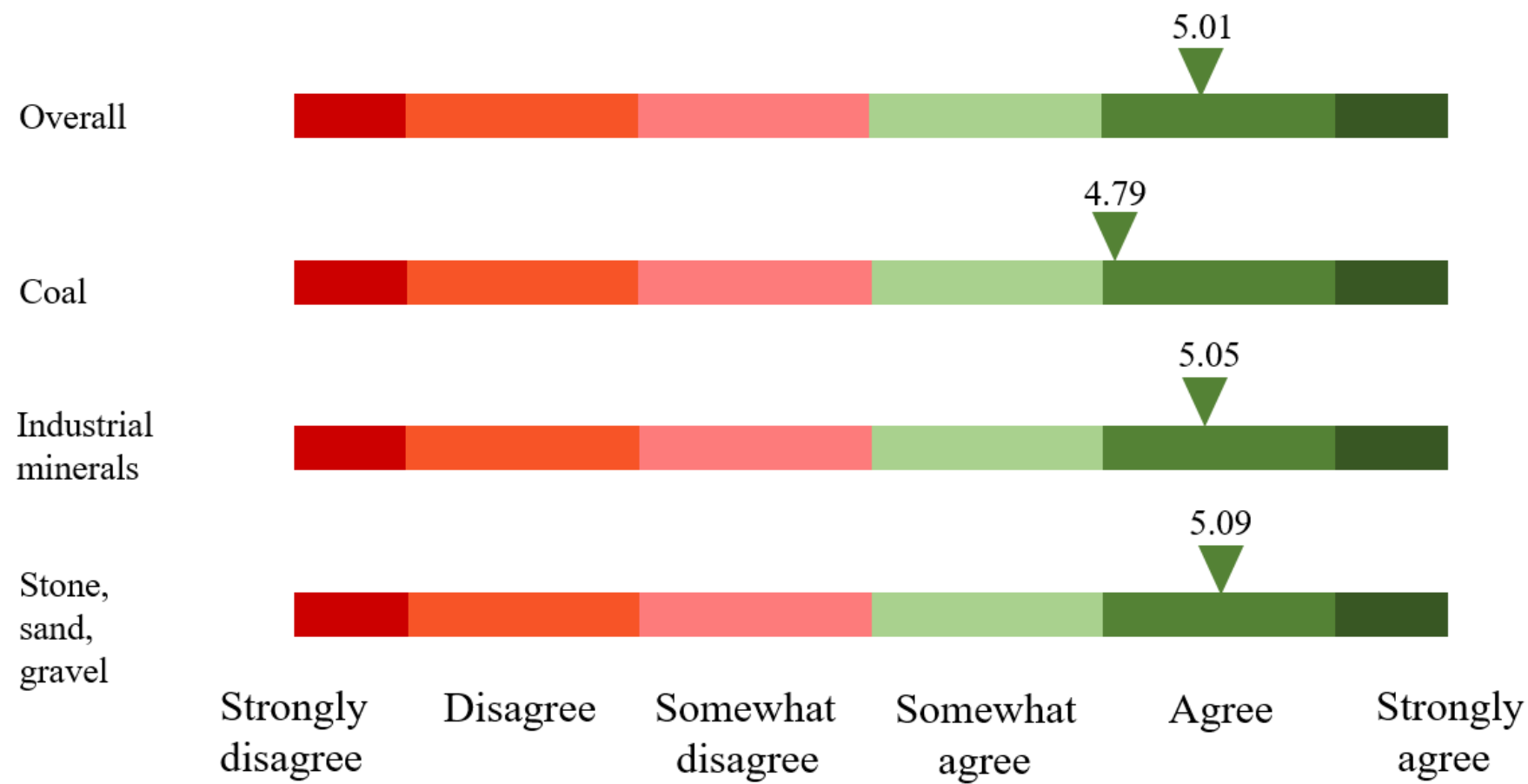
Supervisor communication/support



Common gaps in supervisor communication included:

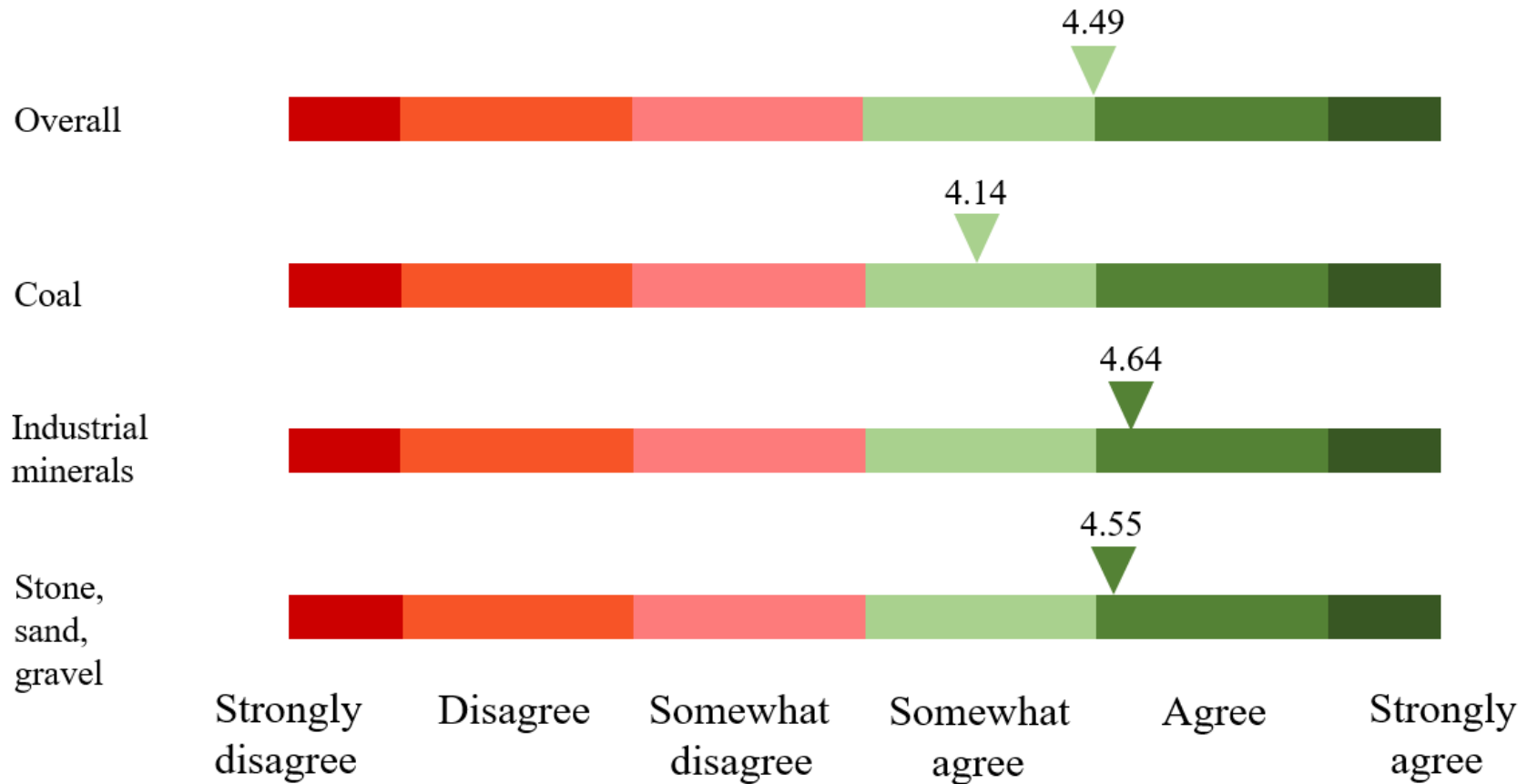
- Communication about site-specific hazards (22% of coal miners disagreed)
- Consequences for not following H&S rules (23% of coal miners disagreed)
- Consistent visibility and monitoring of H&S (29% of coal miners disagreed)

Coworker communication



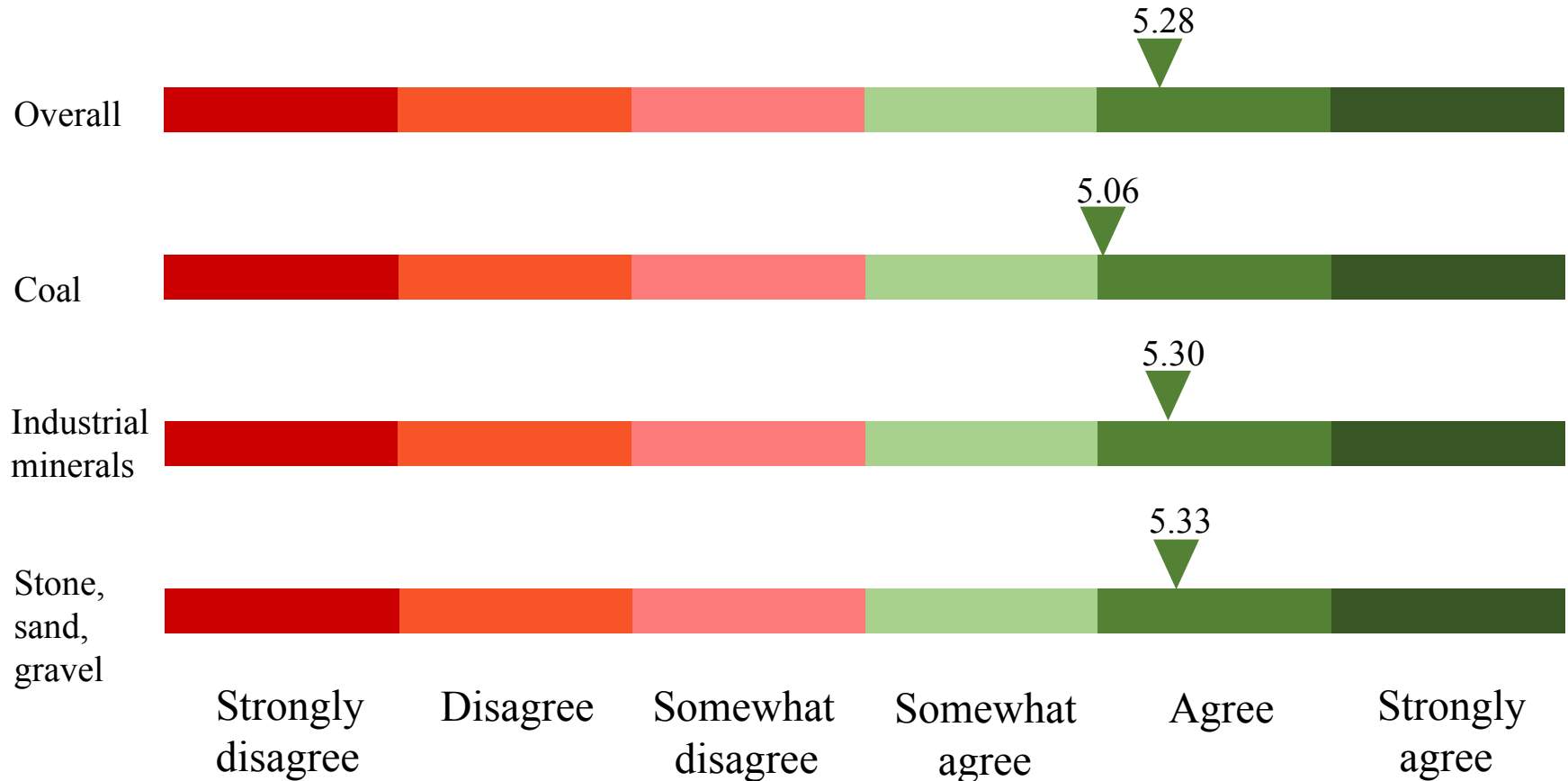
Twice as many coal miners felt that coworkers did not communicate with each other about H&S hazards

Worker engagement



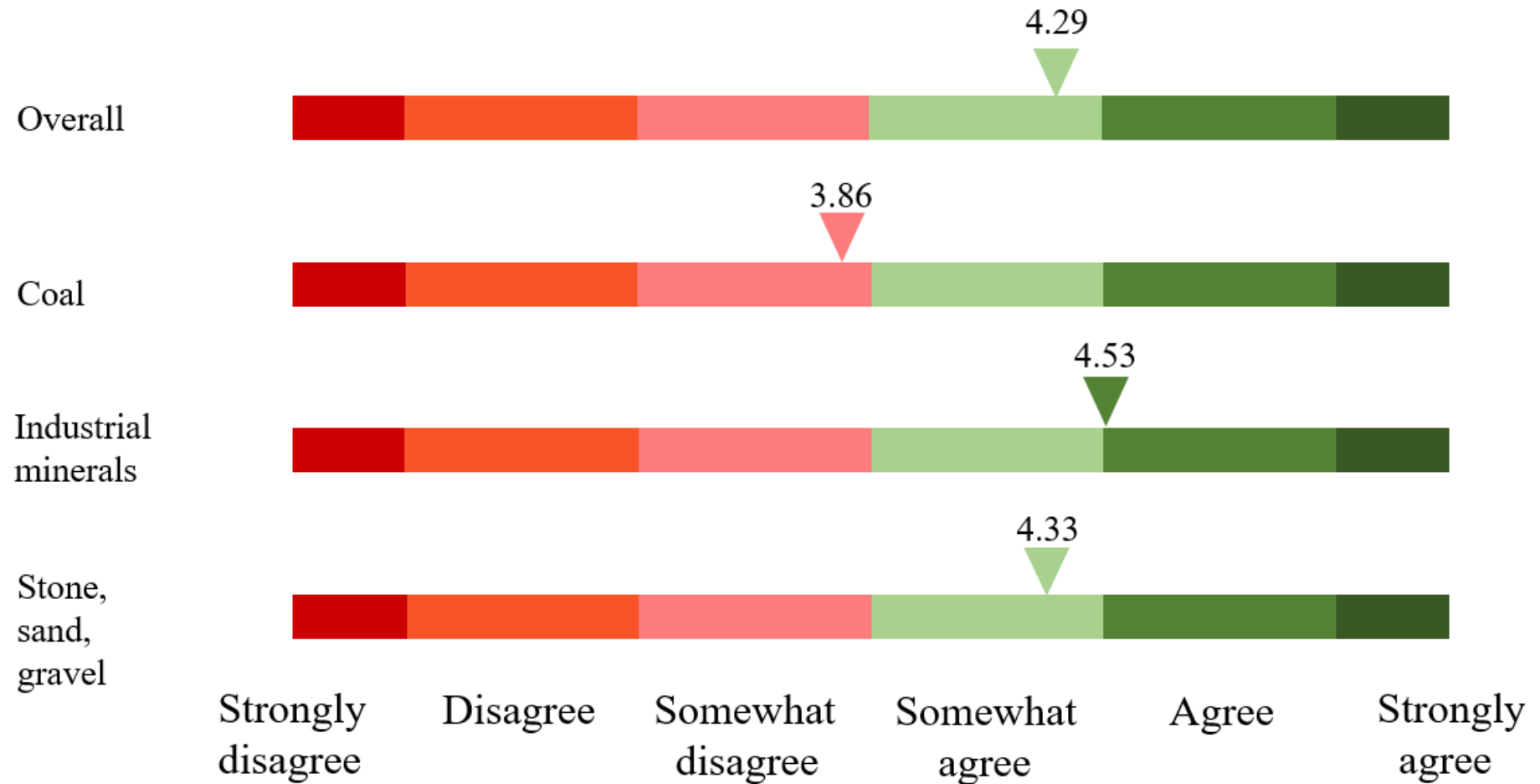
- Even though coal miners had a lower average, about 30% of workers in each industry felt they were not involved in H&S activities on site

Risk tolerance



- Coal miners were more likely to take risks than in other industries, although everyone's scores were pretty avoidant of risks
- ~13% of workers reported taking risks regularly
- Coal companies engaged in several efforts to change workers' risk tolerance perceptions (improved risk assessments, signage, pre-shift meetings, trainings)

Organizational support for health and safety



- 49% of coal miners felt that as long as the job got done, it doesn't matter if H&S rules are followed
- 40% feel they have impossible production pressures

Why do these results matter?

External influences throughout the organization do impact workers' overall proactivity and compliance

Proactivity



Compliance



Does size matter?

- Participating coal mines ranged from 78–280 workers
 - (average = 206)
- Compared to our overall average which ranged from 7–280 workers
 - (average = 74)

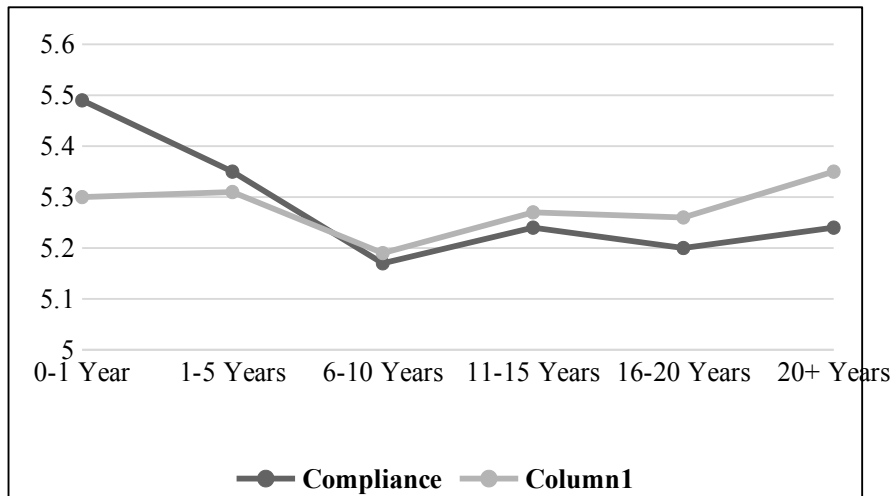
Safety climate research in Australia showed that smaller mines consistently show more positive responses.

While bigger mines often implement bulky HSMSs, smaller mines are able to achieve closer contact between employees. This usually outweighs other resources that larger operations have [Cliff 1999].

Does experience matter?

In all sectors, including coal, results showed different perceptions based on time in the industry

Experience	% Sample
0-1 Year	9%
1-5 Years	18%
6-10 Years	17%
11-15 Years	15%
16-20 Years	10%
20+ Years	30%



- Those with the least amount of experience – under 1 year and 1–5 years were more compliant and risk avoidant.
- Those with 6–10 years of experience significantly dropped and never got as high as those new to the industry again.

That said, what can the coal industry do?

Examples in practice and intervention points

Qualitative data helped further understand H&S frameworks

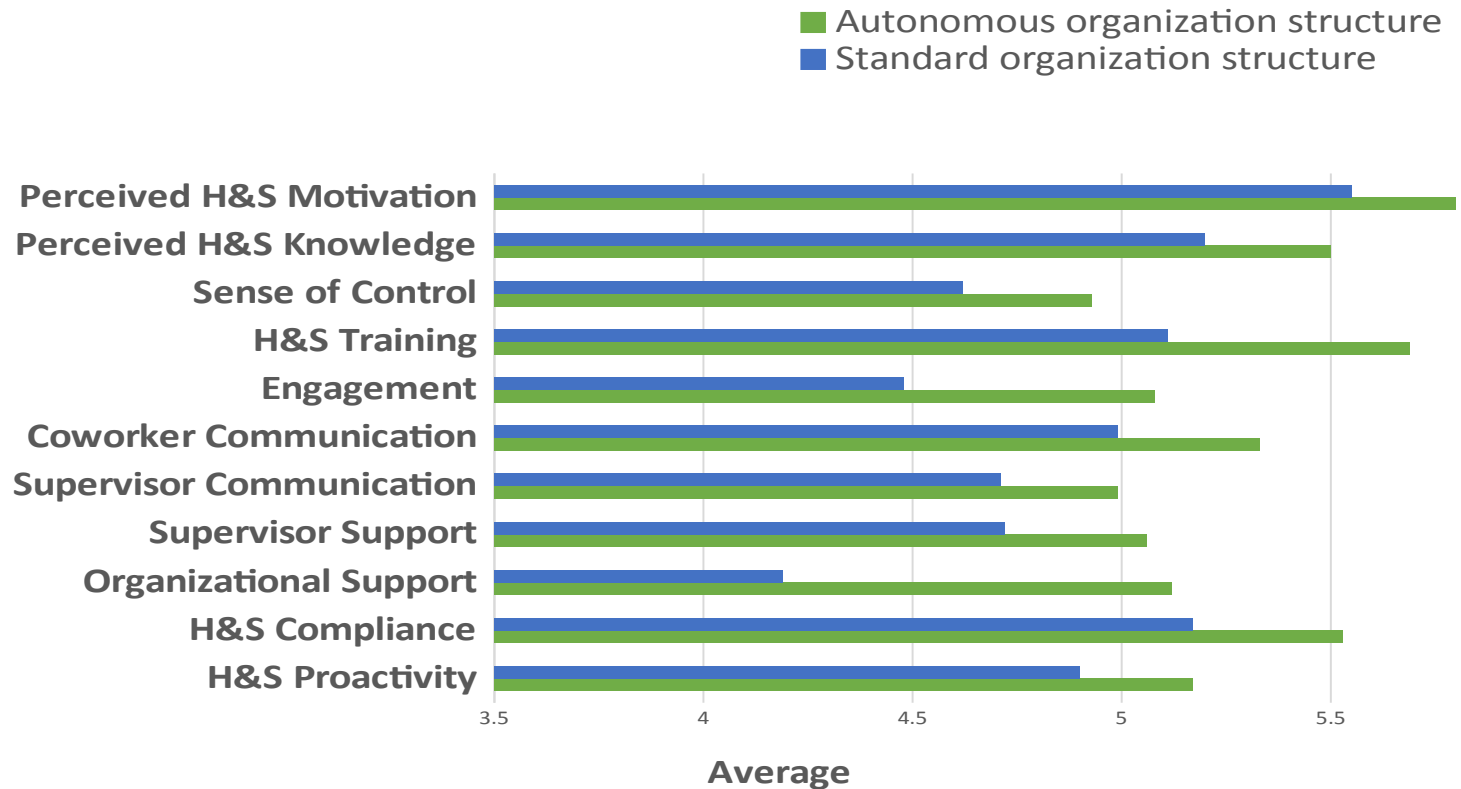


- **12 mines**
 - 4 stone, sand, and gravel/M/NM
 - 2 industrial mineral mines
 - 6 coal mines
- **H&S regional workshops, corporate regional offices**
- **$n = 83$ workers and 56 members of mine management**

How can companies promote autonomy?

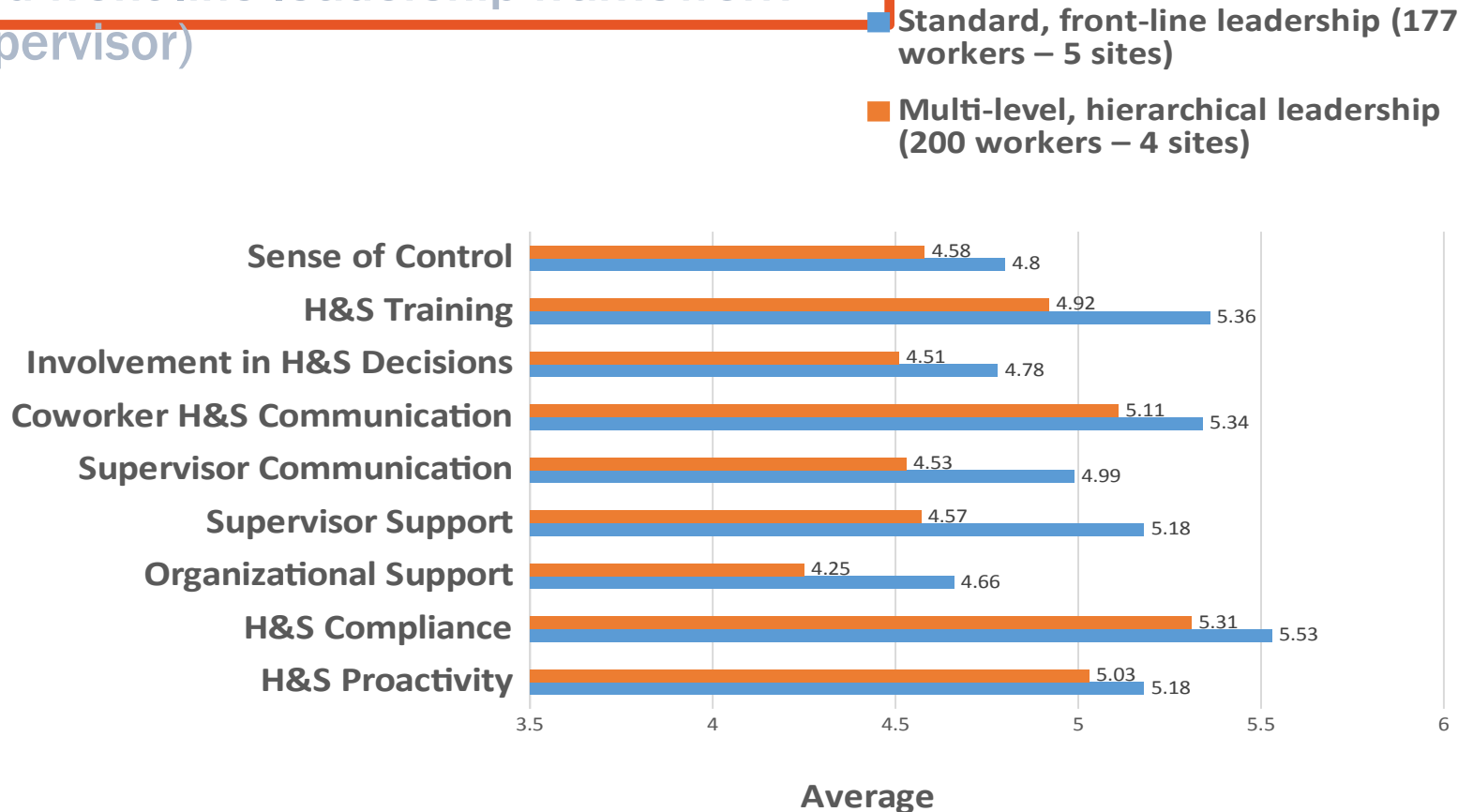
More typical organizational structure vs.
Autonomous organizational structure

Leading Indicators on Survey



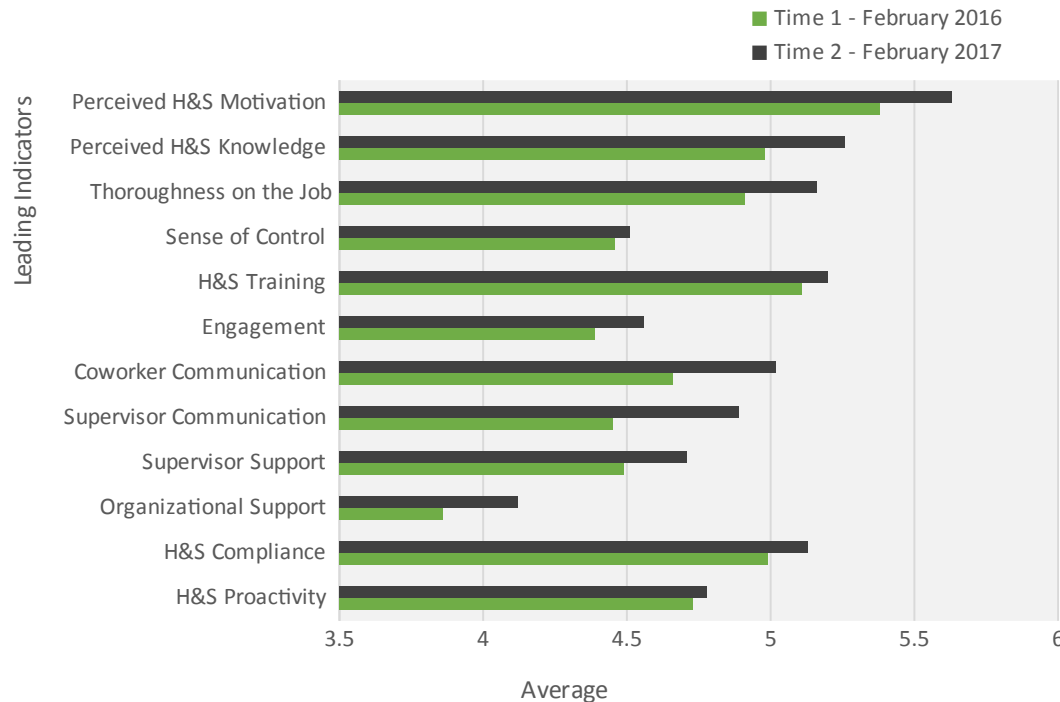
Can concrete leadership roles be established in certain areas on site?

Multi-level hierarchical framework vs.
Standard front-line leadership framework
(one supervisor)



Organizations have the ability to improve the implementation of their HSMS strategy through focusing on workers' soft skills

Pre and Post Assessments for One Site's Intervention Efforts to Improve Health, Safety, and Risk Management



MSHA

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What's missing to better answer our questions?

- We need small coal mines to better understand the differences in perceptions among small to large coal mines
- We need metal mines included in the current sample
 - In Australia, metal mines have lower averages in certain areas of safety culture, compared to coal
- Accident rates of participating mines to compare with worker perceptions
- The scope of HSMSs of participating mines



Thoughts?

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NIOSH Mining Program
www.cdc.gov/niosh/mining