LESSONS LEARNED ABOUT TRANSLATION AND DISSEMINATION OF WORKPLACE HEALTH AND SAFETY INTERVENTIONS FOR SMALL BUSINESSES

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ACKNOWLEDGEMENTS

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FACTS ABOUT SMALL BUSINESSES

MOST PEOPLE WORK FOR SMALL BUSINESSES

- 5 million businesses in U.S.
  - Almost all have <100 employees
- 123.4 million employees in U.S.
  - Many (36%) work in companies with < 100 employees
  - Half work in businesses with < 500 employees
- Injury and illness rates are higher in small businesses
  - Construction
  - Services
  - Manufacturing
  - Transportation

SMALL BUSINESSES HAVE FEW OHS RESOURCES

- Small businesses are unlikely to have on-site workplace safety expertise

- Most small businesses will never receive an OSHA inspection

  - Less than 5% of small businesses are inspected each year

- Limited requirements for employee – management safety committees

  - MN requires only for high-risk industries & more than 25 employees

WHY INTERVENTION RESEARCH

- We know how to prevent employee exposures to many hazards, using engineering & other types of controls (hierarchy of controls)

- <u>We know much less about how to motivate changes in the workplace.</u>

- 1996 - 1st National Occupational Research Agenda (NORA)

- American Journal of Industrial Medicine – special issue on Intervention Research

  - Leviton & Sheehy – Encouraging Small Businesses to Adopt Effective Technologies to Prevent Exposure to Health Hazards

"Study of planned and applied activities designed to produce designated outcomes"

OHS interventions usually combine -
- Source or engineering controls
- Programs & policies
- Education

WHAT IS INTERVENTION RESEARCH

FEATURES OF A WELL-DESIGNED INTERVENTION STUDY

Theoretical basis	• Study design • Intervention design & delivery
Interventions of sufficient duration, frequency and intensity	• Targeted at the right points
Experimental study design	• Randomized, controlled trial
Appropriate statistical analysis	• Power to detect differences • Inter- and intra-class correlations

RESEARCH CHALLENGES IN SMALL BUSINESSES

- Research design
  - How many businesses?
    - Need 40-60 businesses for 80-90% power
  - What is a control group?
    - Need a design where all businesses receive the intervention
  - What is a small business?
    - Number of employees, types of products, independent company
  - What is a random sample?
    - Random sampling + key informant and snowball recruitment

RESEARCH CHALLENGES IN SMALL BUSINESSES

Selecting and designing

Selecting and designing intervention activities
- What combination of activities to motivate change?
- Affordable, achievable, disseminable?

Targeting

Targeting interventions
- Primary target – owners, managers, employees?

Measuring

Measuring outcomes
- Injuries (and illnesses) are uncommon events (lagging indicators)

RESEARCH TRAJECTORY

Minnesota Wood Dust Study
1995-2000
NIOSH (NCI)

RFA – Reduce cancer in workplace settings
Goal – Lower personal exposures to wood dust (nasal carcinogen) in small cabinet and fixture shops in MN
Partners – Woodworking trade association

Minnesota Machine Guarding
2001-2007
NIOSH

RFA – NIOSH NORA; MDH SENSOR grant
Goal – Lower exposures to machine safety hazards (amputations) in small metal fabrication businesses in MN
Partners: Precision metal-forming trade associations

Collision Autobody Repair
Safety Study (CARSS)
2007-2013
NIOSH

Machine Guarding – Translation Into Practice
2010 - 2015
NIOSH

RFA – NIOSH NORA (Manufacturing Sector)
Goal – Evaluate dissemination of machine safety interventions by workers' compensation insurance risk consultants across the U.S.
Partners: Workers' compensation companies, Precision metal-forming trade associations

RFA – NIOSH NORA (Services Sector)
Goal – Lower exposures to chemical, electrical, fire and other hazards in small autobody collision repair businesses in MN
Partner: Association for Automotive Service Providers

Technical Education – Bridging the Gap in Health and Safety in Small Businesses (TECHS)
2014-2018
NIOSH

Goal – Evaluate impact of technical college health and safety training on worker knowledge and skills
Partners: Community and technical colleges; business advisory board
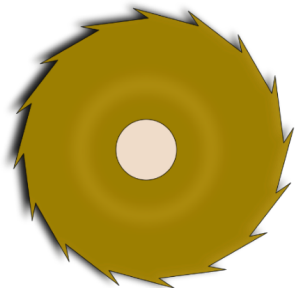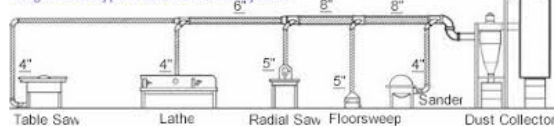
MINNESOTA WOOD DUST STUDY

Diagram of a typical dust collection system

- Randomized, controlled trial following PRECEDE-PROCEED
- 48 businesses: 24 intervention, 24 control
- 5-25 production employees
- Outcome measures
  - Baseline and 1-year follow-up exposures to wood dust (personal samples)
  - Ventilation system evaluations
- Interventions
  - Tailored information to owners
  - Employee education on use of local exhaust systems
  - Financial support for dust collection improvements

No intervention effect

- Exposures dropped 22% in intervention shops and 11% in control shops
- Net effect = 11% (not statistically significant)

Intervention businesses showed greater increases in

- Availability and use of dust controls
- Efficiency of local exhaust ventilation systems

Owners of intervention businesses implemented more recommendations

MINNESOTA WOOD DUST STUDY

LESSONS LEARNED

STRENGTHS

- Interdisciplinary team
- Rigorous design
- Targeted all levels of hierarchy of controls
- High response rate – one shop lost to follow-up
- Several measures of effect

LIMITATIONS

- 30% reduction in dust exposures was unrealistic
- **No real "control" group**
- One year follow-up may be insufficient
- **More focus on ventilation system improvements and less on educating employees how & when to use**

MINNESOTA MACHINE GUARDING STUDY
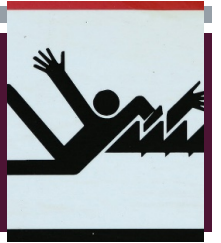
Motivated by surveillance data

- Annual rate of non-fatal workplace amputations in metal working industry far greater than rates for all other industrial sectors

  - 5.2 – 6.7 amputations per 10,000 full-time workers (2002)

  - 34% amputation rate for fabricators and operators (all industries) in MN (2002)

- Guards missing in 70% of amputation incidents

- 75% of injuries result from inadvertent activation of equipment, defective tools or machines, or absence of guarding

- Most amputees never work again or experience significantly lower wages

Study goals

- Evaluate the effectiveness of interventions that focus on better machine safety controls, improved safety programs, and employer/employee training.

MINNESOTA MACHINE GUARDING STUDY

Study Design – 40 shops
- 20 owner-only intervention (control)
- 20 owner-employee intervention

Interventions
- Tailored recommendations to owners
- Peer-based training of safety committee in use of machine safety checklists, program development, methods for improving machine safety

Outcome Measures
- Audits of machine and business safety at baseline and 1-yr follow-up
- Improvements in self-reported knowledge, skills and attitudes
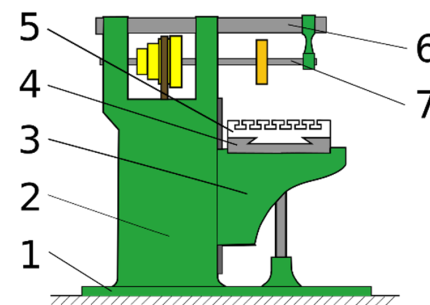
MINNESOTA MACHINE GUARDING STUDY

- 10% improvement in business safety scores in both groups
  - 13% increase in machine guarding
  - 23% increase in safety programs
- Best predictors of baseline business safety:
  - Presence of a safety committee
  - Self-reported perceptions of the workplace environment

LESSONS LEARNED

STRENGTHS

- Intervention mapping & social cognitive theory

- Health and safety committees are best target audience

- Easier to motivate improvements in programs, policies and training

LIMITATIONS

- Difficult to motivate business owners to improve machine safety

  - Fixes are expensive, not readily available, and interfere with production

  - Safety committees may not have power to motivate change

- One year may not be enough time to make improvements

MACHINE GUARDING – TRANSLATION TO PRACTICE
NATIONAL MACHINE GUARDING STUDY

- Interventions need to be "realistic"
  - Easy to disseminate and deliver beyond the research environment
  - Affordable and practical

GOAL

Develop and test the dissemination of machine safety interventions delivered by workers' compensation risk consultants

NATIONAL MACHINE GUARDING STUDY

- Trained 50 risk consultants from 2 workers compensation companies
  - Machine guarding basics
  - Machine safety checklists
  - Study protocol
    - Contact a business & market the study
    - Assess machine safety and business safety programs
    - Create and communicate a report
    - Use software to record and transmit data and develop action plan
   - Deliver intervention

INTERVENTION

- Use scores to develop action plan – discuss with owner

- Business must establish an employee-management safety committee (if not already in place)

- Risk consultant meets with safety committee

  - Review results & action plan

  - Review checklists

  - Discuss methods for making improvements

  - Provide tools and training, as appropriate

NATIONAL MACHINE GUARDING STUDY BASELINE FINDINGS

- 221 businesses in 31 states

- Baseline machine safety scores lowest for
  - Point of operation safeguards (67%)
  - Lockout Tagout procedures (9%)

- Milling, drilling & boring machines were usually the oldest equipment (average 33 years) and least likely to be guarded

- Oldest machines had lowest machine safety scores

- Businesses with safety committees had higher safety scores
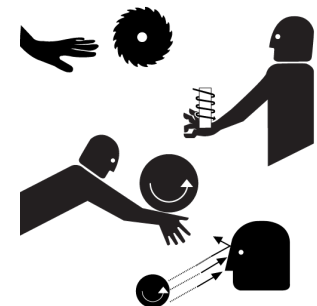
NATIONAL MACHINE GUARDING STUDY RESULTS

- 146 (72%) businesses completed entire program

- Machine safety scores improved from 73 to 79% (p<0.0001)

- Biggest improvements were in Lockout/Tagout procedures (8-33%), point of operation guards (67-72%) and lockable disconnects (88-92%)

- Safety management scores and job hazard analyses also improved

- Businesses starting with a safety committee (34%) made the greatest improvements

- Businesses adding a safety committee during the study made greater improvements

LESSONS LEARNED

STRENGTHS

- Demonstrated a successful dissemination pathway via workers compensation insurance companies

- Engaged both employers and employees via safety committees

LIMITATIONS

- Difficult to monitor activities from a distance

- Safety consultants have many competing demands and priorities

- How to make this sustainable?

COLLISION AUTOBODY REPAIR SAFETY STUDY

- Average business size = 5 employees
- Wide variety of hazards
  - Fire and explosion
  - Respiratory disease – isocyanates in paints
  - Musculoskeletal disorders
  - Eye injuries
  - Skin and systemic health effects
  - Hearing loss (air powered tools)
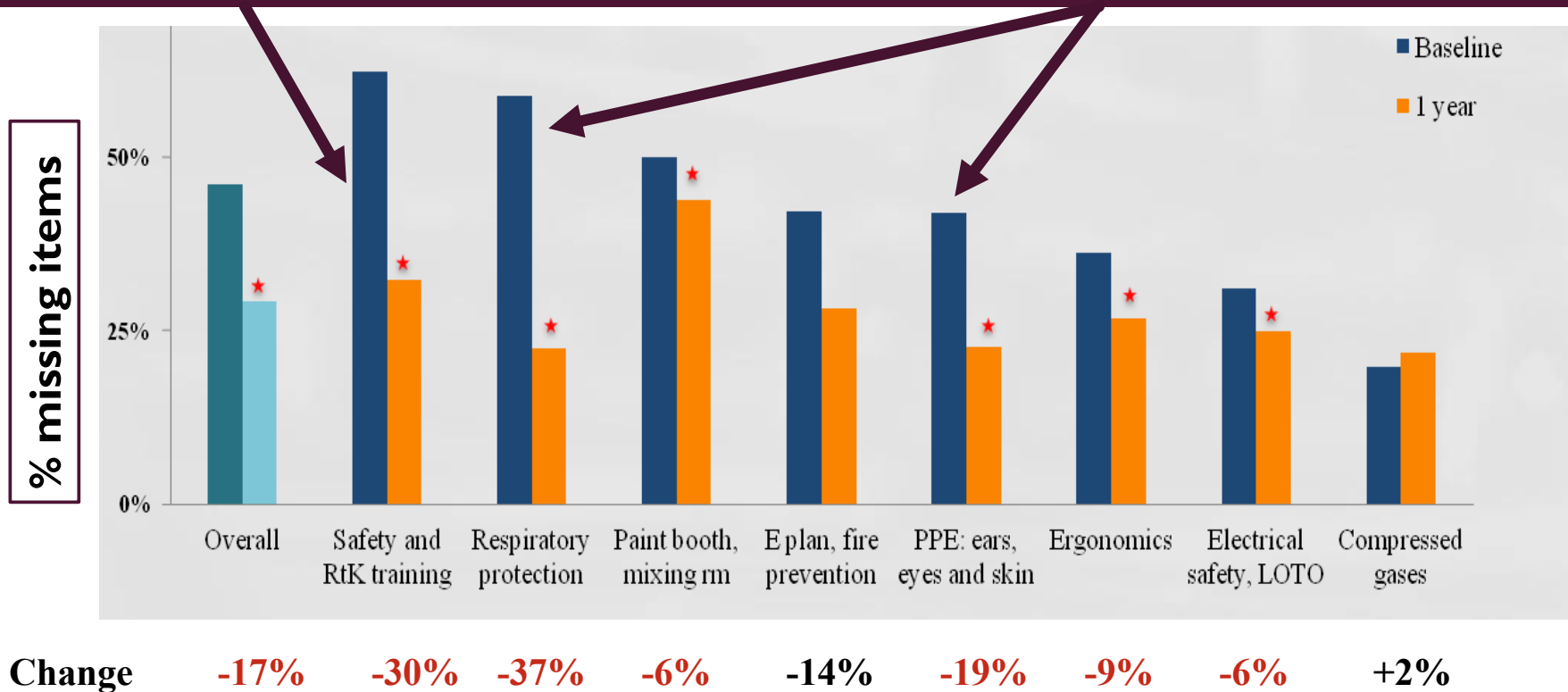 - Electrical safety

STUDY DESIGN

- 40 businesses (all intervention – delayed intervention design)

- Safety audits, safety climate surveys, workplace practices surveys (baseline, 1 and 2-year follow-up)
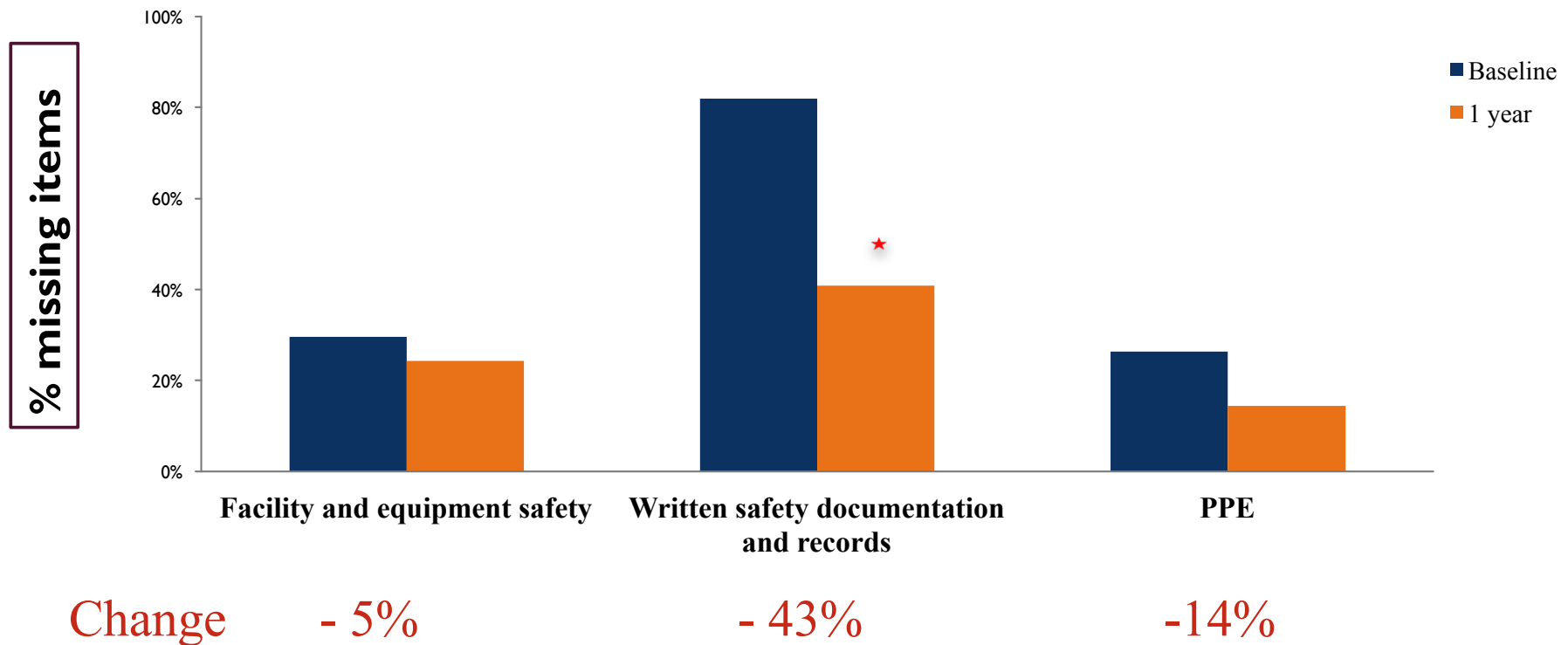
Interventions
- Shop improvement plans with quarterly follow-up
- Tailored assistance
- On-line employee right-to-know training (English & Spanish)
- On-line medical surveillance and respirator fit testing
- Website with additional resources

BIGGEST IMPROVEMENTS IN
HAZARD COMMUNICATION AND PERSONAL PROTECTIVE EQUIPMENT

Change   **-17%**   **-30%**   **-37%**   **-6%**   **-14%**   **-19%**   **-9%**   **-6%**   **+2%**

BIGGEST IMPROVEMENTS IN
WRITTEN SAFETY DOCUMENTS AND RECORDS

CARSS

% missing items

- Baseline
- 1 year

| Facility and equipment safety | Written safety documentation and records | PPE |

| Change | - 5% | - 43% | -14% |

KEY FINDINGS

- Baseline: shops missing 50% of items

- Follow-up: shops missing 30% of items

- Shop owners more likely to improve low-cost items and items where services were offered by research team

- Easier to improve written records than facility & equipment

LESSONS LEARNED

STRENGTHS

- Valid and reliable checklist that can be used by owners, employees and workplace safety professionals
- Focused on owners as gatekeepers
- Business association board involved in study design
- Website was important feature of the intervention

LIMITATIONS

- Random sampling not possible with very small businesses
- No true "controls" – businesses will not participate without some benefits
- Owners often not willing to take an active role – leave it up to the workers
- Employees did not participate
- Was intervention sustainable?

RESEARCH TO PRACTICE

- Increasing numbers of employees report technical college education in these trades

- No or low workplace health and safety knowledge and skills among technical school educators

- No specific health and safety competencies or outcomes in technical school courses

- Significant deficiencies in workplace safety conditions at technical colleges

Technical Education – Bridging the Gap in Health and Safety in Small Businesses (NIOSH R01)

WELLNESS WORKS – COMBINED WORKPLACE SAFETY & SMOKING CESSATION INTERVENTION STUDY

- National Institute on Drug Abuse (R01)

- CO-PI: Deborah Hennrikus – Epidemiologist (U of Minnesota)

- Group-randomized trial in 47 small manufacturing companies (20-150 employees) in Twin Cities metro area
  - Immediate intervention (baseline, intervention, 1-yr followup)
  - Delayed intervention (baseline, 1-year followup, intervention)

- Goal: Increase employee quit attempts by motivating employers to make workplace safety improvements in combination with policy, environmental and other changes that support a non-smoking workplace

- Disseminable by a local public health department

STUDY DESIGN

- Identify and contact ALL eligible manufacturing businesses in specific counties

- Phone calls to human resource managers

- In-person meeting to describe study & expectations

- Baseline survey of all employees – conducted by research staff on-site

- Survey results used to develop report, delivered in person

- Randomized to immediate or delayed intervention

- One-year follow-up survey of all employees

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SURVEYS

Surveyed all employees in 45 businesses at baseline & follow-up

Baseline: 86% return rate (n=2534/2971)
Follow-up: 70% return rate (n=2556/3631)

Perceived safety risks

Safety improvements needed

Smoking and smokeless tobacco use (self-report)

100 cigarettes / daily, some day, not at all

7-day point prevalence

Organizational variables

Safety climate

Job stress & strain

Co-worker support for quitting

INTERVENTION

- Meeting with safety committee to discuss results and motivate improvement(s) in workplace safety

- Presentation to managers and employees about smoking cessation

- Free nicotine replacement products

- Newsletter articles, fact sheets, etc. on smoking cessation to HR director

- Small grants for safety improvements & break activities

- Website with additional resources

BASELINE FINDINGS

- Smoking rates highest in
  - Production workers (32%)
  - Production managers (26%)
  - Support staff (28%)
  - Sales (20%)
- Lowest rates in managers (11%) & R&D/engineers (14%)
- Production workers, production managers & support staff reported highest levels of job stress

RESULTS - SAFETY

- Most companies made at least one safety improvement based on employee input

- 50% of companies used the safety grant ($500)

- Safety climate scores were significantly better in intervention vs. control sites

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RESULTS – SMOKING

- No difference in % smokers or quitters between intervention & control sites

- Significantly more smokers tried smoking cessation aids (gum, lozenges, patches) in intervention (23%) vs. control sites (12%)

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WHAT COULD WE HAVE DONE DIFFERENTLY?

BASELINE SURVEY RESULTS

- Smoking rates highest in
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  - Production managers (26%)
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  - Sales (20%)
- Lowest rates in managers (11%) & R&D/engineers (14%)
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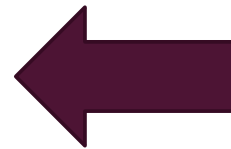
WHO SHOULD HAVE BEEN THE TARGET OF OUR INTERVENTION?
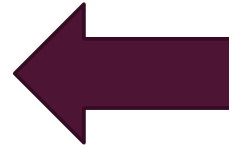
WHAT ELSE SHOULD WE HAVE TARGETED BESIDES WORKPLACE SAFETY?

BASELINE SURVEY RESULTS

Production workers least likely to say that co-workers support their smoking cessation efforts

- Lowest safety climate scores among production employees and support staff

- Employees were able to identify important safety problems at their worksite
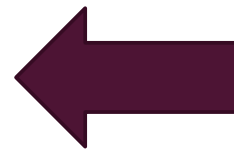
← HOW COULD WE HAVE DESIGNED THE INTERVENTION TO CHANGE THIS?
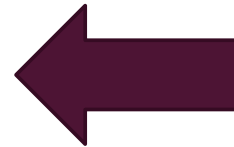
← WHAT ELSE SHOULD WE HAVE DONE TO MOTIVATE SAFETY IMPROVEMENTS?

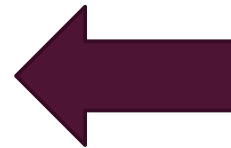# IMPLEMENTATION CHALLENGES

- Scheduling intervention activities
  - No time available during the workday (2 short breaks & unpaid lunch)
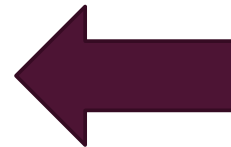
Production managers not supportive

- No time off for surveys or interventions

Not everyone participates

- Some companies had temporary workers, who were not considered employees
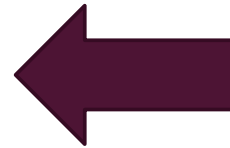
HOW ELSE MIGHT WE HAVE STRUCTURED THE INTERVENTION?

SHOULD WE HAVE INCLUDED THESE WORKERS?

IMPLEMENTATION CHALLENGES
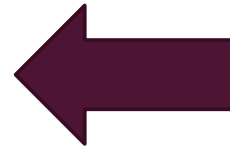
Working with Human Resource managers

- Lots of turnover, very busy, some were non-responsive

← HOW DOES THIS IMPACT THE INTERVENTION?

Safety Committees

- 17% of companies didn't have a safety committee & never put one into place

← HOW ELSE DO WE MOTIVATE SAFETY IMPROVEMENTS?
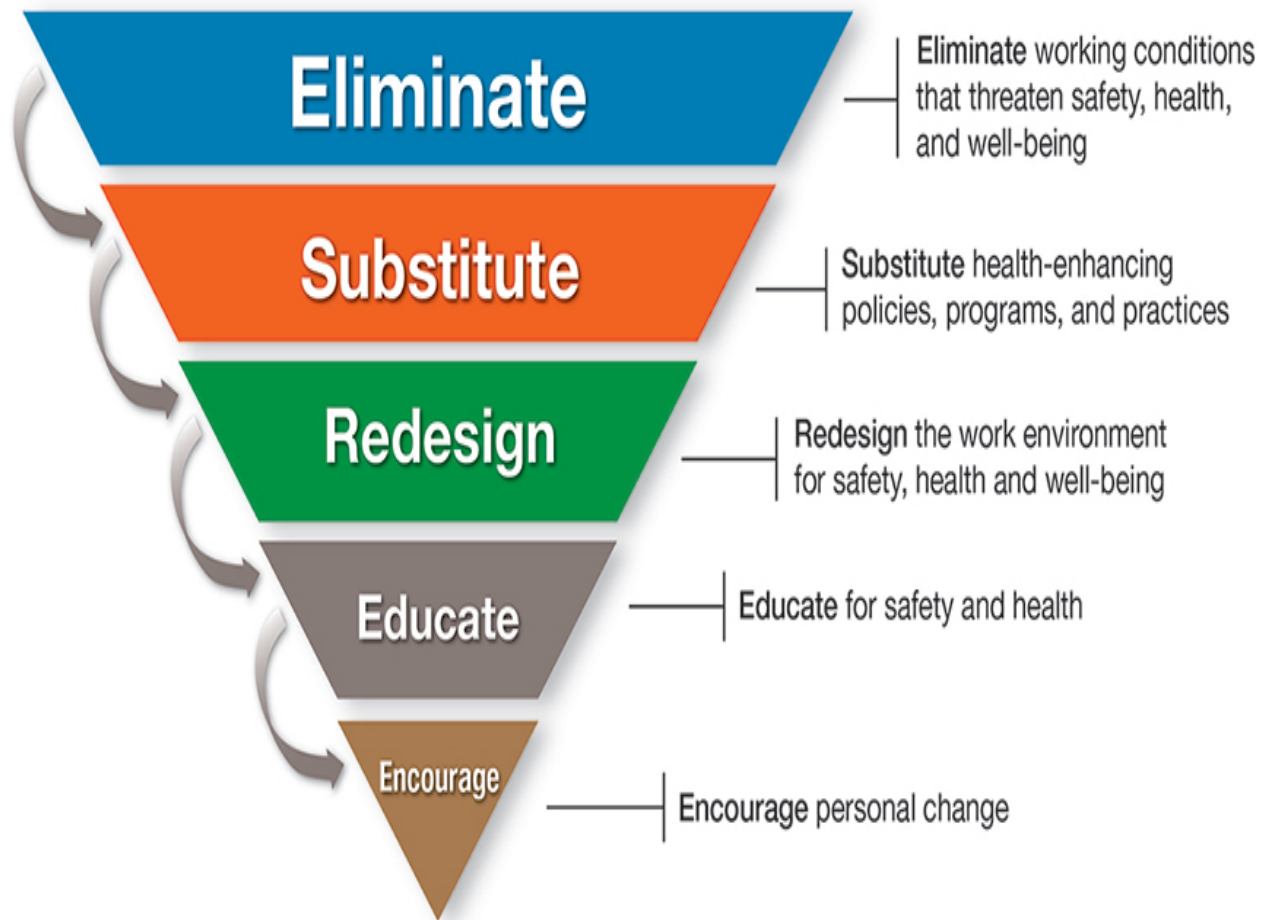
SOME LAST THOUGHTS

- Production managers might be an important first target
    - High smoking rates
    - Not likely to support time off for production employees to participate in smoking cessation activities
- Should also consider including support staff in future studies
- Human resource managers
    - Best point of contact in small companies
    - Lots of turnover, very busy, no or few skills in developing wellness programs
    - Few resources for wellness
- Very difficult to identify all eligible businesses

ANOTHER PERSPECTIVE ON TOTAL WORKER HEALTH

- "Total Worker Health" isn't just workplace safety + health promotion…

- Is smoking really only a personal health behavior or does the work & workplace play a role?

- Do high levels of workplace stress & job strain contribute to smoking or make it more difficult to quit smoking?

- Are there other psychosocial stressors – hours worked, breaks, co-worker support, supervisor support – that might play a role?

- A single safety change is not enough to demonstrate commitment to employee health. What else could we have done?

READINESS SCREENING?

- Safety committees – availability, commitment, preparation, willingness, awareness, make-up

- Management commitment – all levels including production

- Human resources commitment – time, knowledge, skills

- Employee involvement – breaks, time off, participation in decision-making

Eliminate working conditions that threaten safety, health, and well-being

Substitute health-enhancing policies, programs, and practices

Redesign the work environment for safety, health and well-being

Educate for safety and health

Encourage personal change

TOTAL WORKER HEALTH HIERARCHY OF CONTROLS

- Encourage organizational and management policies that give production managers and workers more flexibility and control over their work and schedules, as well as opportunities to identify and eliminate root causes of stress
- Involve production supervisors and employees in designing and implementing changes in workplace, working and employment conditions
- Include all workers – including those in contingent positions
- Recognize the important "gatekeeper" role played by production supervisors – include them as both targets and partners
- Include co-workers and enhance their social support role

TAKE-HOME THOUGHTS…

The health of people <u>at work</u> is a function of multiple factors, including –

- Workplace conditions (chemical, physical, etc. hazards)
- Working or job conditions (psychosocial stressors)
- Employment conditions (pay, benefits, hours, opportunities for advancement)
- Life conditions (housing, transportation, family, etc.)

We should consider all of these factors – and their interactions – when proposing workplace safety or health promotion programs.

Employees do not have much or any control over most of these factors.

Our interventions should be multi-level – and never focused only on employees.

ACKNOWLEDGEMENTS