

The Future of Occupational Safety and Health:

# Policy, Regulatory and Voluntary Approaches to Occupational Risks

Emily A. Spieler  
Gregory R. Wagner

# Disclaimer

The content and conclusions of this presentation are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

# Preview

- What are the goals of OSH interventions?
- What influences workplace H&S conditions?
- Trends that matter for OSH (and resulting opportunities) – an environmental scan
- Implications of trends for OSH research

# Goals of OSH Interventions

- Protect workers from hazards (toxic, physical psychological)—do no harm
- Promote workforce health and wellbeing
- Alternate justification for OSH interventions:
  - Preserve and support enterprise productivity and profitability
    - “Healthy workers are good for business”

# World Health Organization

**Definition of Health:** “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

**Global Plan of Action on Workers' Health:** “All workers should be able to enjoy the highest attainable standard of physical and mental health and favorable working conditions” and “The workplace should not be detrimental to health and well-being”

# Occupational Safety & Health Act

“To assure so far as possible every working man and woman in the Nation safe and healthful working conditions...”

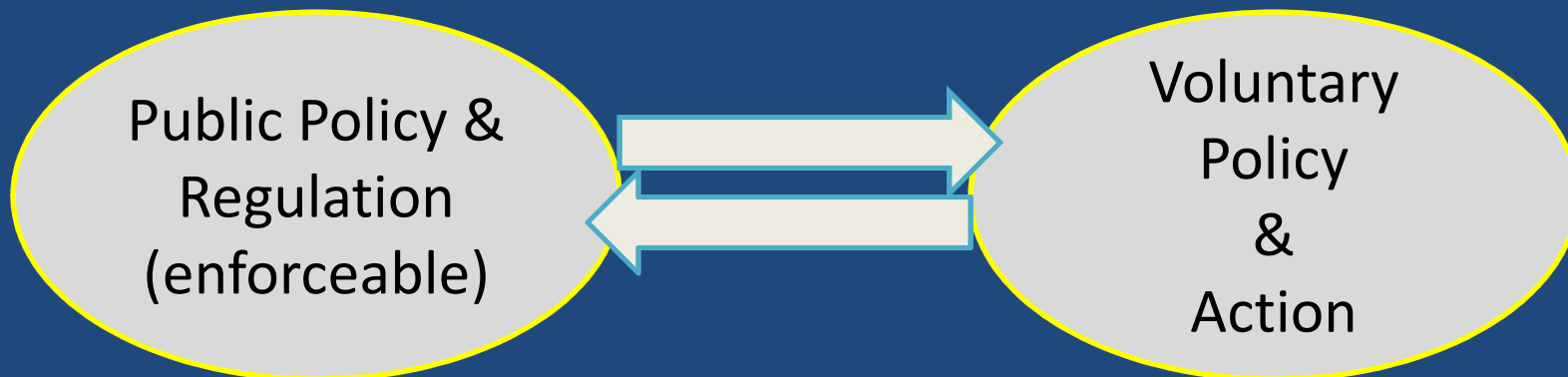
“Each employer... shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees...”

“No employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life...”

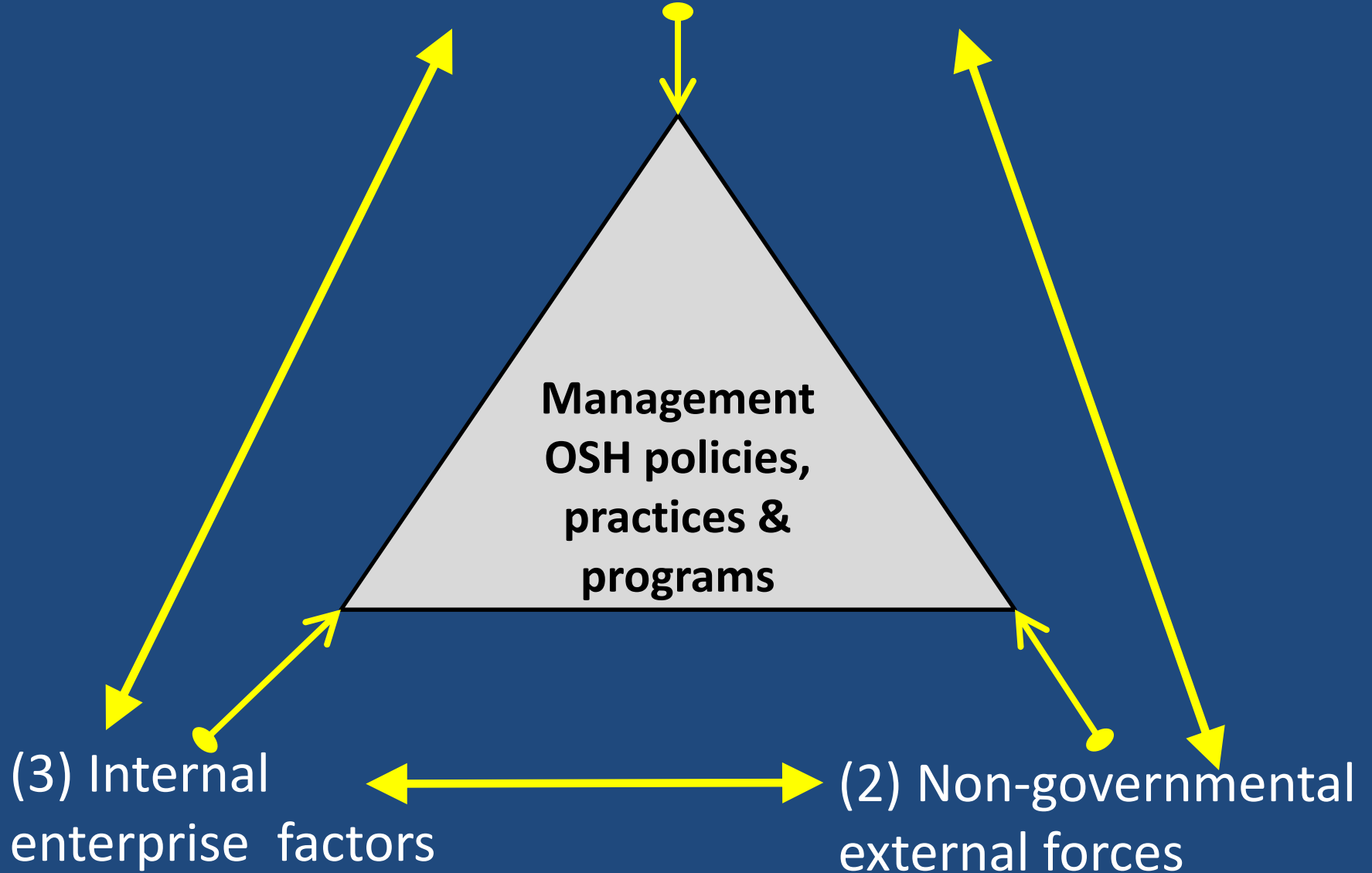
There is no commitment to the precautionary principle in the U.S.

Public policy BALANCES cost & profitability & feasibility against harm to workers.

**WHAT INFLUENCES WORKPLACE  
H&S CONDITIONS?**



(1) Government policies & regulations



# **(1) GOVERNMENT POLICY & REGULATIONS ...**

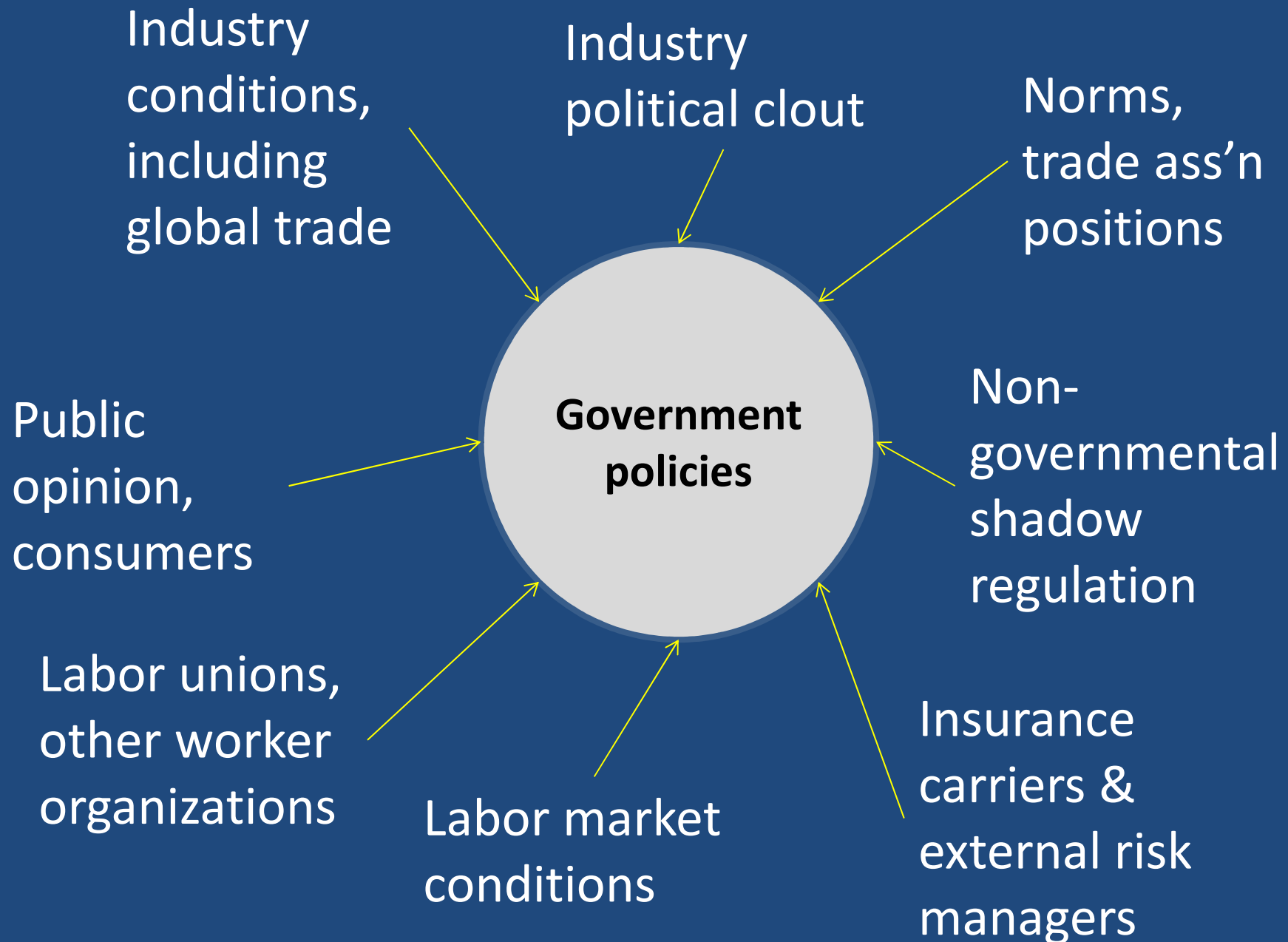
## **OSH relevant governmental policy and regulation:**

- OSH statutes, policies, regulations
- Policing and enforcement of OSH laws
- OSH Surveillance (collection, analysis, reporting of information)
- Workers' compensation and SSDI
- OSH Research – direct, funding & priority setting

## And also:

- Regulation of wages, hours, benefits & leaves
- Disability rights
- Labor-management regulation
- Whistleblower protections
- Tax and financial reporting requirements

## Forces influencing government OSH regulation & policies



# What moves/supports/encourages adoption of new public policy?

Alignment of the following:

- Recognition that there is a problem worth solving (public perception; legislators; regulators; enterprises)
- Development of a "solution" to the problem [economically & technologically & politically feasible]
- The (political) will to adopt/implement the solution
- Timing (window of opportunity when other distractions don't intervene)

Two key policy continua:

How essential is *governmental* intervention to effective OSH practice?

The spectrum:

No regulation:  
market, networks,  
norms (+ internal  
management  
policies, programs &  
practices); “business  
case for safety”

Voluntary  
“regulation” through  
external private  
auditing of  
management  
practices: e.g. the  
Fair Labor  
Association,  
Corporate Social  
Responsibility

Government review  
of and intervention  
in self governance  
through auditing,  
creation of  
incentives, required  
participation of  
stakeholders, etc.

Top down “command  
and control”  
governmental  
regulation: e.g. OSHA  
creation and policing  
of standards

How essential is *worker voice & power* to effective OSH practice? And how essential is governmental / public intervention to support worker voice?

The spectrum:

|                 |   |   |                         |
|-----------------|---|---|-------------------------|
| No worker voice | Various levels of individualized worker input into OSH: health and safety committees; walkaround rights; right to refuse unsafe work; whistleblower protections | Protected collective voice; right to shut down unsafe worksites | Shared control over OSH |
|-----------------|---|---|-------------------------|

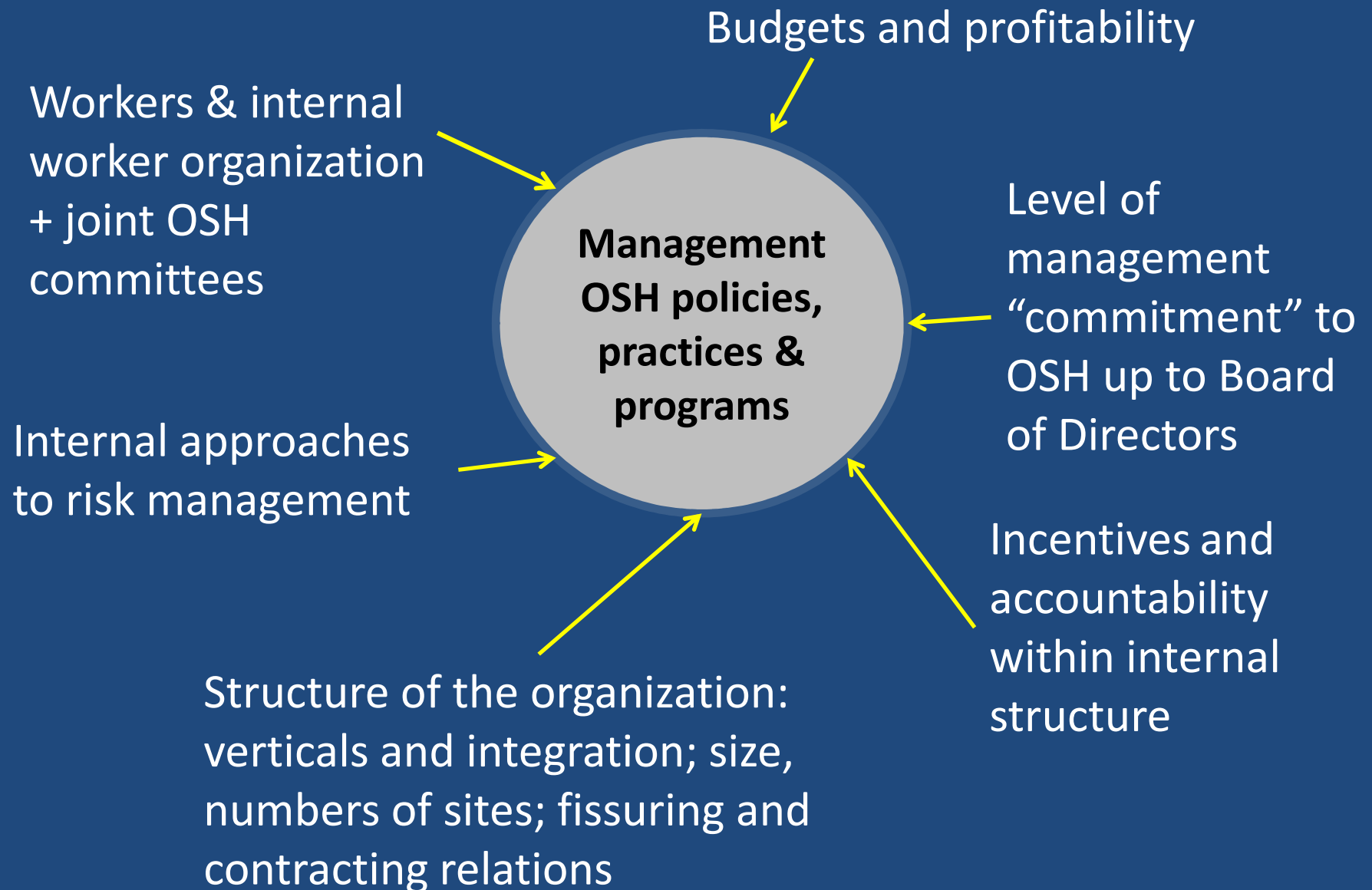
## **(2) NON-GOVERNMENTAL EXTERNAL FORCES...**

Non-governmental external forces also influence enterprise behavior



## **(3) FORCES WITHIN WORKPLACES...**

## Internal organization & management variables with OSH influence



**TRENDS AND DEVELOPMENTS...**

**THE CHANGING CONTEXT FOR OSH**

**“It's tough to make predictions,  
especially about the future.”**

**— Yogi Berra**

# 16 NOTABLE TRENDS

## (and that's probably not all)

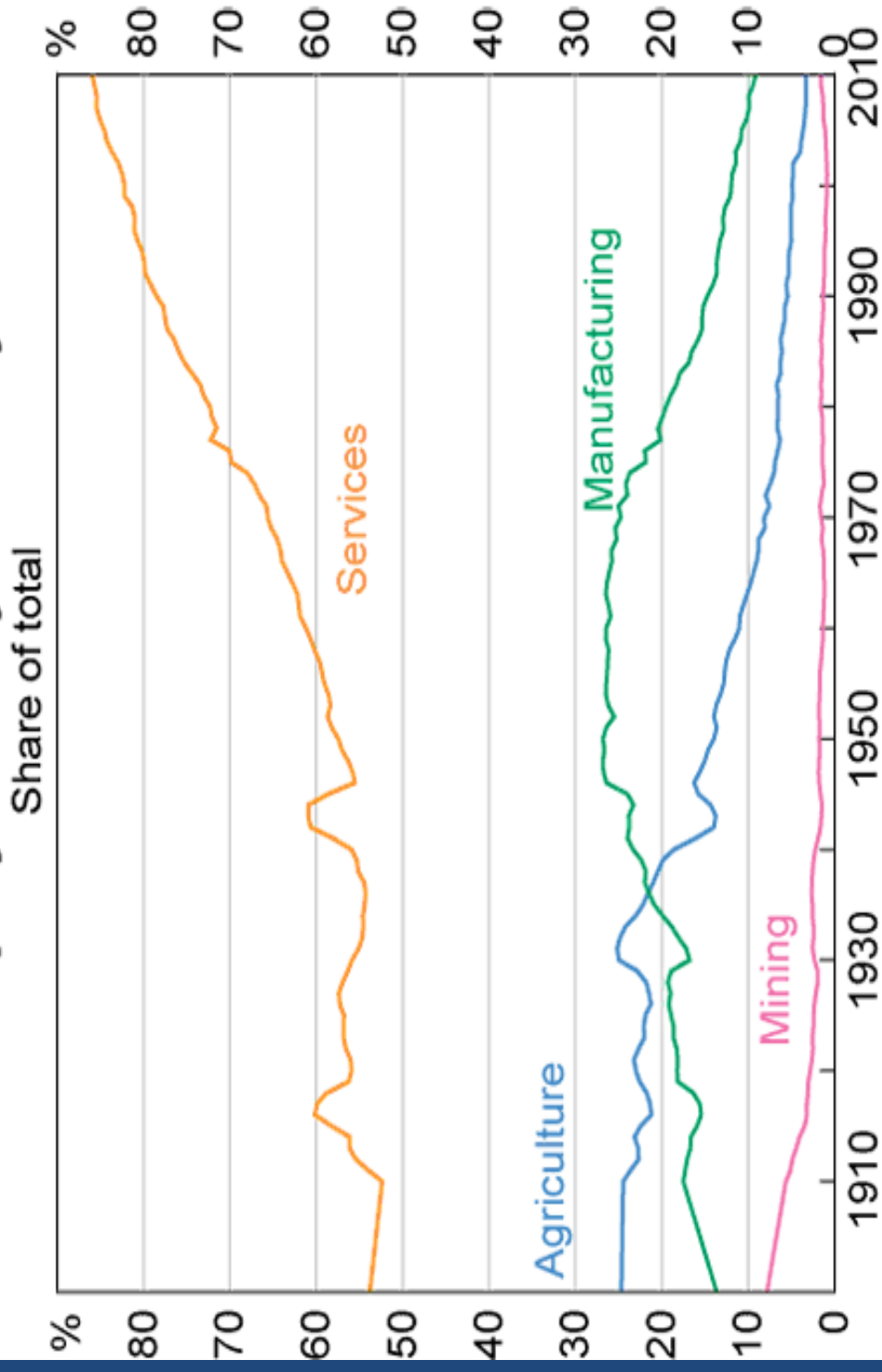
1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# **1. The nature of work**

- Industrial and occupational shifts**
- New relationships, including fissuring**
- Mechanization and the new machine age**

2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation, worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes; infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

## Employment by Industry\*



\* Data are interpolated between 1900 and 1910  
Sources: ABS; RBA; Withers, Endres and Perry (1985)

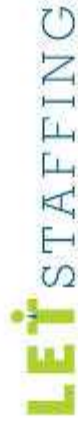


**HOTELS • RESORTS • SUITES**



**North Atlantic, Inc.**  
Innovative • Seafood • Solutions







1. The nature of work

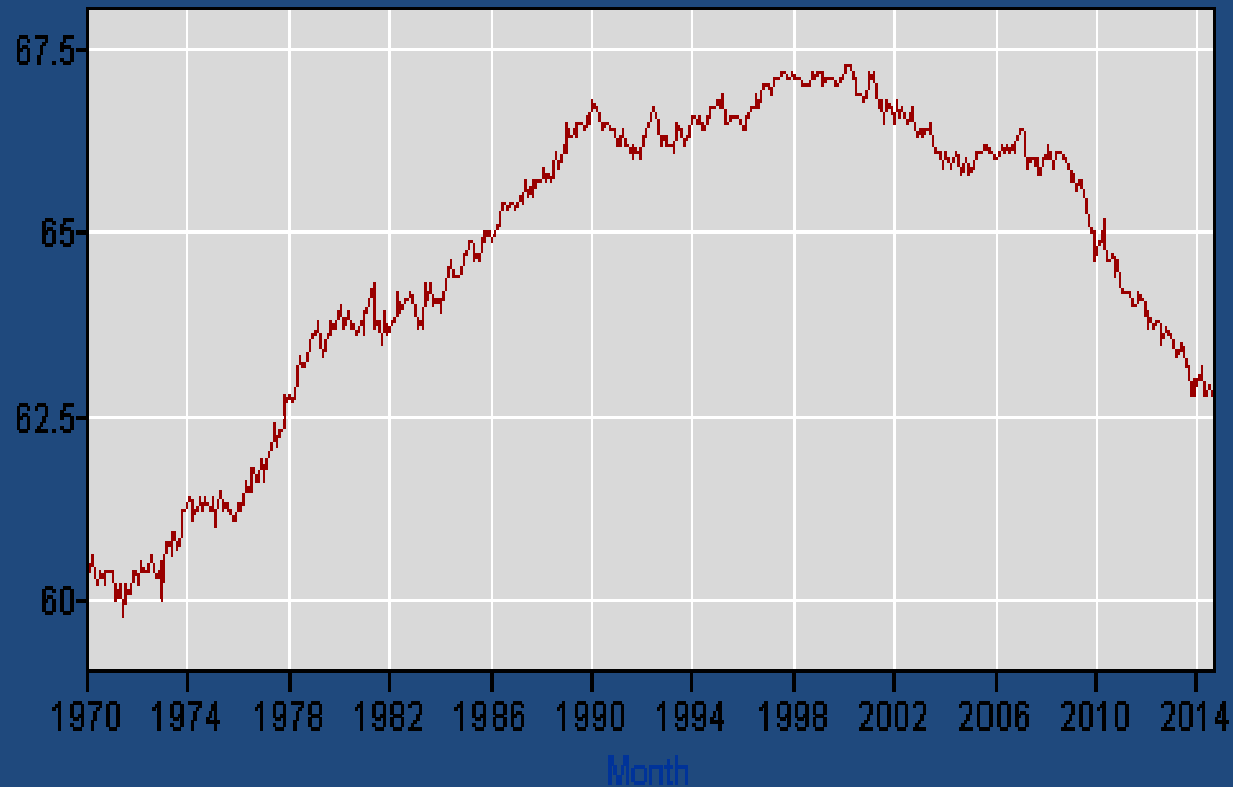
## **2. Workforce characteristics**

- Labor force participation

- Changing demographics in labor market

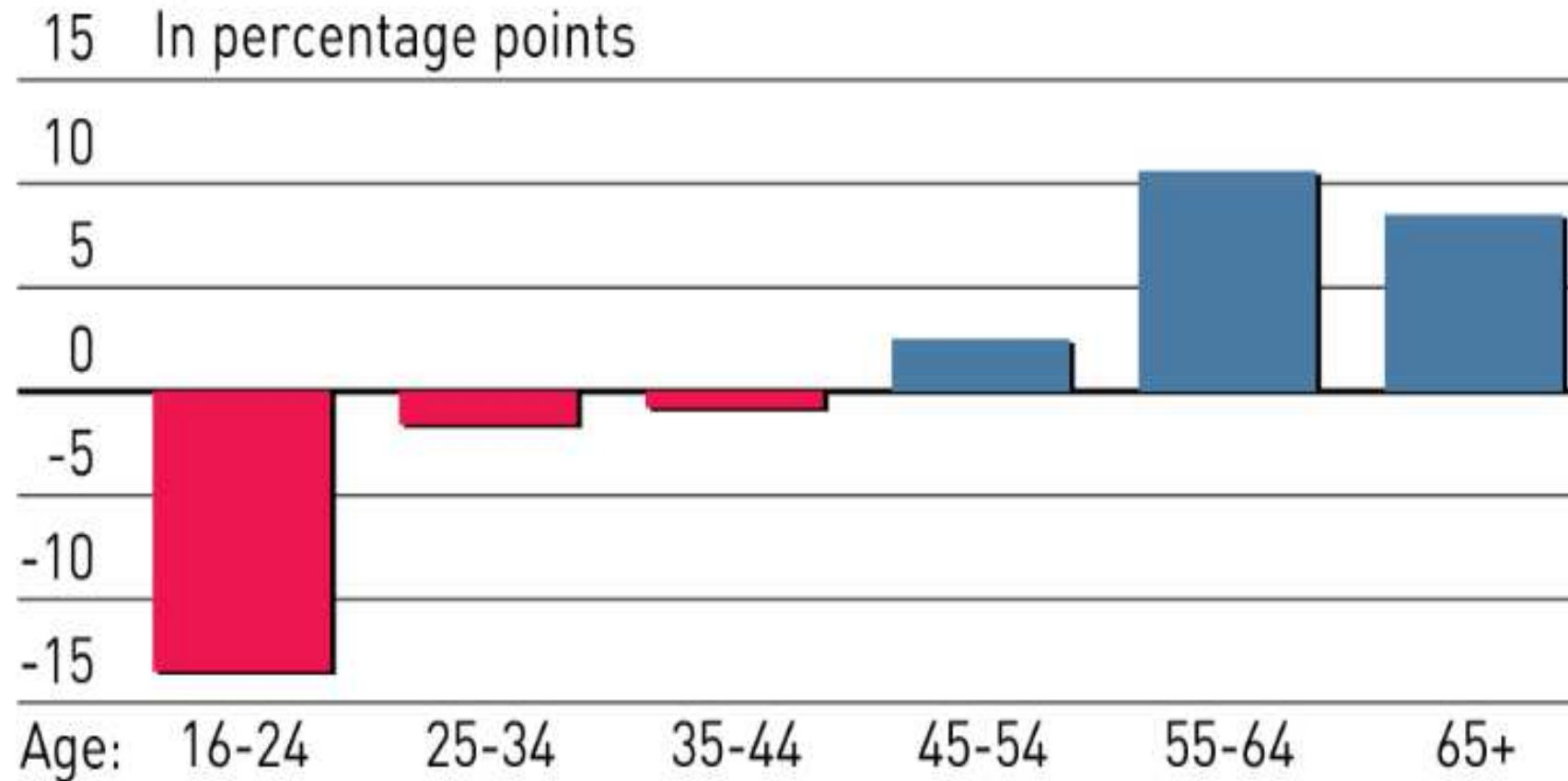
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# Labor Force Participation rate 1970-2014



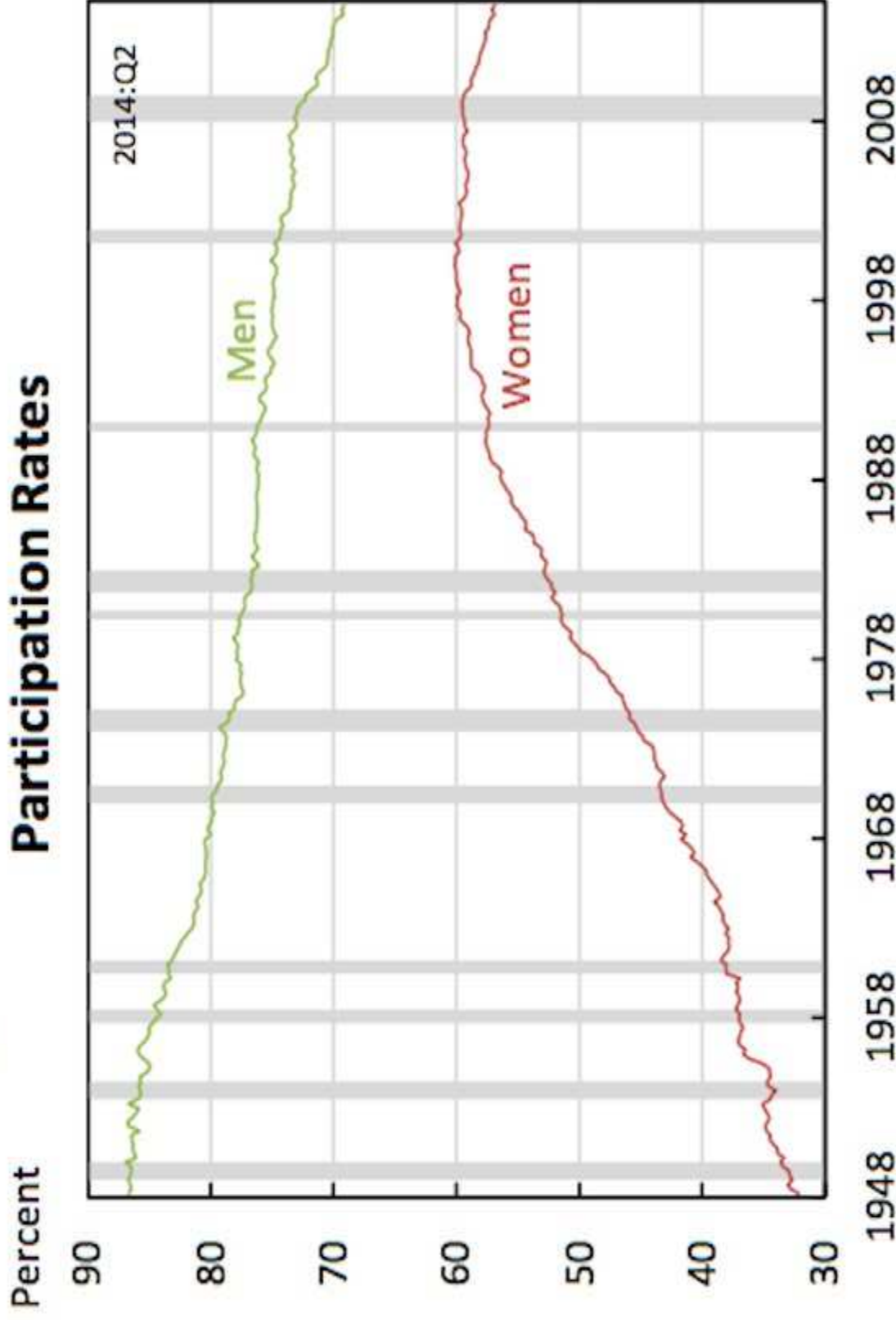
BLS <http://data.bls.gov/pdg/SurveyOutputServlet>

## Change in labor force participation rate by age, 1985 to present



Sources: Labor Dept., Heritage Foundation

**Figure 2: Male and Female Labor Force Participation Rates**

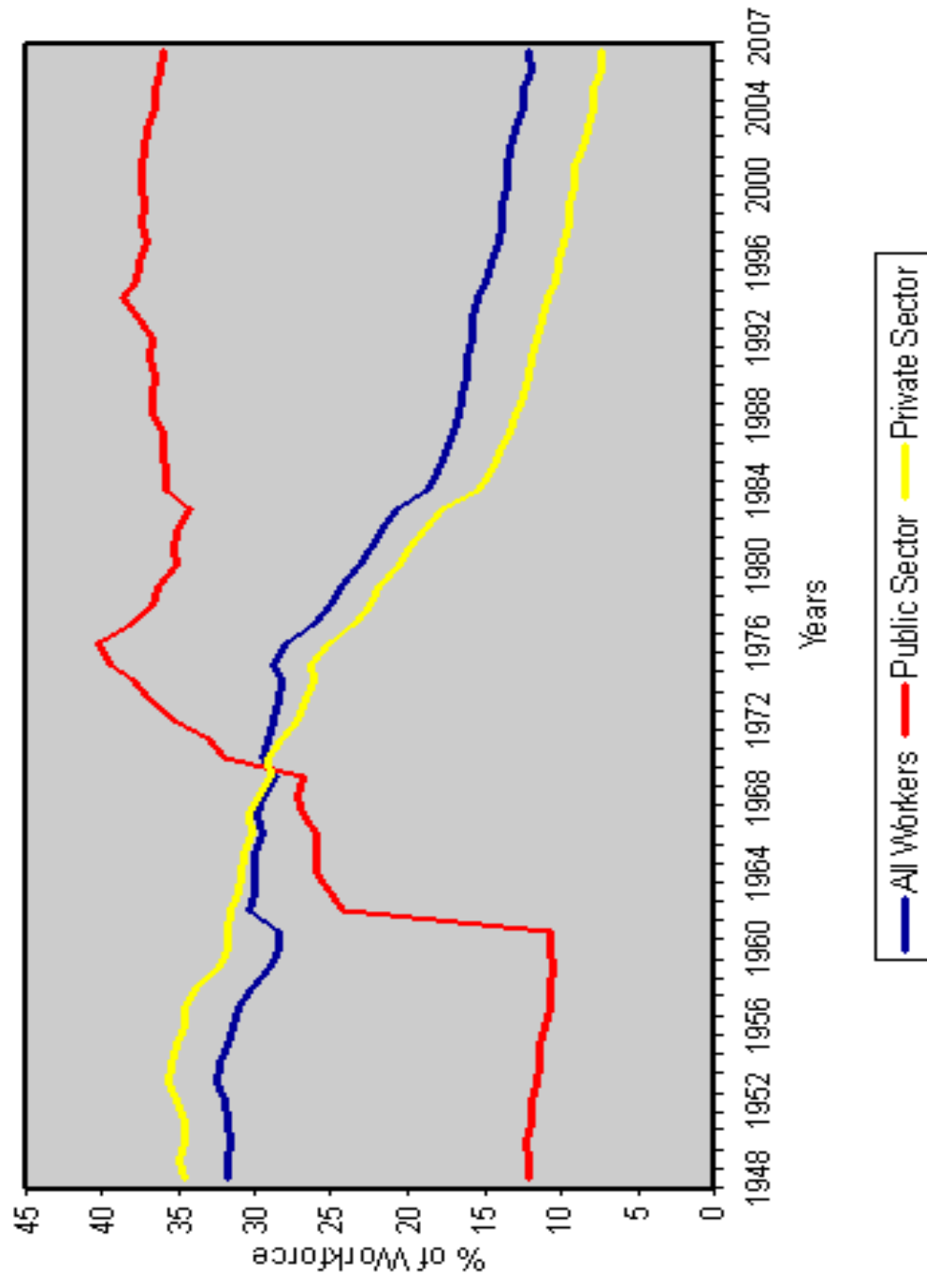


1. The nature of work
2. Workforce characteristics

### **3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections**

4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

% of Workforce in Unions 1948-2007



## Worker Centers:

for workers, by workers,  
organizing for worker justice  
and dignity on the job!



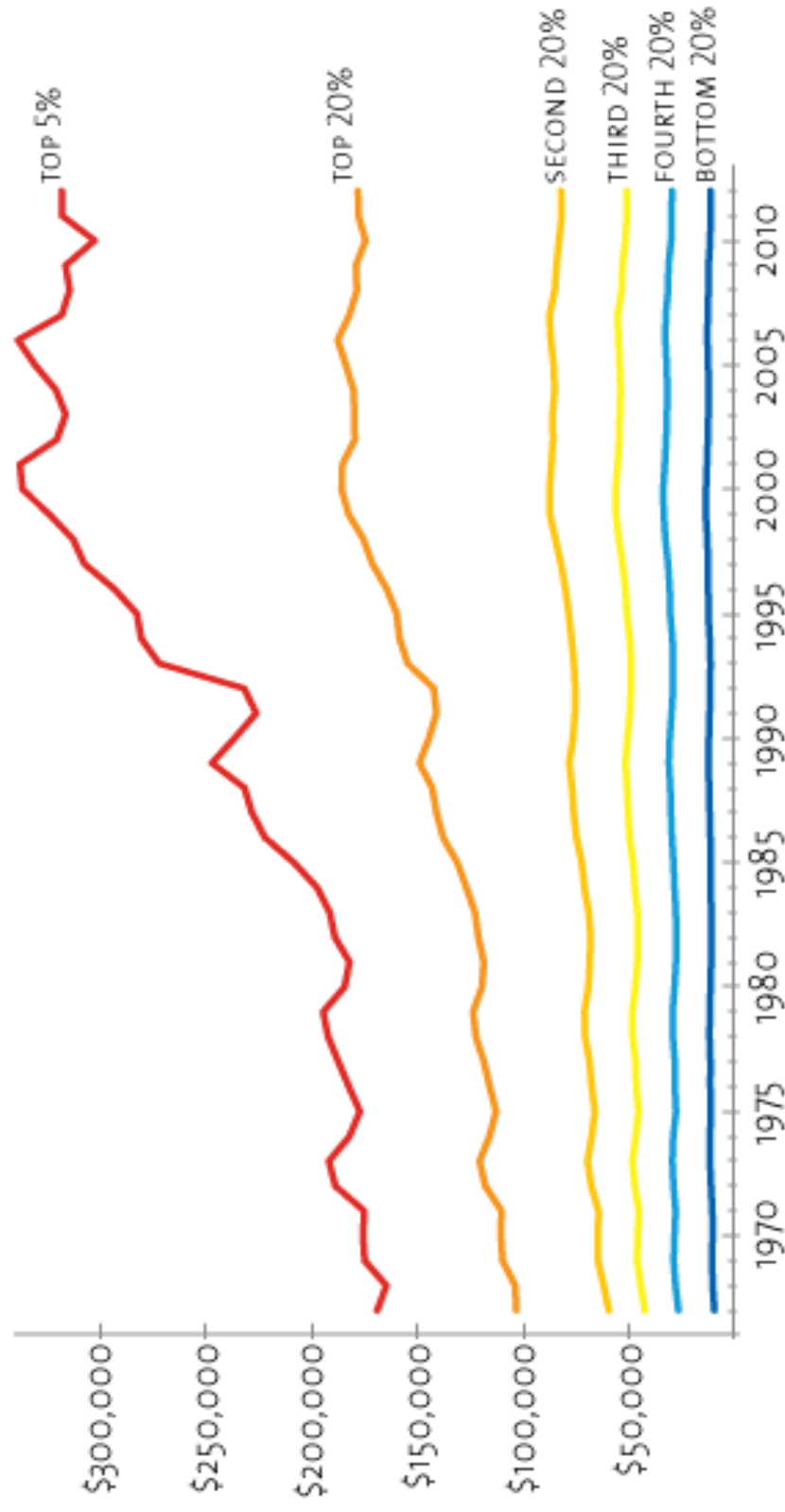
1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections

## **4. Economic inequality, wage stagnation & worker insecurity**

5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

## Average Household Income, 1967-2012

in 2012 dollars, by percentile



SOURCE: CENSUS BUREAU

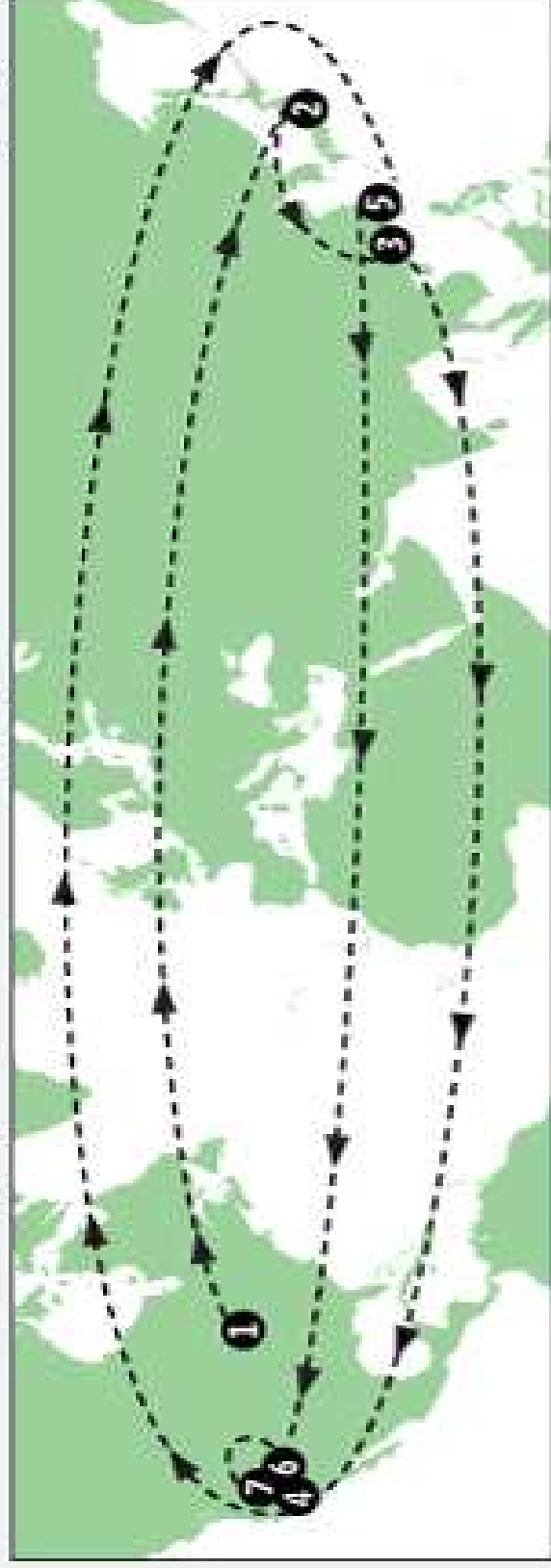
Mother Jones

1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity

## **5. Globalization & supply chain pressures**

6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

## Life of a DVD Player | How the tech supply chain makes the world's gadgets



①

Minnesota-based **Best Buy** decides how many DVD players it wants, orders from Toshiba...

②

Toshiba tells factories-for-hire in China to crank up production ...

③

Those Chinese **factories-for-hire** order chips from Zoran Corp. ...

④

Zoran tells its own subcontractors, including TSMC, to get busy making more chips...

⑤

TSMC, in Taiwan buys equipment from Applied Materials ...

⑥

In California, **Applied Materials** shops for specialty machine-tool services...

⑦

Machine-tool firm **D&H Manufacturing**—at the end of the chain—mills aluminum blocks for Applied.

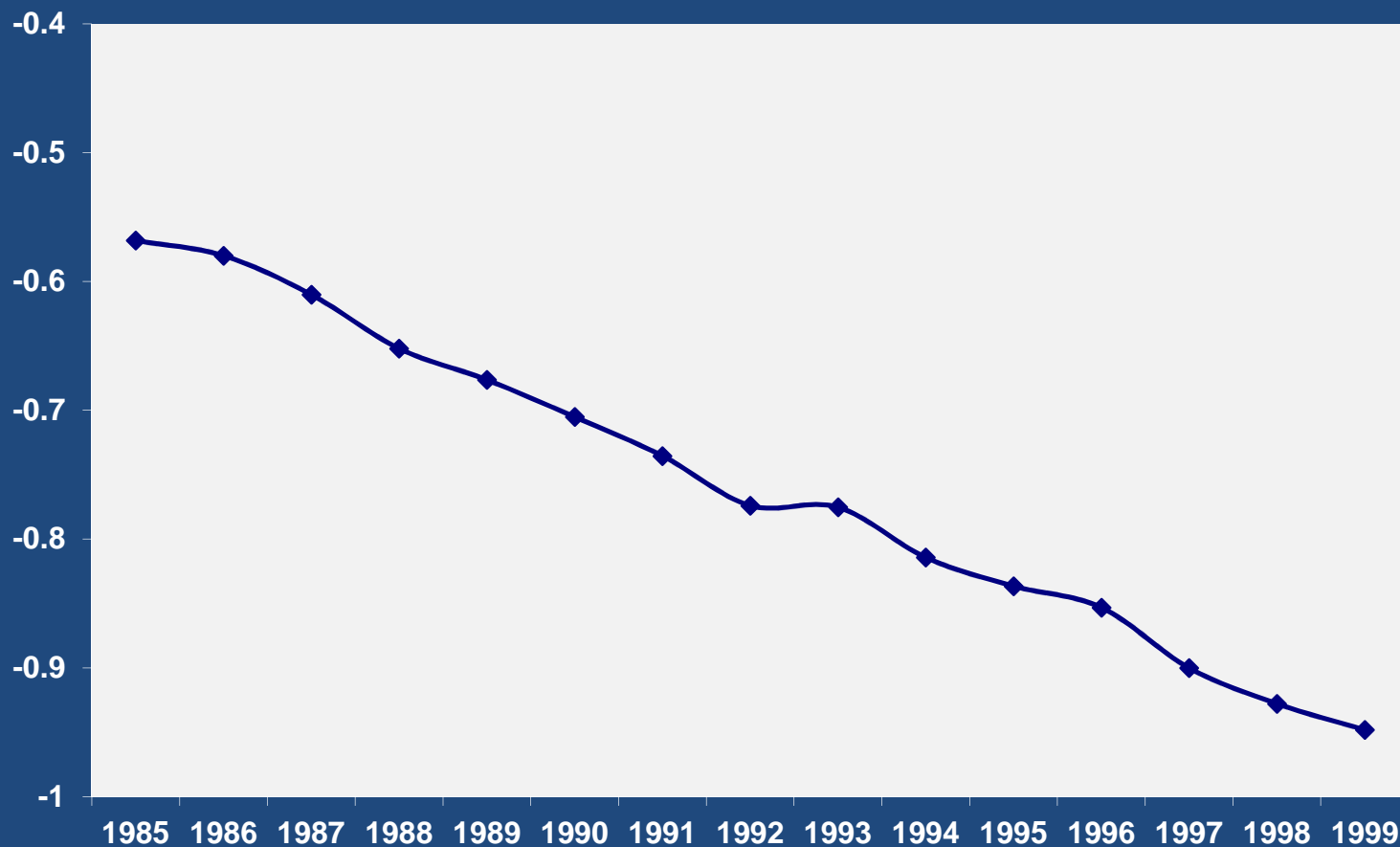


1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures

## **6. Increasing barriers to workers' compensation for work-related conditions**

7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# Effects of changes on compensability: Workers' Compensation Compensability Index, 1985-1999 (Burton-Guo 2010)

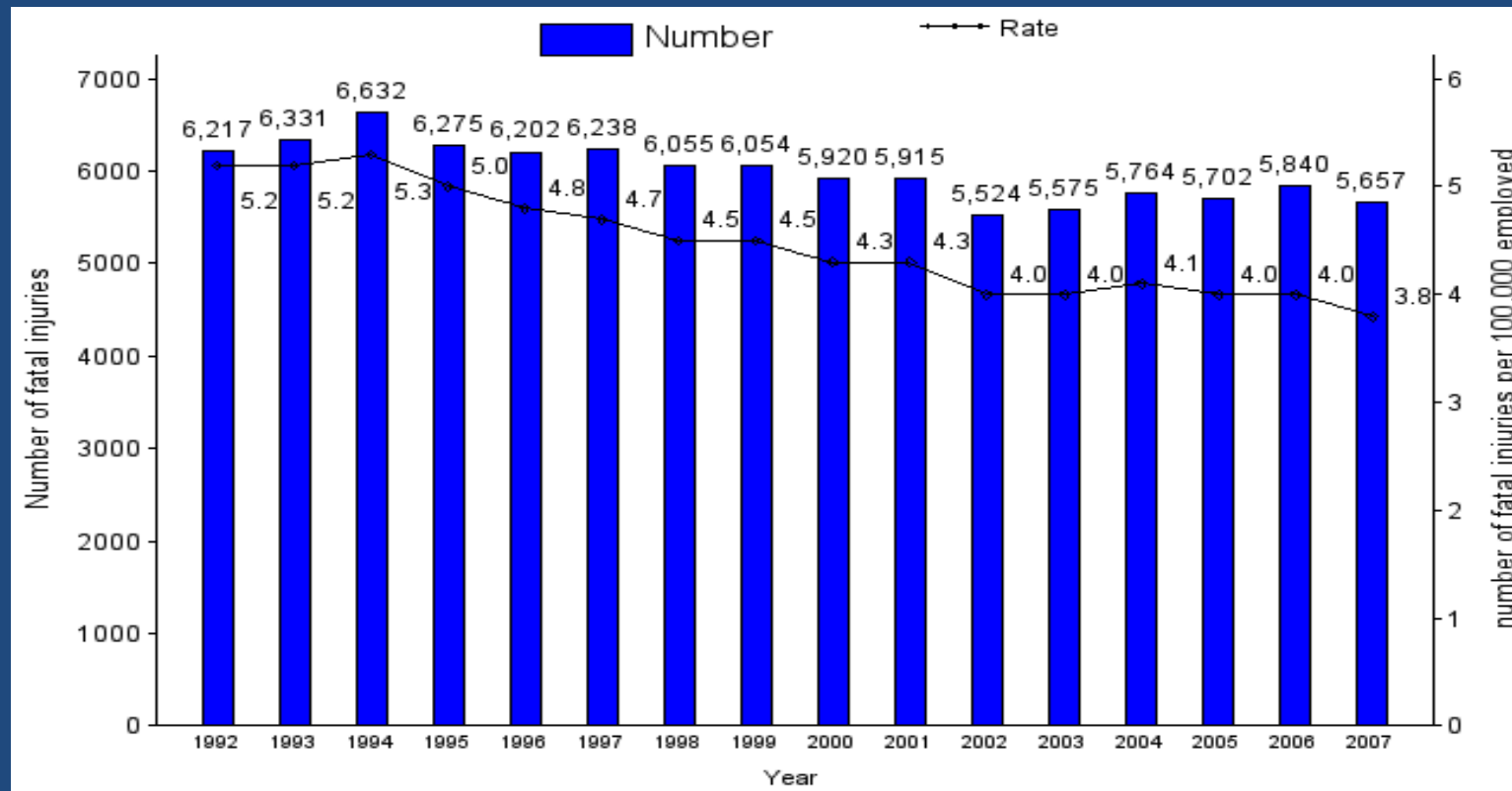


1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions

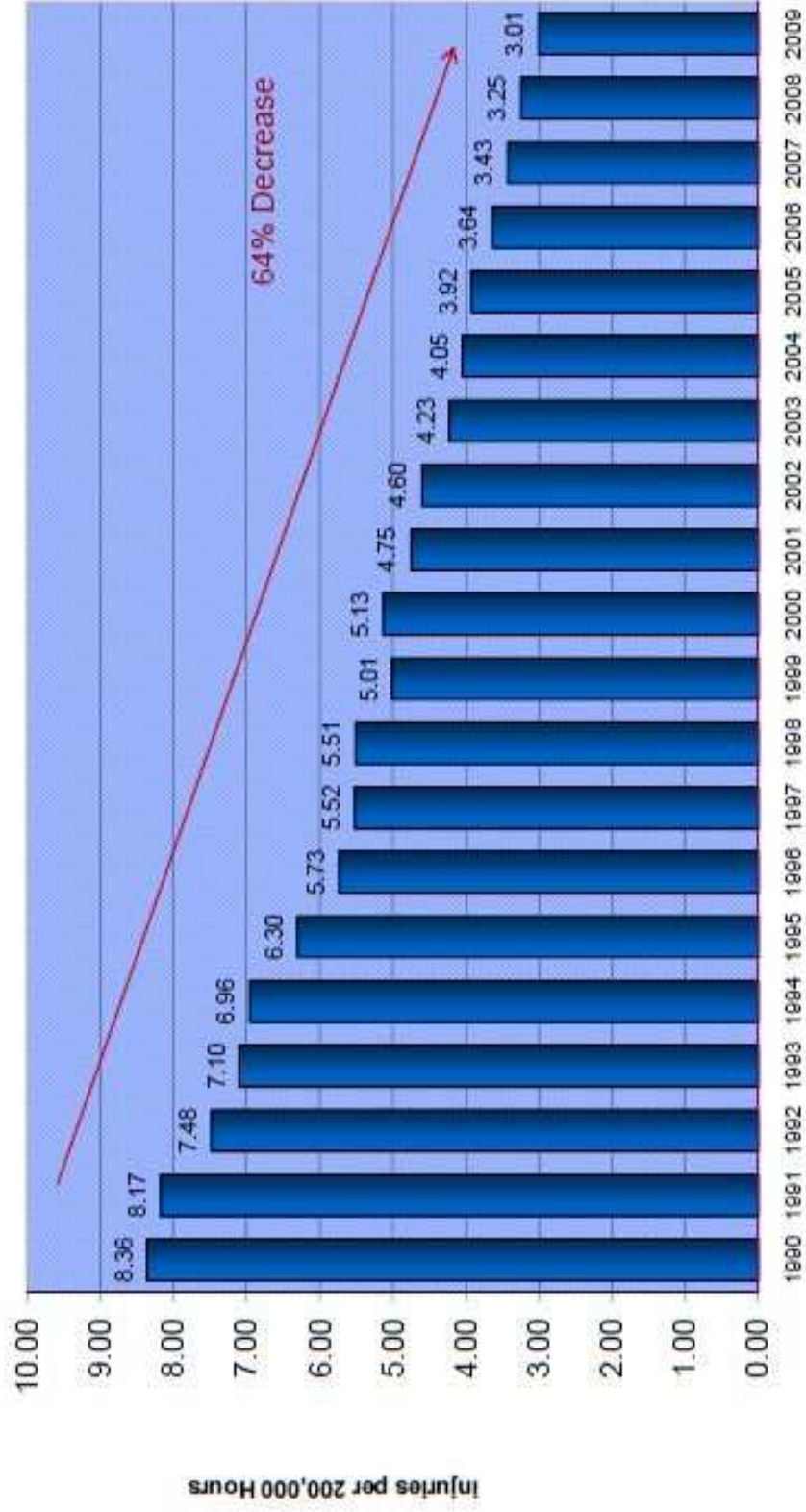
## **7. Decreasing reported injuries, particularly in most hazardous industries**

8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

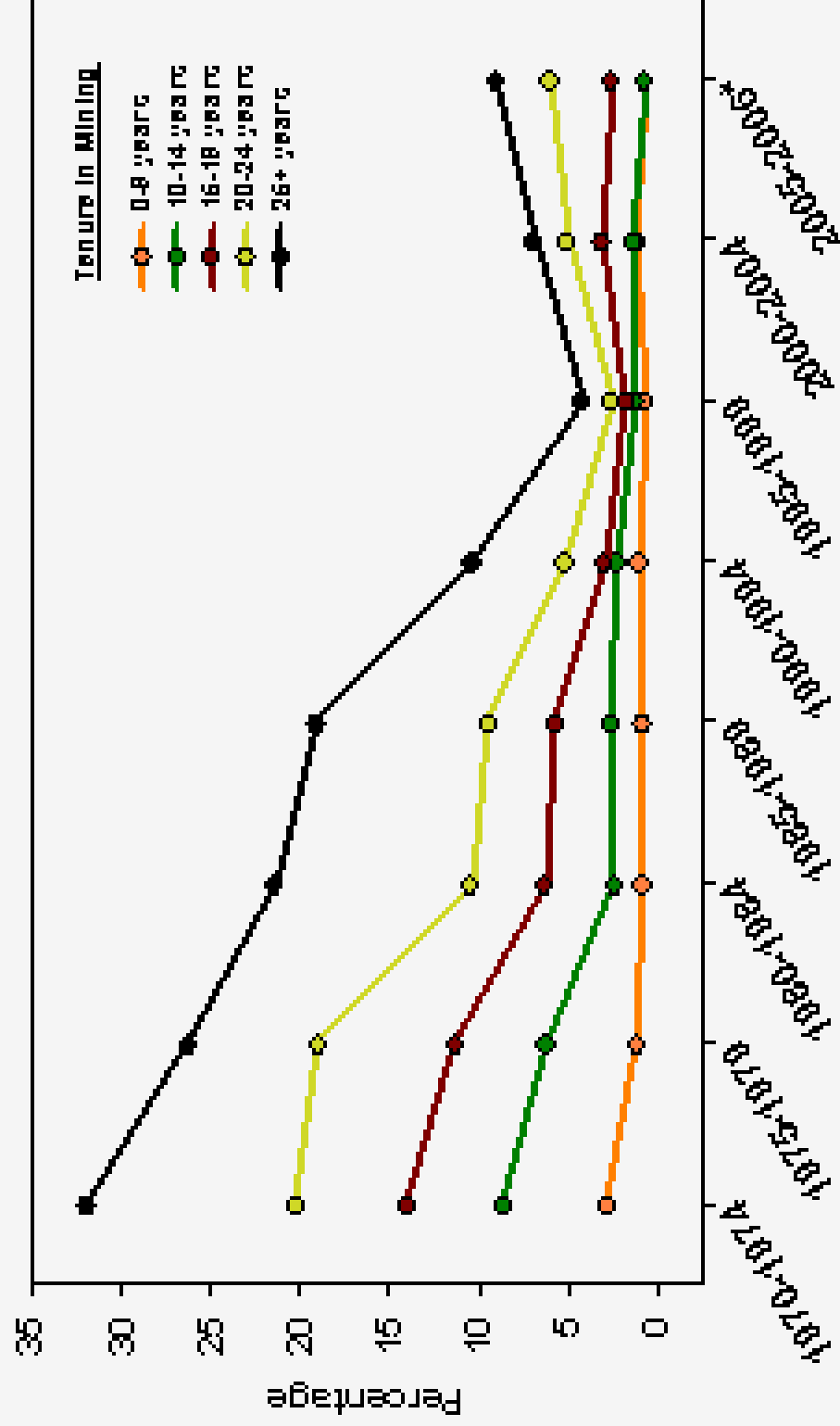
# Fatal workplace injuries and rates, US: 1992-2007



## U.S. Mining Record of Reduction Total Injury Rate, 1990-2009



# Percent of miners with Coal Workers' Pneumoconiosis (CWP) by tenure in mining, 1970-2006



SOURCE: MDSH Coal Workers' X-ray Surveillance Program (COWSP) as cited in MDSH ZIPP WORLD Report, Figure 2-4.

1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries

## **8. Changing health status of the workforce: obesity, diabetes, infectious diseases**

9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

## *Increased Chronic Diseases (for young and old)*

- 39 States with 40% of young adults considered to be overweight or obese in last decade
- In Kentucky, Alabama and Mississippi, >50% young adults are overweight
- Medical Consequences:
  - Increased risk of CVD
  - Increased Type 2 Diabetes
  - Sleep apnea
  - Musculoskeletal disorders

The map displays the following diseases and pathogens, categorized by their distribution markers:

- Red Dots (Indicated Diseases):**
  - Ebola hemorrhagic fever
  - Hepatitis C
  - West Nile virus
  - Cyclosporiasis
  - Human monkeypox
  - Listeriosis
  - 2009 H1N1 influenza
  - Adenovirus 14
  - Anthrax bioterrorism
  - Hantavirus pulmonary syndrome
  - Dengue
  - Yellow fever
  - Human African trypanosomiasis
  - Cholera
  - Marburg hemorrhagic fever
  - MDR/XDR tuberculosis
  - Human plague
  - Chikungunya fever
  - Enterovirus 71
  - Hendra virus
  - Nipah virus
  - SARS
  - H5N1 influenza
  - E. coli O157:H7
  - Severe fever with thrombocytopenia syndrome bunyavirus (SFTSV)
  - Typhoid fever
  - Rift Valley fever
  - Diphtheria
  - Drug-resistant malaria
  - Human monkeypox
  - Plague
- Blue Dots (Indicated Diseases):**
  - Cryptosporidiosis
  - E. coli O104:H4
  - vCJD
  - Lyme disease
  - Lassa fever
  - HIV
- Other Labels:**
  - MRSA
  - Human monkeypox

- Newly emerging
- Re-emerging/resurging
- “Deliberately emerging”

1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases

## **9. ACA**

— **Broader health insurance coverage**

— **Wellness programs**

— **Electronic Medical Records**

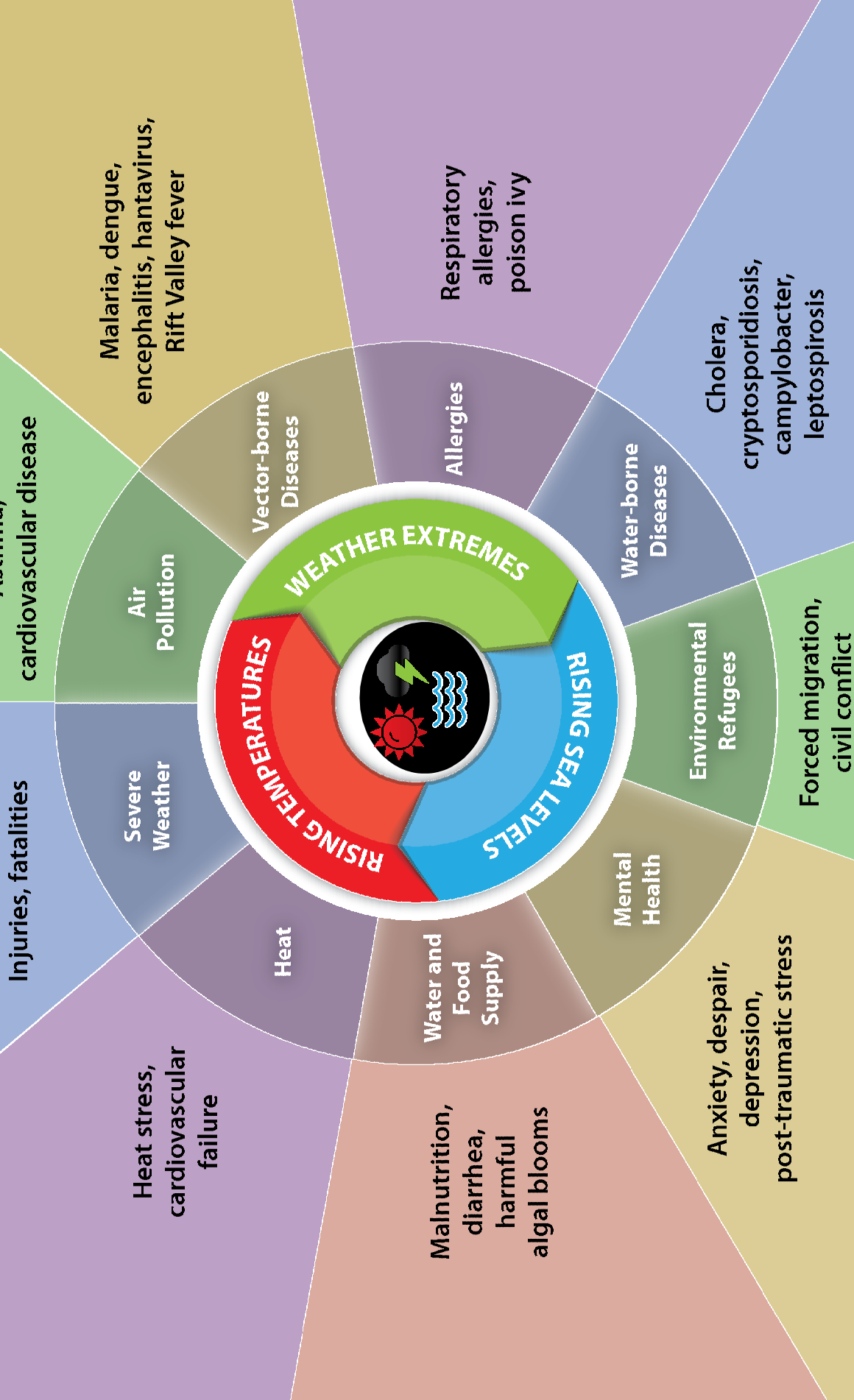
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA

## **10. Climate change**

11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# Impact of Climate Change on Human Health



1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change

## **11. New hazards and changing technologies at work**

12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# Monitors & Sensors

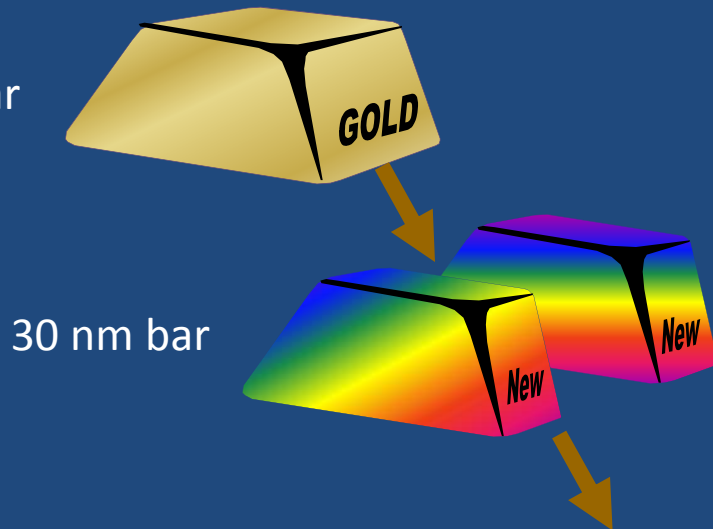
- Work environment
  - Direct-reading instruments
    - Personal Dust Monitor
    - Explosibility Meter
  - Sensors
- Biologic environment
  - Biomarkers of exposure
  - Biomarkers of effect
    - In-dwelling monitors enabled by nanosensors that circulate sending data back to a central database



# NANO: Not only smaller, but different



60 nm bar



30 nm bar

## New Properties

- Lower melting point
- Useful as catalyst
- Different color
- Different conductivity

1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work

## **12. Changing technologies for protection (e.g. PPE, proximity detection devices)**

13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies





1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)

### **13. Advances in genetics & epigenetics**

14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics
15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

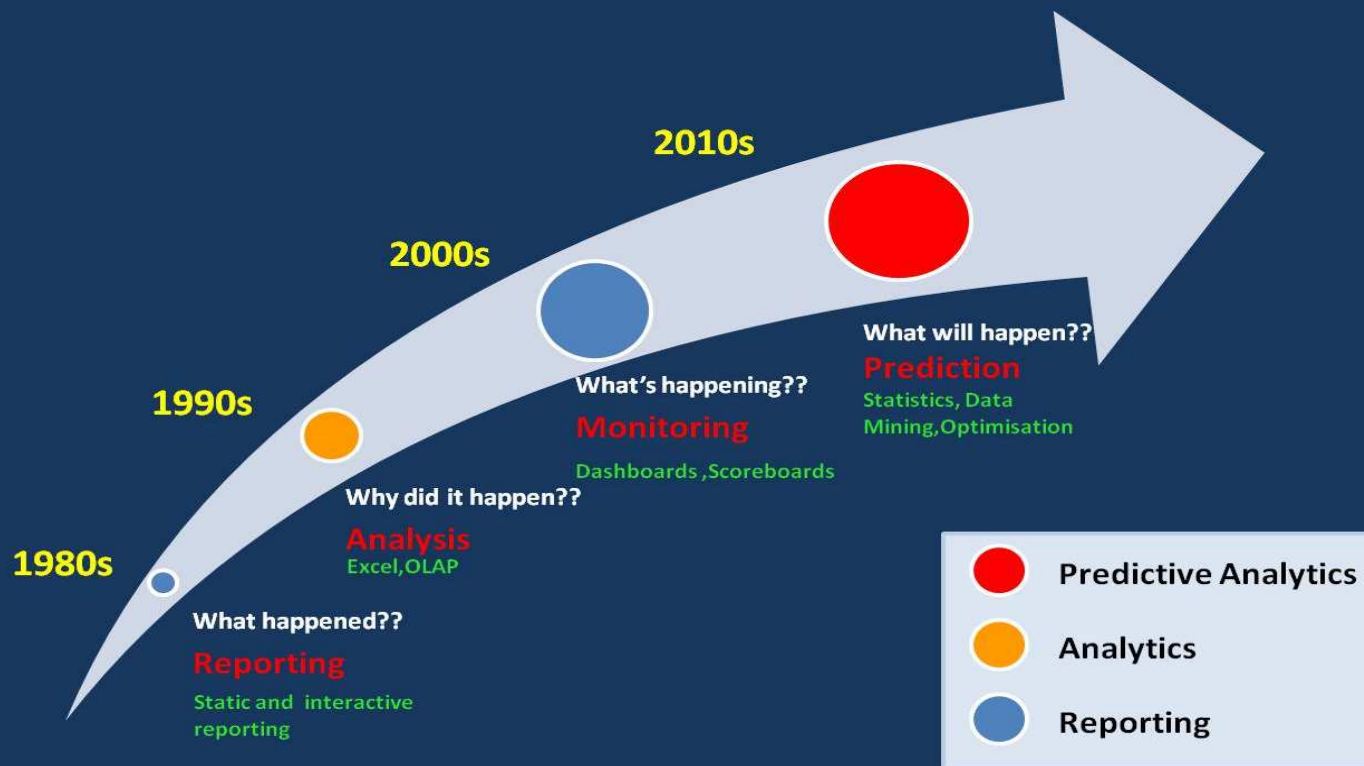
1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics

## **14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics**

15. Increasing importance of local/state-based initiatives
16. Constrained /declining funding for public agencies

# Big Data & Predictive Analytics

## Evolution of Predictive Analytics



1. The nature of work
2. Workforce characteristics
3. Decline of unions, changing worker organization strategies and reliance on whistleblower protections
4. Economic inequality, wage stagnation & worker insecurity
5. Globalization & supply chain pressures
6. Increasing barriers to workers' compensation for work-related conditions
7. Decreasing reported injuries, particularly in most hazardous industries
8. Changing health status of the workforce: obesity, diabetes, infectious diseases
9. ACA
10. Climate change
11. New hazards and changing technologies at work
12. Changing technologies for protection (e.g. PPE, proximity detection devices)
13. Advances in genetics & epigenetics
14. Advances in data capture analytic capabilities—"Big Data" & Predictive Analytics

**15. Increasing importance of local/state-based initiatives**

**16. Constrained /declining funding for public agencies**

**IMPLICATIONS FOR THE FUTURE OF  
POLICY-RELEVANT OSH RESEARCH...**

# New(ish) tools & approaches

- Miniaturization, reduced cost, increased availability of sensor technology
- Real time monitoring (environments & people)
- Predictive analytics (and other approaches using high volume & real-time data)
  - Predictive toxicology
- Electronic Medical Record clinical data
- Economics, including behavioral economics
- Simulations, VR, game theory
- Network theory
- Genetics & epigenetics
- Collaborative research (CBPR)

# New(ish) problems, challenges & opportunities

- Identifying & protecting high-risk sub-populations
  - High hazard
  - Work organization
    - Insecurity / lack of worker voice
  - Mobility
- Exploring what motivates & impedes change
  - Economics of OSH
  - Networks; diffusion of innovation
  - Intervention effectiveness
- Complex environments & networks (social, physical)
  - Work organization & organizational behavior
  - complex mixtures
- Diseases & injuries with occupational contributions

# Strategies for increasing policy impact of research

- Planning: explore current state of relevant policy
- Is the effort disease, injury, or exposure specific or cross-cutting (e.g., methods)?
- Engage with multidisciplinary team
  - Identify knowledge gaps & assess their policy relevance
  - Do what you can
- Peer-reviewed publication is necessary but not sufficient
- Engage with stakeholders & public processes

The End