

The Future of Work: Challenges and Opportunities for Worker Well-Being



Getty Images

Jay Vietas, PhD, CIH, CSP
Chief, Emerging Technology Branch
jvietas@cdc.gov



Courtesy of US Air Force



Courtesy of US Air Force





MENTAL

Awareness
Adaptability
Decision Making
Positive Thinking



PHYSICAL

Endurance
Nutrition
Recovery
Strength



SOCIAL

Connectedness
Communication
Social Support
Teamwork



SPIRITUAL

Core Values
Perseverance
Perspective
Purpose

← COMPREHENSIVE AIRMAN FITNESS (CAF) →



Courtesy of US Air Force



Courtesy of US Air Force

Hopeful Takeaways

Future of Work Initiative at
NIOSH

Benefits and Risks of
Technology in the workplace

Need for Total Worker
Health approach

The National Institute for Occupational Safety and Health

The U.S. Federal agency responsible for *conducting research* and *making recommendations* for the prevention of work-related injury and illness.



Mission: To *develop new knowledge* in the field of occupational safety and health and to *transfer that knowledge into practice*.

Federal Government & Worker Health

**Occupational Safety and Health
Standards Setting & Enforcement**

**Department of Labor
(DOL)**

MSHA

OSHA

**Research and
Authoritative Recommendations**

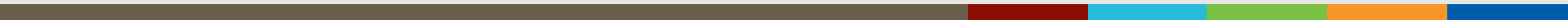
**Department of Health
and Human Services (HHS)**

**Centers for Disease
Control and Prevention (CDC)**

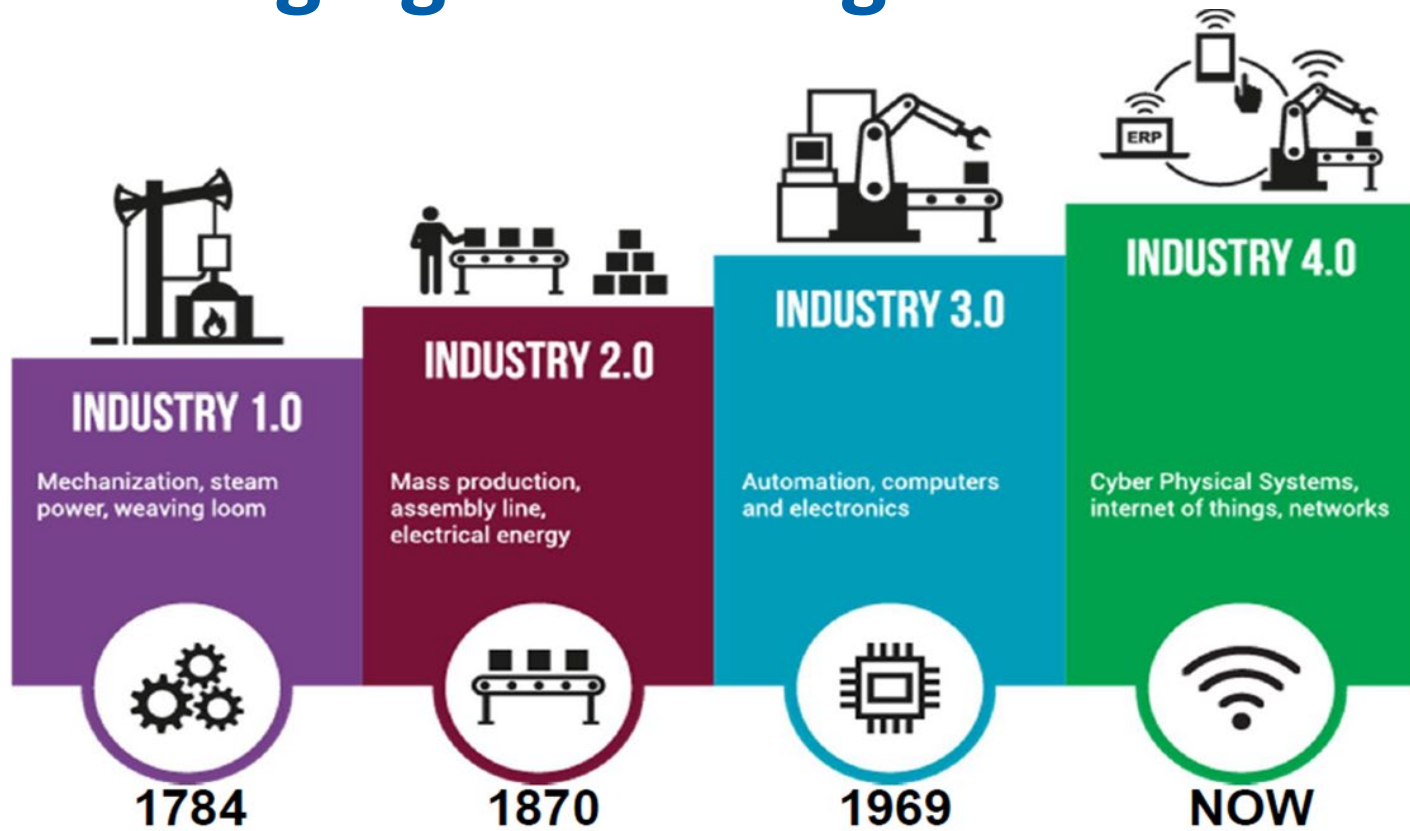
NIOSH

The Future of Work

Anticipating change and shaping possibilities.



Emerging Technologies



- Additive Manufacturing
- Advanced Materials
- AI/Algorithms/DL/ML
- AR/VR
- Big Data Analytics
- Biotechnology
- Digital Supply Chain
- Internet of Things
- Robotics
- Smart Sensors
- Wearable Technology

What is the impact on worker safety, health and well-being?

Future of Work Initiative

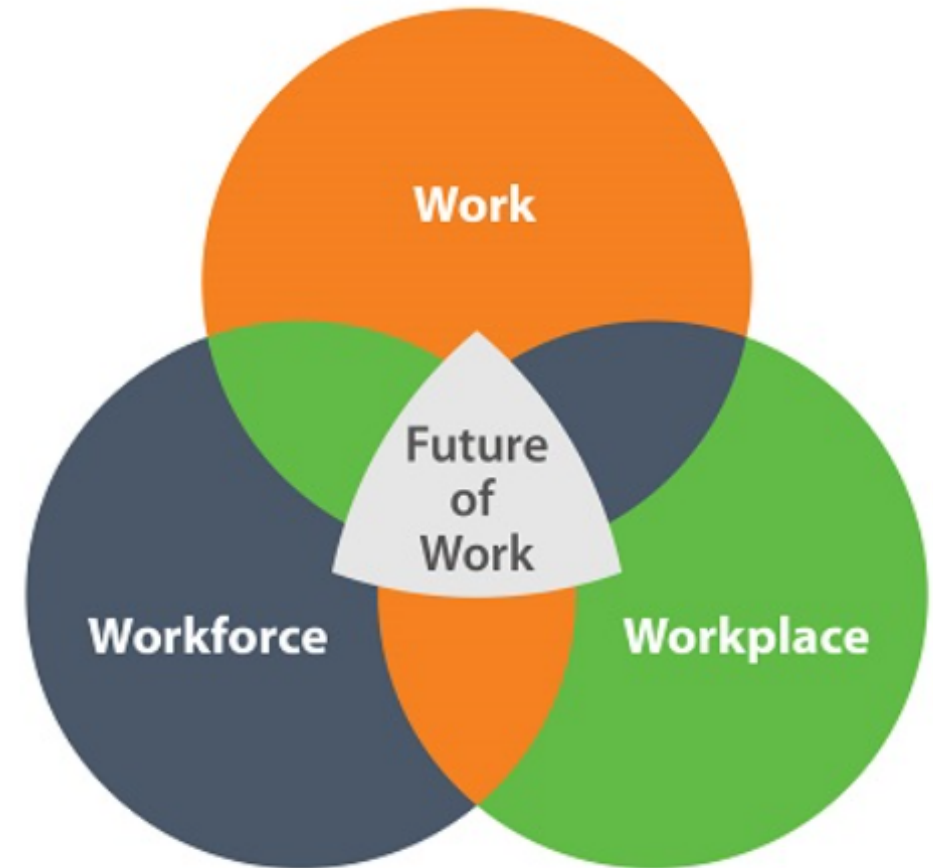
“The future is not predestined; it is influenced by the choices we make today.

No one knows for certain what the future holds for occupational safety and health. What is exceedingly clear, however, is that we must take proactive steps now to ensure the safety, health, and well-being of the workforce.

Now is the time to evaluate the risks and seize the opportunities presented by future of work advances by developing evidence-based research solutions for the future workforce.

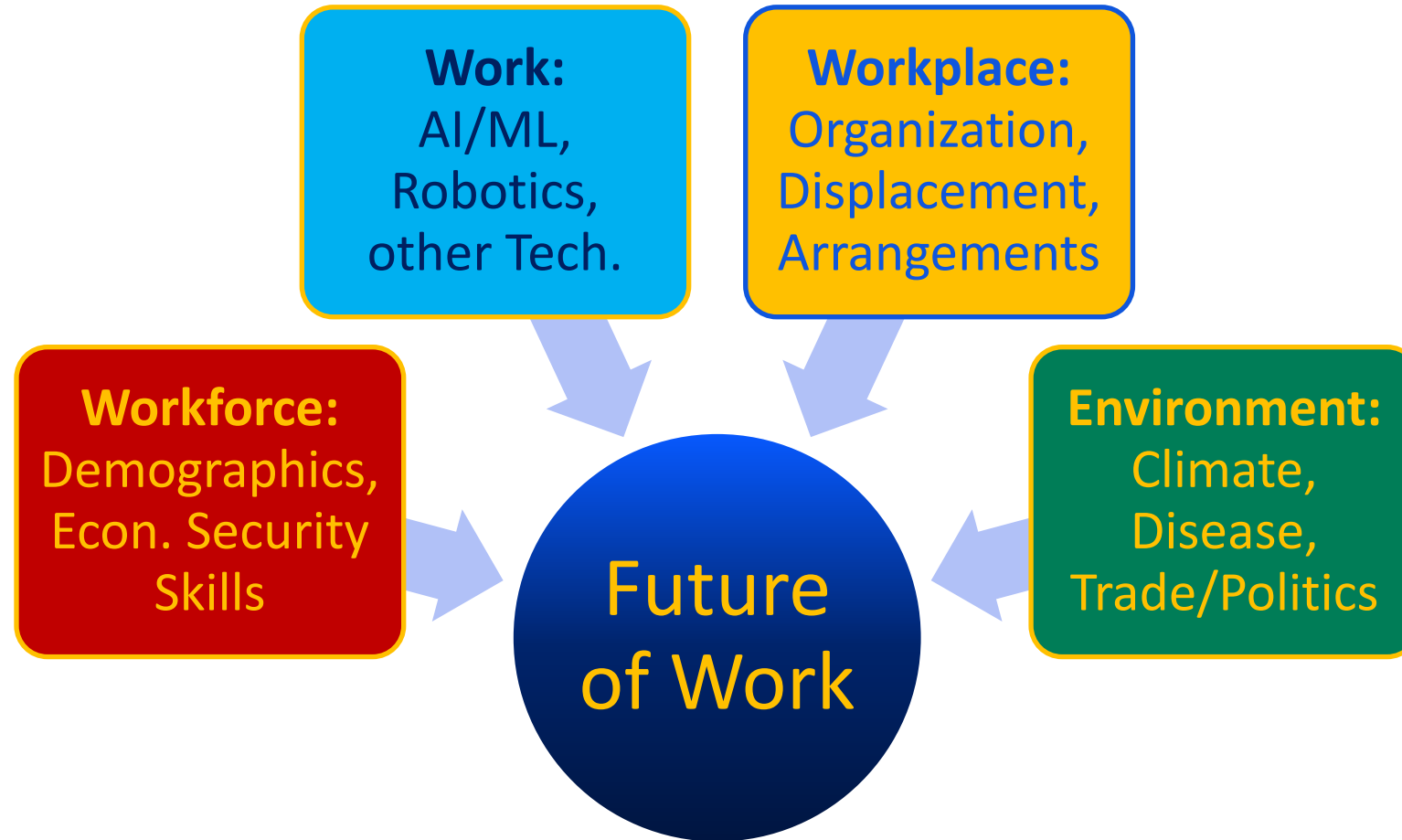
There is no launch date for the future; it starts now.”

– John Howard MD, Director of the NIOSH



<https://www.cdc.gov/niosh/topics/future-of-work/>

Forces affecting the Future of Work



Why should Occupational Safety and Health (OSH) care about the “future of work?”

OSH aims to manage risk by eliminating or reducing hazards and exposure. Risk assessment and communication are essential tools and requires resources.

- **Jobs and tasks** affect hazards and exposures
- **Worker traits** affect risk assessment and effective communication strategy
- **Organizational structure** affects resources and practical constraints for occupational safety and health

The Future of Work implies change for all three!

Artificial Intelligence

An example technology from the Future of Work, and its implications for occupational safety and health.

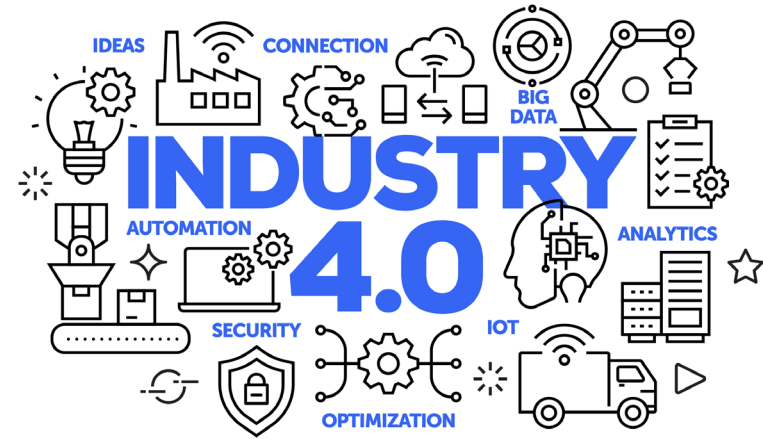
What is Artificial Intelligence?

The subfield of **computer science** centered around the design and implementation of:

- ▶ programs that **make decisions**
 - ▶ at least for a narrowly defined problem
- ▶ machines that have **perception** and can **act** on it
- ▶ systems able to **mimic human cognition**
- ▶ **agents** that are:
 - ▶ **rational**: act to maximize a *quantitative and objective performance measure* (utility function)
 - ▶ **autonomous**: able to operate without guidance
 - ▶ **adaptable**: able to improve with experience

Artificial Intelligence in the workplace

- Automate repetitive work
- Optimize work
 - Predictive Maintenance
 - Forecast supply and demand
 - Perform route management, timing
- Improve Decision-making
 - Healthcare, banking, legal system
- Summarize text, write code, generate images



Potential Improvements to Worker Safety

- Advanced risk assessments
- Integrated monitoring systems
 - Recognition of danger zones
 - Ensure proper PPE use
- Optimize situational awareness
 - Too much information
 - Too little engagement



Adapted from Getty Images

Reduce the need for high-risk work





But add potential new hazards

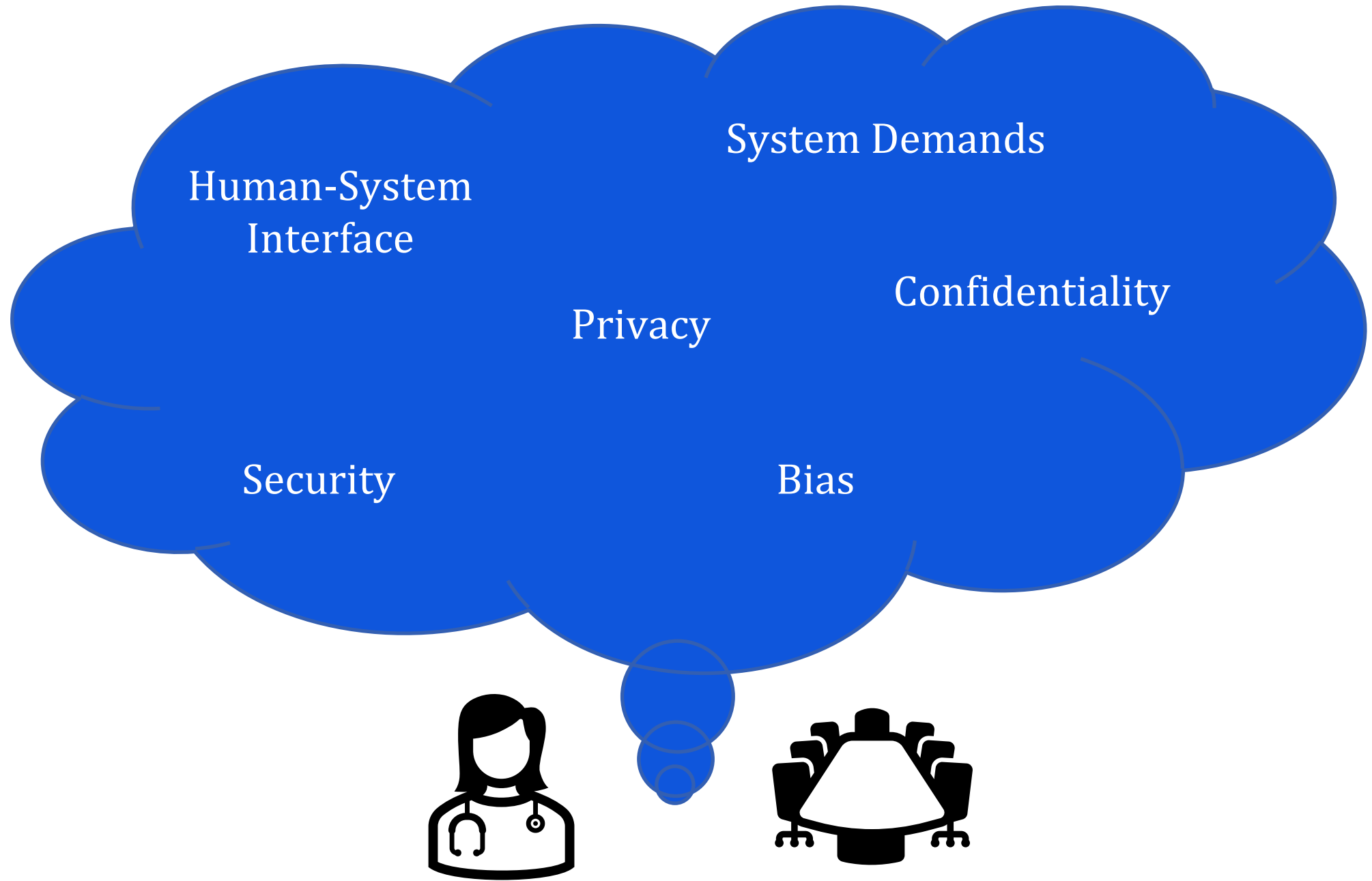
Potential Hazards

- Unintended consequences on the human
 - Safety outcomes
 - Well-being
 - Equity
- Concern over loss of job
- Reduction in certain tasks and change in occupation definition
- Monitoring of workforce and loss of human autonomy



Adapted from Getty Images

Ethical / Responsible AI



Hazard Control

- Traditional models
 - What if
 - Failure Mode and Effects Analysis (FMEA)
- Risk estimates are difficult....
 - Systems approach
 - Integrating the human
- Analyzing harm and potential harm events
 - Root Cause Analysis
- AI Governance



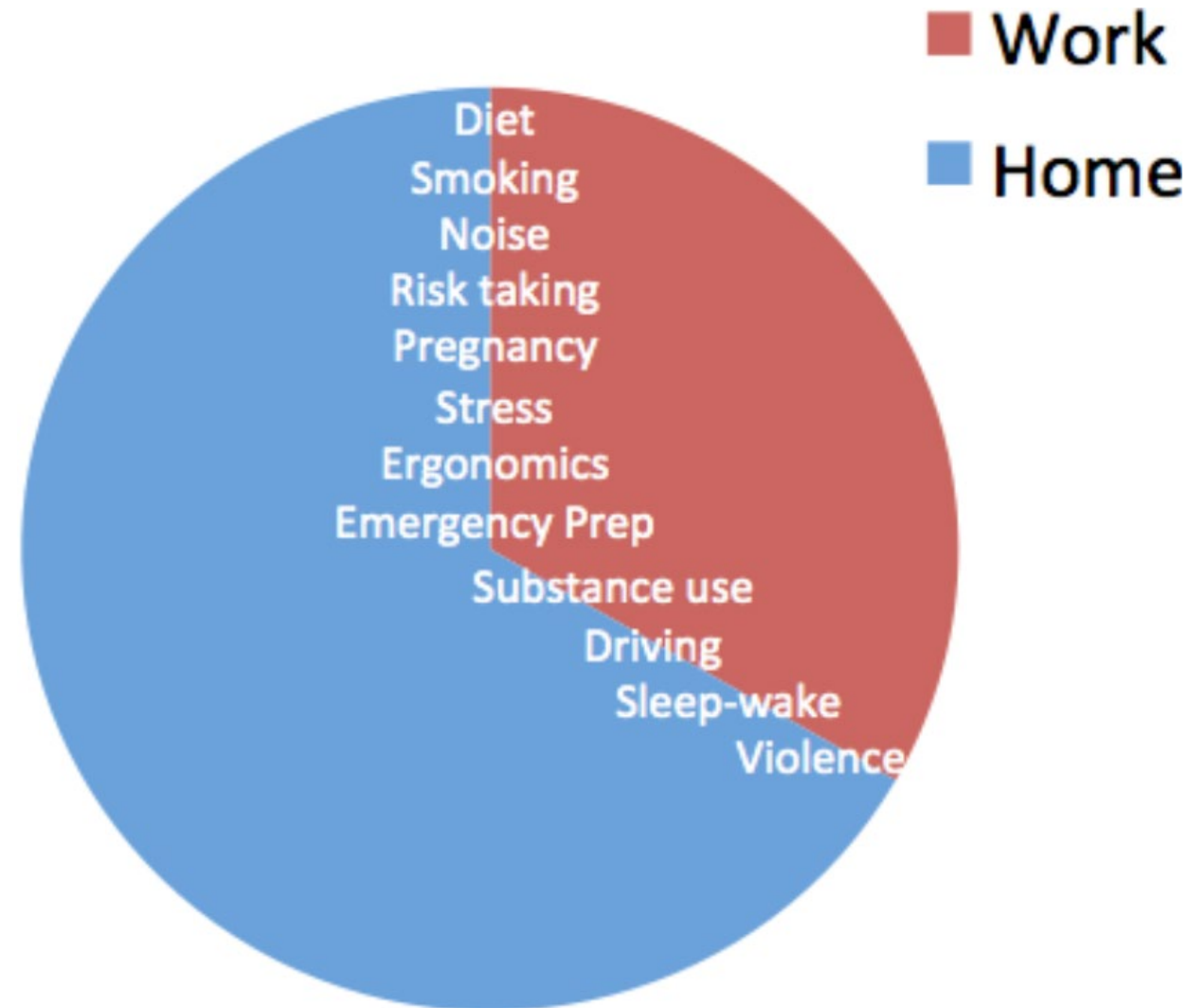
Total Worker Health (TWH)

Refining the approach for occupational health programs.



The Future of Workplace, Work, and Workforce Safety, Health, and Well-Being

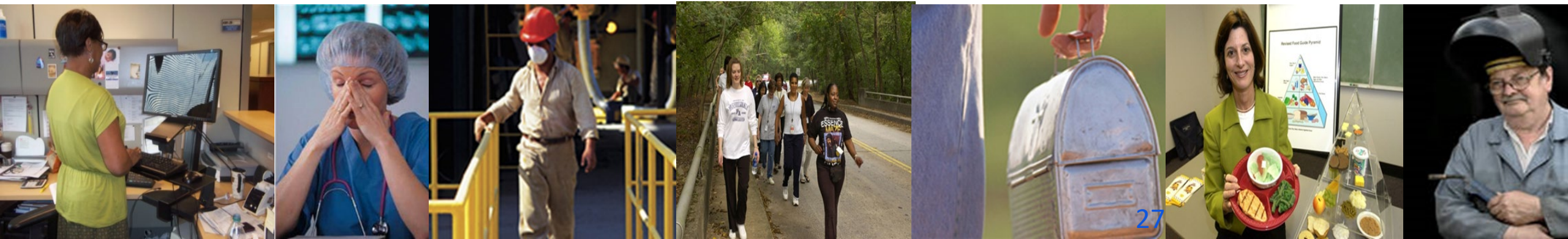
- Workplace and work contribute to workforce safety, health, and well-being
- Workforce safety, health, and well-being are inextricably linked, both on- and off-the-job



Defining *Total Worker Health*®

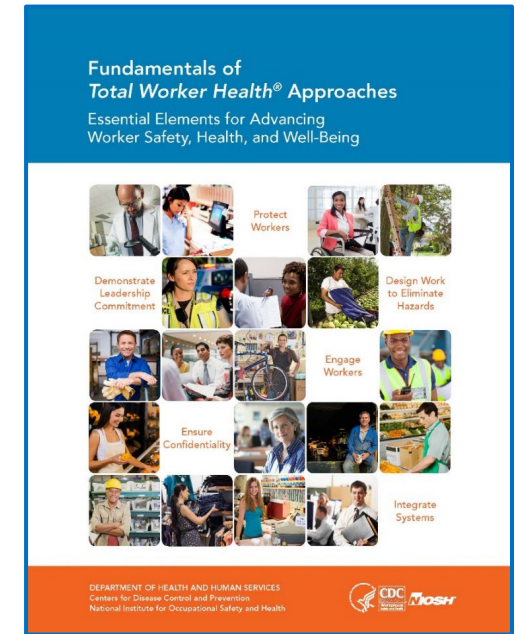
“Policies, programs, and practices that integrate protection from work-related safety and health hazards with promotion of injury and illness prevention efforts to advance worker well-being”

<https://www.cdc.gov/NIOSH/twh/>



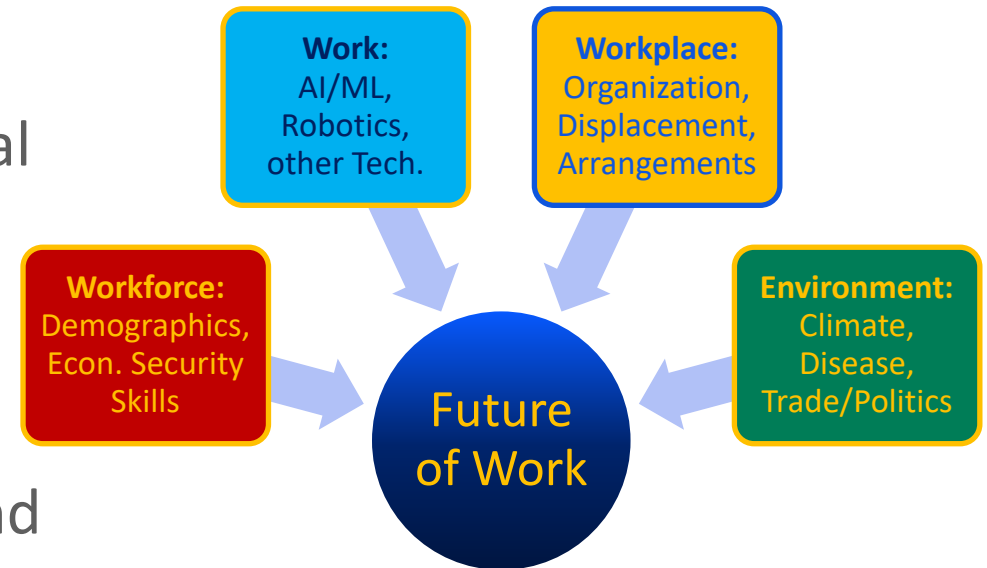
Fundamentals of *Total Worker Health*® Approaches

1. Demonstrate leadership commitment
2. Eliminate hazards and promote well-being
3. Engage workers in program design and delivery
4. Ensure confidentiality and privacy
5. Integrate systems effectively

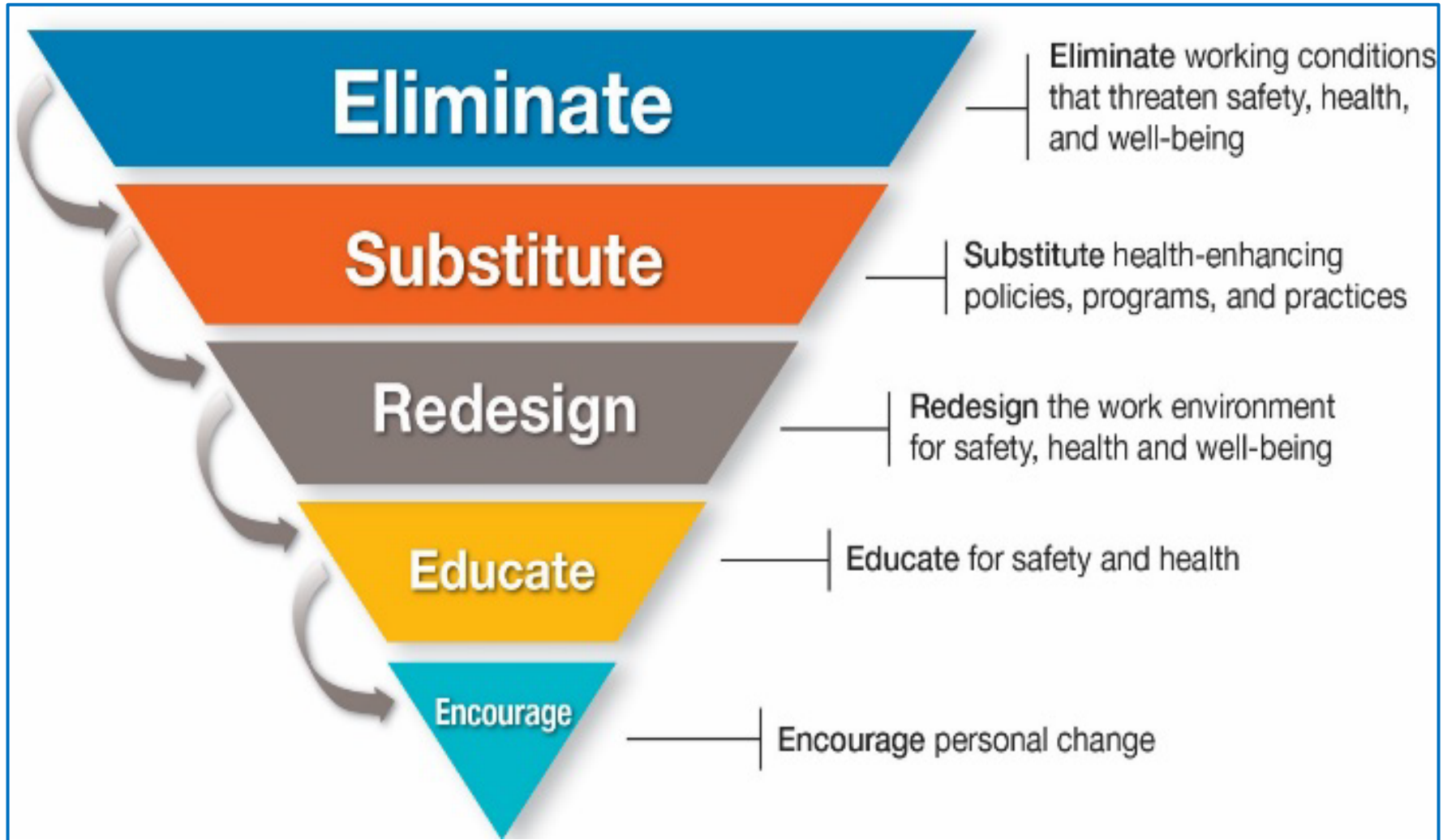


Mental Health is an important frontier for OSH

- COVID-19 highlighted the *already existing* problem of mental health
- Future of Work changes may lead to additional psychosocial hazards
 - Work intensification
 - Blurring of work-life boundaries
 - Changing relationship with supervisors and coworkers
 - Increased data collection and surveillance

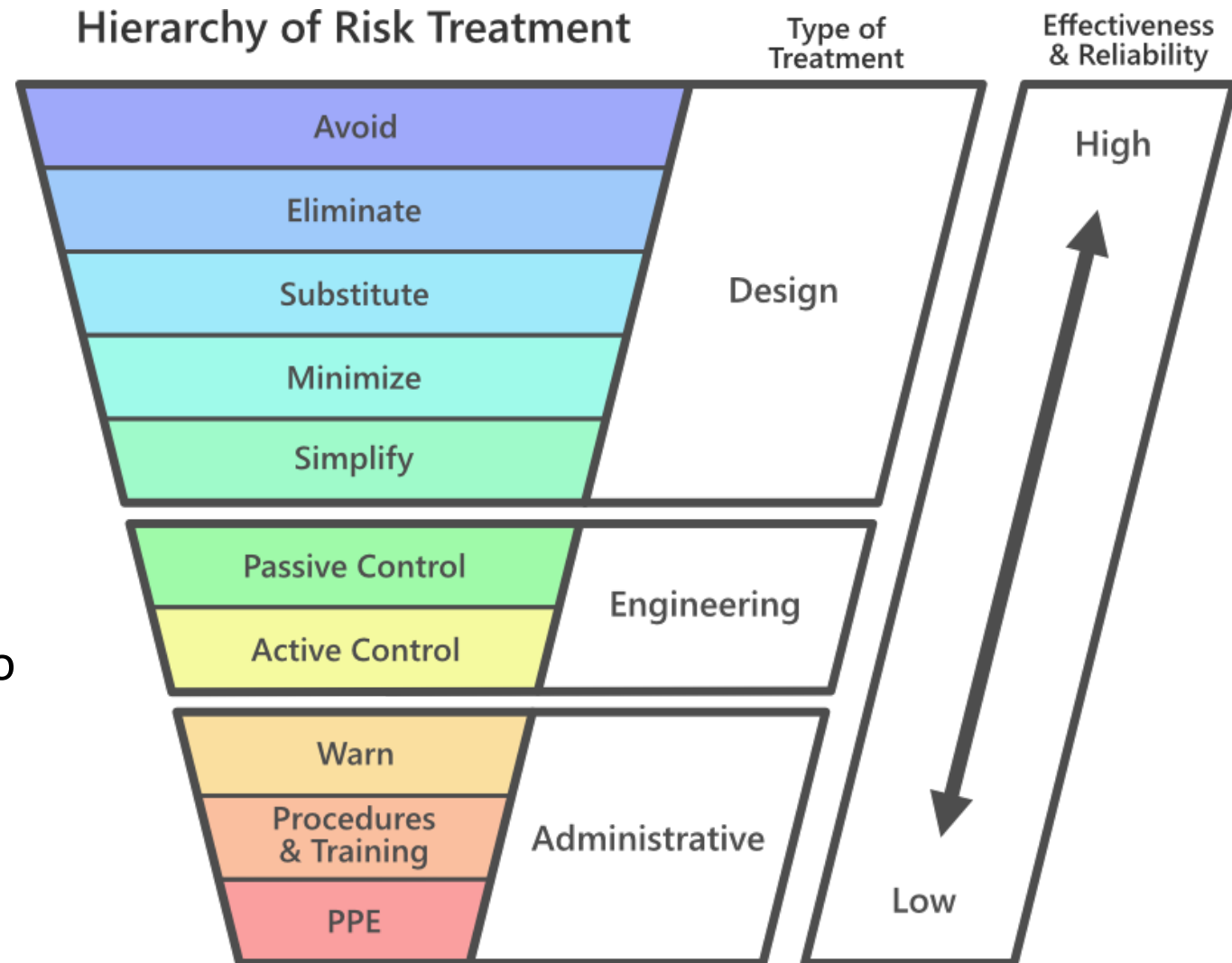


Hierarchy of Controls Applied to *Total Worker Health*[®]



Prevention through Design:

- Fears of being left behind promotes “move fast, break things” attitude
- Negative effects may be hard to recognize, especially without OSH perspective
- Workers may not feel empowered
- Systems once adopted may be costly to improve, replace, or stop



<https://www.cdc.gov/niosh/topics/ptd/default.html>

Adapted from ANSI/ASSP 2021

Multidisciplinary approach to prevention in FOW

- Risk assessment needs to go beyond chemical and physical hazards
 - Need to harness expertise in other areas (e.g.: psychosocial hazards)
 - TWH framework primed to address
- Need to consider impact on human as part of technology adoption
 - Human in the loop
 - Human-centered design
- Human sustainment and productivity
 - Business case
 - Societal benefit

Hopeful Takeaways

FOW Initiative

Benefits and
Risks of
Technology

Total Worker
Health
approach

References

- Anger [2014] Effectiveness of Total Worker Health Interventions, *Journal of Occupational Health Psychology*, Vol. 20, No. 2.
- Giacosa, E. et. al. [2023] Stress-inducing or performance-enhancing? Safety measure or cause of mistrust? The paradox of digital surveillance in the workplace, *Journal of Innovation & Knowledge*, Volume 8, Issue 2
- Kim, Y. et. al. [2021] Smart Helmet-Based Personnel Proximity Warning System for Improving Underground Mine Safety, *Applied Science*, Vol. 11.
- NIOSH [2016]. National occupational research agenda (NORA)/national total worker health® agenda (2016–2026)
- NIOSH [2016]. Fundamentals of total worker health approaches: essential elements for advancing worker safety, health, and well-being.
- Tamers SL, et. Al. [2020]. Envisioning the future of work to safeguard the safety, health, and well-being of the workforce. *American Journal of Industrial Medicine*, Vol. 63, No. 12



For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

