

CUMULATIVE RISK ASSESSMENT: BRIDGING THE GAP BETWEEN WELL-BEING AND OCCUPATIONAL SAFETY AND HEALTH

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DISCLAIMER

- The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health (NIOSH) and should not be construed to represent any agency determination or policy.

CUMULATIVE RISK

National Academies of Science Definition

- “The combination of risks posed by aggregate exposure to multiple agents or stressors in which aggregate exposure is exposure by all routes and pathways and from all sources of each given agent or stressor.”



CUMULATIVE RISK ASSESSMENT (CRA)

Environmental Protection Agency (EPA) Definition

- “An analysis, characterization, and possible quantification of the combined risks to human health or the environment from multiple agents or stressors.”

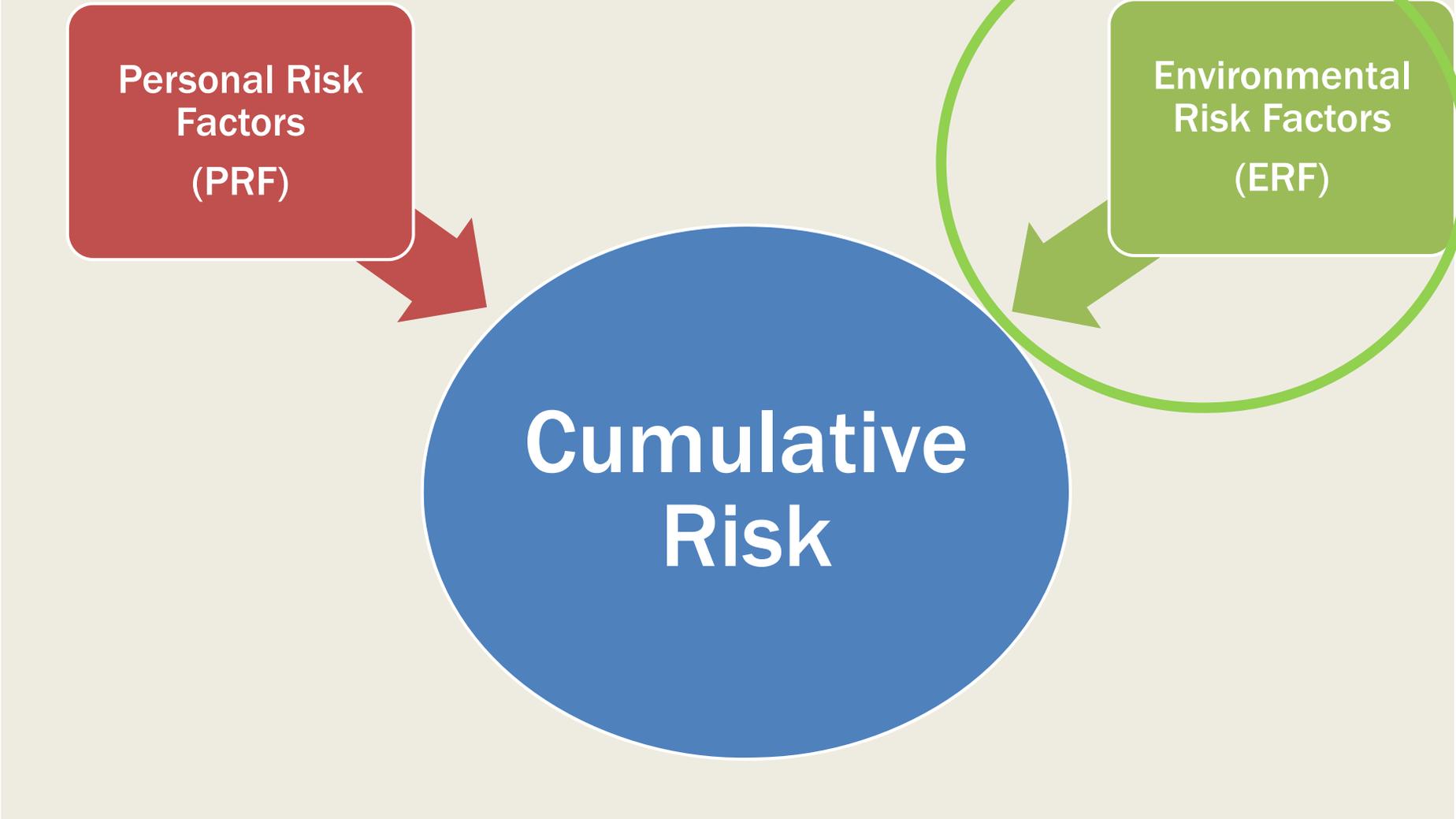
The screenshot shows the EPA website page for 'Cumulative Risk Assessments'. The page features a navigation bar with links for 'LEARN THE ISSUES', 'SCIENCE & TECHNOLOGY', 'LAWS & REGULATIONS', and 'ABOUT EPA'. A search bar is located in the top right corner. The main content area includes a section titled 'WHAT DOES CUMULATIVE RISK MEAN TO YOU?' with a word cloud containing terms like 'exposure', 'multiple', 'risks', 'stressors', and 'chemicals'. Below this is a section titled 'Developing Analytic Methods for Cumulative Risk Assessments' which discusses the general practice of governmental agencies and the EPA's traditional risk assessment paradigm. The right sidebar contains a 'Grantee Abstracts and Reports' section with links to various documents and a 'Multimedia' section with links to webinars and recordings.

CONCEPTUAL MODEL OF CUMULATIVE RISK

Personal Risk
Factors
(PRF)

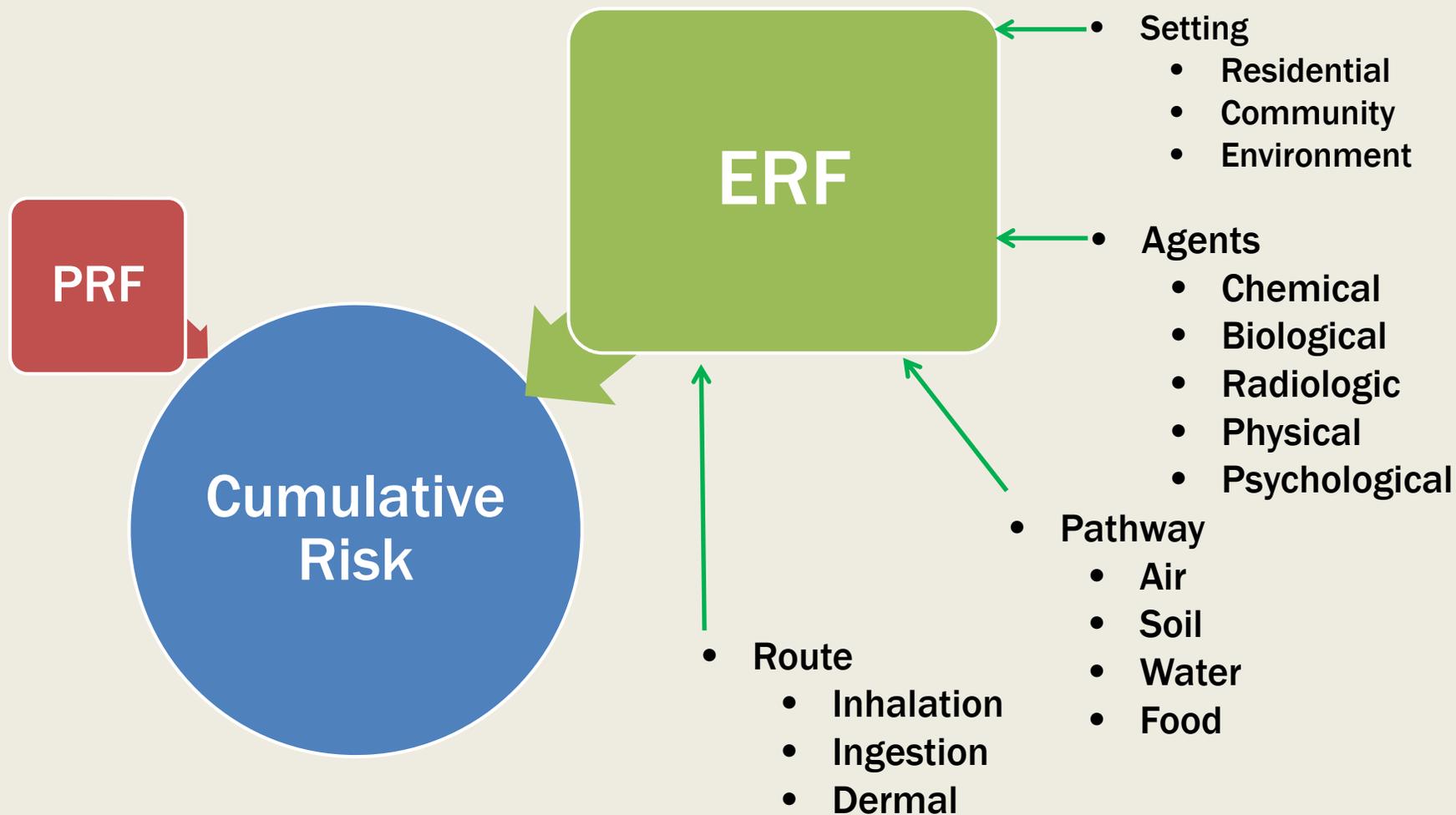
Environmental
Risk Factors
(ERF)

Cumulative
Risk

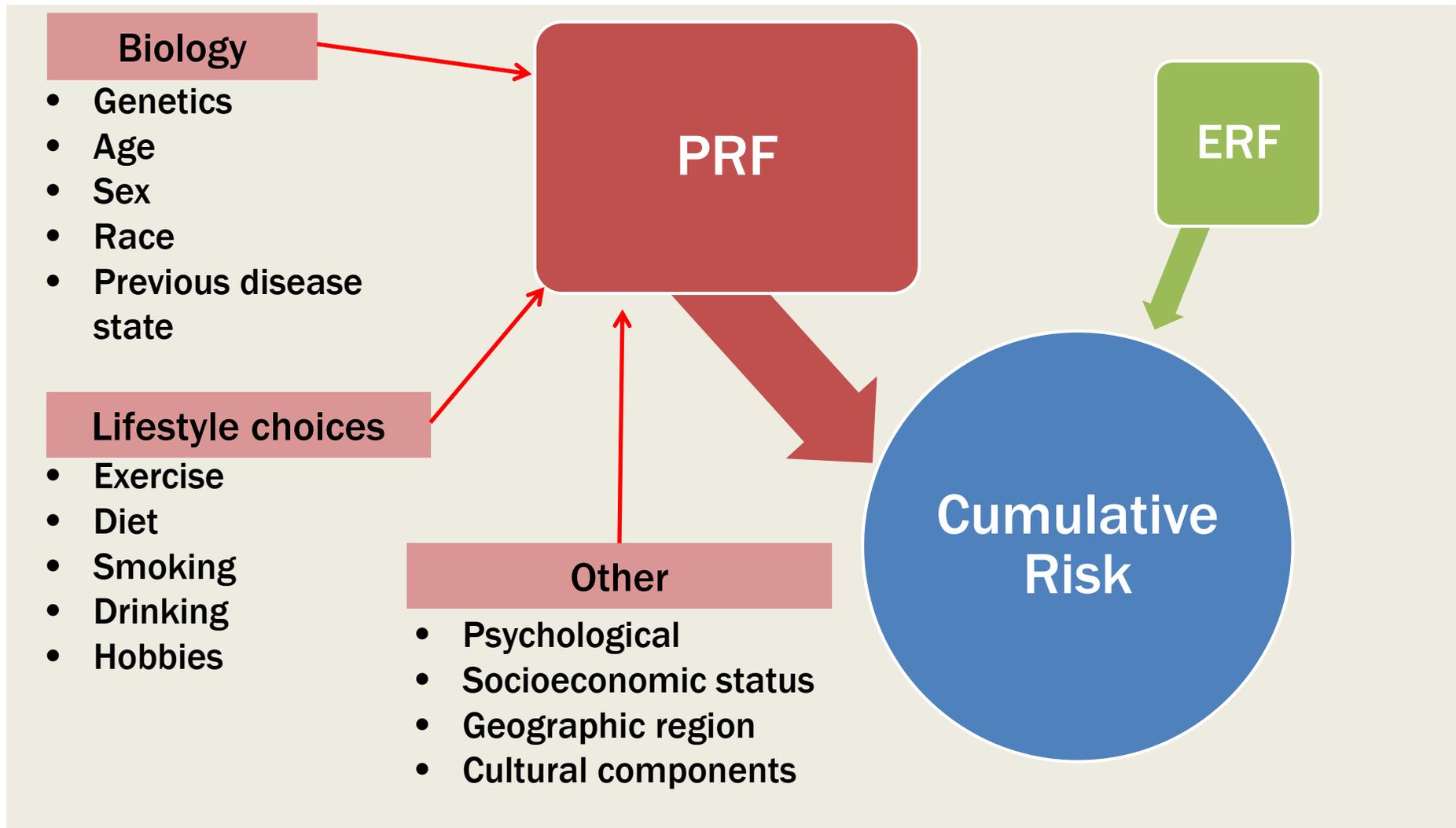


The diagram illustrates the conceptual model of cumulative risk. It features a central blue circle labeled 'Cumulative Risk'. To the left, a red rounded rectangle labeled 'Personal Risk Factors (PRF)' has a red arrow pointing towards the central circle. To the right, a green rounded rectangle labeled 'Environmental Risk Factors (ERF)' has a green arrow pointing towards the central circle. The ERF box and its arrow are enclosed within a larger green circle.

ENVIRONMENTAL RISK FACTORS (ERF)



PERSONAL RISK FACTORS (PRF)

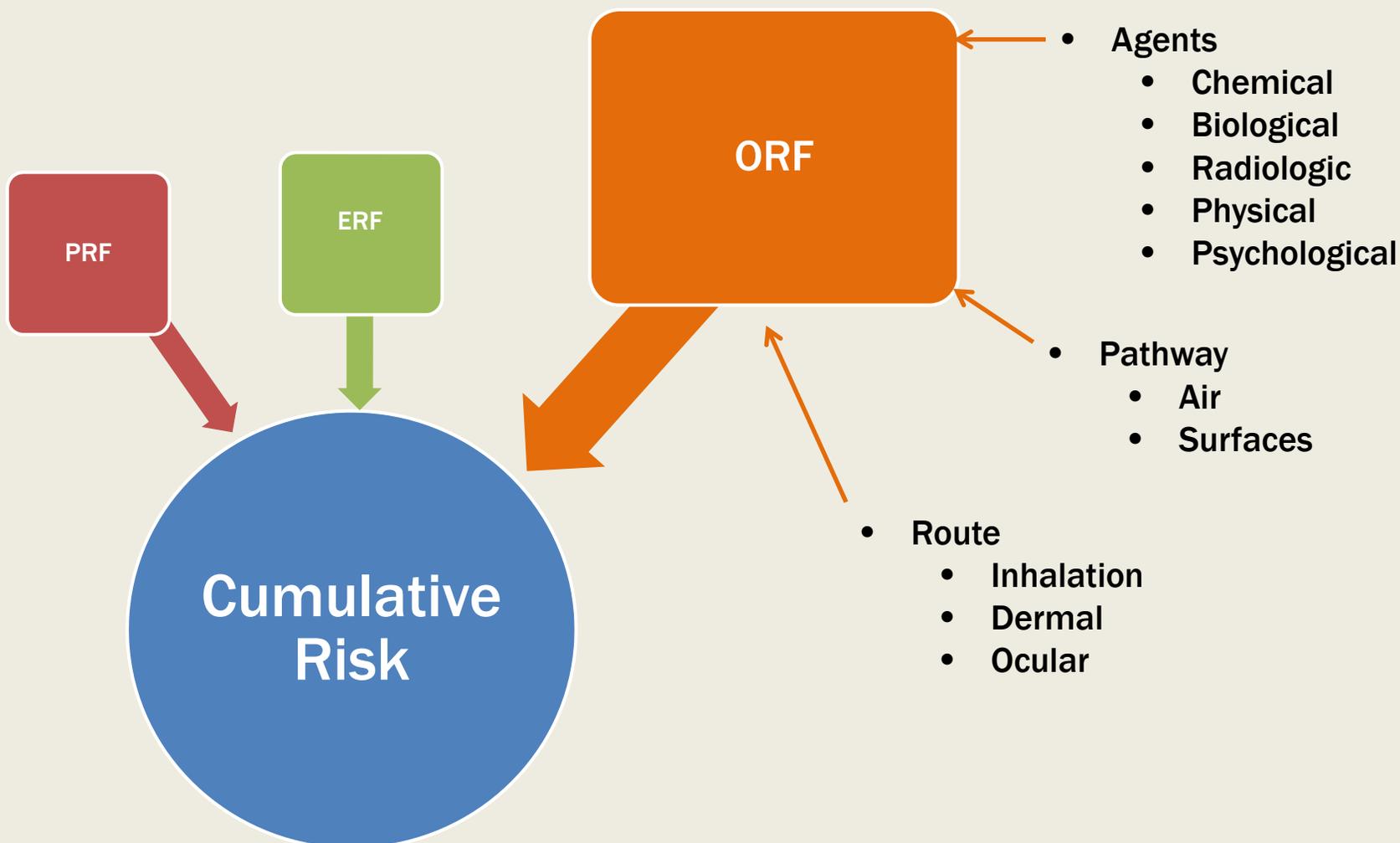


WHAT ABOUT OCCUPATIONAL RISK FACTORS (ORF)?

- **Current CRA approaches focus primarily on:**
 - **Aggregate exposures to chemical classes with common toxic mechanisms**
 - Pesticides - Neurotoxicity
 - **Environmental, community and residential issues**
 - Environmental justice
 - **EPA and academics**
- **What about the workplace and occupational risk factors (ORF)?**

Reference	Health Endpoint	Stressors	Interaction Type	Risk Factor Type
Sexton [2012]	Lung Cancer	<ol style="list-style-type: none"> 1. Asbestos 2. Radon 3. Tobacco smoke 	<ol style="list-style-type: none"> 1. Chemical 2. Radiologic 3. Chemical 	<ol style="list-style-type: none"> 1. ORF 2. ERF 3. PRF
Sliwinska-Kowalska et al. [2004]	Hearing loss	<ol style="list-style-type: none"> 1. Noise 2. Ototoxicants 	<ol style="list-style-type: none"> 1. Physical 2. Chemical 	<ol style="list-style-type: none"> 1. ORF 2. ERF
Wong et al. [2003]	Liver cancer	<ol style="list-style-type: none"> 1. Hepatitis B 2. Vinyl Chloride 	<ol style="list-style-type: none"> 1. Biological 2. Chemical 	<ol style="list-style-type: none"> 1. PRF 2. ORF

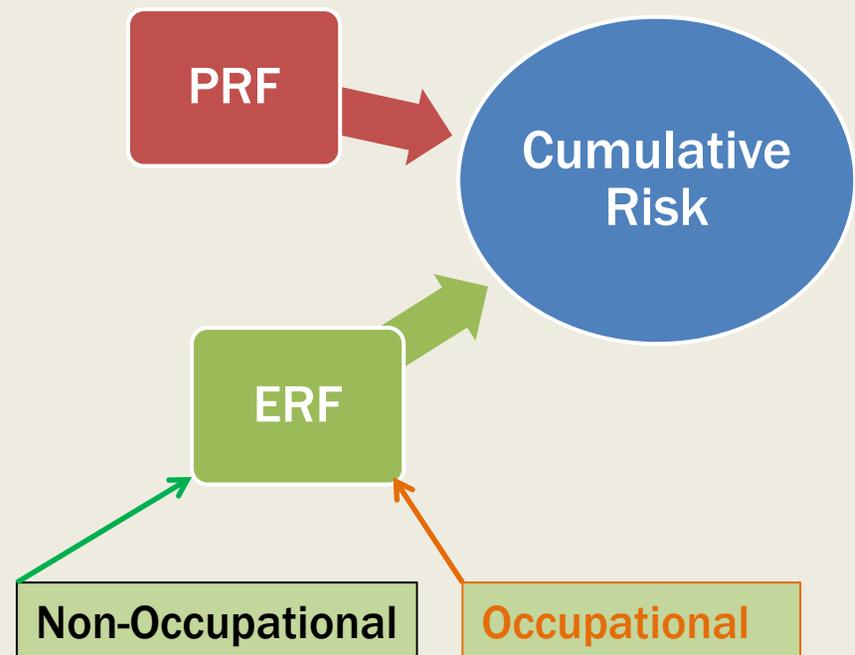
MODIFIED CRA MODEL



INTEGRATING CRA & OCCUPATIONAL RISK ASSESSMENT

- ORF impact health & well-being
- Non-ORF influence workers
- Knowledge of the interaction of risk factors may foster enhanced management of occupational illness and injury

■ [Schulte et al. (2011). Am J Public Health 102 (3): 434-448]



CHANGING WORKPLACE AND CULTURE

■ Workplace changes

- Economic
- Demographics
- Chronic diseases
- Technology
 - Exposome



■ Cultural changes

- Well-being
- Total Worker Health

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

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Proposed National Total Worker Health Agenda
Comment by December 22 on priorities for research and practice!
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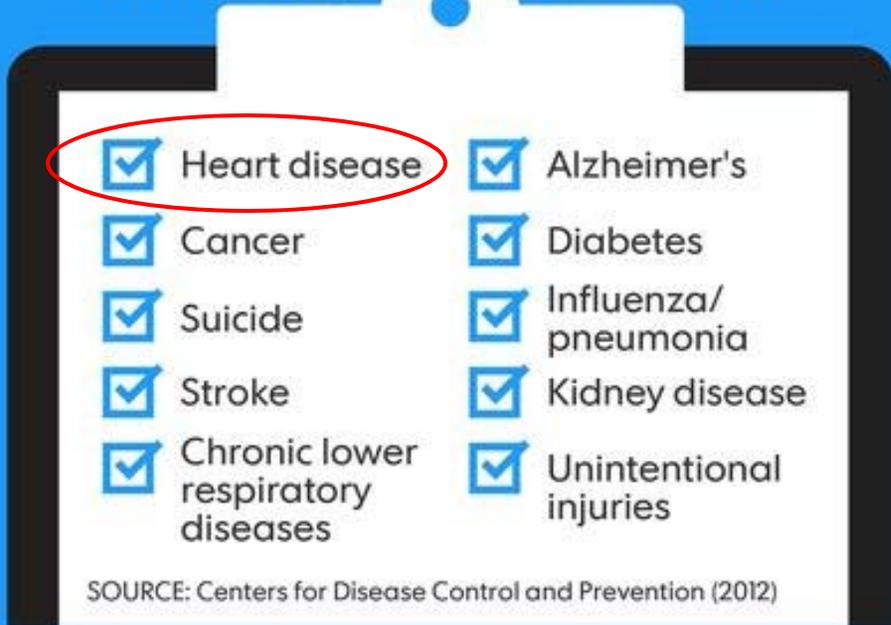
- Program Description
- Intramural Research
- Extramural Research
- Centers of Excellence to Promote a Healthier Workforce
- Partnerships
- Publications and Reports

What is Total Worker Health™?
Total Worker Health™ is a strategy integrating occupational safety and health protection with health promotion to prevent worker injury and illness and to advance health and well-being.

Today, emerging evidence recognizes that both work-related factors and health

CASE STUDY – ADVERSE CARDIAC EFFECTS

10 leading causes of death

- 
- Heart disease
 - Cancer
 - Suicide
 - Stroke
 - Chronic lower respiratory diseases
 - Alzheimer's
 - Diabetes
 - Influenza/pneumonia
 - Kidney disease
 - Unintentional injuries

SOURCE: Centers for Disease Control and Prevention (2012)

FACTORS ASSOCIATED ADVERSE CARDIAC EFFECTS: EPIDEMIOLOGICAL EVIDENCE

Chemicals Stressors	Non-Chemical Stressors	Immutable Factors	Lifestyle Choices	Socio-Economic
Particulate Matter	Temperature	Gender	Smoking	Education
Ozone	Noise	Age	Physical Activity	Income
Sulphur dioxide		Race	Alcohol	
Black carbon		Genetics	Diet	
PAHs				
VOCs				
Methyl mercury				

Traditional ORF

ORF under Well Being Model

CUMULATIVE RISK ASSESSMENT PROJECT

■ Purpose

- Integrate ORF into CRA
- Integrate CRA into occupational risk analysis

■ Funded via National Occupational Research Agenda (NORA)

- Sponsor: Total Worker Health (TWH) Program

■ Funding period: FY15-FY18

■ Three primary phases

Phase 1 - Research Vision

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graph TD; A[Phase 1 - Research Vision] --> B[Phase 2 - Case Studies]; B --> C[Phase 3 - Framework];
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Phase 2 - Case Studies

Phase 3 - Framework

PHASE 1 – FY15 ACTIVITIES

■ Large Team Recruitment

- Subject matter experts (SMEs) in the fields of toxicology, epidemiology, risk assessment/management, exposure science, behavioral science/psychology, statistics, and health policy
- SMEs from US federal agencies (NIOSH, ATSDR, EPA), academia and private industry

■ Small group to focus on specific topics

- Based on National Academies of Science Risk Assessment paradigm
 - Hazard characterization/Dose-response assessment
 - Exposure assessment
 - Risk characterization
 - Risk management

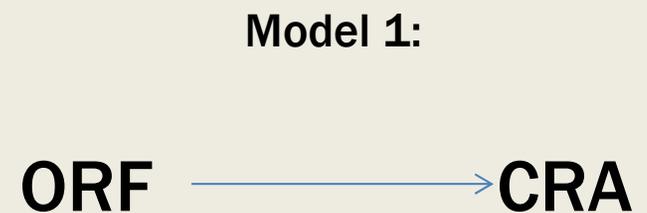
PRIMARY QUESTIONS

- 1. What are the issues that need to be addressed to advance the practice of CRA?**
- 2. What are the issues that need to be addressed to integrate CRA into the practice of occupational risk analysis?**
- 3. What are the data gaps and limitations that must be overcome to integrate ORF-based models in CRA?**

PHASE 1 – FY15 OUTPUTS

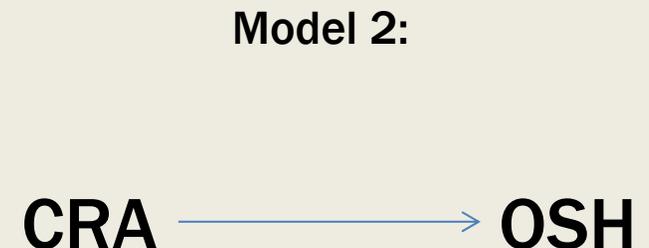
■ Manuscript 1

- Evidence-based paper that illustrates the role of ORF on the cumulative risk of various health endpoints



■ Manuscript 2

- State of the science review
- Outline research needs and vision
- Establish the focus of next phases of the project



SUMMARY

- ORF should be included in cumulative risk
- Workplace an overwhelming source of many unique hazards that may cause or contribute to impairment of health & well-being
- Total Worker Health

QUESTIONS?

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