

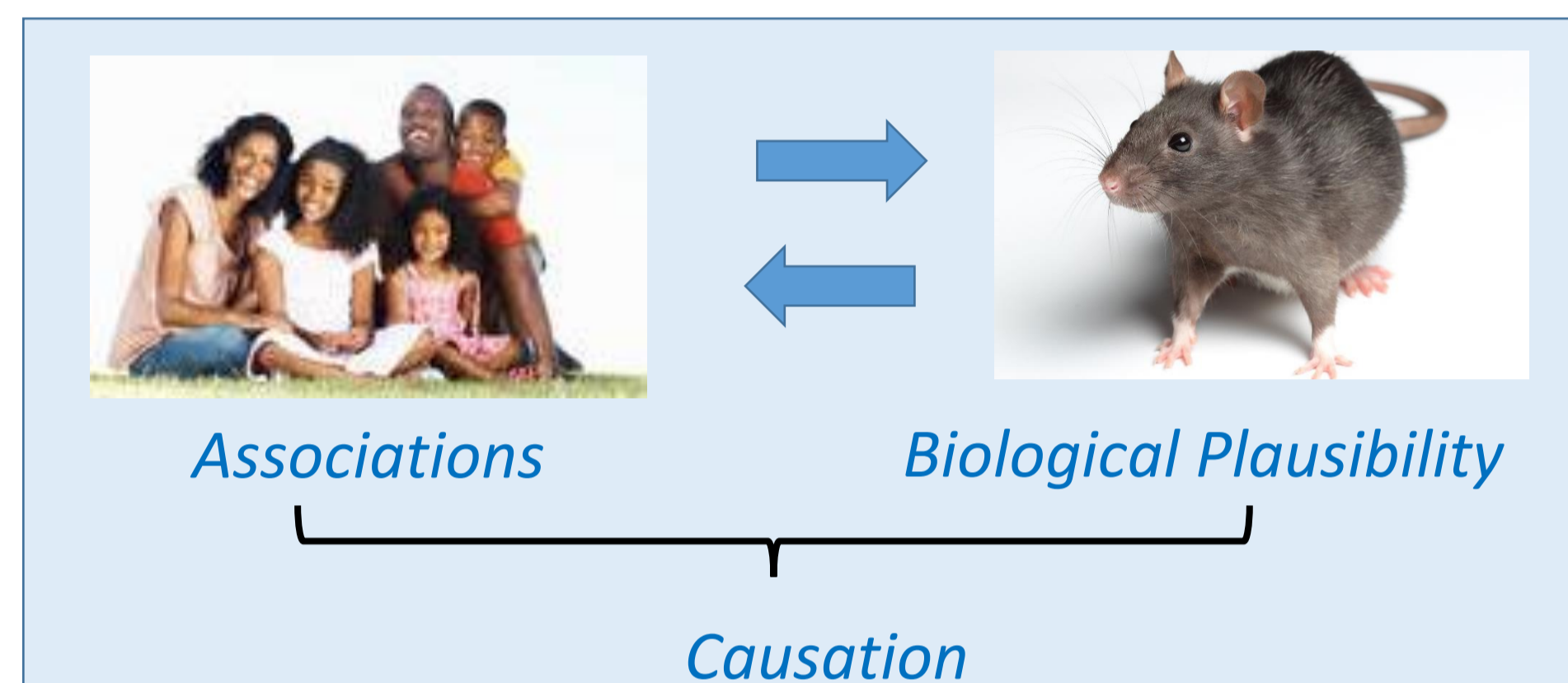
# Understanding Social Determinants of Environmental Health: Complementary Animal and Population-Based Approaches in Projects 2.62 and 2.63

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## Purpose/Utility of Research

NHEERL exploratory research fills critical gaps in our understanding of how social and behavioral determinants may modify human exposures to and health effects of environmental contaminants.



Complementary animal and human approaches show how:

- Prenatal and early life environments impact children's growth, development, health, and future well-being as adults;
- Community stressors impact both individual and community resilience and well-being.

## Highlights

### • Animal Studies:

Reliable methods were developed and used to measure key health outcomes in rodent models, e.g., hypertension, growth and body weight trajectories, and insulin resistance (Rogers et al., 2014; Lau et al., 2015), reproductive development (Furr et al., 2014; Beverly et al., 2014), stress response markers in fetuses/newborns (Cooper et al. 2013), cognitive function (Oshiro et al. 2015), and effects of exercise on body fat distribution (Gordon et al., 2015). These experimental approaches will now be used to evaluate causation and attribution of risk for multiple stressors (chemical and non-chemical), and examine the interplay of factors (e.g., pre-existing obesity; poor vs. enriched environments; general stress; and, chemical contaminants) on resilience of mother's and offspring health as well as life-long allostatic load related to chronic disease vs. well-being.

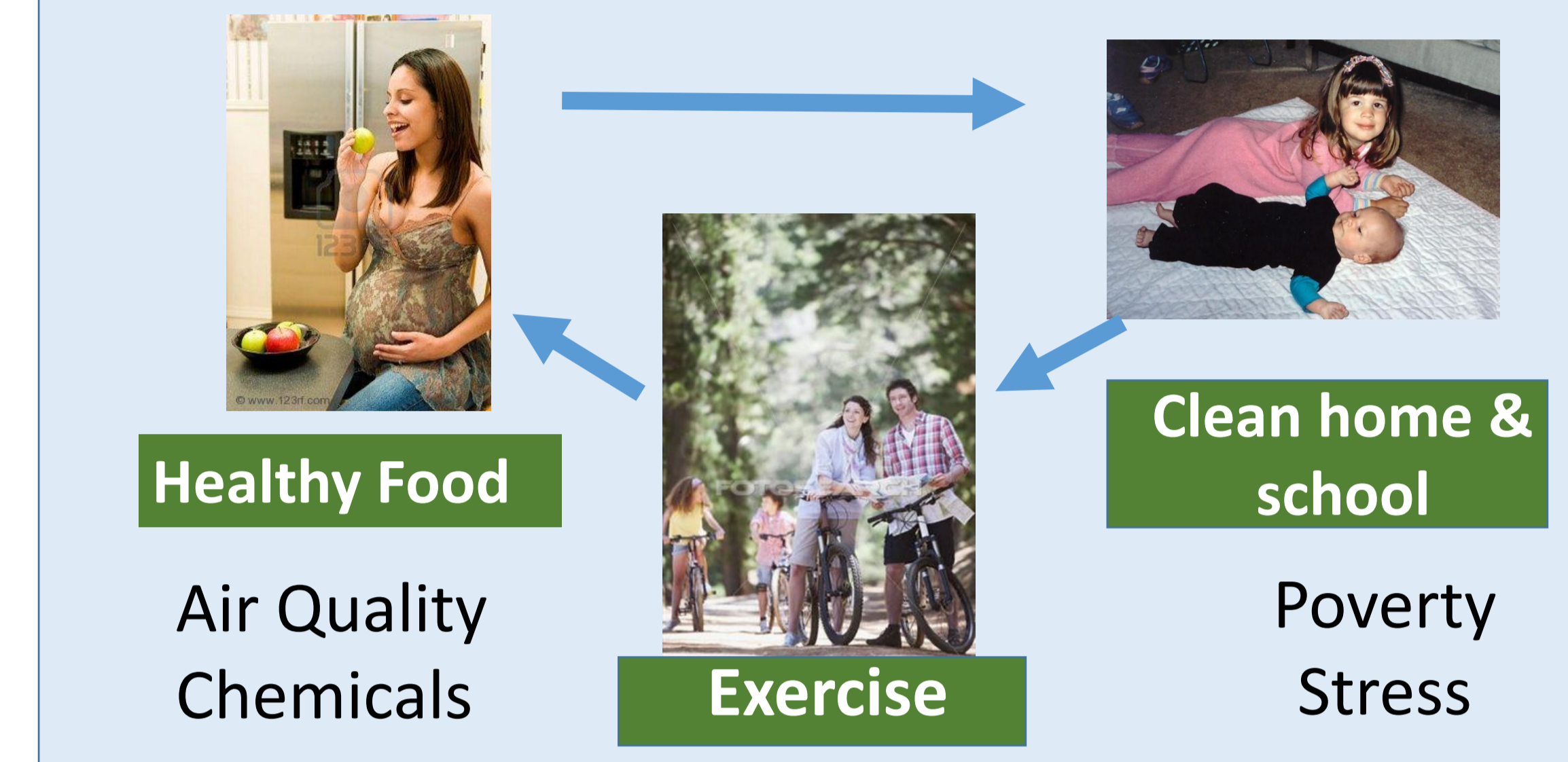
### • Population-based studies:

Exposure to air pollution from wildfires was shown to have a greater impact on health in lower SES communities based on the frequency of emergency room visits for asthma and cardiovascular incidents (Rappold et al. 2012). These approaches are being extended to explore, in large cohort studies, whether and how neighborhood factors impact risks of cardiovascular disease, asthma, obesity and sudden death, alone and in combination with air pollution.

## Application & Translation

- NHEERL is augmenting the evidence base for cumulative risk assessments, particularly in regards to identifying and protecting susceptible and vulnerable populations. Research is designed to address data and knowledge gaps identified in ORD's Children's Health and EJ Roadmaps and bring sound science to bear on Agency decisions and actions that reduce chemical risks and promote equitable access to sustainable and healthy environments.
- Community stakeholders use this information to take action at local scales. For example, wildfire study findings were used in OAQPS's "Wildfire Guide" and are informing community preparedness strategies including public health advisories related to wildfires and air quality (Rappold et al., 2014).

## Factor Interactions & Lifecourse Impacts



## Intended End Users

- Risk assessors in ORD, EPA Program Offices and Regions, States, and Tribes to adequately incorporate social and behavioral determinants of health associated with life stage and living in at-risk communities;
- SHC scientists and others to fill critical data and knowledge gaps and improve decision support;
- OCHP and OEJ to meet cross-agency objectives;
- OSWER in conducting site assessments for fence line communities.

## Connection to SHC Portfolio

- Contributes directly to outputs and outcomes described in 2.62 and 2.63 Charters;
- Informs SHC tools for community assessment (e.g., C-FERST, CCAT, e-ATLAS, HIAs);
- Tests hypotheses generated in NCER's Children's and Health Disparities Centers, and Tribal Science Program;
- Interfaces with ACE and CSS research on at-risk populations and lifestage vulnerability;
- Provides data and examples for HHRA and SHC research on causal inferences and CRA.

## Lessons Learned

- Research is advancing cumulative risk assessment and children's health protection;
- Animal models can be used to show causation based on associations seen in human studies;
- Forecast-based interventions can reduce the health and economic burden of wildfires.