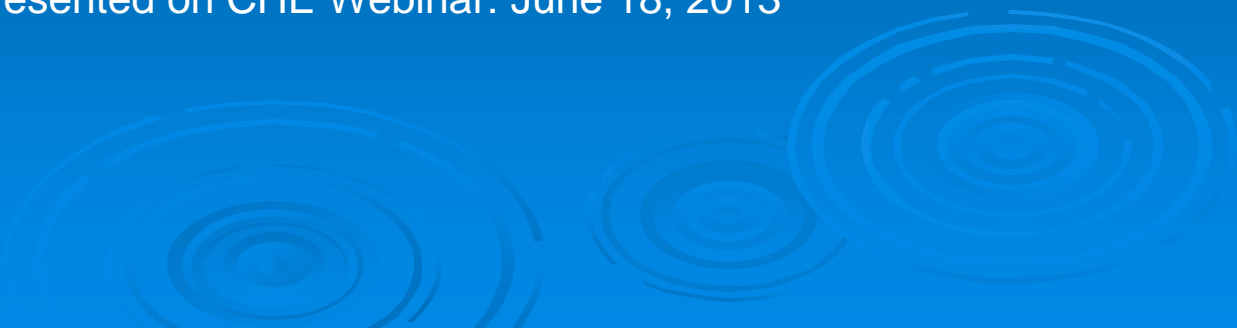



The Primary Prevention of Asthma

The Development of a Roadmap for Reducing Asthma
Onset


Polly Hoppin and David Kriebel
University of Massachusetts, Lowell
Lowell Center for Sustainable Production
Presented on CHE Webinar: June 18, 2013



Thanks

- UML Colleagues
 - Funders
 - American Lung Association of the Northeast
 - Boston Public Health Commission
 - National Institute for Environmental Health Sciences
 - Neighborhood Health Plan
 - US Dept. of Health and Human Services, Region I
New England
 - Planning Committee, DPH, MAAP
 - Symposium Participants
 - CHE
- 

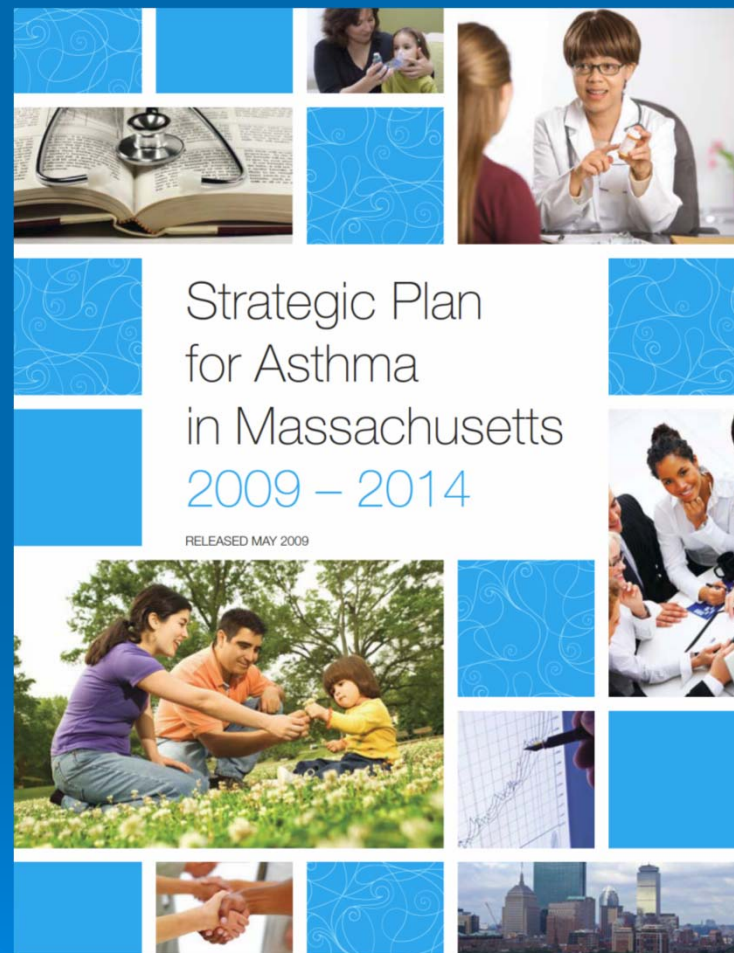
Why Focus on Primary Prevention of Asthma?

- Decreased quality of life, lost capacity and productivity, direct fiscal costs
 - 1 in 5 households
 - \$50 billion in medical costs
 - 10.5 million missed school days
 - Disproportionately affects people of color and low income
 - In some places, rates continue to rise
 - Massachusetts, 2010: 10.4% of adults; increased 22.4% 2000-2010
 - Far more resources focus on managing asthma in people who have it than on preventing the disease
 - CHE review of research dollars
 - Growing understanding:
 - complexity of how asthma develops
 - associations between asthma onset/range of risk factors, many modifiable
- 

Massachusetts Strategic Plan: First State to Pursue Primary Prevention

State/coalition partners released plan in May, 2009

Goal 4: “to develop a roadmap for better understanding the causes of asthma and the role of primary prevention in Massachusetts.”



National-Level Initiatives

- President's Task Force on Environmental Health Risks and Safety Risks for Children
 - Collaborative Interagency Asthma Disparities Working Group
 - Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities, May 2012
 - Strategy 4: Identify and test interventions that may prevent the onset of asthma among ethnic and racial minority children

Steps for Developing the Massachusetts Roadmap

- Evidence review
- Established Planning Committee, building on existing partnerships
- Designed and convened two-day Symposium: Current Evidence, Research Needs and Opportunities for Action
- Focused on Massachusetts; content and process relevant to other states

Symposium Planning Committee

- Gary Adamkiewicz, Harvard School of Public Health
- Robyn Alie, Massachusetts Medical Society
- Doug Brugge, Tufts University School of Medicine
- Carlos Camargo, Massachusetts General Hospital
- Stacey Chacker, Asthma Regional Council of New England
- Diane Gold, Harvard Medical School/Harvard School of Public Health
- Molly Jacobs, University of Massachusetts, Lowell
- Polly Hoppin, University of Massachusetts, Lowell
- Laurita Kaigler Crawle, Massachusetts Asthma Advocacy Partnership
- Kenan Haver, Harvard Medical School and Boston Children's Hospital
- Katie King, American Lung Association of the Northeast
- Jon Levy, Boston University School of Public Health
- Elise Pechter, Massachusetts Department of Public Health
- Margaret Reid, Boston Public Health Commission
- Betsy Rosenfeld, US Department of Health and Human Services, Region I (New England)
- Megan Sandel, Boston University Medical Center
- Ted Schettler, Science and Environmental Health Network
- Mary Beth Smuts, US Environmental Protection Agency, Region 1
- Rosalind Wright, Mt. Sinai School of Medicine
- Jean Zotter, Massachusetts Department of Public Health

April 23, 24, 2013:
Primary Prevention of Asthma: Current Evidence,
Research Needs and Opportunities for Action

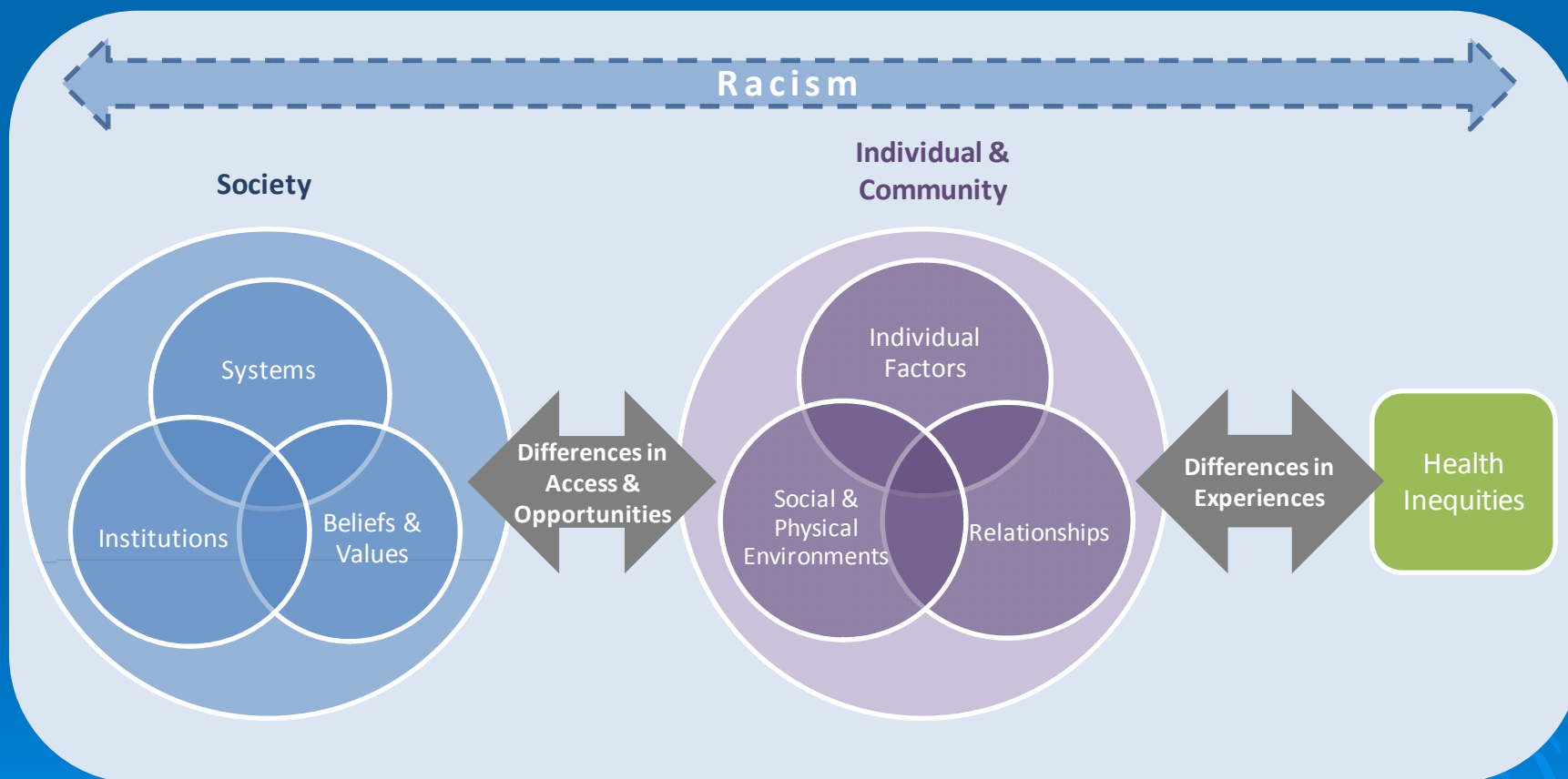
- Participants: 82 people, over-subscribed
 - Researchers
 - Clinicians
 - Public health professionals
 - Government agency staff
 - Environment, health, housing, transportation, education
 - Non-governmental organizations
 - Children's environmental health; tenants; asthma coalitions; labor

Day 1, Session 1: Setting the Context


- Asthma: a Multi-Factorial Disease Requiring Multi-Level Interventions
- Priority Community Questions, Concerns and Opportunities
- Health Inequities: Frameworks for Thinking and Action

Boston Public Health Commission

Social Determinants of Health Inequities



Day 1, Session 2: Key Risk Factors in Asthma Development

- Researchers reviewed evidence; presented their assessments of strength of association and research gaps
 - Obesity, Nutrition
 - Immigration and Infection
 - Prenatal exposures to chemical contaminants
 - Psychosocial environment/stress
 - Allergens indoors
 - Asthmagens in the workplace
 - Air pollution
 - Tobacco
- 

Ted's presentation

- Multi-factorial nature of the disease
- Evidence on associations with risk factors



The Primary Prevention of Asthma

Risk Factors Associated with Asthma Onset

Ted Schettler

Science and Environmental Health Network

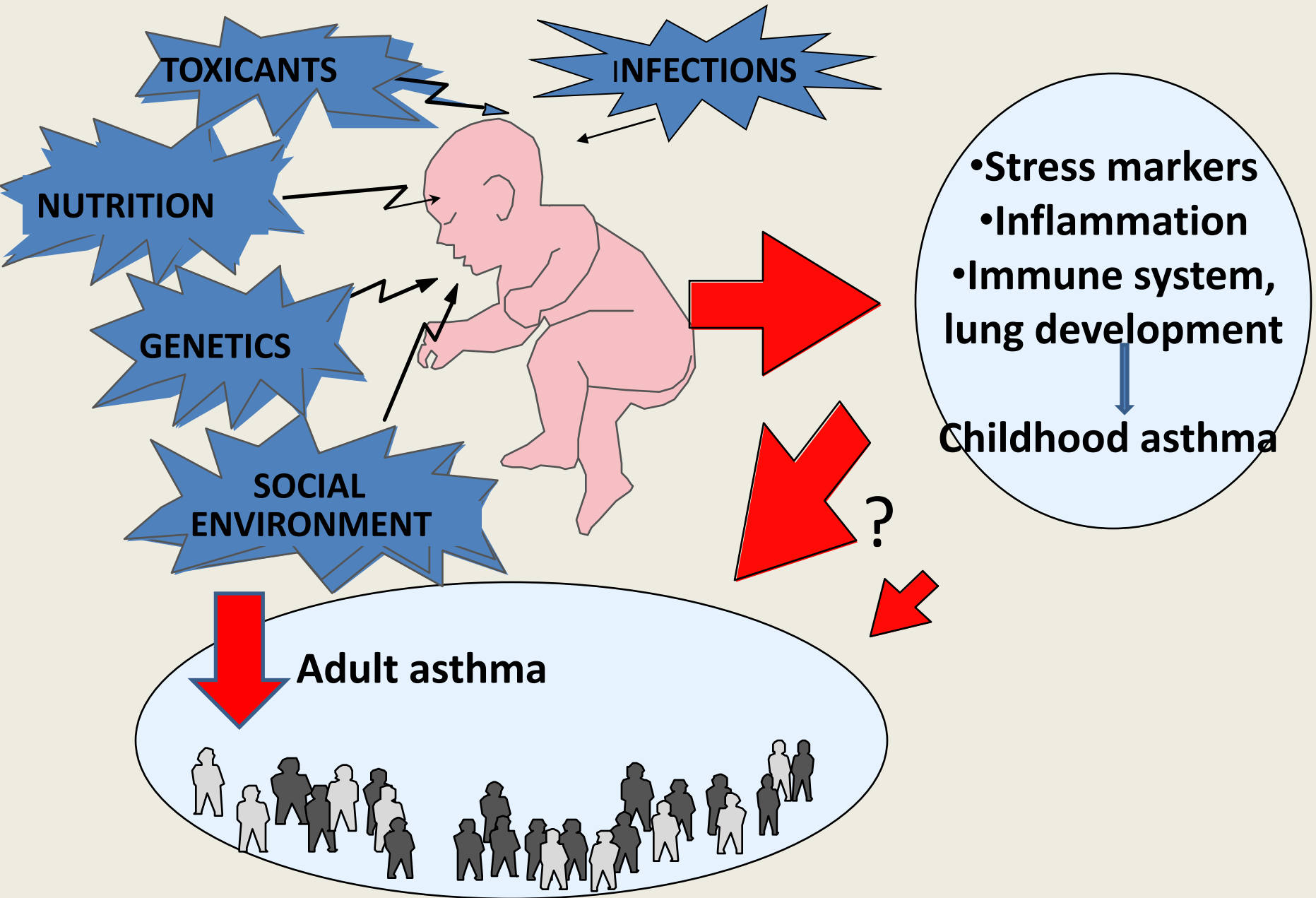
Collaborative on Health and Environment

June, 2013

Asthma: a complex disease(s)

- Common signs and symptoms: airway narrowing, wheeze, cough, shortness of breath
- Different kinds of asthma; pathophysiology varies
- Implications for primary prevention differ

Asthma: Lifecourse perspective



Key Risk Factors in Asthma Onset

- Pets
- Obesity, Nutrition
- Immigration and Infection
- Prenatal exposures to chemical contaminants
- Psychosocial environment/stress
- Allergens indoors
- Asthmagens in the workplace
- Air pollution
- Tobacco

Pets in the home

- “Pet exposure” is complex:
 - Allergen exposure
 - Inhaled and ingested microbial exposure
 - Exposure to support or stress (bites)
 - Exercise

Pets

- Early-life “pet exposure” is probably associated with asthma onset
- But, the evidence for the direction of the association (beneficial, risk factor, no association) varies, and it varies more for cat than for dog ownership.

Pets

- Variability in response to pet allergens or microbes likely depends on
 - Dose from pet in the home
 - Timing of exposure
 - Inheritance
 - Background dose of pet allergen in the community
 - The microbial organisms that the pet carries
 - Unmeasured or measured cofactors influencing susceptibility to allergy, airway inflammation, airway irritability and asthma

Immigration and infection

- Enough studies have been done to show that asthma prevalence is lower in people living in many low-income countries and that it increases after immigration to developed countries.
- The effect sizes are large.
- BUT, the reasons for this are not yet clear.
- Therefore research needs to focus on why.

Immigration and Infection: hypotheses

- Language, culture, and literacy
- “Hygiene” hypothesis
- Chemicals, including air pollution
- Vitamin D
- Selection bias in immigration

Obesity and Nutrition



- **Obesity**

- Maternal obesity during pregnancy
- Early childhood obesity
- Adult obesity

- **Nutrition**

- Antioxidants (eg, fruits & vegetables)
- omega-3 fatty acids (eg, fish)
- Vitamin D (sunlight + diet/supplements)

Obesity, nutrition

- **Obesity** across life span:
 - During pregnancy: probably associated inc. risk
 - Early childhood: probably associated inc. risk
 - Adult: known association
- **Nutrition** during pregnancy & early childhood:
 -  Antioxidants (fruit & vegetables): possibly associated increased risk
 -  omega-3 fatty acids (fish): possibly associated increased risk
 - Vitamin D (sunlight + intake): not classifiable

Chemicals

- Metals: Possibly associated with asthma
- Organochlorine Compounds: Not classifiable; inadequate evidence
- Bisphenol A: Possibly associated with asthma
- Perfluorinated Compounds: Not classifiable; inadequate evidence
- Phthalates: Not classifiable; inadequate evidence
- [Magnetic field: Not classifiable; inadequate evidence]

Psychosocial stress and asthma

- Biological plausibility
- Temporal sequence – prospective prenatal & early childhood cohorts a particular strength
- Exposure-response relationship
- Robust to adjustment for a number of important confounders
- Robust to sensitivity analyses
- Known to be associated with early asthma phenotypes

Psychosocial stress

- Socially toxic environments are NOT simply a marker of a more toxic physical environments
- Social contexts and consequent stress may be as detrimental to children's health as chemical toxicants
- "Social pollutants"
- Psychological stress disrupts biological systems overlapping with those altered by physical pollutants/toxicants

Psychosocial stress

- Independent effects
- Interactive (joint) effects
- Individual- and place-based psychosocial stress may impact host resistance such that physical toxicants (e.g., indoor allergens, traffic-related air pollution) may have adverse effects at relatively lower doses
- Epidemiological studies and interventions need to address physical toxicants and social stress jointly to impact public health most effectively

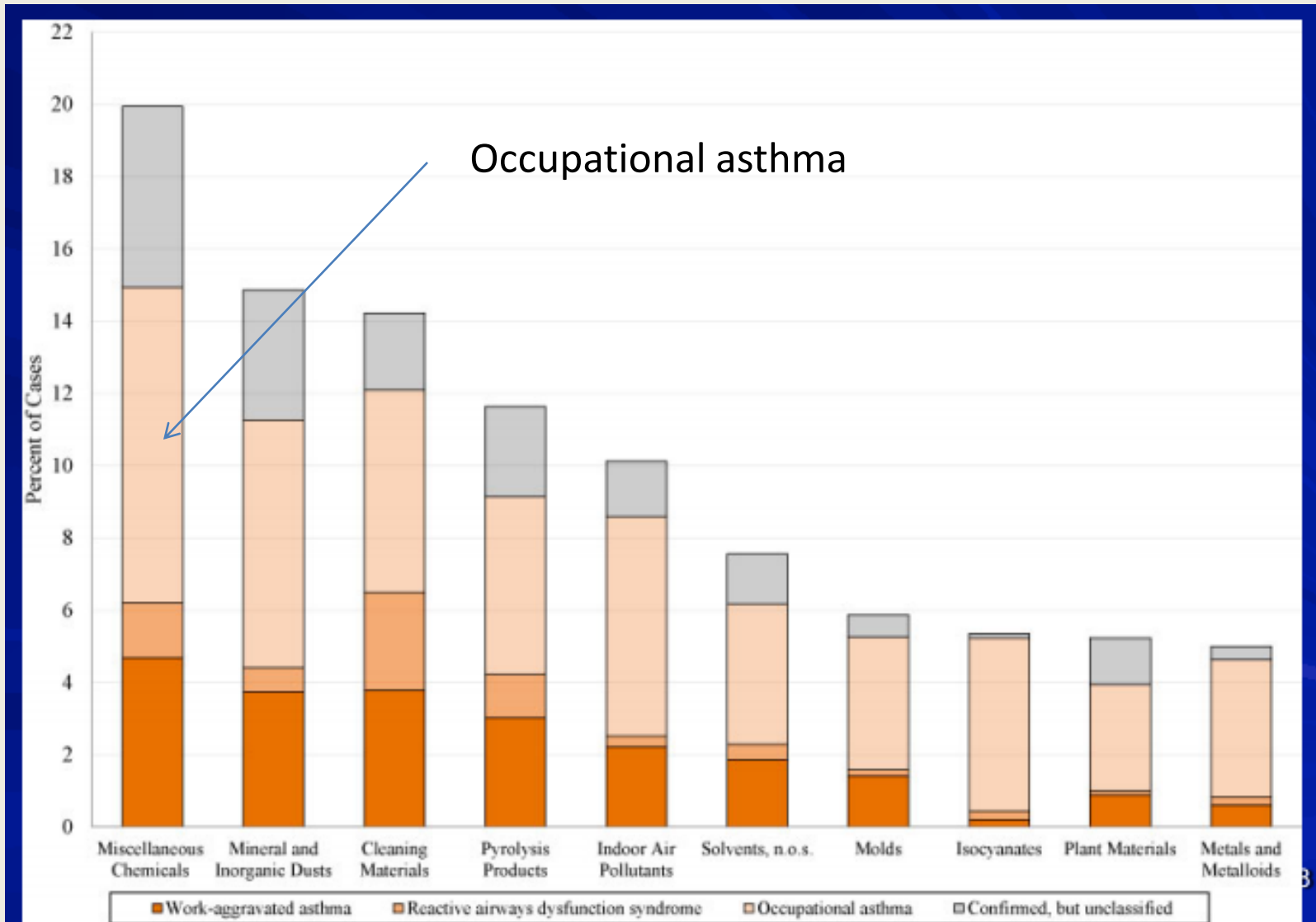
Indoor allergens

- Exposure to cockroach and mouse allergens: probably associated with asthma onset
- Sensitization to dust mites, cat and dog dander known to be associated with asthma onset
 - Timing of exposure to animal dander is important
 - Most wheezers with no atopy lose their symptoms by school age
- Sensitization to molds known to be associated with asthma onset
 - As with animal dander, differs between atopic and non-atopic wheezers
 - May be variable response to various mold species
- Interactions with stress, chemicals, and outdoor air pollution may be important

Occupational asthma

- Occupational Asthma
 - Sensitizer induced
 - Irritant induced
 - Reactive Airways Dysfunction Syndrome (RADS)
 - Low dose irritant induction of asthma
- Work-exacerbated asthma
 - Irritant exposures
 - Workplace exposures to sensitizers

Ten most frequently reported agent categories; state-based surveillance systems



Outdoor air pollution

- Traffic related air pollution:
 - Probably associated with asthma onset
- Ozone and PM 2.5
 - Possibly associated with asthma onset
- Special considerations:
 - Non-specific exposure metrics, (e.g. TRAP and proximity to traffic)
 - Possible synergistic effects with stress and allergens

Tobacco smoke


- Meets all Bradford Hill criteria for causality
 - Consistency and coherence
 - Strength of association
 - Plausible mechanism(s)
 - Oxidative stress from free radicals, epithelial damage, inflammation
 - Temporality
 - Dose-response relationship
- Thus, tobacco smoke exposure is known to be associated with risk of asthma onset

Day 1, Session 3: Roundtables: Readiness for Action

- Weight of the evidence
- Additional factors
- Development of list of risk factors “ready for action”
 - Action includes
 - Intervention research
 - Policy or practice change



Factors for Assessing Readiness for Action

- Weight of the evidence
 - Magnitude of potential public health impact, considering strength of association/scale of potential exposure
 - Populations disproportionately at risk?
 - Unintended consequences?
 - Other benefits from action?
- 

Risk Factors Ready for Action

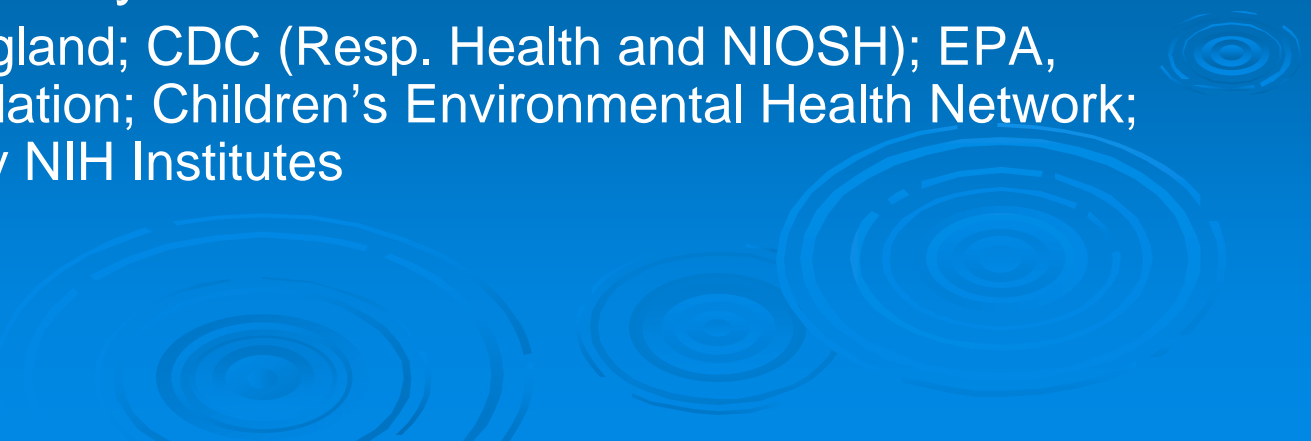
(e.g., intervention research; policy; practice changes)

- × Pets
- ✓ Obesity (pregnancy, childhood and adult)
- × Nutrition
- × Immigration and Infection
- ✓ Prenatal exposures to *some* chemical contaminants (building materials/cleaning + disinfectants)
- ✓ Psychosocial environment/stress
- ✓ Allergens indoors (pests, dust-mite, dampness)
- ✓ Asthmagens in the workplace – beyond?
- ✓ Air pollution (and traffic proximity)
- ✓ Tobacco

Day 2, Session 1: Strategies for Advancing the Primary Prevention of Asthma

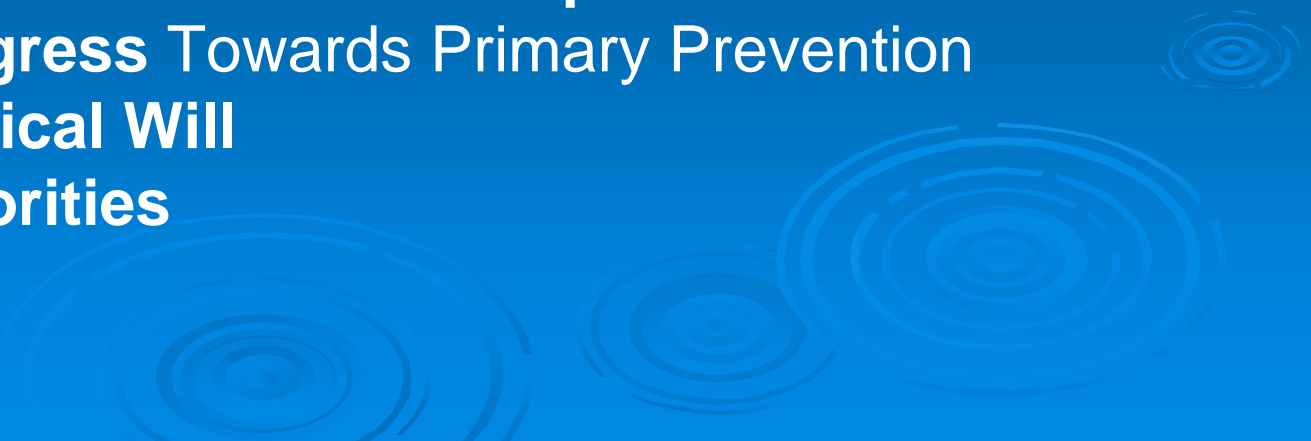
- Part I: Systems Thinking
 - David Kriebel

 - Part II: Panel Discussion. Capacity for Primary Prevention Initiatives in Massachusetts
 - 10 “spheres”; government and non-government

 - Part III. Panel Discussion: National Public/Private Activities in Primary Prevention
 - HHS New England; CDC (Resp. Health and NIOSH); EPA, Kresge Foundation; Children’s Environmental Health Network; submission by NIH Institutes
- 

Day 2, Session 2: Roundtables

Recommendations for the Roadmap

- Comprehensive **Community** Asthma Prevention
 - Asthma-Safe **Housing**
 - Asthma Prevention Opportunities in **ACA**
 - Asthma Prevention in **Schools/Early Childhood Education/Out of School Time**
 - Asthma Prevention in **Health Care**
 - Improved **Ambient Air Quality**
 - Prioritizing Health In **Urban Development**
 - Asthma Prevention in Mass. **Workplaces**
 - **Tracking Progress** Towards Primary Prevention
 - **Building Political Will**
 - **Research Priorities**
- 

Example Goal: Promote Asthma Prevention in Health Care Settings

- Launch asthma prevention initiatives in health care settings, including home health care, to improve environments and change behavior among patients, clients, workers and their families. Pay particular attention to pregnant mothers and people in occupations with likely asthmagen exposures.
 - Promote universal screening/identification of patients, clients, workers:
 - referrals for tobacco exposure
 - stress
 - exposure to workplace asthmagens.
 - Inventory cleaning and disinfecting agents; advance safer alternatives
 - Implement known effective interventions to reduce obesity
 - Ensure the use of Integrated Pest Management for pest control

Selected Ah Hahs

- **Complex disease pathways need complex interventions. Primary prevention of asthma will require multiple interventions at multiple levels: individual, institutional, sectoral. Targeting single risk factors may have limited impact.**
- **With occupational asthma, we have proven primary prevention strategies.**
- **Many risk factors for asthma *onset* also *exacerbate* asthma; interventions may benefit people with and without asthma. Potential to build on existing asthma intervention programs**
- **Particular need/opportunity: maternal/child issues; pre-conception and pregnancy**
- **Clues offered by disparities in incidence and trends in risk factors should inform a primary prevention research agenda**

Two Different Traditions of Evaluating Health Effects of “Exposures”

| | | |
|---|--|---|
| If the “exposure” is: | Treatment/Intervention | Hazard, environmental factor |
| Is it ethical to randomize? | Often | Rarely |
| What do we need to decide on causality? | Randomized trials | Observational studies, Bradford Hill criteria |
| Which is worse: false positives or negatives? | False positives: violate the “first do no harm” principal | False negatives: waiting for more evidence while people continue to be hurt |
| What does precaution mean? | Weigh heavily the possibility of side effects/unintended consequences – high burden of evidence for action | Act in the face of uncertainty |

Next Steps

- Review of foundational principles; goals and actions; ah has; drafting of Roadmap
- Prioritize goals and actions, and lead organizations, for inclusion in Massachusetts strategic plan for asthma 2014-2019
- Disseminate information about process and outcomes to other states, and nationally

More Information

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