

Healthy Housing: A Review of the Science

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Outline

- ▶ Housing Deficiencies, Disparities and Adverse Health Effects
 - Early Housing Laws & Infectious Disease
 - Data on Disparities
 - World Health Organization Report
- ▶ Housing Interventions and Health Gains
 - Chronic Disease & Injury
 - CDC & NCHH Report

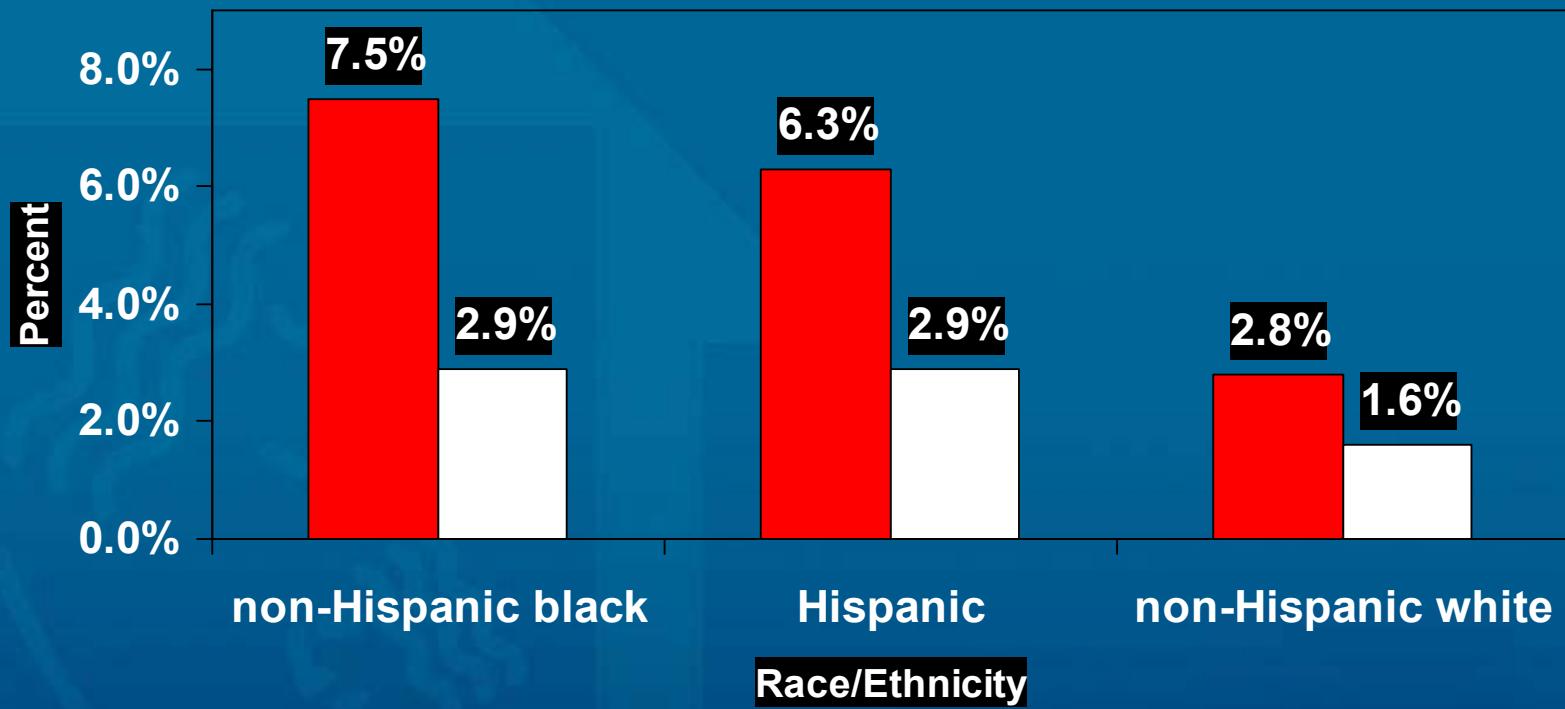


Cholera, Typhoid and Early Housing Laws



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Race/Ethnicity and Substandard Housing (Moderate & Severe)



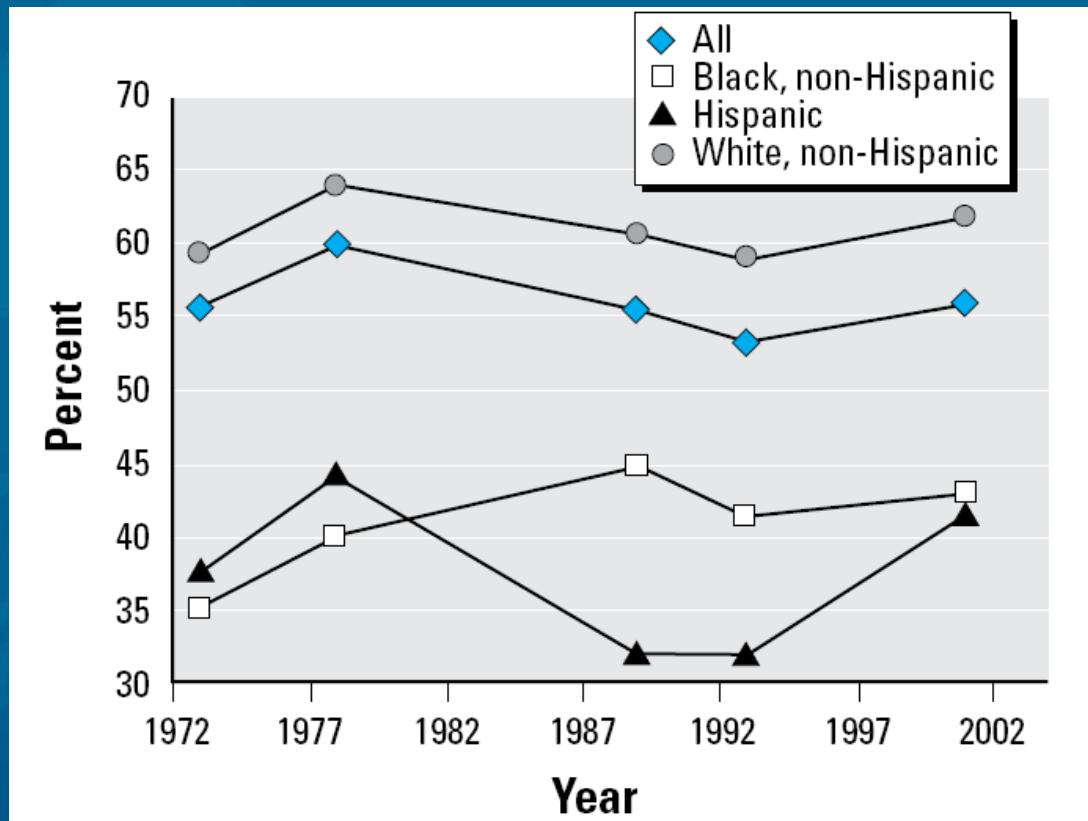
Source: American Housing Survey, 2005

■ moderate ■ severe



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Health & Housing Long Term Disparities



Jacobs et al. 2009. The Relationship of Housing and Population Health: A 30 Year Retrospective Analysis. EHP 117:597-604



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Disparities & Equity

MAY 2005 • THE NATION'S HEALTH

VITAL SIGNS

Perspectives of the president of APHA

**Safer housing: A key step to
overcoming health disparities**



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Housing And Health



Report on the WHO technical
meeting on quantifying
disease from inadequate
housing

Bonn, Germany, 28-30 November, 2005



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Sufficient Evidence (WHO, 2005)

► PHYSICAL FACTORS:

- Heat and cold - excess winter & summer mortality
- Energy efficiency of housing and respiratory health
- Radon exposure in dwellings and lung cancer
- Neighborhood and building noise and mental health

► SOCIAL FACTORS:

- Multifamily housing, high-rise housing, housing quality and mental health

► CHEMICAL FACTORS:

- ETS exposure in dwellings and respiratory and allergic effects
- Lead-related health effects

► BIOLOGIC FACTORS:

- Humidity and mold in dwellings and respiratory health effects
- Hygrothermal conditions and house dust mite exposure (asthma)



Some Evidence (WHO, 2005)

► PHYSICAL FACTORS:

- Ventilation in the dwelling and respiratory and allergic effects

► CHEMICAL FACTORS:

- VOCs and respiratory, cardiovascular and allergic effects

► BIOLOGICAL FACTORS:

- Cockroaches and rodents in dwellings and respiratory and allergic effects
- Cats, dogs and mites in dwellings and respiratory and allergic effects
- Pets and mites and respiratory, allergic or asthmatic effects

► BUILDING FACTORS:

- Sanitation and hygiene conditions and related physical health effects

► SOCIAL FACTORS:

- Social conditions of housing and fear/fear of crime
- Poverty and social exclusion and related health effects
- Crowding and related health effects
- Social factors/social climate and mental health



Today's Chronic Diseases & Injuries

Asthma, Cancer, Neurological Deficits, Others

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**Housing Interventions
and Health:
A Review of the Evidence**



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Structure of Panels

- Available evidence of how housing changes (interventions) affected health outcomes
 - Biological agents
 - Pest allergens, Mold & Moisture, Pests
 - Chemicals
 - Radon, Lead, Particles, Pesticides, VOCs
 - Water & Sewage Treatment
 - Injuries
 - Falls, Fire, Scalds
 - Community-Level Effects



Evidence Considered

- ▶ Clinical outcomes
- ▶ Environmental health outcomes



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Goals

- ▶ Develop policy recommendations for evidence-based interventions
- ▶ Identify research priorities
- ▶ Identify interventions where there is no demonstrated record of effectiveness (mattress covers alone), or where they may be harmful (ozone generators)



Aspects of Studies Reviewed

- ▶ Design/suitability
- ▶ Execution
- ▶ Study size and population
- ▶ Overall value
- ▶ Direction of effect and degree of impact



Effective Interventions

Lead Hazard Control

Multi-Faceted Tailored Asthma Interventions

Integrated Pest Management

Mold and Moisture Control

Smoking Bans

Drinking Water Standards

Smoke Alarms

Hot Water Temperature

Fencing (Pools)

Rental Subsidy Standards



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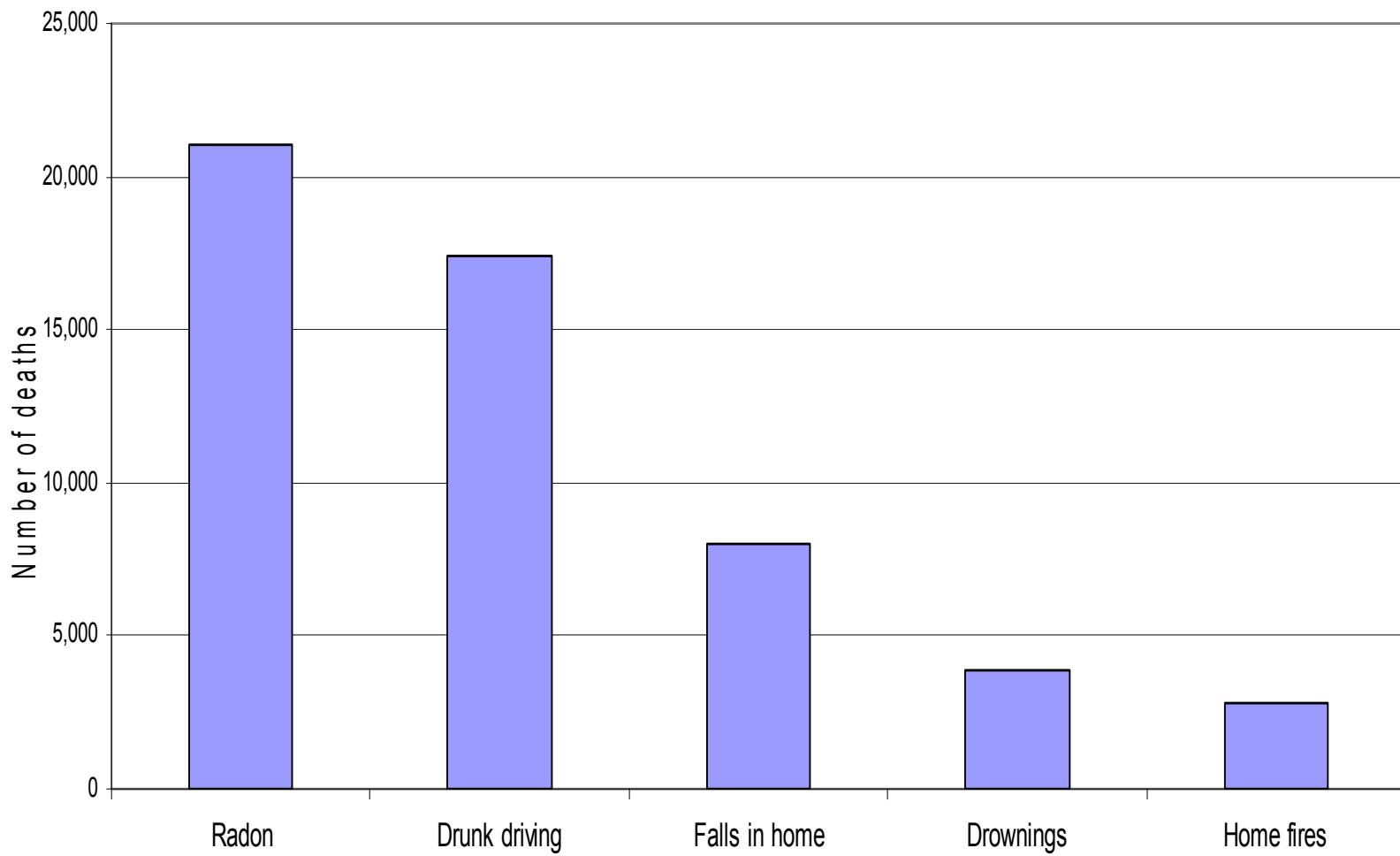
Chemicals



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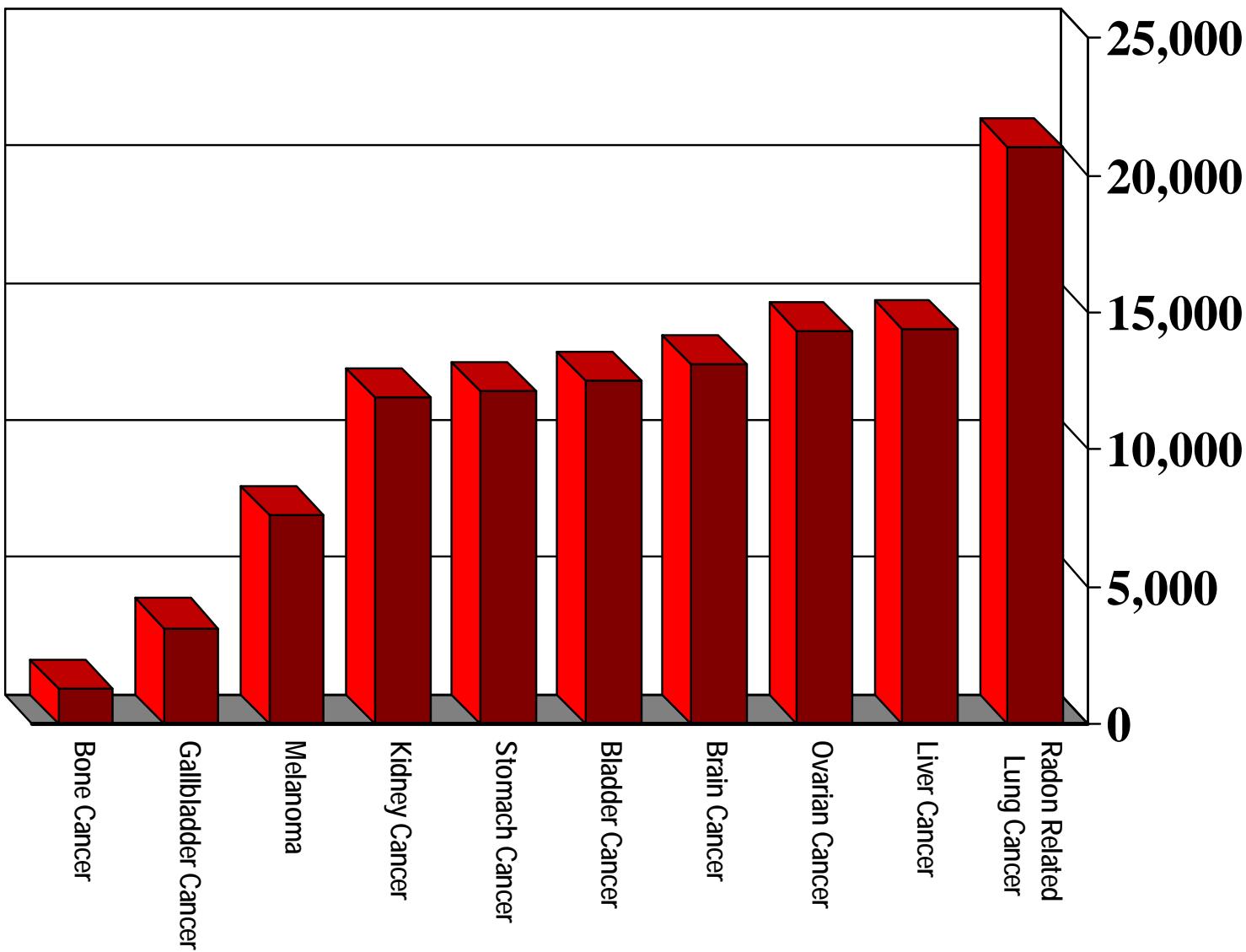
Active Radon Mitigation

Comparison of Annual Deaths by Selected Causes



Source: EPA Home Buyers and Sellers Guide to Radon

■ Comparative U.S. Cancer Deaths in 2004



Integrated Pest Management

- ▶ Severe asthma reduced from 37% to 9% following IPM¹
- ▶ Insecticides were lower in air and absent in maternal blood²
- ▶ More effective against pests than routine spraying³

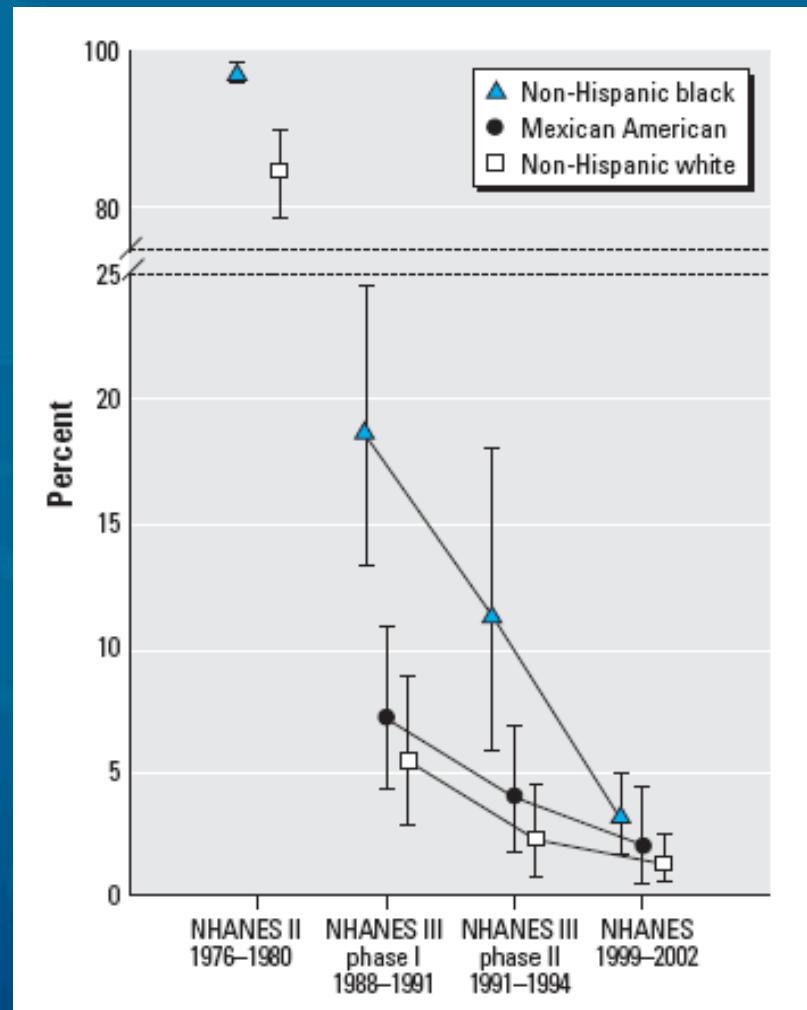
Selected References

- ¹ Sandel et al. Can IPM Impact Urban Children With Asthma?
- ² Williams et al. An Intervention to Reduce Residential Insecticide Exposure During Pregnancy Among An Inner City Cohort. EHP 114: 1684-1689
- ³ Miller & Meek 2004. Cost and Efficacy Comparison of IPM with Monthly Spray Insecticide Applications J Econ Entomology 97 552-569



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Lead Hazard Control

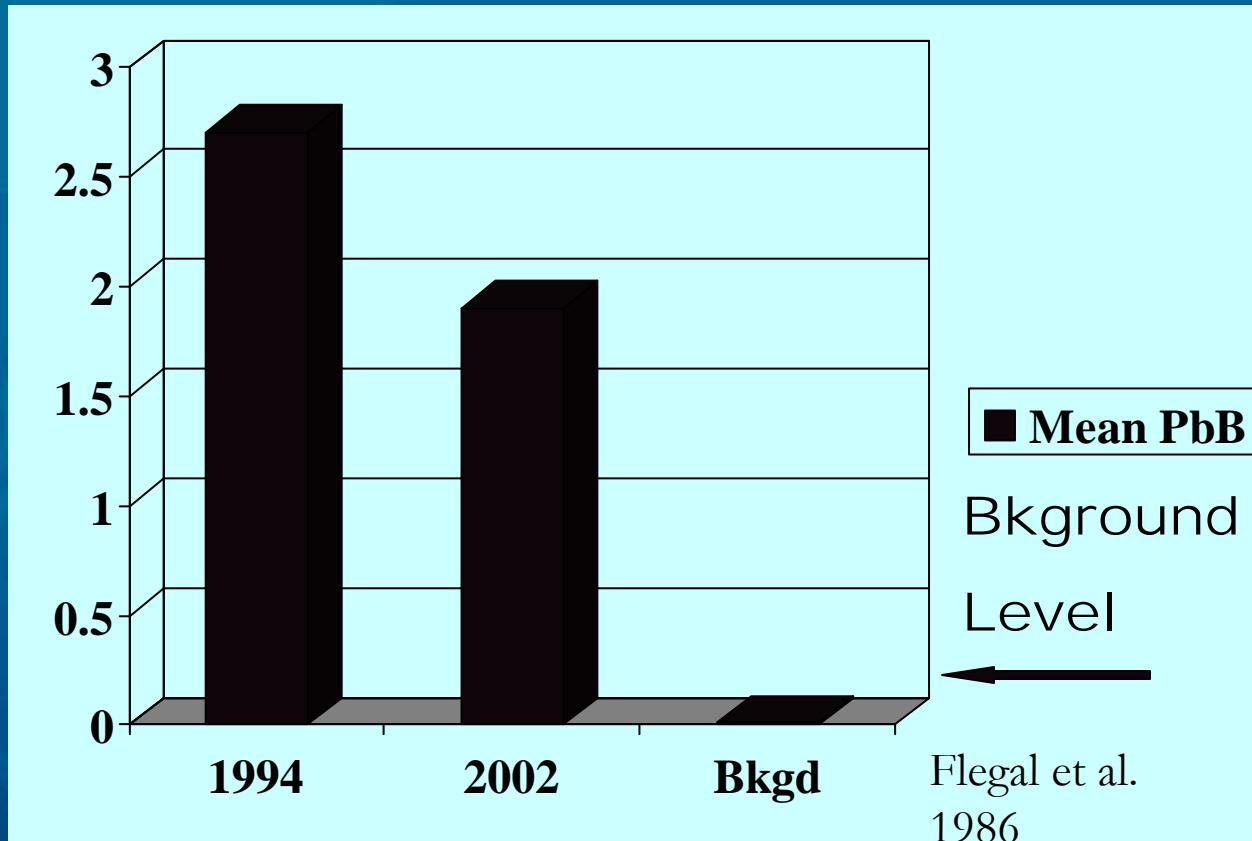


Levin et al. Lead Exposure in US Children, 2008: Implications for Prevention. EHP 116:1285-1293



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US Childhood Blood Lead Compared to Background Level



Lead-Safe Window Replacement

- ▶ Windows have highest lead levels¹
- ▶ 78%-95% improvement after intervention²
- ▶ **Net** benefits due to higher lifetime earnings (from avoided IQ deficits), energy conservation, and increased home value =
\$67 billion³
- ▶ Other benefits are improved weatherization, more jobs, positive climate change impact, reduced lead poisoning, likely mold, asthma and fall benefits

Selected References

¹ Jacobs et al. 2002. Prevalence of LBP Hazards in US Housing. EHP 110: A559-A606

² Wilson et al. 2006. Evaluation of HUD-Funded Lead Hazard Control Treatments at Six Years Post-Intervention, Environ Res. 102(2) 237-48.

³ Nevin R, et al. 2008. Monetary benefits of preventing childhood lead poisoning with lead-safe window replacement, Environ Res 106: 410-419.



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Smoking Bans

- ▶ 3,000 deaths/year in non-smokers¹
- ▶ Premature births and low birth weight²
- ▶ 4,000 chemicals and 40 known carcinogens¹
- ▶ Reduced cognition in teens³

Selected References

- ¹ U.S. EPA. 1992b. Health Effects of Passive Smoking.
- ² Williams et al. 1998. Maternal cigarette smoking and child psychiatric morbidity Pediatrics 102(1): e11.
- ³ Yolton K et al. 2005. Exposure to environmental tobacco smoke and cognitive abilities among U.S. children and adolescents. EHP 113(1): 98-103.



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Biological Agents



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Multi-Faceted Asthma Interventions

(Education, Management, Coordinated Care, Housing Structural Improvements)

- ▶ Symptom Days
- ▶ Medical Care (ER)
- ▶ Missed School
- ▶ Improved Quality of Life

Source: Crocker et al. 2009. Home-Based Environmental Interventions to Reduce Asthma Morbidity. CDC Task Force on Community Services



- ▶ **Asthma-\$18.3 billion a year**
 - \$10.1 billion in direct medical costs
 - \$8.2 billion in lost work/school

Source: asthma and allergy foundation
<http://www.aafa.org/display.cfm?id=6&sub=63>



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Injuries

Place	Total Injury Visits/yr
Home	4,010,000
School	811,000
Public	2,210,000
Other	841,000
Unknown	2,341,000
Source: Phalen et al. 2005. Residential Injuries in US Children and Adolescents. Pub Health Reports 120: 63-70	



Injury Prevention

- ▶ Working Smoke Alarms¹
- ▶ Four-Sided Pool Fencing²
- ▶ Pre-Set Safe Temperature Water Heaters³

¹ DiGuiseppi C, Higgins JP. 2001. Interventions for promoting smoke alarm ownership and function. Cochrane Database Syst Rev(2): CD002246. Updated 2008.

² Thompson DC, Rivara FP. 1998. Pool fencing for preventing drowning in children. Cochrane Database Syst Rev(2): CD001047. Updated 2006

³ Erdmann TC, Feldman KW, Rivara FP, Heimbach DM, Wall HA. 1991. Tap Water Burn Prevention - The Effect of Legislation. Pediatrics 88(3): 572-577.



Community Interventions

► Housing Choice Voucher Program —Section 8

Sources:

Meyers et al. 2005. Subsidized housing and children's nutritional status - Data from a multisite surveillance study. *Arch Pediatrics & Adolescent Medicine* 159(6): 551-556.

Van Ryzin. 2002. Subtenures and housing outcomes for low income renters in New York City. *Journal of Urban Affairs* 24(2): 197-218.

U.S. Department of Housing and Urban Development, 2006. Effects of Housing Vouchers on Welfare Families Part 1 and 2.



Conclusion

- ▶ There is sufficient scientific evidence to implement housing and community interventions to improve health and prevent housing-related disease and injuries
- ▶ Research needs remain

