

Summary of Two Key Institute of Medicine Reports Regarding Asthma, Indoor Air Quality, Damp Indoor Spaces, and Mold

Association Between Biological and Chemical Exposures in the Home and			
Development of Asthma in Sensitive Individuals		Exacerbation of Asthma in Sensitive Individuals	
Biological Agents	Chemical Agents	Biological Agents	Chemical Agents
Sufficient Evidence of a Causal Relationship			
<ul style="list-style-type: none"> House dust mite 	<i>No agents met this definition</i>	<ul style="list-style-type: none"> Cat Cockroach House dust mite 	<ul style="list-style-type: none"> ETS (in preschool-aged children)
Sufficient Evidence of an Association			
<i>No agents met this definition</i>	<ul style="list-style-type: none"> ETS (in preschool-aged children) 	<ul style="list-style-type: none"> Dog Fungi or molds Rhinovirus 	<ul style="list-style-type: none"> Nitrogen oxides (high-level exposures)¹
Limited or Suggestive Evidence of an Association			
<ul style="list-style-type: none"> Cockroach (in preschool-aged children) Respiratory Syncytial Virus 	<i>No agents met this definition</i>	<ul style="list-style-type: none"> Domestic birds <i>Chlamydia pneumoniae</i> <i>Mycoplasma pneumoniae</i> Respiratory Syncytial Virus 	<ul style="list-style-type: none"> ETS (in school aged and older children, & adults) Formaldehyde Fragrances
Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists			
<ul style="list-style-type: none"> Cat, Dog, Domestic Birds Rodents Cockroaches (except for preschool-aged children) Endotoxins Fungi or molds <i>Chlamydia pneumoniae</i> <i>Mycoplasma pneumoniae</i> <i>Chlamydia trachomatis</i> Houseplants Pollen 	<ul style="list-style-type: none"> Nitrogen oxides Pesticides Plasticizers Volatile organic compounds (VOCs) Formaldehyde Fragrances ETS (in older children and adults) 	<ul style="list-style-type: none"> Rodents (as pets or feral animals) <i>Chlamydia trachomatis</i> Endotoxins Houseplants Pollen exposure in indoor environments Insects other than Cockroaches 	<ul style="list-style-type: none"> Pesticides Plasticizers Volatile organic compounds (VOCs)
Limited or Suggestive Evidence of No Association			
<ul style="list-style-type: none"> Rhinovirus (adults) 	<i>No agents met this definition</i>	<i>No agents met this definition</i>	<i>No agents met this definition</i>

Source: **National Academies Press, 2000.** *Clearing the Air: Asthma and Indoor Air Exposures. Executive Summary* Institute of Medicine. ISBN 0-309-06496-1 See www.nap.edu/books/0309064961/html/.

¹ At concentrations that may occur only when gas appliances are used in poorly ventilated kitchens.

- **Sufficient Evidence of a Causal Relationship:** Evidence fulfills association criteria and in addition satisfies criteria regarding the strength of association, biologic gradient (dose-response effect), consistency of association, biologic plausibility and coherence, and temporality used to assess causality.
- **Sufficient Evidence of an Association:** Association has been observed in studies in which chance, bias, and confounding factors can be ruled out with reasonable confidence (e.g. several small bias free studies showing an association that is consistent in magnitude and direction)
- **Limited or Suggestive Evidence of an Association:** Evidence is suggestive of an association but is limited because chance, bias, and confounding cannot be ruled out with confidence (e.g. one high quality study shows association, but results of other studies are inconsistent)
- **Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists:** Available studies are of insufficient quality, consistency, or statistical power to permit a conclusion; or no studies exist
- **Limited or Suggestive Evidence of No Association:** Several adequate studies are mutually consistent in not showing an association (but limited to the conditions, level of exposure, and length of observation covered in the study).

Summary of Two Key Institute of Medicine Reports Regarding Asthma, Indoor Air Quality, Damp Indoor Spaces, and Mold

Exposure to Damp Indoor Environments	Presence of Mold or Other Agents in Damp Indoor Environments
Sufficient Evidence of a Causal Relationship	
Sufficient Evidence of an Association	
<ul style="list-style-type: none"> • Upper respiratory (nasal and throat) tract symptoms • Cough • Wheeze • Asthma symptoms in sensitized persons 	<ul style="list-style-type: none"> • Upper respiratory (nasal and throat) tract symptoms • Cough • Hypersensitivity pneumonitis in susceptible persons • Wheeze • Asthma symptoms in sensitized persons
Limited or Suggestive Evidence of an Association	
<ul style="list-style-type: none"> • Dyspnea (shortness of breath) • Lower respiratory illness in otherwise healthy children • Asthma development 	<ul style="list-style-type: none"> • Lower respiratory illness in otherwise healthy children
Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists	
<ul style="list-style-type: none"> • Airflow obstruction (in otherwise healthy persons) • Skin symptoms • Mucous membrane irritation syndrome • Gastrointestinal tract problems • Chronic obstructive pulmonary disease • Fatigue • Inhalation fevers (nonoccupational exposures) • Neuropsychiatric symptoms • Lower respiratory illness in otherwise healthy adults • Cancer • Acute idiopathic pulmonary hemorrhage in infants • Reproductive effects • Rheumatologic and other immune diseases 	<ul style="list-style-type: none"> • Dyspnea (shortness of breath) • Skin symptoms • Asthma development • Gastrointestinal tract problems • Airflow obstruction (in otherwise healthy persons) • Fatigue • Mucous membrane irritation syndrome • Neuropsychiatric symptoms • Chronic obstructive pulmonary disease • Cancer • Inhalation fevers (nonoccupational exposures) • Reproductive effects • Lower respiratory illness in otherwise healthy adults • Rheumatologic and other immune diseases • Acute idiopathic pulmonary hemorrhage in infants

*Source: National Academies Press, 2004. Damp Indoor Spaces and Health. Tables ES-1 and ES-2
Institute of Medicine of the National Academies, ISBN 0-309-09246-9.
See www.nap.edu/books/0309091934/html/.*

- **Sufficient Evidence of a Causal Relationship:** Evidence is sufficient to conclude that a causal relationship exists between the agent and the outcome. That is, the evidence fulfills the criteria for “sufficient evidence of an association” and, in addition, satisfies the following criteria: strength of association, biologic gradient, consistency of association, biologic plausibility and coherence, and temporally correct association.
- **Sufficient Evidence of an Association:** Evidence is sufficient to conclude that there is an association. That is, an association between the agent and the outcome has been observed in studies in which chance, bias, and confounding can be ruled out with reasonable confidence.
- **Limited or Suggestive Evidence of an Association:** Evidence is suggestive of an association between the agent and the outcome but is limited because chance, bias, and confounding cannot be ruled out with confidence.
- **Inadequate or Insufficient Evidence to Determine Whether an Association Exists:** The available studies are of insufficient quality, consistency, or statistical power to permit a conclusion regarding the presence of an association. Alternatively, no studies exist that examine the relationship.

World Health Organization Regional Office for Europe Quantifying Disease from Inadequate Housing

Housing Inadequacy	Disease
<i>Linkages with sufficient evidence for estimating burden of disease</i>	
Heat	Related cardiovascular effects and/or excess mortality
Cold indoor temperatures	Winter excess mortality
Energy efficiency of housing	Health
Radon exposure in dwellings	Cancer
Neighbourhood and building noise	Related health effects
Environmental tobacco smoke in dwellings	Respiratory and allergic effects
Lead in paint, dust, soil, and drinking water	Lead-related health effects
Humidity and mould in dwellings	Related health effects
Hygrothermal conditions	House dust mite exposure & respiratory disease
Building and equipment factors	Injuries / domestic accidents
Injury Database on domestic accidents	Injuries
Multifamily housing, high-rise housing, and housing quality	Mental health
<i>Linkages with some evidence for estimating burden of disease</i>	
Ventilation in the dwelling	Respiratory and allergic effects
Volatile organic compounds	Respiratory, cardiovascular and allergic effects
Cockroaches and rodents in dwellings	Respiratory and allergic effects
Cats, dogs, and mites in dwellings	Respiratory and allergic effects
Pets and mites	Respiratory, allergic or asthmatic effects
Sanitation and hygiene conditions	Related physical health effects
Social conditions of housing	Fear / fear of crime
Poverty and social exclusion	Related health effects
Crowding	Related health effects
Social factors / social climate	Mental health
<i>Linkages with insufficient evidence for estimating burden of disease</i>	
Lighting conditions in the dwelling	Mental and other health effects
Particulate matter in indoor air	Respiratory and allergic effects

Summary Report prepared by National Center for Healthy Housing from the “Report on the WHO technical meeting on quantifying disease from inadequate housing,” Bonn, Germany, 28-30 November, 2005. See www.euro.who.int/Document/HOH/EBD_Bonn_Report.pdf. For more information on WHO Regional Office for Europe’s work on housing and health, see www.euro.who.int/Housing/20060519_2.

Percentage of Households reporting smoke-free home rules, by state/area -
Current population Survey, United States, 1992-93, 1998-99, and 2003

State/Area	1992 - 1993	1998 - 1999	2003	% change from 1992-1993 to 2003
Utah	69.6	81.1	88.8	27.6
California	59.1	72.7	84.4	42.9
Arizona	54.4	71.6	82.4	51.5
Oregon	50.0	68.0	81.2	62.4
Hawaii	51.5	65.0	79.7	54.9
Nevada	45.5	63.7	79.6	74.9
Colorado	48.3	65.2	79.3	64.3
Washington	54.3	68.9	79.3	46.2
Idaho	50.6	70.3	78.8	55.9
Texas	46.3	65.3	78.5	69.5
Florida	50.2	66.0	78.5	56.4
Georgia	41.8	61.9	77.4	85.4
Maryland	43.0	64.3	75.9	76.6
Alaska	50.9	60.9	75.8	48.8
Massachusetts	40.3	60.1	75.5	87.6
New Mexico	45.6	62.7	75.5	65.8
New Hampshire	38.4	56.5	74.6	94.4
New Jersey	45.5	61.3	74.0	62.5
Connecticut	44.7	60.1	73.4	64.2
Virginia	39.3	58.4	72.7	85.1
Minnesota	39.7	61.5	71.5	80.1
South Dakota	36.8	57.1	71.1	93.2
Alabama	38.9	59.1	70.9	82.1
New York	41.6	58.3	70.5	69.5
Montana	43.1	61.0	70.0	62.5
Rhode Island	38.9	60.4	69.8	79.6
Delaware	40.1	55.4	69.7	73.7
Mississippi	41.2	54.9	69.6	69.1
Vermont	39.1	59.7	69.3	77.5
Nebraska	39.9	59.5	69.2	73.3
Maine	39.4	54.4	69.0	75.1
Louisiana	37.3	58.2	68.6	83.9
North Dakota	41.2	56.4	68.2	65.7
District of Columbia	41.4	56.6	68.1	64.7
Iowa	36.1	52.9	68.0	88.6
Pennsylvania	39.9	56.3	67.5	69.0
South Carolina	40.2	58.6	67.5	67.9
Kansas	39.9	59.3	66.9	67.8
Wisconsin	36.7	55.4	66.4	81.1
Wyoming	38.6	58.0	65.5	69.8
North Carolina	34.3	53.0	65.4	90.8
Illinois	38.6	54.6	64.8	68.0
Oklahoma	39.2	54.1	64.7	64.9
Tennessee	34.1	52.0	64.2	88.3
Missouri	34.5	53.7	64.0	85.7
Indiana	33.9	47.9	62.7	85.2
Ohio	35.1	51.4	60.8	73.2
Michigan	35.4	51.2	60.7	71.7
Arkansas	33.2	53.0	60.1	81.0
West Virginia	27.8	42.8	57.1	105.5
Kentucky	25.7	38.9	53.4	107.9
<i>Minimum</i>	25.7	38.9	53.4	27.6
<i>Maximum</i>	69.6	81.1	88.8	107.9
<i>Range</i>	43.9	42.3	35.4	80.2
<i>Median</i>	39.9	58.6	69.8	71.7
Total	43.2	60.2	72.2	67.1

U.S. Centers for Disease Control and Prevention, Morbidity Mortality Weekly Report,
May 25, 2007, 56(20);501-504. See
www.cdc.gov/mmwr/preview/mmwrhtml/mm5620a3.htm.

**Midcourse
Review**



Environmental Health **8**

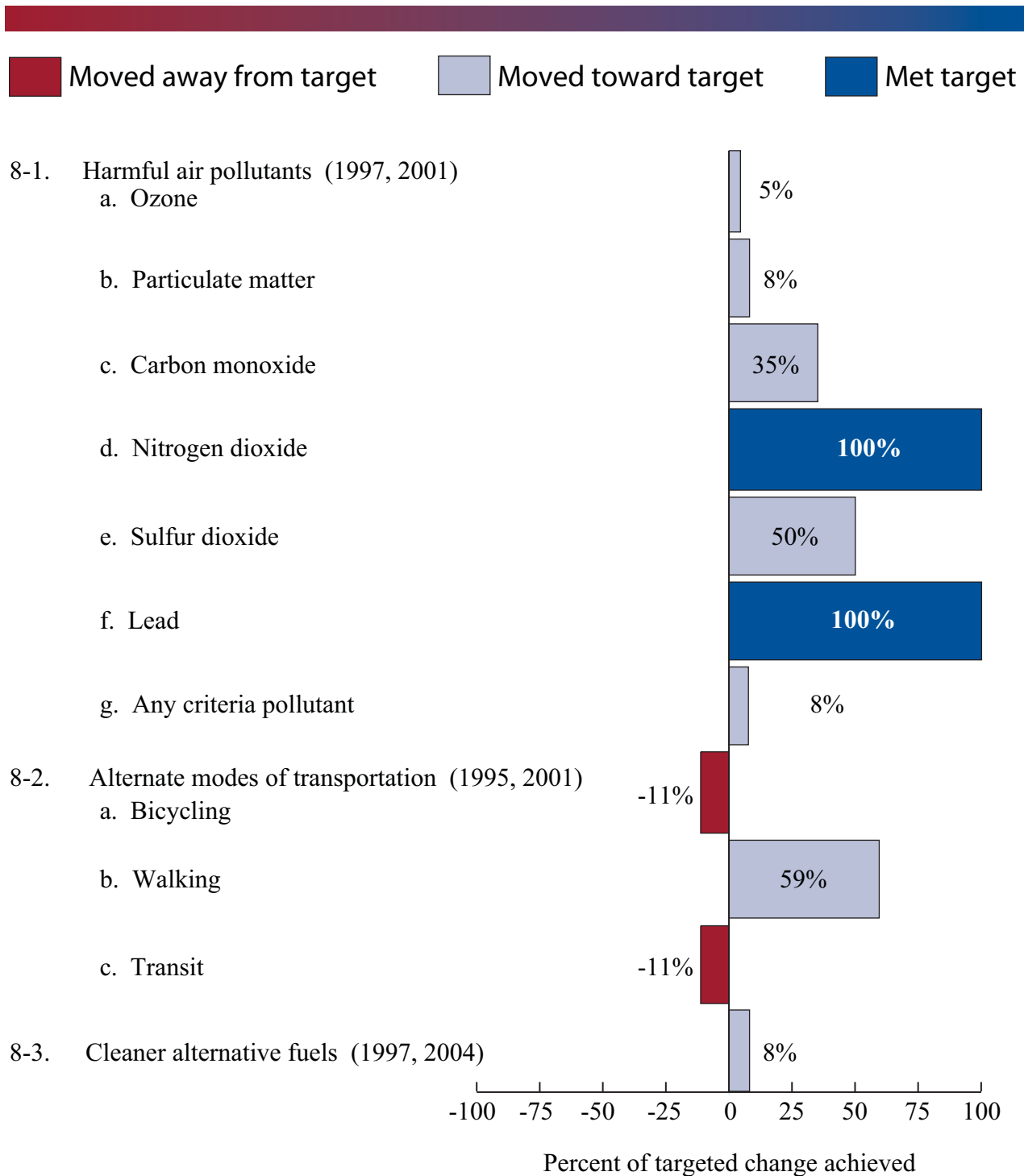
Co-Lead Agencies:

- Agency for Toxic Substances and Disease Registry
- Centers for Disease Control and Prevention
- National Institutes of Health

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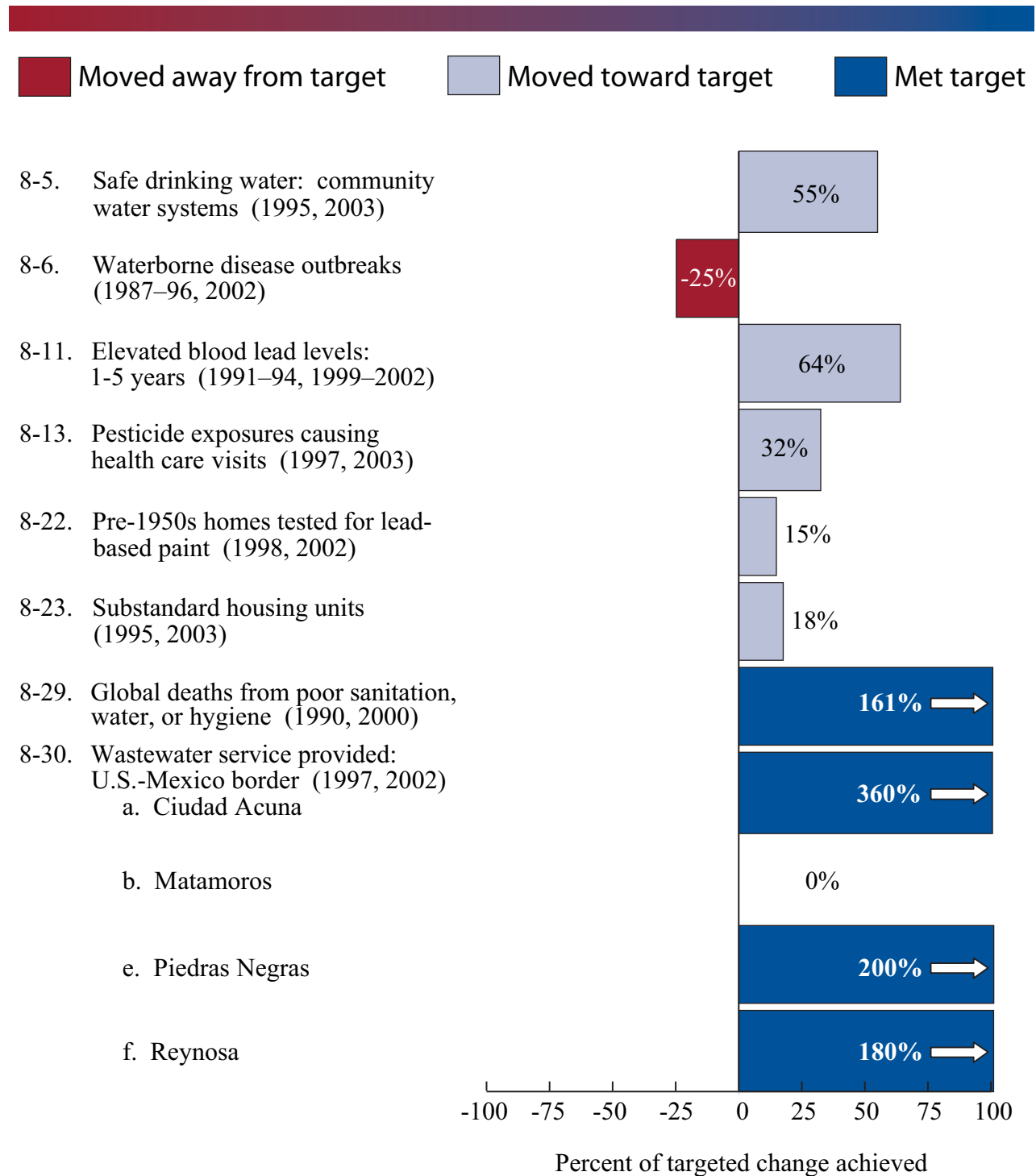
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Figure 8-1. Progress Quotient for Focus Area 8: Environmental Health



See notes at end of chart. (continued)

Figure 8-1. *(continued)*



See notes at end of chart. *(continued)*

Healthy People 2010 Objectives Related to Healthy Homes Mid-Course Review – 2005

NO CHANGE IN OBJECTIVE

8-11. Eliminate elevated blood lead levels in children.

Target: Zero percent.

Baseline: 4.4 percent of children aged 1 to 5 years had blood lead levels exceeding 10 µg/dL during 1991–94.

Target setting method: Total elimination.

Data source: National Health and Nutrition Examination Survey (NHANES), CDC, NCHS.

NO CHANGE IN OBJECTIVE (Data updated and footnoted)

8-13. Reduce pesticide exposures that result in visits to a health care facility.

Target: 11,398¹ visits per year.

Baseline: 22,933² visits to health care facilities were due to pesticides in 1997. (A total of 172,088³ pesticide exposures were documented in 1997.)

REVISED OBJECTIVE

8-16. Reduce indoor allergen levels.

Target and baseline:

Objective	Reduction in Proportion of Homes With Measured Allergens	1998 Baseline	2010 Target
		<i>Percent</i>	
8-16a.	Group I dust mite allergens that exceed 2 micrograms per gram of dust in the bed	46.2	37.0
8-16b.	Group I dust mite allergens that exceed 10 micrograms per gram of dust in the bed	24.2	19.4
8-16c.	German cockroach allergens that exceed 0.1 unit per gram of dust in the bed	6.1	4.9

Target setting method: 20 percent improvement.

Data source: National Survey of Lead and Allergens in Housing, NIEHS, and U.S. Department of Housing and Urban Development.

Healthy People 2010 Objectives Related to Healthy Homes Mid-Course Review – 2005

NO CHANGE IN OBJECTIVE

8-18. Increase the proportion of persons who live in homes tested for radon concentrations.

Target: 20 percent.

Baseline: 17 percent of the population lived in homes in 1998 that had been tested for radon (age adjusted to the year 2000 standard population).

Target setting method: Better than the best.

Data source: National Health Interview Survey (NHIS), CDC, NCHS.

NO CHANGE IN OBJECTIVE

8-19. Increase the number of new homes constructed to be radon resistant.

Target: 2.1 million additional new homes.

Baseline: 1.4 million new homes as of 1997.

Target setting method: 50 percent improvement.

Data source: National Association of Home Builders Research Center Survey, National Association of Home Builders.

NO CHANGE IN OBJECTIVE

8-22. Increase the proportion of persons living in pre-1950s housing that has been tested for the presence of lead-based paint.

Target: 50 percent.

Baseline: 16 percent of persons aged 18 years and older living in homes built before 1950 in 1998 reported that their homes had been tested for the presence of lead-based paint (age adjusted to the year 2000 standard population).

Target setting method: Better than the best.

Data source: National Health Interview Survey (NHIS), CDC, NCHS.

Healthy People 2010 Objectives Related to Healthy Homes
Mid-Course Review – 2005

REVISED OBJECTIVE

8-23. Reduce the proportion of occupied housing units that have moderate or severe physical problems.

Target: 3.1¹ percent.

Baseline: 6.5² percent of occupied U.S. housing units had moderate or severe physical problems in 1995.

Target setting method: 52 percent improvement.

Data source: American Housing Survey, U.S. Department of Commerce, Bureau of the Census.

¹ Target revised from 3.0 because of baseline revision after November 2000 publication.

² Baseline revised from 6.2 after November 2000 publication.

Relationship Between Interior Problems and Exterior Problems-
Based on the American Housing Survey - 2007 National Data for Occupied Housing

Exterior Problem	Homes (000s)	Likelihood of Finding an Interior Problem if an Exterior Problem is Reported Compared to the Likelihood of Finding an Interior Problem if an Exterior Problem is Not Reported*									
		Leaks		Rodents		Heating		Structural			Resident Dissatisfied
		From Interior	From Exterior	Rats	Mice	Heating Problem	Fire/CO Danger	Cracks in Walls	Holes in Floors	Paint/ plaster	
Sagging roof	1,860.8	2.7	3.6	5.0	3.0	3.5	3.2	6.8	12.1	9.1	10.7
Missing roofing material	3,846.2	1.8	2.3	3.7	2.2	2.0	2.3	3.8	6.0	5.1	5.8
Hole in roof	1,288.3	2.8	5.5	5.4	3.2	3.3	4.3	7.6	18.6	11.0	11.9
Sloping outside walls	1,172.6	2.3	3.0	3.9	3.1	3.4	3.9	7.7	13.9	8.9	15.6
Missing bricks, siding, other outside wall material	2,116.4	2.5	2.8	6.5	2.7	2.8	3.7	5.3	8.3	7.9	9.7
Broken windows	2,947.8	2.7	2.5	6.0	2.8	3.1	3.3	5.4	13.2	8.1	7.0
Boarded up windows	806.6	1.9	2.3	8.3	2.8	2.8	4.5	6.4	11.8	10.3	9.5
Foundation crumbling or has open crack or hole	2,147.4	2.1	3.5	5.2	2.7	2.8	2.3	7.3	11.9	7.5	8.2
One or more ext. problem	10,086.0	2.3	2.9	4.2	2.6	2.6	2.7	5.9	11.8	7.4	7.5
Two or more ext. problem	3,250.9	2.5	3.8	6.3	3.2	3.5	3.9	8.3	15.3	10.9	11.5
Three or more ext. problem	1,434.1	2.9	4.4	9.0	3.7	3.9	4.9	9.9	20.3	14.6	18.8
Four or more ext. problem	656.6	3.0	4.2	14.2	4.1	4.5	5.7	10.5	22.6	17.1	21.7
Five or more ext. problem	364.7	3.1	3.6	12.3	4.3	4.8	5.8	10.0	23.6	19.7	24.8
Six or more ext. problem	202.5	3.0	3.3	13.4	3.5	4.5	5.9	9.8	24.6	18.4	28.7
Seven or more ext. problem	127.2	2.1	2.8	15.1	4.1	3.5	5.6	7.1	23.7	13.1	20.5
Eight or more ext. problem	64.1			5.7			4.3	3.6	13.2	7.2	8.2

* A home is L times as likely to have a specific interior problem (column heading) if the exterior problem is reported (row heading) than if the exterior problem is not reported. For example, a home is 2.7 times as likely to have a leak from the interior if it has a sagging roof than if it does not have a sagging roof.

Relationship Between Interior Problems and Exterior Problems

The National Center for Healthy Housing developed the table to help communities make homes healthier by giving them a better understanding of the direct relationship between exterior problems such as a sloping outside wall and interior problems such as rats, large holes in the floor, and water damage that can impact resident health and safety. With this understanding, communities can more effectively and efficiently identify homes with serious health and safety threats and set priorities for assessments of the interior. The table is based on the American Housing Survey (AHS). The AHS tracks some but not all items related to health. For example, it does not track cockroaches, radon, lead-based paint, and carbon monoxide levels.

Background on American Housing Survey

The AHS is conducted by the Bureau of the Census for the Department of Housing and Urban Development (HUD) to describe the condition of the Nation's housing. The AHS includes apartments, single-family homes, mobile homes, and vacant housing units. It describes household characteristics, income, housing and neighborhood quality, housing costs, equipment and fuels, size of housing unit, and recent movers. National data are collected in odd numbered years, and data for each of 47 selected Metropolitan Statistical Areas (MSA) are collected currently about every six years. The national sample covers an average 55,000 housing units. Each metropolitan area sample covers 4,100 or more housing units. The AHS returns to the same housing units year after year to gather data; therefore, this survey is ideal for analyzing the flow of households through housing. For more information, go to www.census.gov/hhes/www/housing/ahs/ahs.html.

Key Definitions Related to Healthy Homes

- **Leaks – Interior or Exterior:** Resident reported leakage that occurred in the 12 months prior to the interview or while the household was living in the unit if less than 12 months. Housing units with water leakage are classified by whether the water leaked in from outside the building (roof, basement, walls, closed windows, or doors) or inside of the building (fixtures backed up or overflowed or pipes leaked).
- **Rodents – Rats or Mice:** Resident reported mice or rats if they saw mice or rats or signs of mice or rats inside the house or building during the 3 months prior to interview or while the household was living in the unit if less than 3 months. Signs of mice or rats include droppings, holes in the wall, or ripped, or torn food containers.
- **Heating – Heating Problems:** Resident reported that the home was uncomfortably cold for 24 hours or more during the winter prior to the interview for any reason.
- **Heating – Fire / CO Danger:** Resident reported using as primary heating source either room heater without flue (i.e., any room heater that burns kerosene, gas, or oil, and that does not connect to flue, vent, or chimney or a stove or oven for heat), portable electric heater, stove, cooking stove, fireplace without insert or no heat.
- **Structural – Cracks in Walls:** The resident reported open cracks or holes in the interior wall or ceilings of the housing unit. Included are cracks or holes that do not go all the way through to the next room or to the exterior of the housing unit. Hairline cracks or cracks that appear in the walls or ceilings but are not large enough to insert the edge of a dime, are not counted. Very small holes caused by nails or other similar objects are also not counted.
- **Structural – Holes in Floors:** The resident reported holes in the interior floors of the unit. The holes may or may not go all the way through to a lower floor or to the exterior of the unit. The holes are only counted if large enough for someone to trip in.
- **Structural – Paint / Plaster:** The resident reported peeling paint or broken plaster. The area of peeling paint or broken plaster must be on the inside walls or ceilings and at least one area of broken plaster or peeling paint must be larger than 8 inches by 11 inches.
- **Resident Dissatisfied:** The resident rated structure based on a scale from 1 to 10, where 10 is the best and 1 is the worst. Resident is dissatisfied if the structure is rated 1, 2 or 3.

American Housing Survey - National 2007
Selected Elements Related to Healthy Homes

	Occupied Units	Owner	Renter	Const < 4 years	Manuf. Housing	Severe Problems	Moderate Problems	Elderly	Moved in past year	Below poverty	Northeast	Midwest	South	West
Total Occupied Units(,000)	110,692	75,647	35,045	5,747	6,919	1,806	3,965	22,864	17,904	14,157	20,392	25,292	40,609	24,400
GENERAL														
Owner occupied (,000)	75,647	75,647	-	4,710	5,419	729	1,565	18,271	5,501	5,566	13,339	18,194	28,508	15,607
Renter occupied (,000)	35,045	-	35,045	1,036	1,500	1,077	2,401	4,594	12,403	8,591	7,052	7,097	12,101	8,794
Owner Occupied	68.3%	100.0%		82.0%	78.3%	40.4%	39.5%	79.9%	30.7%	39.3%	65.4%	71.9%	70.2%	64.0%
Renter occupied	31.7%		100.0%	18.0%	21.7%	59.6%	60.6%	20.1%	69.3%	60.7%	34.6%	28.1%	29.8%	36.0%
Units in Structure														
1, detached	64.5%	82.6%	25.5%	73.8%		43.4%	45.3%	68.7%	40.6%	41.3%	54.5%	69.8%	67.0%	63.4%
1, attached	5.5%	5.3%	5.8%	8.7%		5.7%	3.0%	5.1%	6.8%	5.4%	9.0%	4.3%	4.8%	4.9%
2 to 4	7.9%	1.9%	21.0%	3.2%		13.2%	16.0%	5.4%	14.9%	14.4%	12.9%	8.0%	5.3%	8.0%
5 to 9	4.8%	0.8%	13.4%	2.1%		8.0%	10.1%	2.7%	11.3%	9.7%	4.4%	4.4%	4.5%	5.9%
10 to 19	4.2%	0.6%	12.0%	2.5%		8.4%	7.5%	2.0%	10.0%	6.0%	4.1%	3.6%	4.4%	4.8%
20 to 49	3.3%	0.6%	9.0%	1.6%		8.1%	7.0%	2.7%	6.7%	6.3%	4.9%	2.4%	2.4%	4.4%
50 or more	3.5%	1.0%	9.0%	2.2%		6.9%	5.8%	6.7%	4.4%	6.9%	7.4%	2.9%	2.0%	3.3%
Manufactured/mobile home or	6.3%	7.2%	4.3%	5.9%	100.0%	6.3%	5.4%	6.7%	5.3%	10.1%	2.7%	4.6%	9.7%	5.3%
Year Structure Built														
Post-2000	10.6%	12.3%	6.8%	100.0%	14.4%	3.9%	3.8%	6.5%	17.1%	6.1%	5.1%	9.0%	13.6%	11.7%
Post-1980	36.0%	39.6%	28.3%	100.0%	69.4%	18.9%	20.0%	27.9%	40.4%	26.6%	20.2%	30.0%	45.7%	39.4%
Pre-1980	64.0%	60.4%	71.7%	0.0%	0.0%	80.9%	80.0%	72.1%	59.6%	73.4%	79.8%	70.0%	54.3%	60.6%
Pre-1960	32.1%	30.5%	35.6%	0.0%	0.0%	48.8%	49.2%	35.6%	28.6%	37.2%	53.5%	39.0%	21.0%	25.6%
Pre-1940	15.6%	13.6%	19.9%	0.0%	0.0%	27.7%	28.1%	14.6%	15.3%	19.3%	33.5%	21.3%	7.2%	8.7%
Foundation														
1-unit building, excluding	70.0%	88.0%	31.3%	82.5%	0.0%	49.1%	48.3%	73.8%	47.4%	46.6%	63.5%	74.1%	71.8%	68.3%
With basement under all of	23.2%	30.4%	7.5%	23.5%	0.0%	15.3%	7.6%	24.2%	12.2%	12.5%	42.7%	43.6%	9.6%	8.3%
With basement under part of	7.5%	9.9%	2.2%	3.2%	0.0%	5.3%	5.0%	8.3%	3.6%	3.8%	11.3%	12.9%	4.0%	4.4%
With crawl space	16.3%	19.8%	9.0%	13.1%	0.0%	15.2%	23.5%	18.6%	12.3%	13.9%	3.5%	10.1%	23.6%	21.5%
On concrete slab	22.0%	26.7%	11.9%	42.3%	0.0%	11.9%	9.9%	21.3%	18.7%	15.2%	5.5%	6.7%	33.2%	33.1%
Other														

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Total Occupied Units(,000)	110,692	75,647	35,045	5,747	6,919	1,806	3,965	22,864	17,904	14,157	20,392	25,292	40,609	24,400
EXTERIOR														
External Building Conditions (excluding multiunit														
Sagging roof	2.2%	1.8%	4.4%	0.4%	4.5%	8.2%	13.9%	1.3%	2.8%	4.9%	2.4%	2.1%	2.4%	1.8%
Missing roofing material	4.6%	4.3%	6.2%	1.9%	4.2%	11.2%	15.6%	3.9%	4.4%	7.3%	4.7%	4.6%	4.7%	4.1%
Hole in roof	1.5%	1.2%	3.3%	0.5%	3.0%	10.8%	12.2%	1.4%	2.0%	3.3%	1.4%	1.4%	1.7%	1.3%
Missing bricks, siding, or other outside wall materials	2.5%	2.0%	5.1%	0.6%	3.3%	12.7%	13.0%	1.6%	3.1%	5.4%	2.5%	3.1%	2.4%	2.1%
Sloping outside walls	1.4%	1.0%	3.5%	0.5%	2.6%	8.4%	8.8%	1.1%	2.3%	3.0%	1.1%	1.6%	1.5%	1.1%
Boarded up windows	1.0%	0.7%	2.2%	0.3%	1.8%	5.5%	5.6%	0.7%	1.1%	2.9%	0.5%	1.0%	1.2%	0.7%
Broken windows	3.5%	2.8%	7.3%	1.1%	6.7%	15.3%	15.2%	2.2%	5.1%	7.6%	3.0%	3.5%	3.8%	3.2%
Bars on windows	3.6%	3.4%	4.9%	0.6%	0.8%	6.4%	9.0%	4.5%	2.7%	6.3%	2.8%	1.8%	3.9%	5.5%
Foundation crumbling or has open crack or hole	2.5%	2.2%	4.7%	0.9%	1.4%	8.6%	12.5%	1.9%	3.0%	4.1%	2.9%	3.7%	2.1%	1.8%
<i>None of the above</i>	82.5%	84.0%	74.1%	93.8%	80.5%	61.9%	53.3%	84.6%	82.0%	72.0%	82.3%	82.8%	82.6%	82.3%
Water Leakage in Last 12														
With leakage from outside	10.3%	10.8%	9.1%	5.6%	10.8%	18.9%	27.9%	8.1%	8.7%	9.6%	16.3%	13.3%	7.6%	6.4%
Roof	4.7%	4.8%	4.3%	2.6%	7.8%	10.9%	17.2%	3.7%	3.9%	5.2%	5.8%	4.7%	4.6%	3.8%
Basement	3.5%	4.3%	1.8%	1.7%	0.1%	3.8%	5.7%	2.9%	2.2%	2.1%	8.1%	6.4%	1.1%	0.7%
Walls, closed windows, or	1.7%	1.4%	2.3%	1.0%	2.6%	5.4%	5.7%	1.0%	1.9%	2.0%	2.1%	2.0%	1.3%	1.5%
Other or unknown	1.0%	1.0%	1.2%	0.7%	0.9%	1.6%	2.4%	0.7%	1.2%	1.1%	1.5%	1.1%	1.0%	0.7%

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INTERIOR														
Holes in floors	1.0%	0.6%	1.7%	0.1%	2.5%	8.7%	9.7%	0.6%	1.5%	2.7%	1.1%	1.0%	1.1%	0.7%
Open cracks or holes	4.8%	3.7%	7.2%	1.6%	6.2%	19.1%	31.3%	3.0%	5.7%	8.0%	5.2%	5.4%	4.8%	4.0%
Broken plaster or peeling paint	2.0%	1.4%	3.2%	0.4%	1.7%	10.4%	19.3%	1.6%	1.9%	3.7%	2.5%	2.0%	2.0%	1.4%
Water Leakage in Last 12														
With leakage from inside	7.9%	6.6%	10.7%	3.8%	8.7%	17.6%	25.4%	4.9%	9.6%	10.0%	8.4%	7.9%	7.9%	7.6%
Fixtures backed up or	2.1%	1.7%	2.8%	1.0%	1.6%	4.4%	7.3%	1.1%	2.7%	2.8%	2.1%	2.1%	1.9%	2.2%
Pipes leaked	3.4%	2.8%	4.8%	1.9%	5.0%	9.1%	11.6%	2.2%	4.4%	4.7%	3.4%	3.2%	3.5%	3.4%
Broken water heater	0.8%	0.8%	0.8%	0.2%	1.5%	1.1%	1.9%	0.6%	0.6%	0.7%	0.6%	0.7%	0.9%	0.8%
Other or unknown	2.0%	1.6%	2.8%	0.8%	1.1%	4.3%	6.7%	1.1%	2.2%	2.4%	2.5%	2.0%	2.0%	1.6%
Rodents in Last 3 Months														
Signs of rats	0.7%	0.5%	1.0%	0.1%	1.0%	4.8%	3.3%	0.5%	0.6%	1.4%	0.8%	0.1%	0.9%	0.9%
Signs of mice	5.5%	5.2%	6.0%	2.6%	9.0%	12.1%	12.0%	5.0%	4.3%	8.1%	9.0%	5.9%	4.8%	3.2%
Signs of rodents, not sure	0.4%	0.3%	0.6%	0.1%	0.4%	2.5%	1.3%	0.2%	0.5%	0.6%	0.5%	0.2%	0.4%	0.4%
Electrical														
No electrical wiring	0.0%	0.1%	0.0%	0.3%	0.0%	2.4%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%
Exposed wiring	1.0%	0.8%	1.4%	0.6%	0.6%	3.0%	1.9%	1.0%	1.4%	1.5%	1.0%	0.7%	1.1%	1.1%
Rooms without electric outlets	1.3%	1.1%	1.8%	1.2%	1.2%	5.4%	3.1%	1.0%	2.1%	2.3%	1.1%	1.4%	1.3%	1.3%
With fuses or breakers blown in last 3 months	9.1%	9.1%	9.1%	8.5%	8.1%	15.0%	15.8%	5.6%	10.2%	7.6%	9.4%	10.3%	8.0%	9.3%

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SANITATION/WATER														
Lacking complete kitchen	1.6%	0.4%	4.1%	0.6%	0.3%	8.9%	39.4%	1.1%	3.5%	3.6%	1.8%	1.5%	1.3%	1.9%
Lacking some or all plumbing facilities	1.1%	0.7%	2.0%	0.3%	1.1%	69.7%	0.0%	1.2%	1.4%	2.3%	1.7%	1.0%	1.0%	1.1%
Water not safe to drink	8.0%	6.4%	11.4%	7.7%	10.1%	14.3%	13.7%	5.2%	10.2%	11.3%	6.6%	5.1%	7.9%	12.4%
With water stoppage in last 3 months	3.4%	2.8%	4.6%	2.3%	6.8%	8.9%	6.3%	2.9%	3.7%	3.8%	3.6%	3.1%	3.4%	3.5%
No flush toilets working some time in last 3 months	1.9%	1.1%	3.8%	0.9%	1.8%	7.4%	9.9%	1.2%	3.9%	4.1%	1.9%	1.8%	2.1%	1.9%
With sewage disposal breakdown in last 3 months	1.0%	0.8%	1.5%	0.8%	0.9%	2.7%	3.6%	0.7%	1.4%	1.4%	0.9%	1.1%	1.0%	1.1%
<i>Septic tank, cesspool or chemical toilet</i>	19.8%	25.6%	7.3%	22.5%	50.9%	15.0%	17.2%	22.8%	10.2%	14.4%	20.5%	18.9%	24.8%	11.8%
Septic tank or cesspool breakdown in last 3 months	0.3%	0.3%	0.2%	0.4%	0.8%	1.2%	0.2%	0.2%	0.3%	0.3%	0.2%	0.2%	0.4%	0.2%
SAFETY EQUIPMENT														
Working smoke detector	92.4%	93.1%	90.8%	98.0%	88.0%	84.3%	82.5%	91.1%	91.5%	86.6%	95.0%	94.3%	90.0%	92.1%
Smoke detector batteries replaced in last 6 months	61.7%	63.8%	57.1%	58.2%	57.1%	57.0%	52.5%	60.6%	55.1%	57.1%	67.6%	66.8%	58.3%	57.2%
Fire extinguisher purchased or recharged in last 2 years	43.6%	49.2%	31.5%	49.2%	43.3%	31.7%	31.5%	40.4%	37.4%	32.6%	43.3%	43.2%	44.5%	42.8%
Sprinkler system inside home	3.9%	2.3%	7.2%	11.8%	0.9%	4.9%	5.3%	5.2%	7.1%	4.6%	3.3%	2.7%	3.7%	5.7%
Working carbon monoxide	32.6%	37.4%	22.1%	35.8%	18.7%	29.7%	21.2%	32.0%	24.7%	22.7%	54.7%	45.7%	21.0%	19.8%

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HEATING/FUEL														
Main Heating Equipment														
Warm-air furnace	62.9%	67.4%	53.2%	71.7%	75.8%	44.3%	39.7%	60.3%	61.7%	56.2%	42.1%	81.1%	59.9%	66.2%
Steam or hot water system	11.5%	9.9%	15.0%	2.5%	0.3%	21.9%	11.2%	13.0%	8.5%	12.8%	45.8%	8.2%	1.4%	3.2%
Electric heat pump	11.7%	12.6%	9.8%	21.8%	13.7%	7.3%	4.5%	11.6%	13.2%	8.5%	1.8%	2.8%	25.8%	5.9%
Built-in electric units	4.3%	2.8%	7.6%	1.2%	1.2%	5.1%	5.1%	5.0%	5.8%	6.4%	5.5%	4.4%	2.2%	6.9%
Floor, wall, or other built-in hot-air units without ducts	4.5%	2.7%	8.4%	1.5%	2.1%	7.8%	4.9%	4.3%	5.9%	6.7%	2.1%	1.6%	3.0%	12.1%
Room heaters with flue	1.0%	0.9%	1.3%	0.1%	1.0%	1.9%	1.4%	1.6%	1.0%	1.9%	0.8%	0.5%	1.4%	1.1%
Room heaters without flue	1.1%	1.0%	1.3%	0.0%	1.5%	2.8%	28.7%	1.5%	1.1%	2.5%	0.1%	0.2%	2.6%	0.2%
Portable electric heaters	0.9%	0.6%	1.7%	0.1%	2.3%	3.7%	2.6%	0.8%	1.0%	1.8%	0.1%	0.1%	1.8%	1.0%
Stoves	0.9%	1.0%	0.4%	0.2%	1.2%	3.3%	0.7%	0.9%	0.1%	1.1%	0.9%	0.6%	0.7%	1.3%
Fireplaces with inserts	0.1%	0.2%	0.1%	0.1%	0.0%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%
Fireplaces without inserts	0.0%	0.1%	0.0%	0.0%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
Other	0.4%	0.4%	0.5%	0.6%	0.4%	0.4%	0.4%	0.3%	0.7%	0.9%	0.3%	0.2%	0.6%	0.4%
Cooking stove	0.1%	0.0%	0.2%	0.0%	0.1%	0.6%	0.1%	0.1%	0.1%	0.2%	0.2%	0.0%	0.1%	0.0%
None	0.4%	0.3%	0.7%	0.1%	0.1%	0.4%	0.6%	0.3%	0.7%	0.7%	0.1%	0.1%	0.2%	1.4%
Water Heating Fuel														
Electricity	40.0%	37.9%	44.5%	43.8%	74.2%	35.9%	39.9%	41.7%	46.3%	45.9%	22.0%	28.8%	64.3%	26.5%
Piped gas	51.4%	53.1%	48.0%	48.2%	18.9%	50.0%	51.1%	48.5%	48.8%	46.5%	49.8%	65.9%	32.2%	69.8%
Other	8.5%	9.0%	7.5%	8.0%	6.9%	14.1%	9.0%	9.7%	4.9%	7.6%	28.2%	5.3%	3.5%	3.8%
Clothes Dryer Fuel														
Electricity	77.1%	75.1%	85.9%	78.2%	91.3%	75.7%	84.3%	77.2%	83.7%	83.3%	68.2%	68.5%	92.4%	65.9%
Piped gas	21.3%	23.2%	13.6%	19.5%	6.2%	22.6%	15.1%	21.0%	15.5%	15.8%	28.4%	29.6%	6.8%	32.9%
Other	1.6%	1.8%	0.6%	2.2%	2.4%	1.8%	0.6%	1.8%	0.8%	0.9%	3.4%	1.9%	0.7%	1.2%
Heating Problems														
Uncomfortably cold for 24 hours or more last winter	8.2%	7.3%	10.1%	4.8%	12.0%	37.3%	17.1%	6.1%	7.6%	11.8%	8.5%	10.6%	5.9%	9.3%
Heating Equipment	2.4%	2.0%	3.3%	1.3%	3.6%	29.5%	3.5%	1.6%	2.2%	3.8%	3.3%	2.6%	2.1%	2.0%
Other causes	6.0%	5.5%	7.0%	3.5%	8.6%	11.4%	13.9%	4.6%	5.6%	8.3%	5.4%	8.2%	3.9%	7.6%
Utility interruption	2.4%	2.7%	1.6%	2.3%	4.0%	2.0%	2.1%	2.2%	1.3%	1.7%	1.6%	4.1%	1.1%	3.2%
Inadequate heating capacity	1.0%	0.5%	1.9%	0.3%	1.4%	4.2%	3.7%	0.6%	1.2%	1.8%	1.1%	0.9%	0.8%	1.2%
Inadequate insulation	0.8%	0.5%	1.6%	0.2%	1.0%	2.4%	3.4%	0.3%	1.2%	1.8%	0.7%	1.0%	0.6%	1.0%
Cost of heating	0.8%	0.9%	0.8%	0.4%	1.1%	1.3%	2.5%	0.5%	0.8%	1.4%	1.0%	0.8%	0.7%	1.1%
Other	1.3%	1.1%	1.8%	0.4%	1.5%	3.2%	3.3%	1.1%	1.4%	2.1%	1.3%	1.6%	0.9%	1.6%

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SELECTED PHYSICAL PROBLEMS														
Severe physical	1,806	729	1,077	33	113	1,806 ...		300	359	467	516	348	553	388
Severe physical problems	1.6%	1.0%	3.1%	0.6%	1.6%	100.0%	0.0%	1.3%	2.0%	3.3%	2.5%	1.4%	1.4%	1.6%
Plumbing	1.1%	0.7%	2.0%	0.3%	1.1%	69.7%	0.0%	1.2%	1.4%	2.3%	1.7%	1.0%	1.0%	1.1%
Heating	0.4%	0.2%	0.9%	0.2%	0.4%	25.6%	0.0%	0.2%	0.5%	0.8%	0.7%	0.3%	0.3%	0.4%
Electric	0.0%	0.1%	0.0%	0.2%	0.0%	2.7%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%
Upkeep	0.1%	0.0%	0.2%	0.0%	0.2%	4.3%	0.0%	0.0%	0.1%	0.3%	0.1%	0.0%	0.1%	0.1%
Moderate physical problems(,000)	3,965	1,565	2,401	59	216 ...		3,965	697	992	1,087	580	715	2,000	670
Moderate physical problems	3.6%	2.1%	6.9%	1.0%	3.1%	0.0%	100.0%	3.0%	5.5%	7.7%	2.8%	2.8%	4.9%	2.7%
Plumbing	0.2%	0.1%	0.3%	0.2%	0.1%	0.0%	4.7%	0.1%	0.2%	0.3%	0.2%	0.1%	0.2%	0.1%
Heating	1.0%	1.0%	1.2%	0.0%	1.4%	0.0%	28.7%	1.4%	1.1%	2.3%	0.1%	0.2%	2.5%	0.1%
Upkeep	1.1%	0.7%	1.9%	0.4%	1.5%	0.0%	30.4%	0.6%	1.2%	2.3%	1.1%	1.2%	1.2%	0.7%
Kitchen	1.4%	0.3%	3.7%	0.4%	0.2%	0.0%	39.4%	1.0%	3.3%	3.0%	1.5%	1.4%	1.1%	1.8%
Overall Opinion of Structure														
1 (worst)	0.5%	0.2%	1.2%	0.4%	1.4%	4.1%	2.6%	0.3%	0.8%	1.6%	0.5%	0.5%	0.6%	0.4%
2	0.3%	0.1%	0.7%	0.1%	0.8%	1.9%	1.5%	0.1%	0.5%	0.4%	0.2%	0.2%	0.4%	0.2%
3	0.6%	0.3%	1.4%	0.2%	1.4%	3.5%	3.2%	0.3%	0.9%	1.5%	0.7%	0.5%	0.7%	0.7%
4	1.0%	0.5%	2.0%	0.0%	1.9%	3.3%	3.9%	0.5%	1.6%	1.9%	1.0%	0.9%	1.0%	1.1%
5	4.8%	3.1%	8.4%	1.4%	8.0%	11.0%	12.2%	3.5%	6.4%	8.9%	4.5%	4.6%	5.0%	4.8%
6	4.9%	3.4%	8.0%	1.6%	6.6%	8.3%	8.7%	3.1%	6.5%	6.5%	5.0%	4.7%	4.8%	5.0%
7	13.3%	11.3%	17.5%	8.4%	12.3%	13.6%	14.9%	7.8%	16.6%	13.4%	13.0%	13.0%	12.8%	14.6%
8	27.7%	28.1%	26.8%	21.2%	22.7%	25.1%	23.2%	24.0%	27.6%	23.5%	27.8%	28.1%	27.0%	28.3%
9	16.0%	17.7%	12.1%	19.3%	11.8%	10.7%	9.4%	16.7%	14.7%	11.6%	15.6%	16.6%	14.9%	17.3%
10 (best)	27.1%	31.2%	18.3%	43.9%	28.6%	16.7%	17.9%	39.7%	21.1%	25.4%	26.9%	27.1%	28.9%	24.4%

American Housing Survey: A Healthy Homes Perspective

Overview

The survey is conducted by the Bureau of the Census for the Department of Housing and Urban Development (HUD). The results and details are available at www.census.gov/hhes/www/housing/ahs/.

The American Housing Survey (AHS) collects data on the Nation's housing, including apartments, single-family homes, mobile homes, vacant housing units, household characteristics, income, housing and neighborhood quality, housing costs, equipment and fuels, size of housing unit, and recent movers. National data are collected in odd numbered years, and data for each of 47 selected Metropolitan Areas are collected currently about every six years. The national sample covers an average 55,000 housing units. Each metropolitan area sample covers 4,100 or more housing units.

The AHS returns to the same housing units year after year to gather data; therefore, this survey is ideal for analyzing the flow of households through housing.

Key Definitions Related to Healthy Homes

1. **Broken plaster or peeling paint (interior).** The area of peeling paint or broken plaster must be on the inside walls or ceilings and at least one area of broken plaster or peeling paint must be larger than 8 inches by 11 inches.
2. **Electric fuses and circuit breakers.** These statistics are presented for occupied housing units. The data show whether an electric fuse has blown or circuit breaker has tripped in the home in the 3 months prior to the interview, or while the household was living in the unit if less than 3 months. A blown fuse or tripped breaker switch results in the temporary loss of electricity until the fuse is replaced or the breaker switch reset. Blown fuses inside major pieces of installed equipment (such as some air conditioners) are counted as blown fuses or tripped breaker switches. The item may identify inadequate wiring, but it also happens commonly when people move into houses and are unfamiliar with which items can be turned on at the same time.
3. **Electric wiring.** A housing unit is classified as having exposed electric wiring if the unit has any wiring that is not enclosed, either in the walls or in metal or plastic coverings. Excluded are appliance cords, extension cords, chandelier cords, and telephone, antenna, or cable television wires.
4. **Electric wall outlets.** A housing unit is classified as having rooms without electric wall outlets if there is not at least one working electric wall outlet in each room of the unit. A working electric wall outlet is one that is in operating condition; that is, it can be used when needed. If a room does not have an electric wall outlet, an extension cord used in place of a wall outlet is not considered to be an electric wall outlet.
5. **Flush toilet and flush toilet breakdowns.** A privy or chemical toilet is not considered a flush toilet. Flush toilets outside the unit were not counted. The statistics on breakdowns of flush toilet are shown for housing units with at least one flush toilet for the household's use only. The flush toilet may be completely unusable because of a faulty flushing mechanism, broken pipes, stopped up sewer pipe, lack of water supplied to the flush toilet, or some other reason. For households with more than one toilet, the question asked about times when *all* toilets were unusable.
6. **Foundation.** This item is restricted to one-unit buildings and excludes mobile homes. A structure has a basement if there is an enclosed space at least partially underground in which a person can walk upright under all or part of the building. The basement is under all the building if it is under the entire main

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structure, excluding garages, car-ports, and porches. Crawl space is space between the ground and the first floor of the house, but it is not high enough for a person to walk upright. A house is built on a concrete slab if it is built on concrete that has been poured on the ground. The “other” category refers to a house built on stilts or pilings (for example, beach houses), boats, and motor homes. housing unit is still too cold for the occupants. *Inadequate insulation* refers to air drafts through window frames, electrical outlets, or walls that are cold. *Cost of heating* refers to the occupants turning down their thermostat or turning the equipment off altogether to save money. This category includes utilities/fuels that are unavailable due to unpaid bills.

7. **Holes in floors.** Respondents were asked about holes in the interior floors of the unit. The holes may or may not go all the way through to a lower floor or to the exterior of the unit. The holes are only counted if large enough for someone to trip in.
8. **Light fixtures in public halls.** These statistics are presented for housing units in two-or-more-unit structures. Data include whether or not there are light fixtures in the public halls and whether or not some, none, or all of the light fixtures are in working order. Light fixtures include wall lights, ceiling lights, or table lamps in the public halls of the building. Public halls are used by the occupants and guests to get to their apartment doors.
9. **Open cracks or holes (interior).** Statistics are presented on open cracks or holes in the interior wall or ceilings of the housing unit. Included are cracks or holes that do not go all the way through to the next room or to the exterior of the housing unit. Hairline cracks or cracks that appear in the walls or ceilings but are not large enough to insert the edge of a dime, are not counted. Very small holes caused by nails or other similar objects are also not counted.
10. **Plumbing facilities.** The category “With all plumbing facilities” consists of housing units that have hot and cold piped water as well as a flush toilet and a bathtub or shower. For units with less than two full bathrooms, the facilities are only counted if they are for the exclusive use of the occupants of the unit. Plumbing facilities need not be in the same room. Lacking some plumbing facilities or having no plumbing facilities for exclusive use means that the housing unit does not have all three specified plumbing facilities (hot and cold piped water, flush toilet, and bathtub or shower) inside the housing unit, or that the toilet or bathing facilities are also for the use of the occupants of other housing units. See also the definitions “Complete bathrooms,” “Flush toilet and flush toilet breakdowns,” and “Sewage disposal and sewage disposal breakdowns.”
11. **Signs of mice or rats.** The statistics on signs of mice or rats refer to respondents who reported seeing mice or rats or signs of mice or rats inside the house or building during the 3 months prior to interview or while the household was living in the unit if less than 3 months. Signs of mice or rats include droppings, holes in the wall, or ripped or torn food containers.
12. **Water leakage during last 12 months.** Data on water leakage are shown if the leakage occurred in the 12 months prior to the interview or while the household was living in the unit if less than 12 months. Housing units with water leakage are classified by whether the water leaked in from inside or outside the building and by the most common areas (roof, basement, walls, closed windows, or doors) or reasons (fixtures backed up or over-flowed or pipes leaked) of water leakage.
13. **Room heater without flue** refers to any room heater that burns kerosene, gas, or oil, and that does not connect to flue, vent, or chimney.

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AHS's Rating System for Physical Problems

Physical Problems	Severe (any one of 5 categories)	Moderate (any one of 5 categories but none severe)
Plumbing	Lacking hot or cold piped water or a flush toilet, or lacking both bathtub and shower, all inside the structure (and for the exclusive use of the unit, unless there are two or more full bathrooms).	On at least three occasions during the last 3 months, all the flush toilets were broken down at the same time for 6 hours or more.
Heating	<ol style="list-style-type: none"> 1. Having been uncomfortably cold last winter for 24 hours or more because the heating equipment broke down, and 2. It broke down at least three times last winter for at least 6 hours each time. 	Having unvented gas, oil, or kerosene heaters as the primary heating equipment.
Electric for Severe / Kitchen for Moderate	<ol style="list-style-type: none"> 1. Having no electricity, or 2. All of the following three electric problems: <ol style="list-style-type: none"> a. Exposed wiring, b. A room with no working wall outlet, and c. Three blown fuses or tripped circuit breakers in the last 90 days. 	Lacking a: <ol style="list-style-type: none"> 1. kitchen sink, 2. Refrigerator, or 3. Cooking equipment (stove, burners, or microwave oven) inside the structure for the exclusive use of the unit.
Hallways	Having all of the following four problems in public areas: <ol style="list-style-type: none"> 1. No working light fixtures, 2. Loose or missing steps, 3. Loose or missing railings, and 4. No working elevator. 	Having any three of the four problems listed under "Physical problems—severe" under Hallways.
Upkeep	Having any five of the following six maintenance problems: <ol style="list-style-type: none"> 1. Water leaks from the outside, such as from the roof, basement, windows, or doors; 2. Leaks from inside structure such as pipes or plumbing fixtures; 3. Holes in the floors; 4. Holes or open cracks in the walls or ceilings; 5. More than 8 inches by 11 inches of peeling paint or broken plaster; or 6. Signs of rats in the last 90 days. 	Having any three or four of the six problems listed under "Physical problems—severe" under Upkeep.

American Housing Survey: A Healthy Homes Perspective

Potential Errors in American Housing Survey

All numbers from the American Housing Survey (AHS), except for sample size, are estimates. As in other surveys, errors come primarily from the following:

- **Incomplete data** – Incomplete data are adjusted by assuming that the respondents are similar to those not answering, and the size of these errors is estimated.
- **Wrong answers** – The U.S. Census Bureau does not adjust for wrong answers and does not estimate the size of the errors.
- **Sampling** – Sampling errors are not adjusted and the size of the error is estimated.

WRONG ANSWERS

Wrong answers happen because people misunderstand questions, cannot recall the correct answer, or do not want to give the right answer. The table below shows which items have been measured for inconsistency when people are reinterviewed after a few weeks. The actual survey did not catch and reconcile these inconsistencies and continuously occurring errors are not measured at all. Thus, a high rate of wrong answers remains for some items. The Census Bureau categorizes these levels of inconsistency into three ranges:

1. Less than 20 is considered a low level of inconsistency.
2. Between 20 and 50 is considered a moderate level of inconsistency.
3. Greater than 50 is considered a high level of inconsistency indicating that responses are not reliable.

Table Y
Different Answers a Month Apart

HIGH LEVEL OF INCONSISTENCY	
Other kinds of heating equipment (central warm-air)	91
Water came in from other places	81
Difficulty hearing with or without a hearing aid	72
Water safe for drinking	66
Other kinds of heating equipment (none)	63
Peeling paint on the ceiling	63
Other kinds of heating equipment (unvented room)	62
Electric fuses or breaker switches blown	58
Open cracks or holes in building	58
Other major repairs over \$500 each—repair done	57
Central air conditioning/dehumidifier	56
Broken plaster or peeling paint	55
Water came in from walls, doors, windows	55
A working electric wall outlet	55
Other kinds of heating equipment (fireplace with no insert)	54
Broken plaster on the ceiling	53
Water came in from roof	53
Other major repairs over \$500 each	
—someone in household did the work	51
Rate the place (10 categories)	51

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MODERATE LEVEL OF INCONSISTENCY

Holes in the floors	50
Other kinds of heating equipment (other built-in electric)	50
Central air fuel	50
Other kinds of heating equipment (portable electric)	47
Water came in from basement	45
Water leaked into home from outdoors	43
Other kinds of heating equipment (fireplace with insert)	43
Heat breakdown	41
Heating equipment broke down for 6 hours or more	41
Other kinds of heating equipment (stove)	36

LOW LEVEL OF INCONSISTENCY

Heating equipment broke	18
Clothes dryer fuel	12
Source of water	8



National Center for Healthy Housing

Housing Interventions and Health: A Systematic Review of the Evidence

In December 2007, a panel of experts met in Atlanta, Georgia through a cooperative agreement between the Centers for Disease Control and Prevention (CDC) National Center for Environmental Health / Agency for Toxic Substances and Disease Registry and the National Center for Healthy Housing (NCHH). The panel conducted an exhaustive review of healthy housing intervention research. The panel of experts found sufficient evidence to determine that following interventions were effective. See www.nchh.org/Housing_Interventions_and_Health.pdf for more details.

A. **Controlling Asthma Symptoms and Reducing Asthma Morbidity:**

Multi-faceted in-home interventions for asthma tailored to the individual that include:

1. Home environmental assessment;
2. Education;
3. Use of mattress and pillow covers;
4. Use of HEPA vacuums and HEPA air filters;
5. Smoking cessation and reduction in environmental tobacco smoke exposure;
6. Cockroach and rodent management;
7. Minor repairs; and
8. Intensive household cleaning.

But the following were found to be ineffective:

Bedding encasement, sheet washing and upholstery cleaning each by themselves in isolation from other interventions.

B. **Reducing Asthma Triggers and Exposure to Asthma Triggers**

When implemented together, eliminating moisture intrusion and leaks and removal of moldy items.

C. **Reducing Exposure to Pests and Pesticides:**

Cockroach control through Integrated Pest Management (IPM). IPM includes:

1. Household cleaning and tool dispensing;
2. Professional cleaning;
3. Education of residents,
4. Baits;
5. Structural repairs; and
6. When necessary, intensive application of low-toxicity, non-spray pesticides.

D. **Reducing Exposure to Pesticide Residues:**

Integrated pest management (IPM) which includes:

1. Professional cleaning;
2. Sealing of pest entry points;
3. Application of low-toxicity pesticides; and
4. Education.

E. Reducing Exposure to Radon in Air to Less than 4 pCi/L:
Active sub-slab depressurization systems in high-risk areas.

F. Reducing Exposure to Environmental Tobacco Smoke
Elimination of environmental tobacco smoke.

But the following were found to be ineffective:

Portable air cleaning filtration systems are ineffective in controlling exposures to environmental tobacco smoke and also formaldehyde, although it is possible that there may be some modest decline in exposure.

G. Reducing Children’s Blood Lead Levels, Deteriorated Lead-Based Paint and Dust Lead
Residential lead hazard control.

But the following were found to be ineffective:

Single professional cleaning regimens have been shown to be ineffective in controlling long-term exposures to lead contaminated dust

H. Reducing Death and Injuries from Residential Fires:
Installed, working smoke alarms.

But the following were found to be less effective:

Community programs that give away smoke alarms without taking steps to make sure they are actually installed are less effective than programs that actually install alarms, and have not been proven to reduce injuries

I. Preventing Drowning:
Isolation 4-sided pool fencing

But the following were found to be ineffective:

Use of three-sided pool fences instead of complete four-sided pool fencing is not effective and may actually increase risk because care-givers may believe the incomplete fencing is adequate.

J. Reducing Scald Burns:
Pre-set safe temperature hot water heaters

The following were also found to be ineffective:

- Portable air cleaning filtration systems are ineffective in controlling exposures to environmental tobacco smoke and also formaldehyde, although it is possible that there may be some modest decline in exposure.
- “Air cleaners” that produce large amounts of ozone should not be used, because they result in increased exposure to ozone, which mimics the health effects of radiation exposure and is a known respiratory toxicant.

The State of Childhood Asthma, United States, 1980-2005, U.S. Centers for Disease Control and Prevention

Millions of children in the United States are affected by asthma, a chronic respiratory disease characterized by attacks of difficulty breathing. An asthma attack is a distressing and potentially life-threatening experience. Scientific advances have greatly improved the understanding of the mechanisms that cause asthma attacks and have led to effective medical interventions to prevent morbidity and improve quality of life. Yet, the burden in prevalence, health care use, and mortality remains high. Asthma remains a significant public health problem in the United States. See December 29, 2006 Revision at www.cdc.gov/nchs/data/ad/ad381.pdf

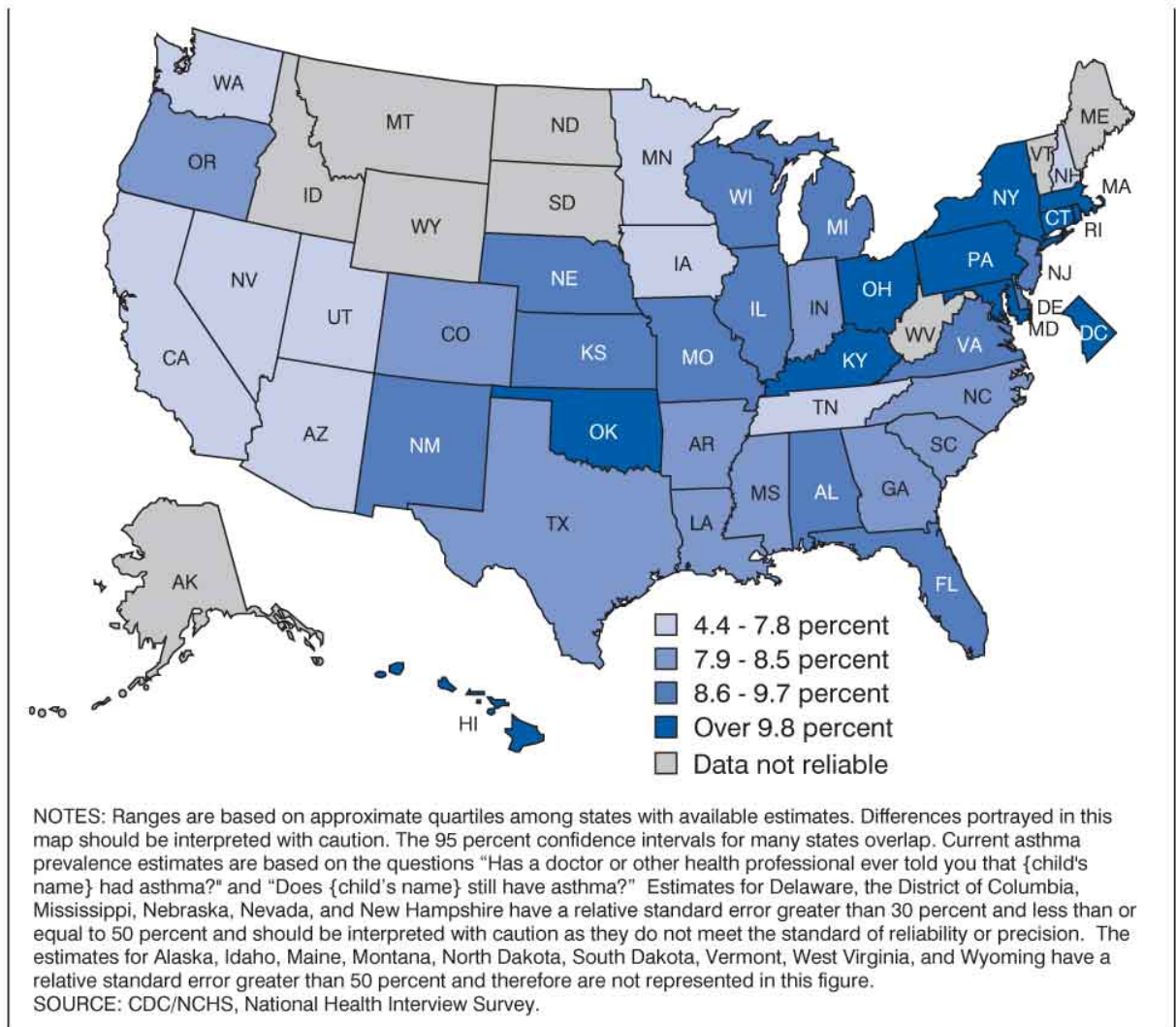


Figure 1. Current asthma prevalence among children 0–17 years of age, by State, annual average for the period 2001–2005

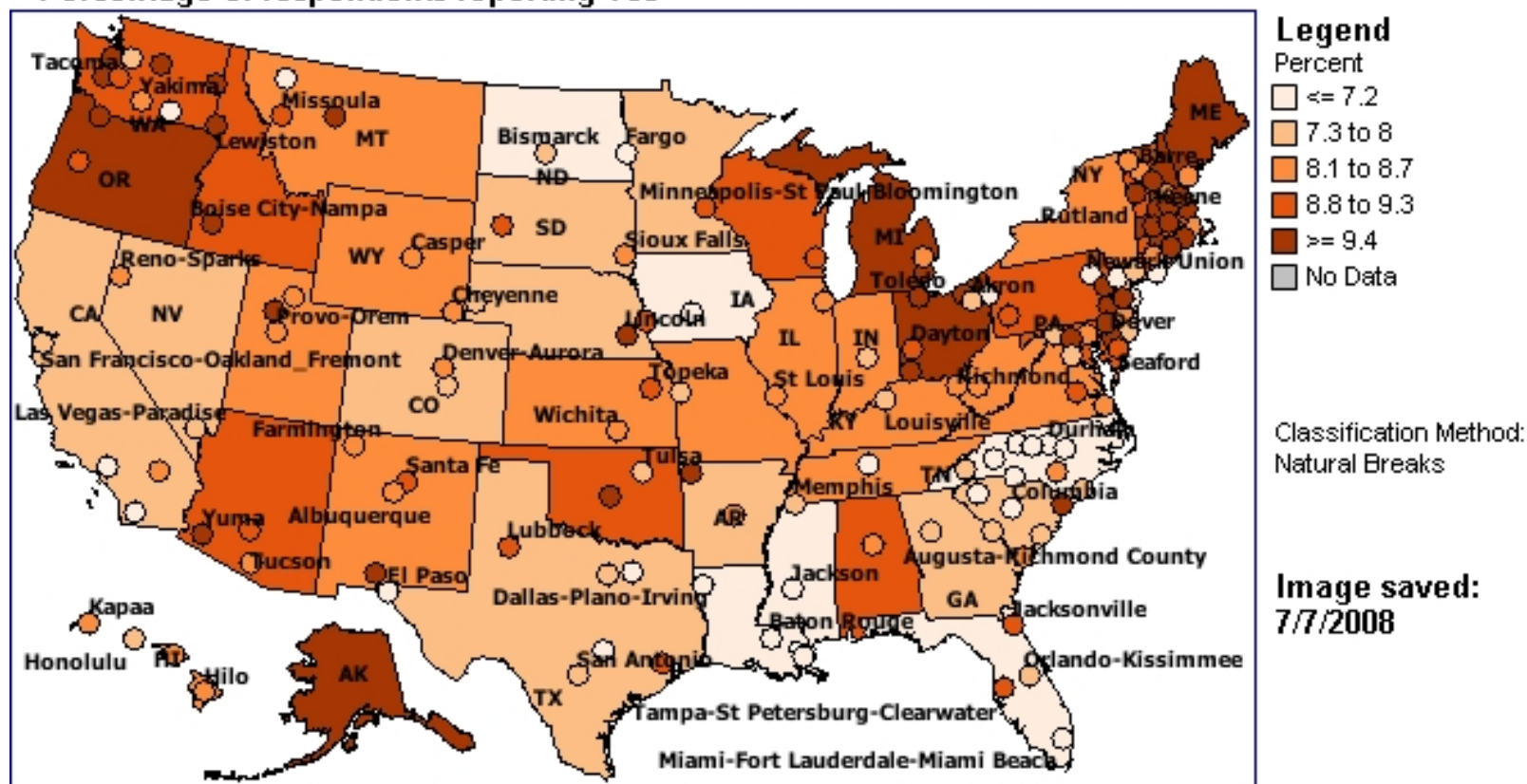
National Center for Chronic Disease Prevention and Health Promotion Behavioral Risk Factor Surveillance System

BRFSS Maps

Year - 2006

Adults who have been told they currently have asthma

Percentage of respondents reporting Yes



Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007. See <http://apps.nccd.cdc.gov/gisbrfss/map.aspx>

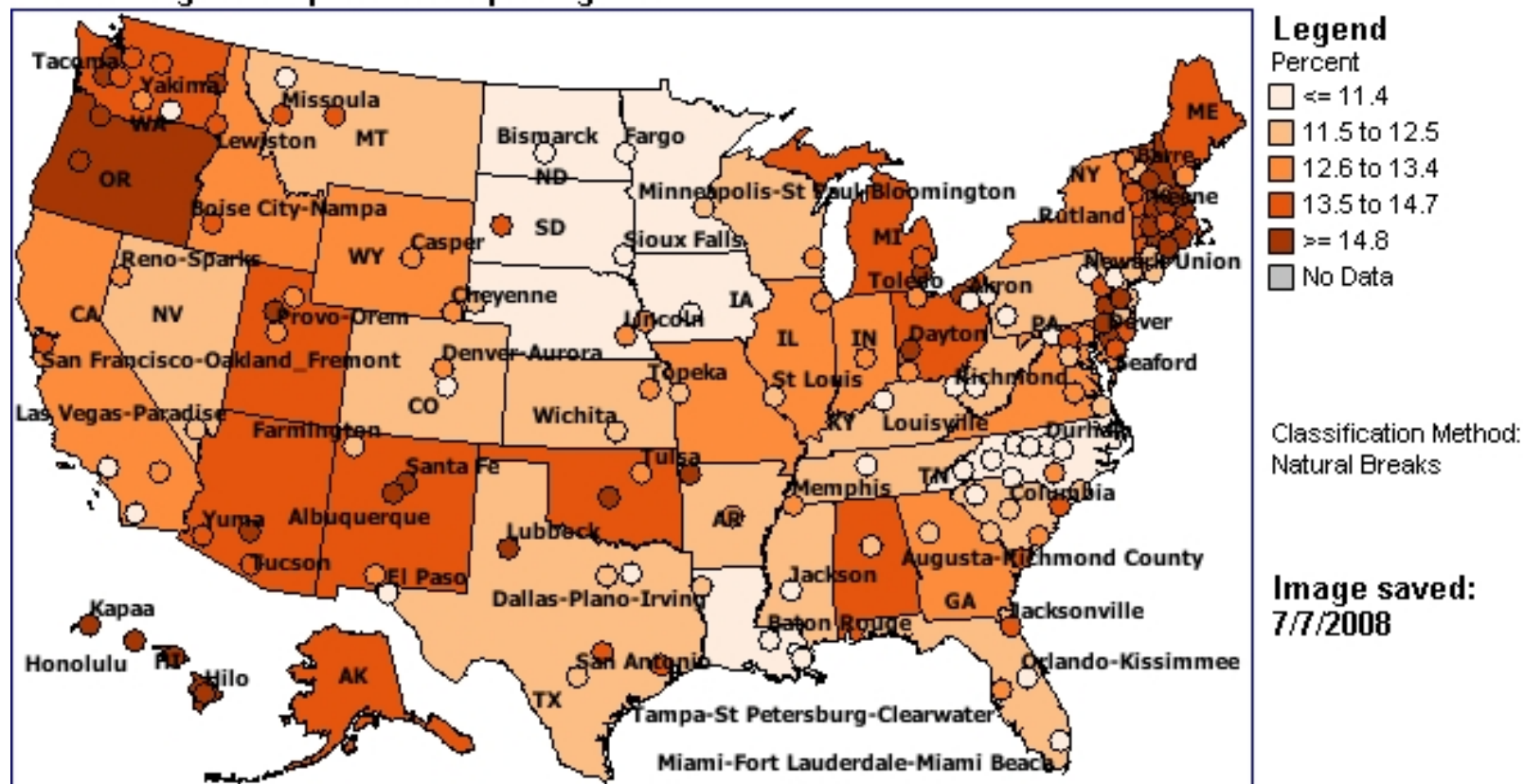
National Center for Chronic Disease Prevention and Health Promotion
Behavioral Risk Factor Surveillance System

BRFSS Maps

Year - 2006

Adults who have ever been told they have asthma

Percentage of respondents reporting Yes



Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007. See <http://apps.nccd.cdc.gov/gisbrfss/map.aspx>

EPA Map of Radon Zones

