

Action Plan *for*

HEALTHY HOMES



Healthy People *in Healthy Places*



goal...

Overarching Goal Statement

HEALTHY PEOPLE IN HEALTHY PLACES (CDC GOAL 2):

The places where people live, work, learn, and play will protect and promote their health and safety, especially those at greater risk of health disparities.

Strategic Goal Statement

HEALTHY HOMES:

Protect and promote health through safe and healthy home environments.



Healthy Homes

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LEARN MORE ABOUT THE HEALTH PROTECTION GOALS, THEIR SUPPORTING OBJECTIVES,
AND THE GOAL ACTION PLANS AND TEAMS BY VISITING WWW.CDC.GOV/GOALS



Home is a place that can support not only basic physical needs (such as air, water, food, and shelter), but also the psychological and social health of its occupants.

OBJECTIVES

OBJECTIVE 1:

Promote homes that are healthy, safe, and accessible.

OBJECTIVE 2:

Promote adopting behaviors that keep people healthy and safe when in their homes.

OBJECTIVE 3:

Promote the availability of healthy, safe, and accessible homes.

action...

“Working toward these goals makes sense. There is much more work to do, and we will plan, execute, learn, and adapt as we go. These goals will allow us to report internally and externally our successes and our gaps. This process will make obvious where we need more resources and support.”

—Julie Louise Gerberding, MD, MPH
speaking during an employee all-hands meeting held in 2006

plan.



During the summer and fall of 2006, CDC organized Health Protection Goal teams to focus on developing goal action plans for each of the goal areas:

1

**HEALTHY PEOPLE
IN EVERY STAGE
OF LIFE**

2

**HEALTHY PEOPLE
IN HEALTHY PLACES**

3

**PEOPLE PREPARED
FOR EMERGING
HEALTH THREATS**

4

**HEALTHY PEOPLE IN
A HEALTHY WORLD**

THE CENTERS FOR Disease Control and Prevention (CDC) recently developed a set of four overarching Health Protection Goals, which together provide a framework for achieving health protection and health equity. By focusing on these goals, CDC can also fulfill its mission *To promote health and quality of life by preventing and controlling disease, injury, and disability* and be able to demonstrate success through measurable improvements in health and reductions in health disparities.

Moreover, these Health Protection Goals complement and support the goals and objectives for *Healthy People 2010*. Further, CDC’s goal action plans will identify additional priorities and opportunities to inform the discussions about *Healthy People 2020*.

To facilitate that effort, CDC hosted a series of partner, public, and internal CDC meetings to gain input and further direction. The goal teams incorporated the input from those meetings into draft goal action plans that would link, leverage, and coordinate CDC’s activities across the agency to increase effectiveness and impact.

This initial set of goal action plans seeks to provide a collective overview of CDC’s current activities, to identify gaps in service, to recommend actions to close those gaps, to capture both current and new funding initiatives, to identify areas for greater collaboration and to encourage such collaboration, and to recommend new activities within each goal area.

We ask that you consider these plans as starting points for how CDC hopes to work with its traditional partners and for expanding our work to involve new partners. These goal action plans outline high-level perspectives for achieving mutual goals with our partners and provide a baseline by noting CDC’s current response and key achievements. All of these goal action plans are designed to be evolving works and are not intended to be all-inclusive or encyclopedic. They are not the “final word” but represent a carefully crafted “first cut” that will change as we gain input, experience, and perspective.

This planning process will be a continuous cycle that features flexible deliverables and periodic communications to update successes, priorities, and challenges for interested CDC audiences. Each goal team is responsible for completing or updating its goal action plan annually.

—JULIE LOUISE GERBERDING, MD, MPH
DIRECTOR, CENTERS FOR DISEASE CONTROL AND PREVENTION



home
[hohm] *n.*:

1. a house, apartment, or other shelter that is the usual residence of a person, family, or household.

2. the place in which one's domestic affections are centered.

INTRODUCTION

“The connection between health and dwelling is one of the most important that exists.”

—FLORENCE NIGHTINGALE

HOME IS A place that can support not only basic physical needs (such as air, water, food, and shelter), but also the psychological and social health of its occupants. Home is a place where people spend much of their lives, yet most people do not realize the close connection between their home and health. A home's physical features can support occupants through a wide range of developmental stages, promote health and safety, and support mental and emotional health. For instance, the physical environment can be designed and constructed to prevent elderly occupants from experiencing falls in showers and on stairs. Proper air ventilation and filtration and ample natural light not only support physical health and prevent injury,

but also may improve mental health. Home design and construction materials can support a clean and sustainable environment, conserve natural resources, and promote health and well-being.

THE SOCIAL AND physical environment of the home also can support behaviors that contribute to health and safety (**Figure 1**). A person's social environment includes their living and working conditions, income level, educational background, and social networks. All these have a powerful effect on health. The social environment in the home can support positive choices (e.g., about diet or physical activity) and reduce risk of dangerous behaviors (such as those that can lead to injury or violence). The physical environment in and around the home also can support good behaviors. For example, the availability of neighborhood sidewalks may encourage physical activity that low-

FIGURE 1



We have the means to increase the availability of healthy, safe, and accessible homes for everyone, regardless of their age or ability or income level.

ers obesity levels among residents. Finally, relationships between behavior and the environment can protect us and others. For example, locking cabinets that store chemicals, and installing and maintaining smoke alarms and carbon monoxide detectors can save lives. Making homes completely smoke free can reduce residential fires as well as asthma attacks, cardiovascular disease, and lung cancer.

WE HAVE THE means to increase the availability of healthy, safe, and accessible homes for everyone, regardless of their age or ability or income level. For people with disabilities, certain design elements and construction characteristics of housing, such as stairs or narrow doorways, can limit an entire range of housing options and adversely affect ease of access to and within the house. A home's design features can either exclude or enhance the ability of a person with disabilities to participate in the community. For elderly Americans, appropriate housing

design and construction can allow them to remain at home rather than move to an assisted living facility or nursing home.

WHEN THE SUPPLY of affordable units is insufficient, people must pay a larger percentage of their income for housing. As a result, they cannot meet expenses for other basic needs such as medical care, childcare, and food. Each year in the United States an estimated 2.1 million adults and 1.3 million children are homeless (Burt et al., 2001).

THIS REPORT TAKES a comprehensive view of the key elements that influence health, safety, and well-being in the home environment. These elements are **1)** the physical environment, **2)** the individual and the social environments, and **3)** the availability of affordable, healthy, safe, accessible, and sustainable housing (Figure 2). Achieving the Healthy Homes goal and objectives will require multiple, well-coordinated efforts by various partners. Our approach will focus

on coordinating new and existing resources to simultaneously address a range of risk factors in ways that are comprehensive and holistic. This approach should create economies of scale for prevention programs.

THE STATE OF HEALTHY HOMES

Current Disease Burden and Recent Trends

THIS PLAN FOCUSES on major deaths, illnesses, and functional impairments related to the home environment for which evidence-based interventions are available. We identified known home-related health outcomes and associated risk and protective factors by reviewing reports from the World Health Organization (WHO, 2006), Health Canada (Health Canada), and the

U.S. Environmental Protection Agency (EPA) (U.S. EPA, 2006). Information on health burden was obtained from articles, reports, and consultation with subject matter experts (Table 1). The major potentially preventable home-related deaths were related to **1)** poor indoor-air quality, **2)** unintentional injuries, and **3)** violence. Most of these also result in substantial numbers of morbidity.

CONTRIBUTORS TO POOR indoor-air quality are secondhand smoke, radon gas, and carbon monoxide. Secondhand smoke is associated with deaths from heart disease and lung cancer in nonsmoking adults and in sudden infant death syndrome (Cal EPA, 2005). Radon, a naturally-occurring radioactive gas, is the leading cause of lung cancer among nonsmokers, claiming an estimated 21,000 lives each year (NAS, 1998). Carbon monoxide is an odorless, colorless gas that can kill people without warning (CDC,

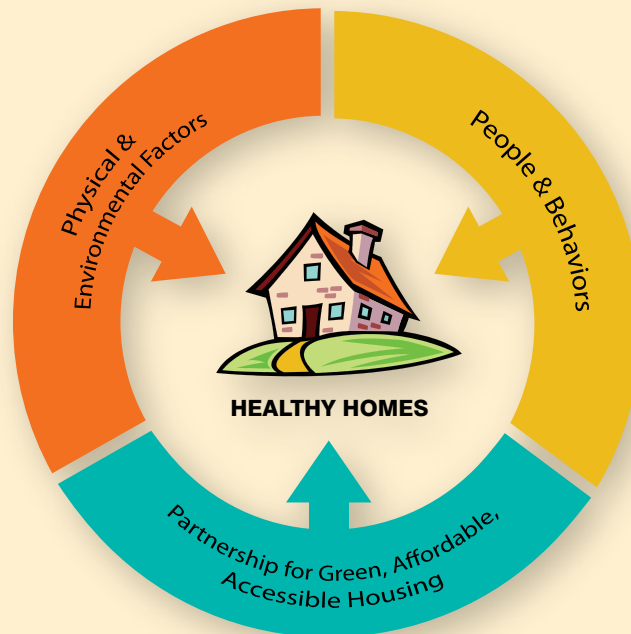
Secondhand smoke is associated with deaths from heart disease and lung cancer in nonsmoking adults and in sudden infant death syndrome.

FIGURE 2

HEALTHY HOMES MODEL

- Second-hand Smoke
- Radon
- Fire Hazards
- Fall Hazards
- Allergens
- Lead
- Pesticides
- Volatile Organic Compounds
- Smoke & Carbon Monoxide Detectors
- Private Drinking Water Wells

- Universal Design
- Construction Materials
- Handicapped Accessible



- Safe Food Handling & Storage
- No Smoking Rules
- Improve Nutrition
- Increase Physical Activity
- Improved Parenting Skills
- Coping and Conflict Management Skills

- Access to Sidewalks & Green Space
- Environment Friendly

TABLE 1

HOME-RELATED DEATHS, ILLNESSES, INJURIES, AND RISK FACTORS

RISK FACTOR	ANNUAL MORTALITY	ANNUAL MORBIDITY
PHYSICAL AND ENVIRONMENTAL FACTORS		
SECONDHAND SMOKE	<ul style="list-style-type: none"> • 46,000 Heart disease among nonsmoking adults • 3,400 Lung cancer among nonsmoking adults • 430 Sudden infant death syndrome (Cal EPA, 2005) 	<ul style="list-style-type: none"> • 790,000 Physician visits for child ear infections • 202,300 Child asthma episodes • 24,500 Low-birth weight infants among nonsmoking pregnant women (Cal EPA, 2005) • 150,000–300,000 Bronchitis and pneumonia cases in infants and toddlers (Cal EPA, 1997)
RADON	• 21,000 Lung cancer (NAS, 1998)	None known
FALLS	• 5,961 (Runyan et al., 2005a)	• 3,752,895 Emergency department visits (Runyan et al., 2005b)
FIRES	• 3,402 (Runyan et al., 2005a)	• 14,175 Injuries (Karter, 2005)
DROWNING	• 823 (Runyan et al., 2005a)	• 2380 Unintentional near-drownings (Home Safety Council, 2004)
CARBON MONOXIDE	• 480 (CDC, 2005a) [percent attributable to exposures in the home is unknown.]	• 15,200 Emergency department visits [64% or 9,728 attributable to carbon monoxide exposures in the home.] (CDC, 2005a)
HEAT, COLD, NATURAL DISASTERS	• 427 (Runyan et al., 2005a)	• 517,495 Emergency department visits (Runyan et al., 2005b)
ALLERGENS	• 3,800 Asthma deaths (CDC, 2007) [percent attributable to exposures in the home is unknown.]	• 1.8 Million emergency department visits for asthma (CDC, 2007) [percent attributable to exposures in the home is unknown.]
VOLATILE ORGANIC COMPOUNDS	<ul style="list-style-type: none"> • Some can cause damage to the liver, kidneys, and central nervous system. Some are known carcinogens. National burden estimates are not currently available due to insufficient information on the magnitude and duration of exposures. 	<ul style="list-style-type: none"> • Exposure to elevated concentrations can result in eye, nose, and throat irritation; headaches, loss of coordination, and nausea. National burden estimates are not currently available due to insufficient information on the magnitude and duration of exposures.
PESTICIDES	<ul style="list-style-type: none"> • Some are known neurotoxicants and carcinogens. National burden estimates are not currently available due to insufficient information on the magnitude and duration exposures. 	• 171,000 pesticide poisonings (EPA, 2004)
DRINKING-WATER CONTAMINANTS	<ul style="list-style-type: none"> • Some can cause cancer, liver and kidney damage, disorders of the nervous system, damage to the immune system, and birth defects. National burden estimates are not currently available due to insufficient information on the magnitude and duration of exposures. 	<ul style="list-style-type: none"> • 168,000 viral illnesses (EPA, 2000) • 34,000 bacterial illnesses (EPA, 2000) • 45 million private well users may be exposed to unhealthy levels of chemical and biological contaminants (EPA, No Date).
PEOPLE		
CHILD MALTREATMENT	<ul style="list-style-type: none"> • 1,500 deaths (ages 0–17 years) <ul style="list-style-type: none"> - 77% ages 0–4 - 13% ages 4–7 - 4% ages 8–11 - 6% ages 12–17 (DHHS, 2005) 	<ul style="list-style-type: none"> • 900,000 child maltreatment victims <ul style="list-style-type: none"> - 63% child neglect - 7% emotional abuse - 9% sexual abuse - 17% physical abuse (DHHS, 2005)
INTIMATE PARTNER VIOLENCE	• 1,300 deaths (CDC, 2003a)	• 2 million injuries (CDC, 2003a)
FOOD PREPARATION AND STORAGE	• 5,000 foodborne illness-related deaths (Mead et al., 1999) [Percent attributable to exposures in the home is unknown.]	<ul style="list-style-type: none"> • 76 million foodborne illnesses • 300,000 hospitalizations (Mead et al., 1999) [Percent attributable to exposures in the home is unknown.]

2005a). Interventions include properly maintaining gas appliances and installing and maintaining carbon monoxide monitors; not allowing smoking in the home; and testing for radon gas and reducing its concentrations through home modification when necessary.

MANY UNINTENTIONAL INJURIES and deaths are related to the home and its environs. Within the home an estimated 11,093 people die each year from potentially preventable unintentional injuries including falls, fires, drowning, and severe weather events (for example, heat waves, hurricanes, tornadoes, and other natural disasters) (Runyan et al., 2005a). Interventions include identifying and addressing fall hazards in homes, installing and maintaining smoke detectors and making homes completely smoke-free, closely supervising infants in bath tubs and near water, and installing appropriate fences around swimming pools. Other interventions include identifying people who may need assistance during severe weather events and planning to provide appropriate assistance to them in their homes.

VIOLENCE IN THE home environment results in many deaths and injuries. About 50% of homicides and suicides occur in the home. Each year, intimate partner violence results in 1,300 adult deaths and almost 2 million injuries. Additionally, 1,500 children die from maltreatment and approximately 900,000 children are classified by child protective services as victims. Home visits have been shown to reduce child maltreatment (Bilukha, 2005).

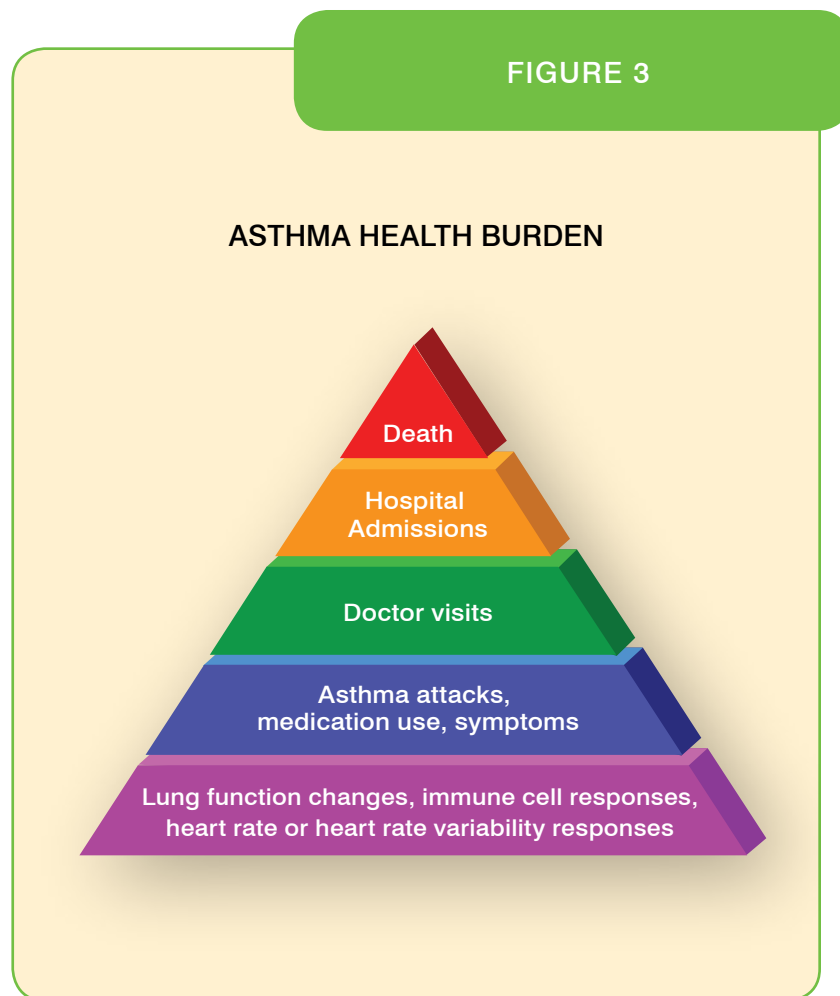
DEATH STATISTICS ALONE do not capture the full human health burden attributed to the undesirable home environments. It is important to consider other measures of health burden as well.

ASTHMA AND FOODBORNE illnesses are examples of issues that cause relatively few deaths but result in major illness and suffering.

FIGURE 3 DEPICTS deaths as a fraction of all indicators of adverse health effects from asthma. Twenty million Americans have asthma. Although the number of people who die from asthma annually are relatively small, there are an estimated 1.8 million emergency department visits for asthma each year. If left uncontrolled, asthma also can limit lifestyle and diminish quality of life.

THE HOME ENVIRONMENT can contribute importantly to asthma occurrence and severity. Residential exposures, such as to allergens or secondhand smoke, have been attributed to approximately 39% of new asthma cases in children aged < 6 years, and to 44% of new and existing asthma cases in children aged 6–16 years (Lanphear, 2001a; 2001b). Reducing allergen levels in homes has helped reduce asthma attacks (Morgan et al., 2004).

Death statistics alone do not capture the full human health burden attributed to the undesirable home environments.





FOODBORNE ILLNESS IS an example of illness that affects large numbers of people. Of the 76 million Americans estimated to suffer from foodborne illness each year, 300,000 are hospitalized and as many as 5,000 die (Mead et al., 1999). Although the precise number of foodborne illnesses that are acquired in home environments is not known, we think that a substantial proportion of the relevant exposure occurs in the home environment. Foodborne illness may result from improper food preparation or storage or cross-contamination in homes. For example, undercooked meat and poultry can cause foodborne illness. Foodborne illness also occurs when food eaten in the home has been contaminated in the field or factory. Good hand washing and surface disinfecting practices, and safe food handling and storing practices will decrease the incidence of foodborne illness each year.

IN ADDITION, EXPOSURE to some hazards may not result in death or acute illness but may cause lifetime adverse health effects. Childhood lead poisoning is an example. Today it is rare for a child to die from lead poisoning in the United States. Nevertheless, 310,000 U.S. children have elevated blood lead levels (≥ 10 micrograms per deciliter) (CDC, 2005b). Elevated blood lead levels have been linked with impaired cognitive development and behavioral problems. Preventing elevated blood lead levels allows more children to reach their potential. For example, the estimated economic benefit resulting from the reductions in typical lead exposure in the United States since 1976 for each year's cohort of 2-year-old children ranges from \$110 billion to \$319 billion (Grosse et al., 2003). Because no therapies can reverse the harmful effects of lead exposure, lowering children's exposures by identifying and controlling lead sources will be the preferred strategy for dealing with this hazard.

DISPARITIES IN HEALTHY HOMES

ALTHOUGH HOMES OF any age or value can contain serious environmental hazards, older, lower-valued properties that are poorly maintained typically present the greatest risks. Residents of poorly maintained housing are at increased risk from fire, falls, lead poisoning, asthma, and other illnesses and injuries. People living in substandard housing are disproportionately of minority race or ethnicity. Substandard housing has been classified as homes with severe or moderate problems. An example of housing with severe problems is a home lacking hot or cold piped water or lacking a flush toilet. A home with moderate physical problems is a home in which all the toilets were inoperable at the same time for 6 hours or more on at least three occasions during the previous 3 months. A greater proportion of non-Hispanic blacks (7.5%) than Hispanics (6.3%) or non-Hispanic whites (2.8%) live in housing with moderate physical problems. A greater percentage of non-Hispanic blacks (2.9%) and Hispanics (2.9%) live in homes with severe physical problems than whites (1.6%) (Figure 4).

AN INDICATOR OF the lack of affordable housing is the number of households classified as "worst case needs for housing assistance." This is defined as the number of families and individuals whose incomes fall 50 percent below an area's median income, who either pay 50 percent or more of their monthly income for rent, or who live in substandard housing. More families with children comprise the group of worst case needs for housing assistance than do households with elderly members or households with persons with disabilities (Figure 5). However, the size of all three groups is increasing (Figure 5) and the need for affordable housing units is growing.

RATES OF ASTHMA in the United States, which as noted earlier can be provoked by exposures in the home environment, are highest among children aged < 18 years and children and adults living in poverty (Figure 6).

EXPOSURE TO SECONDHAND smoke among nonsmokers is measured by blood tests for levels of cotinine, a metabolite of nicotine. Secondhand smoke exposure tends to be higher for children and non-Hispanic blacks (CDC, 2006) (Figure 7).

FIRE- AND BURN-RELATED deaths among children aged 1-9 years is highest among non-Hispanic blacks, followed by non-Hispanic whites, Hispanics, and Asian Pacific Islanders (Figure 8). Many deaths from fires in homes are caused by smoking. Properly placed working smoke detectors in homes save lives.

FALLS, THE LEADING cause of injury-related death for older adults, have increased during the past decade. Among older adults, fall-related death rates are higher among men than women (Figure 9). Changes in the home environment, such as adding hand rails and good lighting in stairwells, can reduce risk for falls among older adults.

FOR SOME HEALTH issues trends, disparities, or burdens cannot be assessed because there is limited or no tracking data. For example there are no nationwide systems that track home hazards, such as levels of radon or private well contaminants. Many existing data systems that can be used to track health outcomes, such as emergency department visit data, do not routinely collect information regarding the place where the illness was acquired or the injury occurred. This is true for foodborne illness and intimate partner violence, for example.

FIGURES 4-6

FIGURE 4: RACE/ETHNICITY OF PEOPLE LIVING IN HOMES WITH SEVERE AND MODERATE PHYSICAL PROBLEMS

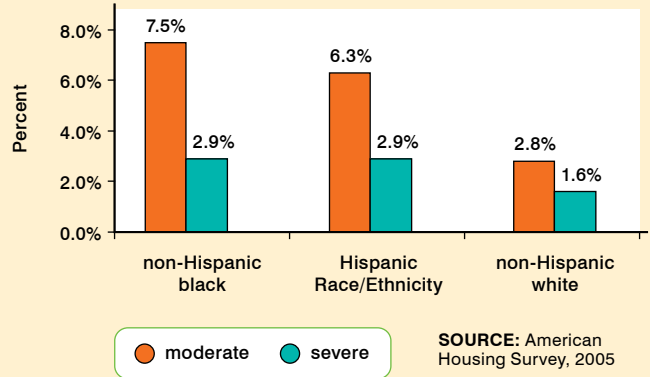


FIGURE 5: WORST CASE NEEDS FOR HOUSING ASSISTANCE

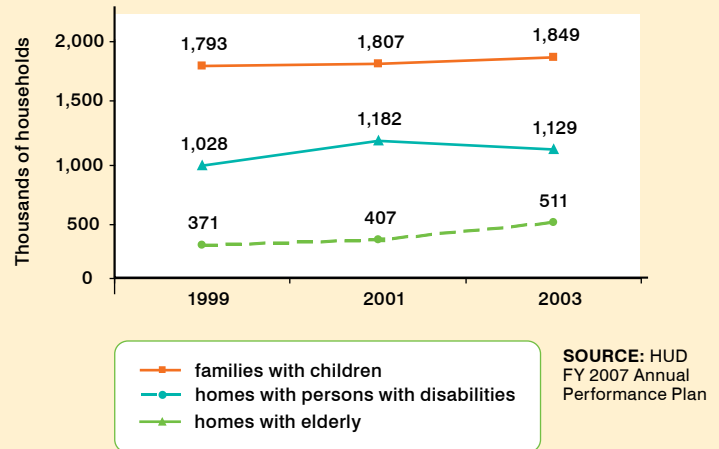
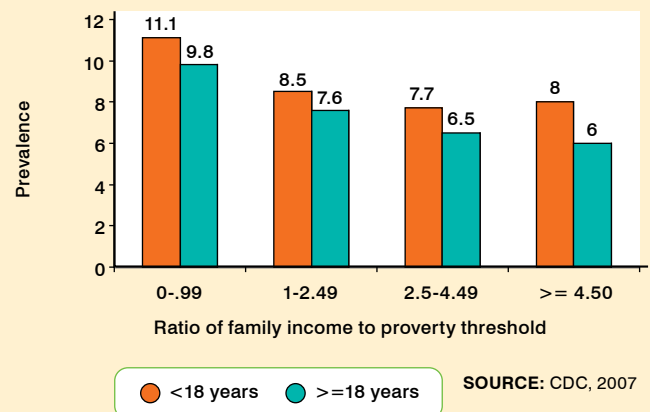


FIGURE 6: ASTHMA BY POVERTY AND AGE GROUP, U.S., 2001-2003



FIGURES 7-9

FIGURE 7: MEAN COTININE LEVELS AMONG NONSMOKERS BY AGE GROUP AND RACE/ETHNICITY, U.S., 2001-2002

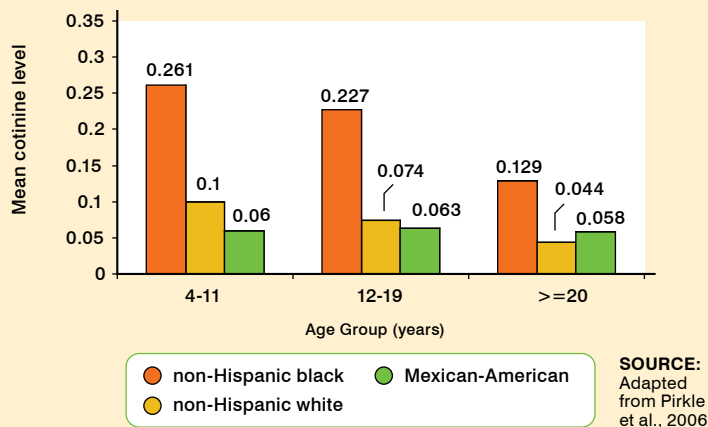


FIGURE 8: UNINTENTIONAL FIRE/BURN DEATH RATES AMONG CHILDREN AGED 1-9 YEARS BY RACE/ETHNICITY, U.S., 1999-2002

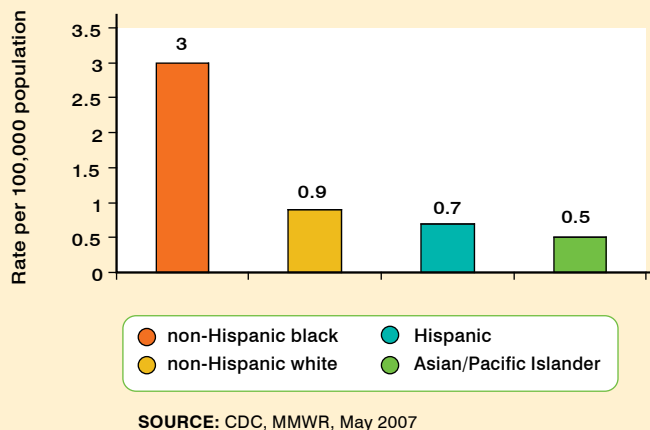
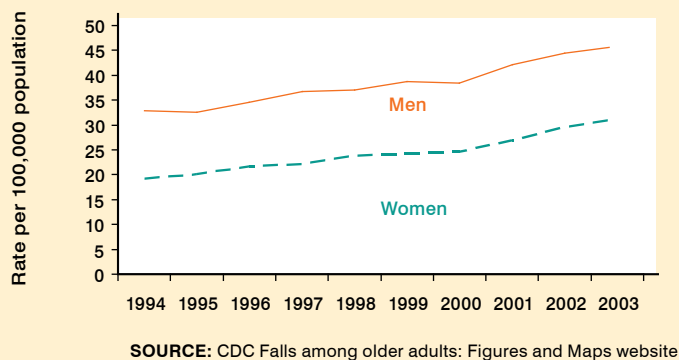


FIGURE 9. AGE ADJUSTED UNINTENTIONAL FATAL FALL RATES AMONG MEN AND WOMEN AGED 65 YEARS AND OLDER, U.S., 1994-2003



EMERGING HEALTHY HOMES ISSUES

IN ADDITION TO these known causes of home-related deaths, diseases, and injuries, there is growing scientific evidence that other home-related exposures to contaminants may be significant contributors to the burden of disease (Figure 10).

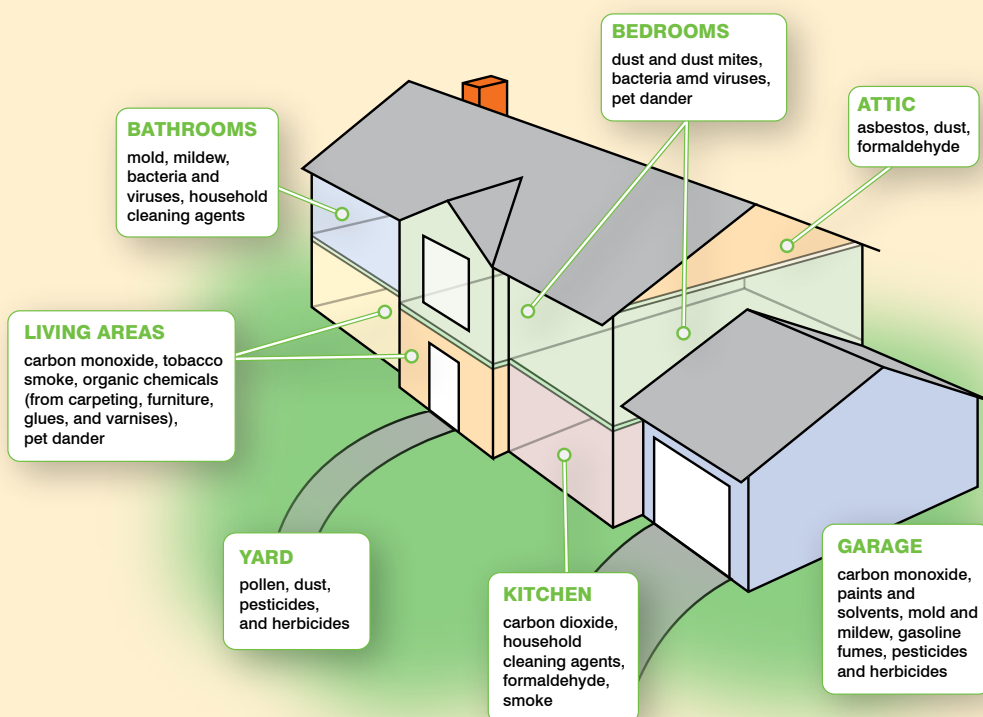
MANY CONTAMINANTS THAT cause significant health effects, including those at high levels known or suspected to cause cancer, can be found in home environments, generally at lower levels. We do not, however, have complete information on typical levels of exposure in homes, nor do we fully understand all the health effects related to chronic exposures in homes.

VOLATILE ORGANIC COMPOUNDS are chemicals that can cause eye, nose, and lung irritation and can trigger rashes, headaches, nausea, vomiting, and asthma. Some volatile organic compounds, such as benzene and formaldehyde, may cause cancer (NCI, 2004; ACS, 2006). These chemicals can be released in the home or garage from substances such as cleaning products, adhesives, paints, gasoline, wood preservatives, and tobacco smoke. Indoor levels of volatile organic compounds can be up to 10 times higher than outdoor levels.

IT IS COMMON for pesticides to be used in and around homes. However, people exposed to pesticides can suffer irritation to their eyes, nose, and throat; damage to their central nervous system and kidneys; and increased risk of developing cancer. In 2004, 71,000 children suffered poisonings or exposures related to common household pesticides (U.S. EPA, 2004). It is estimated that they are used inside 75% of U.S. households (U.S. EPA, 2007). Integrated pest management (IPM), an approach that uses an ecological approach to controlling

FIGURE 10

POTENTIAL HAZARDS THAT CAN BE FOUND IN HOMES



SOURCE: Adapted from AirAdvice, Inc. www.airadvice.com

rodents, cockroaches, and other pests, can significantly reduce or eliminate the use of pesticides and is a safer alternative. This intervention approach controls pests, as well as mold, by addressing water and moisture problems.

PRIVATE WELLS PROVIDE drinking water for an estimated 45 million Americans. In 1999–2000, contaminated private well water (e.g., from improperly maintained or malfunctioning septic systems) caused 26% of the drinking-water related illness outbreaks that made people sick (CDC, 2003b). Exposure to elevated concentrations of chemical contaminants is also a concern with these systems. They have been associated with certain cancers, liver and kidney damage, nervous system disorders, immune system damage, adverse reproductive outcomes, and birth defects. One study by the U. S. Geo-

logical Surveys (USGS) estimates that 12.8% of private wells contain water with contaminants at levels above health-based standards (Squillace et al., 2002). However, unlike community drinking water systems, private wells are not monitored.

LACK OF AVAILABLE and accessible housing can result in tremendous social and economic costs and negatively affect millions of Americans (Figure 11).

ANOTHER EMERGING ISSUE that merits further attention is the limited supply of housing, including rental units, that is affordable as well as safe, healthy, and accessible. Creating an adequate supply of housing units that is accessible for elders and people with disabilities and allowing all people to have a place to call home will result in significant public health improvements.

Lack of available and accessible housing can result in tremendous social and economic costs and negatively affect millions of Americans.

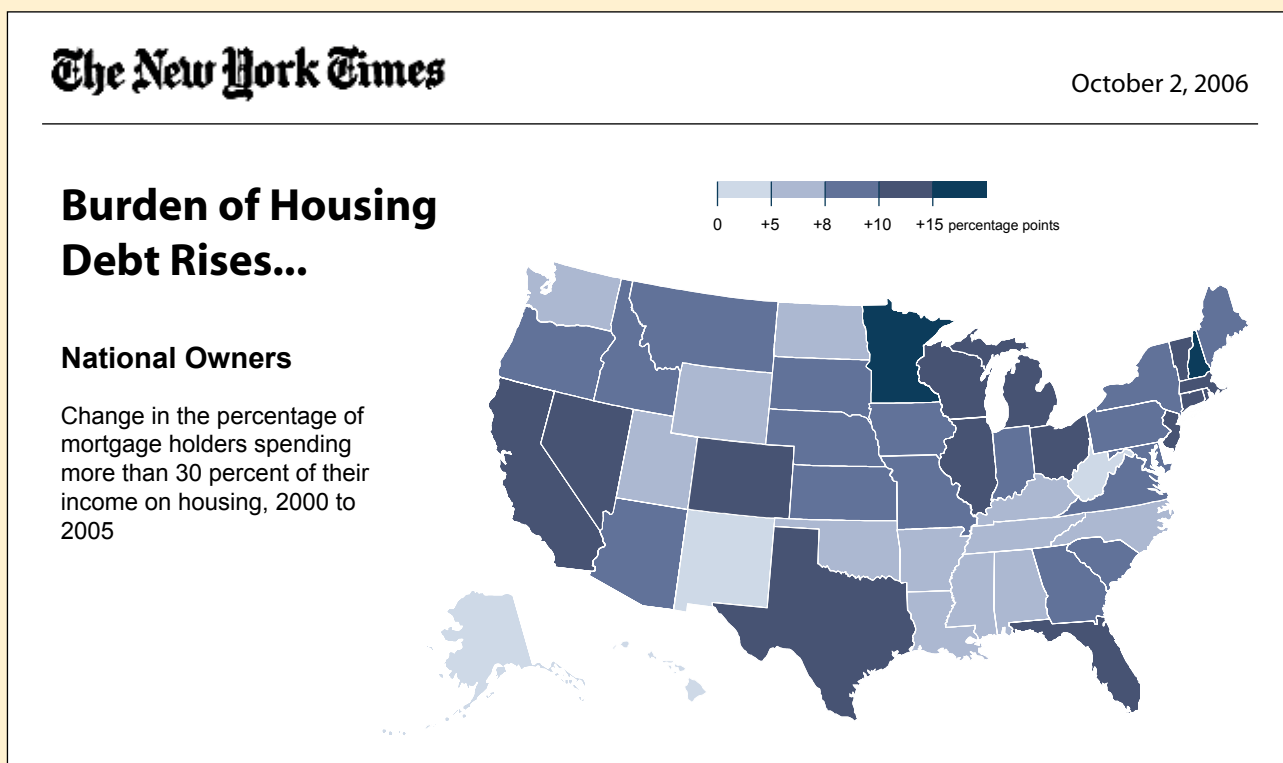
AFFORDABLE HOUSING

Rental housing units are generally considered affordable if they cost no more than 30% of household income for a low- or very low-income household.

RENTAL HOUSING UNITS are generally considered affordable if they cost no more than 30% of household income for a low- or very low-income household. Currently, more than 13 million households pay more than 50% of their income for housing, and of the 14.8 million households with annual incomes of \$10,000 or less, a year's rent consumes an estimated 70% of their total income (JCHS, 2005). Additionally, housing instability during childhood is associated with adolescent homelessness, suggesting that housing stabilization for homeless or poorly housed families may contribute to the prevention of chronic homelessness (Robertson et al., 1999; Park et al., 2004). Interventions to make housing healthier and safer should not make the cost of housing unattainable.

FAMILIES MAKE UP roughly 40% of those who become homeless (Shinn et al., 1998). Risk factors for homelessness include substance abuse or mental illness, the presence of violence in the home, and lack of affordable housing in the community. Not only does this group face dangers, isolation, and deprivation, but they also have higher rates of disease than the general population. Being chronically homeless can reduce life expectancy by up to 20 years (Wright et al., 1998). The cost of homelessness can be quite high, particularly for those with chronic illnesses. Each year millions of homeless people in the United States need important health care services. Interventions targeted to the risk factors for homelessness, i.e., substance abuse, mental illness, violence in the home, and lack of affordable housing, can keep people in homes and so they do not have

FIGURE 11



to use shelters or live on the streets. CDC's Healthy Institutions Goal Action Plan contains additional information on the nation's homeless population.

ACCESSIBLE HOUSING

IN 2000, THERE was not one U.S. housing market in which a person with a disability and living on Social Security income could afford to rent an average one-bedroom apartment without having to spend more than 50 percent of their income on rent (O'Hara and Miller, 2001). Also challenging for persons with disabilities is that available housing often is not designed to accommodate even their most basic needs. For example, people with disabilities frequently are confronted by unreachable water faucets, inaccessible sanitation facilities, or lack of wheelchair ramps. In 2002, among adults with disabilities 10 percent reported environmental barriers in the home (HP 2010, No Date).

BECAUSE MANY HOME-RELATED illnesses and injuries share common causes, solutions to individual problems often offer collateral benefits.

SELECTED STRATEGIES

THE HEALTHY HOMES Goal Action Plan will address priority and emerging issues by considering similarity of intervention approaches. These can be summarized as interventions that target the physical environment, the individual and social environments, and expanding partnerships.

PHYSICAL ENVIRONMENT STRATEGIES

EXISTING STATE AND local programs with a home visitation component have potential to deliver multiple interventions and to influence changes in the home environment. For example, home visits to identify lead exposure sources for children with elevated blood





appliances; eat a well-balanced, nutritious diet; and engage in regular physical activity. Strong social relationships are protective of health in multiple ways. Neighbors, friends, and family can provide material, as well as emotional support. This support can help buffer stressful situations, prevent damaging feelings of isolation, and contribute to a sense of self-esteem. Preventing violence in the home can protect children and intimate partners from abuse. The Task Force on Community Preventive Services recommends early childhood home visitation for preventing child abuse and neglect (Bilukha, 2005). Effective interventions to reduce harmful situations and to promote healthy behaviors require a multifaceted, theory-based approach so that individuals seek change and maintain healthy behaviors.

STRATEGIES TO PROMOTE AFFORDABLE, HEALTHY, SAFE, AND GREEN HOMES

BUILDERS, ARCHITECTS, AND building code inspectors can design, build, and renovate homes with affordability, accessibility, safety, health, and environmental sustainability in mind. Some design elements and housing construction practices, such as stairs or narrow doorways, limit an entire range of housing options for some Americans and affect their ease of access to and within the house. Conversely, using materials and designs that help protect against radon, mold, and pests exposure can prevent myriad associated health effects. Locating residential neighborhoods safe distances from toxic pollution sources and designing the neighborhoods in a manner conducive to physical activity will greatly contribute to the health, development, and social integration of their inhabitants. The way we build our homes can have a huge impact on the environment. An environmentally protective “green” home generates less waste, uses less energy and natural resources, and can be designed to promote health and well-being.

An environmentally protective “green” home generates less waste, uses less energy and natural resources, and can be designed to promote health and well-being.

lead levels could be expanded to also assess whether working smoke alarms and carbon monoxide detectors are present, and whether moisture-related conditions exist (such as mold and pest infestation). New York state’s Healthy Neighborhoods program demonstrated that the cost of implementing multiple housing-based interventions is far lower than if they are implemented singly. The cost for each unit visited was estimated as \$132 which was a savings of \$285 per unit versus performing the interventions one at a time (HUD, 1999).

STRATEGIES FOR THE INDIVIDUAL AND SOCIAL ENVIRONMENTS

TARGETED EDUCATIONAL AND health promotion campaigns can increase behaviors that will make home environments healthy and safe. For example, people can adopt safe food preparation and storage practices; test private well water; properly maintain septic tanks and carbon monoxide-emitting

KEY MEASURES

THERE ARE MANY Healthy People 2010 objectives that are relevant to healthy homes. We have included 10 relevant Healthy People 2010 objectives. We have also created a new objective that focuses on increasing the number of high risk homes that receive interventions.



KEY MEASURES

MEASURE 1: Increase the number of high-risk homes targeted, assessed, and receiving multiple prioritized, cost-effective, evidence-based interventions.

MEASURE 2: Reduce the proportion of children who are regularly exposed to tobacco smoke at home.
JUSTIFICATION: *HP 2010, 27-9*

MEASURE 3: Increase the proportion of persons who live in homes tested for radon.
JUSTIFICATION: *HP 2010, 8-18*

MEASURE 4: Reduce deaths from falls.
JUSTIFICATION: *HP 2010, 15-27*

MEASURE 5: Reduce deaths from residential fires.
JUSTIFICATION: *HP 2010, 15-25*

MEASURE 6: Eliminate elevated blood lead levels in children.
JUSTIFICATION: *HP 2010, 8-11*

MEASURE 7: Reduce the proportion of occupied housing units that are substandard.
JUSTIFICATION: *HP 2010, 8-23*

MEASURE 8: Reduce people's exposure to pesticides, heavy metals, and other toxic chemicals, as measured by blood and urine concentrations of the substances or their metabolites.
JUSTIFICATION: *HP 2010, 8-25*

MEASURE 9: Increase the proportion of consumers who follow key food safety practices.
JUSTIFICATION: *HP 2010, 10-5*

MEASURE 10: Increase the number of functioning residential smoke alarms.
JUSTIFICATION: *HP 2010, 15-26*

MEASURE 11: Reduce residential drownings.
JUSTIFICATION: *HP 2010, 15-29*

CDC'S INVESTMENTS IN PUBLIC HEALTH ACTIVITIES SUPPORTING HEALTHY HOMES

HEALTHY HOMES IS a recent goal area for CDC, however, much of CDC's current work in a number of areas contributes to achieving our Healthy Homes goals and objectives. Although CDC's investment in the Healthy Homes goal area is difficult to quantify, its many related activities span a variety of programs from across the agency. In addition, CDC has invested in program, surveillance, research, policy, and partnerships that contribute to healthier home environments. Key CDC prevention programs include childhood lead poisoning, unintentional injury, child maltreatment, intimate partner violence,

foodborne illness, asthma, carbon monoxide, residential fires, and secondhand smoke. The following outlines those program areas with significant investment in Healthy Homes:

DIVISION OF ENVIRONMENTAL HAZARDS AND HEALTH EFFECTS (DEHHE)

DEHHE'S NATIONAL ASTHMA Control Program funded grantees in 33 states, the District of Columbia and Puerto Rico, three national organizations, and others for activities to be conducted in FY 2007. These grantees and CDC are conducting asthma tracking, intervention, partnership, and public health research activities.

DEHHE WORKS WITH national and state data sources to monitor, evaluate, and present information on carbon monoxide-related illness and death in the United States. Although there are no grants available, the DEHHE program strengthens state and local capacity to respond to carbon monoxide-related issues; monitors surveillance data; conducts and publishes study findings; develops a research agenda, partnership, and education related to carbon monoxide poisoning prevention; assesses methods to formally evaluate the effectiveness of carbon monoxide detectors; engages private industry and regulatory agencies to reduce carbon monoxide exposure; and works with regulatory agencies to develop standards for boat engines and carbon monoxide emissions.

DIVISION OF EMERGENCY AND ENVIRONMENTAL HEALTH SERVICES (DEEHS)

DEEHS ASSISTS STATE and local childhood lead poisoning prevention programs to provide a scientific basis for policy decisions and to ensure that health issues are addressed in decisions about housing and the environment. In 2003, DEEHS awarded \$31.7 million to 42 state and local health departments to develop and implement comprehensive lead poisoning prevention efforts.



DIVISION OF FOODBORNE, BACTERIAL AND MYCOTIC DISEASES (DFBMD)

DFBMD PLAYS A key role in identifying prevention strategies and building state and local health department epidemiology, laboratory, and environmental health capacity to support foodborne disease surveillance and outbreak response. DFBMD leads federal efforts to gather data on foodborne illnesses, investigate foodborne illnesses and outbreaks, and monitor the effectiveness of prevention and control efforts. CDC is not a food safety regulatory agency but works closely with the food safety regulatory agencies, in particular with FDA and the USDA's Food Safety and Inspection Service within.

OFFICE ON SMOKING AND HEALTH (OSH)

OSH FUNDS HEALTH departments in all 50 states, the District of Columbia, and seven U.S. territories for comprehensive tobacco prevention and control programs. Funded programs focus on tobacco use prevention, cessation, smoke-free environments, and tobacco-related disparities. OSH works collaboratively with state and national partners and networks in providing strategic leadership, a solid science base, and technical assistance to advance evidence-based interventions at the state and local levels.

DIVISION OF UNINTENTIONAL INJURY PREVENTION (DUIP)

DUIP WORKS TO prevent home and recreational-related injuries through research projects and nearly 30 grants and cooperative agreements. Priorities include injuries caused by residential fires, falls among older adults, and inadequate supervision of children. Additional activity areas include prevention of sports and recreational-related injuries such as drowning, and unintentional poisoning.



DIVISION OF VIOLENCE PREVENTION (DVP)

DVP'S GOAL IS to prevent injuries and deaths caused by violence, including intimate partner violence, child maltreatment, youth violence, suicide, sexual violence, and elder maltreatment. DVP strives to stop violence before it begins (i.e., primary prevention) by monitoring violence-related injuries; conducting research on the factors that put people at risk or protect them from violence; creating and evaluating the effectiveness of violence prevention programs; helping state and local partners plan, implement, and evaluate prevention programs; and conducting research on the effective adoption and dissemination of prevention strategies.

ACCOMPLISHMENTS

THE UNITED STATES has supported prevention programs that have resulted in important improvements in home-related health and safety issues.

- ▣ **Reduced children's blood lead levels**— The restriction of lead in products such as gasoline, residential paint, plumbing solder, and food and drink cans; federal prevention programs targeting residential lead remediation; and CDC's childhood lead poisoning prevention programs have contributed to the nationwide decrease in children's blood lead levels. CDC's primary strategies have been to test children and identify and remove lead sources, and to collaborate with federal agencies, especially HUD and EPA, to remove lead sources from children's environments. Home visits to identify and control lead exposure sources for children have been a key strategy of child lead poisoning prevention programs.
- ▣ **Reduced secondhand smoke exposure**— The proportion of nonsmokers aged 4 years and older with a detectable cotinine level (a metabolite of nicotine that is used as a biologic marker for secondhand smoke exposure) in their blood has fallen from 88% in 1988–1991 to 43% in 2001–2002 (Pirkle et al., 2006). This

is largely due to implementation of state and local smoke-free laws and voluntary employer policies in workplaces and public places, as well as implementation of comprehensive state tobacco control programs that receive funding and technical assistance from CDC. As the number of adult smokers has decreased, public awareness about the health effects of secondhand smoke has increased. Social norms have changed resulting in the proportion of households adopting voluntary smoke-free home rules increasing from 43% in 1992–1993 to 72% in 2003. The home is the primary setting where children are exposed to secondhand smoke. EPA, CDC, and other organizations have conducted educational initiatives encouraging parents to make their homes smoke-free in order to protect their children from secondhand smoke.

- ▣ **Residential fire deaths prevented**— CDC promotes smoke alarm installation and fire safety education in high-risk communities including those with fire related death rates higher than state and national averages and median household incomes below the poverty level. As a result of this program, 1,224 lives are estimated to have been saved since 1998. By promoting smoke alarm installation and supporting efforts to assure that detectors are functioning, CDC could help further reduce the annual 13,825 injuries and 3,200 lives lost from fires each year.

- ▣ **Healthy Homes Training Center and Network**—CDC, HUD, and EPA support the National Healthy Homes Training Center and Network. This training center and network brings together public health and housing industry practitioners to promote practical and cost-effective methods for making homes healthier and is a forum for exchanging information on new research and best practices.



RECOMMENDATIONS

THE RECOMMENDATIONS THAT follow are based on assessment of the hazards and risk factors that carry a high public health burden and for which there are evidence-based interventions. The highest healthy homes intervention priorities are **1**) improving indoor air quality—especially reducing exposure to secondhand smoke, unhealthy levels of radon, carbon monoxide, and asthma triggers; **2**) preventing unintentional injuries—especially residential falls, fires, and poisonings, including exposure to lead and toxic chemicals in the home; and **3**) preventing violence in the home—especially child maltreatment.

THESE RECOMMENDATIONS ARE not intended to replace or reduce existing effective program activities. These are intended to address gaps and to offer strategies that can be used to fill those gaps.

Expand existing home visit programs to adopt healthy homes approaches.

THERE ARE MANY existing prevention programs that have home visit components that address single issues even though there are often multiple health, safety, and well-being issues that families face. A key healthy homes strategy is to assess multiple potential risks and include additional safety and health promotion messages during home visits and to coordinate appropriate follow-up. There is currently no CDC healthy homes program to coordinate implementation of the comprehensive healthy homes activities across multiple programs at the state and local levels. The following actions will help improve coordination efforts:

- **Begin discussions with partners and Congress to explore how the mandate of CDC’s lead poisoning prevention program could be expanded to include a broader range of healthy homes activities.** CDC’s lead poisoning prevention branch funds



comprehensive state and local prevention programs that include a home visit as part of case management. These programs have existing infrastructure that easily can expand to adopt healthy homes strategies and can play a key role in coordinating state and local referral and follow-up activities. The mandate of CDC’s lead poisoning prevention program should be expanded to include healthy homes responsibilities and coordination.

- **Expand tracking of home-related health status, exposures, and hazards.** Many existing surveillance systems would be more useful for healthy homes surveillance by including a few new fields, such as where illness was acquired or injury occurred. Work should begin to assess current data gaps and recommend new data fields to address those gaps in existing surveillance systems. This will make them more useful for healthy homes applications. There is a need to make existing, independent surveillance systems easier to combine and analyze. This should be accomplished by adopting standards for formatting and exchanging data.
- **Increase information collection on environmental exposures and potential hazards.** There is limited hazard and exposure information at the state and local

levels that can be analyzed to assess their relationships with health outcomes, and effectiveness of interventions. Testing for contaminants in private wells and radon gas in homes should be increased and the data entered into databases with standardized formats. This will provide the capability to monitor potential hazards as well as to examine their relationship with exposures and health effects.

- **Develop risk assessment tools.** Risk assessment tools should be developed to document observations of the home environment and to record responses to questions that can alert public health practitioners of needs for follow-up. The risk assessment tools should be developmentally and geographically appropriate and designed for different household characteristics. For example, a household with no children does not need safety locks on cabinets and stair gates. Lead paint exposure is a greater health threat

for young children than the elderly. On the other hand, many types of fall-prevention strategies are most appropriate for the elderly.

Develop a holistic healthy homes health marketing plan and health messages.

KNOWLEDGE IS THE critical first step to making behavioral changes. Much health information has been generally developed by subject matter experts at CDC and other federal agencies and organizations that can be adapted for a home perspective. This information is not yet fully developed for dissemination to a wide range of audiences. Existing information and health information related to the home's physical and social environments should be compiled and appropriately targeted to multiple audiences. The following actions will increase the effectiveness of Health Homes communication activities:

Existing information and health information related to the home's physical and social environments should be compiled and appropriately targeted to multiple audiences.





Educational resources directed toward health professionals often neglect the housing component, whereas information for housing professionals tends to lack the public health perspective.

- **Develop a comprehensive health marketing plan.** A comprehensive plan will help to identify multiple target audiences. Target audiences should include the public, health and housing professionals, builders, architects, pest control specialists, and weatherization experts, to name a few.
- **Develop existing messages so they are appropriate for various target audiences.** For example, older adults should be advised about good nutrition and physical activity, as well as specific actions to prevent falls around the home. Families with pregnant women or with children should be advised to adopt smoke-free home rules. Adolescents and adults at risk for intimate partner violence should be targeted with messages about positive behaviors that reduce the risk for conflict escalating to violence.
- **Develop effective, bundled messages.** The healthy homes approach of addressing multiple home-related health issues simultaneously requires assessing the most effective ways to deliver these messages and products. An example of bundled products in a home improvement store

would be a display for gas generators. The display also would include carbon monoxide monitors and outdoor extension cords. A brochure would accompany the generator explaining the need to use the generator outdoors with an outdoor extension cord and to install a battery-operated carbon monoxide monitor indoors to alert residents if carbon monoxide enters the home.

Increase the number of workers trained in healthy homes strategies.

HEALTH OR HOUSING workers who visit homes should be cross-trained to assess and address multiple problems within a home. Currently, educational resources directed toward health professionals often neglect the housing component, whereas information for housing professionals tends to lack the public health perspective. These actions will expand the number of workers trained in healthy homes strategies:

- Adapt existing training programs to include healthy homes approaches and information, and develop a set of core competencies.



- Training should include a common, science-based framework for identifying, developing, and implementing healthy housing practices.
- Promote interdisciplinary training and collaboration between professionals and the skilled workers who perform the actual construction and remodeling tasks.
- Develop a Healthy Homes licensing or certification program for individuals who demonstrate proficiency in the set of core competencies.
- Develop a Healthy Homes Fellowship program that provides year-long onsite training at CDC for emerging leader in the field.
- Cross-train ATSDR health communicators in healthy home assessment and remediation interventions.

Increase scientific knowledge about the relationship between health and home environment.

A BETTER UNDERSTANDING of the relationship between health and safety and the total physical, behavioral, and social environments in the home is necessary to develop effective healthy homes interventions. Best practices for prevention that take a science-based comprehensive approach should be compiled. To increase the amount of scientific knowledge applicable to healthy homes issues, the following actions should be undertaken:

- Increase knowledge of the relationship between biomonitoring results and health outcomes. This will help us understand the health impact of exposures to contaminants in the home.
- Increase research of the social and physical environment, and of behaviors that

affect an individual's ability to adopt healthy and safe practices. Such research will necessitate a broad approach involving many disciplines (e.g., health promotion, engineering, psychology, design, and environmental science).

- Identify additional housing factors, including using green materials and improved construction methods, that either can harm or promote and protect people's health. Then use this information to develop healthy homes interventions, policies, and regulations.
- Identify subpopulations most at risk for disease, injury, or disability. More research is needed to understand which groups of people are likely to be exposed to toxic pollution sources in and around their homes. When this data is available, science-based interventions can be developed, targeted, and evaluated.
- Quantify the costs and benefits of healthy homes interventions. There is a need for more information about the economic costs that are incurred from disease, injury, or death as a result of unhealthy home environments. Also needed is the relative costs and benefits for, or cost-effectiveness of, those interventions that have been shown to positively affect health. This should include using green materials and products and their affect on health.
- Develop and evaluate cost effective interventions to prevent homelessness or to ensure a speedy transition to stable permanent housing by using adequate shelters and emergency services.
- Clarify the relationship between mental health and the home environment and develop interventions and design homes that promote well-being.



Initiate or strengthen partnerships that support developing a housing supply that is affordable, accessible, and sustainable.

PUBLIC HEALTH AGENCIES typically do not design, construct, or maintain housing (Krieger and Higgins, 2002). They also do not develop or enforce building codes and zoning laws, nor do they provide financial housing assistance. However, all these activities have significant affects on public health so it is critical for public health agencies to partner with other agencies and organizations that are directly involved in these housing issues.

Public health agencies typically do not design, construct, or maintain housing. They also do not develop or enforce building codes and zoning laws, nor do they provide financial housing assistance.

MANY SUCH AGENCIES and organizations play important roles in improving health and safety in homes. CDC partnerships with EPA, HUD, and other federal agencies and their state and local counterparts should be expanded. Professional organizations, such as those of architects and urban planners; business entities, such as home improvement stores and builders; and other non-governmental organizations all can play roles in ensuring that an adequate number of affordable and accessible homes are sited, designed and constructed to be healthy, safe, and green. Finally, community-based and advocacy organizations are needed to initiate grassroots movements, identify popula-

tions most in need, and to raise social capital and empowerment. Good interdisciplinary collaboration is essential for success; the following actions will help achieve this:

- Create a national coalition of experts and practitioners in the health, housing, planning, environmental science, and economics fields. These specialists should:
 - Develop a coordinated national agenda to address the most urgent housing needs for disparately affected populations.
 - Create a national dialogue and share successes and lessons learned from healthy home pilot programs.
 - Identify and disseminate cost effective, science-based best practices that address known risks and protective factors.
 - Establish a standardized vocabulary and consistent measures to track progress in achieving long- and short-term healthy homes objectives.
 - Develop science-based information that will inform housing-related regulations, codes, policies, and market-based incentive programs.



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***“If I were asked
to name the chief
benefit of the
house, I should
say: The house
shelters day-
dreaming, the
house protects
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house allows
one to dream in
peace.”***

***-Gaston Bachelard,
French philosopher,
1884-1962***

***healthy
people***

*in healthy
places.*

