



University of California, San Francisco
c/o California Poison Control System
San Francisco Division, Box 1369
San Francisco, CA 94143-1369
415-206-4320

University of California, Irvine
Center for Occupational & Environmental Health
5201 California Avenue, Suite 100
Irvine, CA 92617
949-824-1857

Environmental Hazards for Children in the Aftermath of Wildfires

James M. Seltzer, M.D., Mark Miller, M.D., M.P.H., and Diane L. Seltzer, M.A.
Pediatric Environmental Health Specialty Units (PEHSU) Region IX
University of California, Irvine School of Medicine
&
University of California, San Francisco
November 5, 2007

Children are especially vulnerable to environmental hazards. They eat more food, drink more liquids, and breathe more air than adults on a pound for pound basis. Children are in a critical period of development when toxic exposures can have profound negative effects, and their exploratory behavior often places them in direct contact with materials that adults would avoid.







Wildfires expose children to a number of environmental hazards, e.g., fire, smoke psychological conditions, and the byproducts of combustion of wood, plastics, and other chemicals released from burning structures and furnishings. While wildfires are burning (acute phase), the major hazards to children are fire and smoke (described in the fact sheet "Health risks of wildfires for children – acute phase").

In the aftermath of wildfires – the recovery phase - children may be exposed to a different set of environmental hazards involving not only their homes, but also nearby structures, land, and recovery activities. The environmental landscape is dotted with potential hazardous conditions and situations (hereafter referred to as environmental hazards). Some of these are easy to see, such as broken glass and exposed electrical wires, and others are not, such as soil contaminated with hazardous materials like lead or persisting hot spots which can flare without warning.

Key requirements for children to return to an area impacted by wildfires include restored drinking water and sewage removal, safe road conditions, removal of ash and debris, and structurally sound homes. Schools and outdoor play areas should be cleaned, cleared of hazards and made ready for use. Persisting hazards should be isolated and made inaccessible to children. Children, and whenever possible, teens, should only be permitted to return after affected areas have been cleaned up. **Children should be the last group to return.** These recommendations also apply to pregnant women.


Key facts and recommendations for children and their families in the aftermath of wildfires are highlighted below.


BEFORE RETURNING TO YOUR HOME:

-  Know the location and status of your nearest medical treatment facility and verify the route to reach it is passable.
-  Be sure a clean water supply, electricity, and communication system (including 911 access) is restored, reliable, and readily accessible.
-  Be certain areas not yet cleaned or not safe are not accessible to children.
-  Routes to and from living, learning, and playing places should be as clean and free of environmental hazards as possible to reduce the risks of harm.
-  Homes and outdoor areas where children play (e.g., parks, playgrounds, yards) should be clean and free of environmental hazards.
-  Thoroughly remove ash at sites where CCA (pressure treated) wood was present, such as wooden decks, play structures, and wood chips. Clean the area, as the ash may contain high levels of arsenic.


FIRE DAMAGE

TOXIC HAZARDS

 **Ash:** The recent fires have deposited large amounts of ash on indoor and outdoor surfaces in areas near the fires. This ash may cause irritation of the skin, nose, and throat, and may cause coughing. Ash and dust (particularly from burned buildings) may contain toxic and cancer causing chemicals including asbestos, arsenic, and lead. For these reasons children should not be in the vicinity while cleanup is in progress. Even if you are careful it is easy to stir up dust that may contain hazardous substances.

 **Carbon monoxide:** NEVER use generators, space heaters, or any gas or kerosene appliances in enclosed spaces as this may result in carbon monoxide poisoning.

PHYSICAL HAZARDS - Children should not be permitted near potentially harmful physical hazards

 **Debris:** Broken glass, exposed electrical wires (whether or not they are “live”), nails, wood, metal, plastics, and other solid objects commonly found in areas of fire damage can cause puncture wounds, cuts, electrical injuries, and burns from smoldering materials.

- ✿ **Watch for ash pits and mark them for safety.** Ash pits are holes full of hot ashes, created by burned trees and stumps. Falling into ash pits or landing in them with your hands or feet can cause serious burns. This underscores the need for children to only enter areas that have been cleaned and examined for safety.
- ✿ **Unstable building structures** including flooring, stairways, railings, balconies, roofing, and fire escapes. Children should not be permitted in the residence or permitted to play on nearby fire-damaged buildings or structures until these have been cleared by their local authorities.
- ✿ **Materials in storage** areas may have moved into unstable positions and could fall. Doors and entryways to storage areas should be opened carefully.
- ✿ **Floors** may be slippery.
- ✿ **Trees:** Avoid burned or damaged trees as they may be unstable and fall.
- ✿ **Roadways, sidewalks, bridges** and other outdoor structures may be damaged or unstable.

CLEANING UP ASH AND DEBRIS

- ✿ Adults should wear protective face masks (see below) and goggles.
- ✿ To minimize skin contact wear gloves, long sleeved shirts, and long pants when handling ash.
- ✿ Wash any home-grown fruits or vegetables before eating.
- ✿ Clean all children's toys before using.
- ✿ Avoid spreading the ash in the air; wet down the ash before attempting removal; do not use leaf blowers or shop vacuums.
- ✿ Avoid washing ash into storm drains.
- ✿ Collect ash in plastic bags and deposit in the regular trash, unless you suspect hazardous waste is present – in which case you should contact your local hazardous waste authorities regarding appropriate disposal.
- ✿ Other hazards to be aware of include glass and sharp objects, snakes, and unstable damaged walls, walkways, or other structures.
- ✿ More detailed recommendations for cleaning up ash and debris can be found on the websites shown below.

WATER DAMAGE

- ✿ Water damage to building materials, e.g., walls, flooring, support timbers, furniture, and personal belongings can release potentially hazardous chemicals that could cause rashes, infections, or exposure to toxins.

- 🌐 Wet materials are breeding grounds for bacteria and fungi. Potentially harmful microorganisms grow readily on or in non-refrigerated food and liquids. They can also grow on damp building materials, personal belongings, and dead animals.

🏠 UTILITIES

- 🌐 **Water:** In areas impacted by the fires water pressure may have been lost or entirely out for periods of time. Check with your water provider to be sure that your water is OK to drink. If your water comes from a private well that has had damage it may require disinfection. If you are uncertain of the cleanliness of your water you may heat it to a rolling boil for 1 minute to kill potentially harmful bacteria and other microscopic organisms before drinking. If your water looks dirty do not drink it. Directions for well disinfection treatment are available from the San Diego County website listed below.
- 🌐 **Electricity:** Electrical hazards need to be repaired. Avoid down or damaged electrical lines.
- 🌐 **Propane:** If your home propane tank is damaged and leaking call 911 and your propane service provider. Do not transport leaking BBQ propane tanks in your car or dispose of them in the trash. Contact the hazardous materials section of your local health department for information.

🏠 FOOD

- 🌐 Loss of power to refrigeration and freezer units can cause food to spoil, for example, meats, milk and egg products. Do not feed children such foods that have warmed, e.g., close to room temperature for more than 2 hours. Immediately discard cooked and uncooked foods that may have spoiled. Frozen foods that have thawed to room temperature for more than 2 hours should also be thrown away. If food smells bad or looks bad, or if you're just not sure it's safe, throw it out. Also, discard any food that may have come in contact with hazardous materials, e.g., fire retardant, ash. **When in doubt, throw it out!**

🏠 ANIMALS

- 🌐 Deceased animals should be removed or buried as soon as possible to prevent children from contacting the microorganisms that grow readily on the carcasses. Guidelines and local assistance can be found at the websites listed below or from your county health department.
- 🌐 Keep your child away from wild or stray animals. They may be hurt or afraid, and may bite. If your child is bitten, immediately seek medical attention.

- 🌐 Stay away from snakes and other animals that may seek shelter in your home. Open nearby windows and doors to permit an easy escape route. If the animal will not leave on its own, phone your local animal control office for assistance.

🚧 TRAFFIC AND CONSTRUCTION

- 🌐 Alterations in automobile traffic may occur as a result of clean-up or restoration operations, e.g., rerouted, slowed. This may result in heavier traffic in areas where children may play or travel.
- 🌐 Construction should be effectively isolated from pedestrians and residents in areas frequented by children to minimize hazardous situations, e.g., hazardous chemicals (use and storage), increased traffic, especially of large vehicles, and falling debris. Unfortunately, it may be impossible to effectively isolate some hazards, such as noise.
- 🌐 Children who may be affected by such changes should be counseled to be extra careful crossing streets, watch for traffic from atypical directions, and to watch for construction vehicles.
- 🌐 Parents should be aware of any changes that may affect both driving patterns and children's play patterns to avoid colliding with children in the area.

🚧 PREVENTIVE MEASURES

- 🌐 **Personal hygiene:** If your child has had contact with any potentially hazardous substance or has been playing in a fire-damaged area wash their hands and any other exposed body part thoroughly with soap and water or bathe them. Remove any exposed clothing and wash separately as soon as possible.

🌐 MASKS

- 🌐 Paint, dust, and surgical masks are not effective obstacles to inhalation of the fine airborne particles in smoke generated by wildfires. However, they do provide partial protection from ash which contains larger particles, during clean up.
- 🌐 Masks that filter out 95% of particles measuring 0.3 micrometers diameter or larger are more effective if properly fitted to the wearer's face, and are safer than other, less effective, types of masks. They are available at hardware stores and from mail order catalogues, and are usually termed "N95", "R95", or "P95".
- 🌐 Even more efficient masks, e.g., "N99" or "N100", are also available. Full-face and half-face respirators with HEPA filter cartridges that

efficiently filter out the fine airborne particles in smoke as well as some gases can be purchased, but are significantly less comfortable than the masks.

- ✿ No mask is effective unless it is fitted properly. Any of these masks can be uncomfortable to wear and breathe in for any extended period of time. Some brands produce masks for various sized faces.
- ✿ Although smaller sized masks may appear to fit a child's face, none of the manufacturers recommend their use in children. If your child is in an area that warrants wearing a mask, you should remove them to an environment with cleaner air.

PSYCHOLOGICAL HAZARDS

- 🌍 During the recovery phase, children may experience significant emotional distress, resulting from excess anxiety, ongoing stress, grief associated with loss and trauma related to having lived through a natural disaster. Children may suffer from fears connected to the smell of smoke, feelings of anxiety when weather conditions indicate a heightened potential for fires, or overwhelming guilt at having survived the wildfires with little or no damage to their property. If children experience the loss of a loved one or their home, their sense of personal safety and security is often destroyed as well.
- 🌍 Children's behaviors frequently reflect their current state of mind. Parents should remain watchful for behavioral changes related to psychological distress, for loving adults are in a unique position to provide a tremendous amount of support and comfort to the children in their care. Emotional distress may show itself in a variety of ways, depending upon a child's age, stage of development and emotional state before the onset of the wildfires. Parents and caregivers may observe children displaying one or several of the following reactions during the recovery stage:
 - ✿ Irritability
 - ✿ Uncooperative behaviors; i.e., argumentative, quarrelsome
 - ✿ Physical complaints; i.e., stomach aches, headaches, general complaints of feeling unwell
 - ✿ Clinging to parents or caregivers; difficulty separating
 - ✿ Nightmares
 - ✿ Eating or sleeping too much or too little
 - ✿ Exaggerated tales related to the wildfires
 - ✿ Risk-taking behaviors
 - ✿ Indifference
 - ✿ Fatigue, both physical and emotional
 - ✿ Withdrawal from previously enjoyed activities
 - ✿ Difficulty concentrating or focusing at home and/or on school work
 - ✿ Aggression or outbursts of anger

- ✿ Uncontrollable crying or weeping
 - ✿ Fears, e.g., the dark, monsters, strangers, being left alone
 - ✿ Returning to “babyish” behaviors

- 🌍 Parents and caring adults are well-positioned to provide significant support and assistance to children during times of emotional disorder and distress. Even if circumstances require a family to relocate to temporary housing, the sooner routines and structures previously in place are re-established, the more quickly children will begin to experience the return of feelings of normalcy, security and safety.

- 🌍 Parents and caregivers play an important part in establishing environments where children feel safe to express their fears, concerns, and feelings of powerlessness. The following suggestions and recommendations will assist parents and other involved adults in their efforts to support children experiencing tumultuous emotions and significant personal challenges as a result of the recent wildfires.
 - ✿ Maintain continuity and familiar routines in the child’s life, both at home and school.
 - ✿ Listen, listen, listen with an open heart and mind, without judging or attempting to fix the problem.
 - ✿ Imagine how the child feels; let children know their feelings are normal.
 - ✿ Encourage expression of feelings through conversation, role-playing, music, visual art, and writing (letters, diaries, journals).
 - ✿ Provide honest and accurate answers to the questions children ask, keeping in mind the child’s age and their ability to make sense of your response.
 - ✿ Reassure them with words, for children gain confidence and comfort from your strength.
 - ✿ Provide hugs and comforting touches, remembering children thrive on loving human contact.
 - ✿ Practice patience. Children may need a bit more time and encouragement, as well as overall understanding at this time.
 - ✿ Emphasize a child’s personal strengths and help the child recognize his/her coping skills already in place.
 - ✿ Help children to see there were heroes and helpers who tried to make things better for the community during a time of need.
 - ✿ Find ways to reach out to other children who may benefit from your helping hand.
 - ✿ Encourage and schedule time for children to be with a favorite friend or a supportive group their age.
 - ✿ Although children may need to discuss the events repeatedly, minimize the amount of time a child is exposed to scary media reports or frequent adult conversation of fire, smoke, loss of property and loss of life.

- ☀ Be alert for any self-destructive behaviors adolescent children show; e.g., drug or alcohol experimentation or use.

- 🌍 Children who were emotionally healthy prior to the wildfires usually are remarkably resistant to any serious ill effects from the wildfires. However, they look to the adults in their lives for strength, guidance and emotional stability. If parents are struggling with their own feelings of pain, loss, anxiety or vulnerability, they may not be in a position to support their child's emotional health and overall sense of wellbeing. Parents may be unaware of the unspoken psychological messages their reactions communicate to the child and inadvertently may add to a child's feeling of distress. It is very important for parents to be in touch with their own emotions and to know when to look for help from professionals who are in a position to provide mental health assistance.

- 🌍 In some cases, the whole family may benefit from counseling. It is important for parents to always remember it is a sign of health, not weakness, to ask for professional support during times of emotional distress.

To contact your local Pediatric Environmental Health Specialty Unit with any questions about this fact sheet please visit www.aoec.org/PEHSU.htm.

RESOURCES

California Governor's Office of Emergency Services

October 2007 Fires:

www.oes.ca.gov/Operational/OESHome.nsf/ALL/876C5DEE11FE66808825737C005B8754?OpenDocument

California Environmental Protection Agency Department of Health Services.

Safe Cleanup of Fire Ash: www.calepa.ca.gov/Disaster/Fire2003/FireAsh.pdf

Fire Response and Recovery: Cal/EPA Emergency Response and Disaster Preparedness: www.calepa.ca.gov/Disaster/Fire/#DebrisCleanup

Wildfire Smoke: a Guide for Public Health Officials:

www.arb.ca.gov/smp/progdev/pubeduc/wfgv8.pdf

County of San Diego - Department of Environmental Health

Wildfires: www.sdcounty.ca.gov/deh/index.html

Federal Emergency Management Agency (FEMA):

Recovering from Disaster:

www.fema.gov/pdf/areyouready/recovering_from_disaster.pdf

U.S.D.A. Forest Service:

Wildland Fire – chemical clean-up:

www.fs.fed.us/rm/fire/wfcs/documents/cleanup.pdf

Pediatric Environmental Health Specialty Units & American Academy of Pediatrics

Clinician Recommendations Regarding Return of Children to Areas Impacted by Flooding and/or Hurricanes:

www.aoec.org/content/Hurricane_recs_AAP_PEHSU.pdf

Additional information on supporting children during times of trauma, crisis and loss can be found on the following internet sites:

National Association for the Education of Young Children

Helping Young Children After a Disaster: www.naeyc.org/families/disaster.asp

National Association of School Psychologists

Helping Children after a Wildfire:

www.nasponline.org/resources/crisis_safety/wildfire_teachers.pdf

Responding to Natural Disasters: Helping Children and Families:

www.nasponline.org/resources/crisis_safety/naturaldisaster_teams_ho.aspx

The Dougy Center for Grieving Children & Families website regarding **grief and loss:**

www.dougy.org

We would like to thank members of the PEHSUs nationwide and members of the Committee on Environmental Health of the American Academy of Pediatrics for their assistance reviewing this fact sheet.