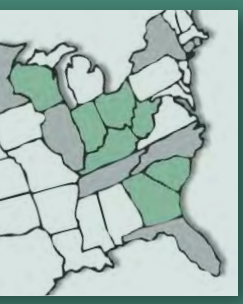
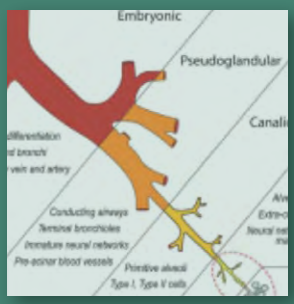
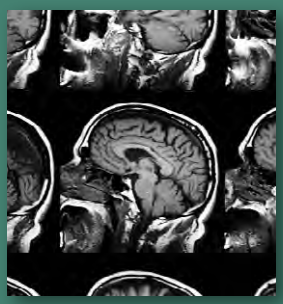
A Story of Health







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For more information:

WSPEHSU: pehsu@ucsf.edu

Authors – Sofia's story

Stephanie Holm, MD, MPH, Co-Director, Western States Pediatric Environmental Health Specialty Unit (WSPEHSU) at UCSF

Mark Miller, MD, MPH, Co-Director, Western States Pediatric Environmental Health Specialty Unit (WSPEHSU) at UCSF; Director, Children's Environmental Health Center

Samuel Goldman, MD, MPH, Principal Investigator, WSPEHSU

Marya G. Zlatnik, MD, MMS, WSPEHSU

Anthony Pacini, MD, MPH, Occupational and Environmental Resident, UCSF

Maria Valenti, Director, Health and Environment Literacy Project, Commonweal

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ART TEAM

Illustrations, eBook design, production
Stephen Burdick,
Stephen Burdick Design
(Behance portfolio)

Illustrations
Dan Higgins- Artist

REVIEWERS

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Catherine Karr, Scott Needle, Melanie Marty, Petra Steinbuchel, Susan Lyon Stone

OTHER CONTRIBUTORS

Videos Contributors: Scott Needle, MD, FAAP

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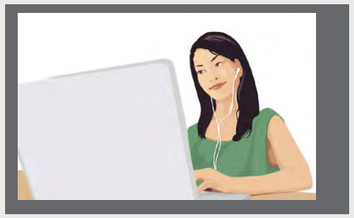
HELP PAGE How to Navigate Our eBook

THE INDIVIDUAL STORIES OF HEALTH in this eBook are written to address many audiences. For example, some sections are more technical than others – you can skip sections if you wish.

(Note: underlined words or phrases link to online information, prompt down-loads or navigate to a related page.)



Each of the eBook stories is embedded with a wide range of resources. These help further explain possible environmental and/or genetic "risk factors" – (contributors to the development of a disease, or factors that might make a disease worse) – and how these factors interact.

We also provide links for additional resources, including actions you can take to prevent disease, and "tools you can use."

RESOURCES INCLUDE videos, slides with audio commentary, tables, charts, and graphics. Some 'pop-up' in the story, and some connect online. Through these links, you can choose to dig deeper and learn more. Refer to the icons (to the right) for guidance.

REFERENCES AND CITATIONS: Certain references are cited in the text where we believe they are most warranted. Full references by topic can be found at the end of each story.

To enroll in this CME go to:
https://www.train.org/cdctrain/course/1118589/details

Getting Started

Our eBook Navigation: Click on selections in the bar at the top of each page to move between stories, navigate back to this 'Help Page', and to find out more in the References section.

If you lose your place, use the 'Go Back' selection in the navigation bar to return to your previous screen.

Adobe Acrobat Tools

This interactive pdf document is best viewed on a laptop or desktop, downloaded and opened in a current version of Adobe Acrobat Reader. Refer to the top Adobe menu bar for features including:

Magnify - If you want to enlarge a diagram or some text, click (+) button.

Move through pages - You can use the up and down arrows to move through pages.

You can also move through pages using the scroll up and down feature to the right of your screen.

Note: Navigation features may not work properly using other pdf reader platforms.

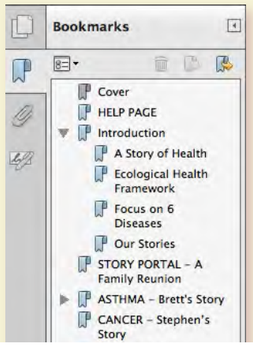


Table of Contents

Use the sidebar Bookmark Tools as a table of contents to skip to a section of interest, find your place, or return to this Help page.

Icons

Click on icons that may appear throughout the stories for pop-ups, videos, and links to more information as described.

- key concept
- watch a video
- additional resources, tools
- technical details for health professionals
- definition

INTRODUCTION Free Continuing Education

Information on free Continuing Education offered from the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry

Before you begin the story, please review the learning objectives at right. These will help you focus as you read the story, and prepare you for the CE test.

We have linked to many useful resources in this story relevant to a wide range of audiences, including clinicians. To quickly access resources on specific topics in this story, use the Bookmarks toolbar on the left (which you can open or close), or return to the Help page for more details on other eBook features.

Free credits are offered by the Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease.

Free Continuing Education available by specialty:

- Continuing Medical Education (CME) for Physicians
- Continuing Nursing Education (CNE) for Nurses
- Continuing Education Units (CEU) for other professionals
- Continuing Education Contact Hours (CECH) for Certified Health Education Specialists (CHES)

Review these learning objectives for Sofia's story:

- Identify the components of wildfire smoke.
- Explain the relationship between climate change and wildfires.
- Explain how wildfire smoke affects asthma.
- Explain why children are more vulnerable to wildfire smoke than adults.
- Identify the chronic health effects of wildfire smoke.
- List ways patients can protect themselves from wildfire smoke.
- Describe wildfire emergency preparedness procedures to protect health.
- Explain how to assess and protect indoor air quality during wildfires.

Register and take the test for free CE for a variety of health professions. Follow this link to the CDC/ ATSDR CE page.

WILDFIRE HEALTH IMPACTS Sofia's Story

Sofia is a healthy 9-year-old girl who lives in Southern California. Sofia and her friend Brett love playing soccer together. Brett is the same age, lives nearby and has asthma.

Charles, one of Sofia's dads, coaches the soccer team. He often picks up Sofia and Brett from school on practice days.

Unfortunately, this year a lot of their practices and games have had to be cancelled because of wildfire smoke.

Particulate size infographic used with permission from California Air Resources Board.

- What's in Wildfire Smoke?
- Envisioning Particulate Matter
- Don't Rely Entirely on Odor or Visibility to Determine Risk

WILDFIRE HEALTH IMPACTS Sofia's Story

"Hi kids!" Charles says as they get in the car after school.

Sofia tells her dad that they've been learning about climate change at school. "Did you know that climate change makes wildfires bigger?"

Brett adds, "Maybe that's why we've had so many fires and why we've had to miss so much soccer in the last couple years."

- Climate change and wildfires
- Increasing risk of very large fires in US
- Annual Acres Burned by Wildland Fires in the US

Climate Change forest fire image by Jean Beaufort courtesy of Publicdomainpictures.net.
Increasing risk map used with permission from Climate.gov.
Annual Acres Burned data source: National Interagency Fire Center.

WILDFIRE HEALTH IMPACTS Sofia's Story

Today is one of those days when there is a nearby fire blowing smoke into their area.

"Before we go to practice we're going to stop at home for a snack and to check on the air quality because there is some smoke in the air," says Charles.

"OK Dad but let's not stay too long because we really want to practice, we have a big game coming up," says Sofia.

Watch: Be Smoke Ready: Know Where to Go for Air Quality Info

The US EPA demonstrates the use of some of their tools for finding your local Air Quality Index (AQI).

Air Quality Index: How do I know if the air around me is bad?

Air Quality Index table via airnow.gov.

Additional resources:

- **Go to airnow.gov to check your local air quality.**
- **Go to fire.airnow.gov for detailed information on air quality in your community.**
- **If conditions are changing rapidly, some maps show changing information faster, such as the PurpleAir map, but this data may be less high-quality.**

Wildfire smoke in Japatul Valley photo by Dammit Karissa, courtesy of Wikimedia Commons.

WILDFIRE HEALTH IMPACTS Sofia's Story

Charles and the kids arrive at Sofia's house where Sofia's other dad, Jose, has just gotten home from his job at the health department. Jose has snacks of empanadas and applesauce ready for Sofia and Brett. As they eat, they talk about school.

"I don't like the smoke," Sofia says. "Sometimes they won't let us go outside for recess when there's smoke."

"It makes me cough and my breathing feels bad because of my asthma," adds Brett.

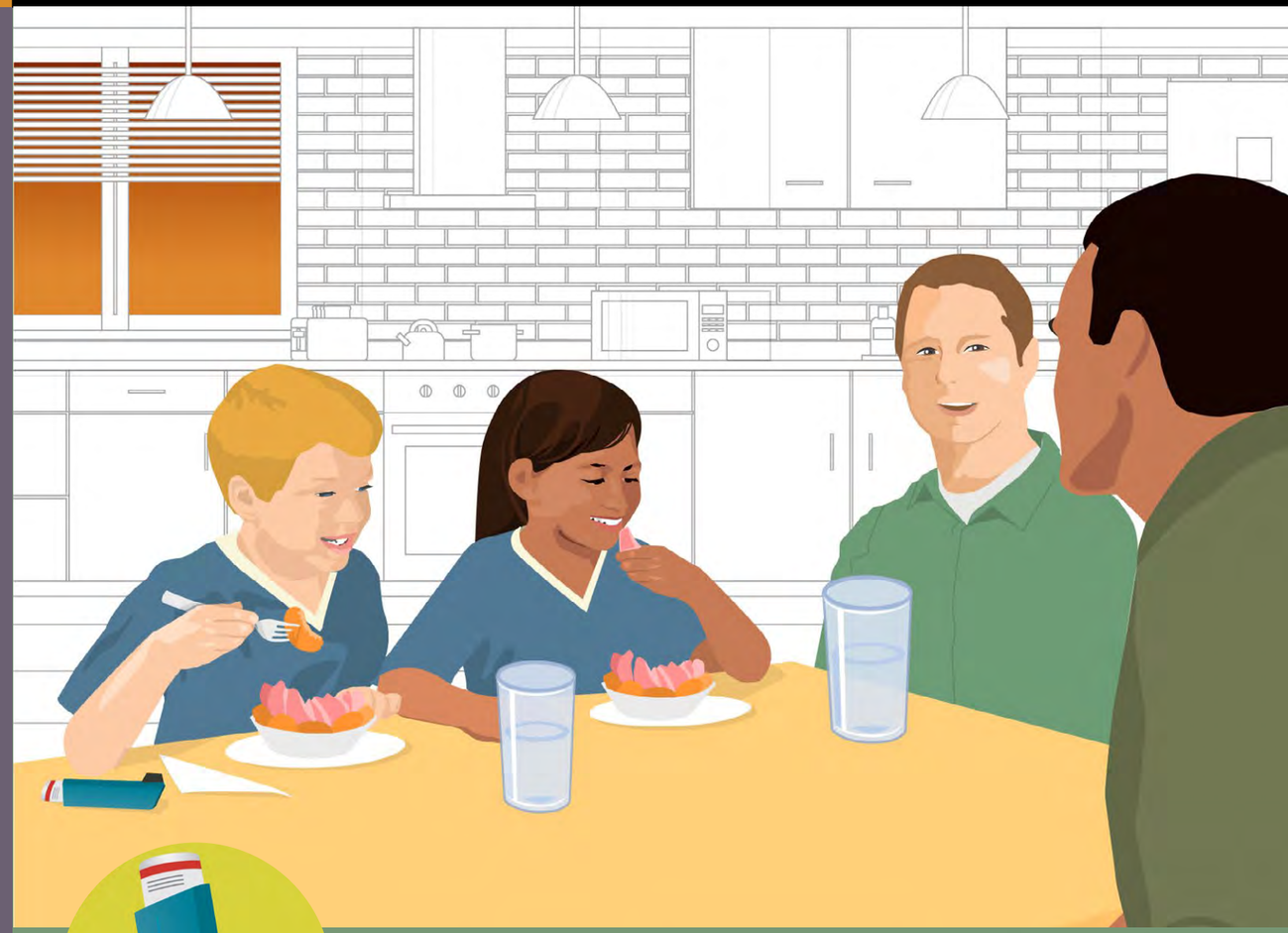
"Smoke can affect everyone's breathing even if you don't have asthma. How is your breathing now, Brett?" asks Jose. "When did you last use your inhaler?"

Brett says he hasn't used his albuterol inhaler since the morning and he is coughing a lot, so Jose suggests he take his dose and stay inside where the air is filtered.

Key Concept: Inflammation, oxidative stress and wildfires

- Oxidative stress
- Inflammation

Asthma and Wildfire Smoke — Tips for your patients



Asthma and Wildfire Smoke Resource: The Lung Association Saskatchewan: Wildfires Impact lung health

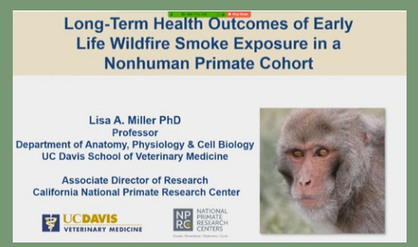
Resource: CDC: Wildfire Smoke Precautions for People with Chronic Conditions **(cdc.gov)**

WILDFIRE HEALTH IMPACTS Sofia's Story

"But I don't have asthma," says Sofia. "Why can't I play soccer when there's smoke?"

Jose explains to Sofia that all kids are more sensitive to smoke than adults. Kids with breathing problems, like Brett, can be even more sensitive.

Watch: Lisa A. Miller, PhD, discuss her research on wildfire smoke and nonhuman primates



- **Wildfire smoke can affect children's health in a number of ways**
- **Early life wildfire smoke exposure may have life-long impacts**

Resources:

UCDavis: As Fire Threats Grow, Exploring and Treating the Impacts on People, Animals and the Environment

Wildfires — What Parents Need to Know

WILDFIRE HEALTH IMPACTS Sofia's Story

"What about Tia Alejandra?" asks Sofia "Is it okay for her and the baby to be around smoke? Doesn't she live where the fires are right now?"

"Great question!" Jose says to Sofia,

"People who are pregnant are also extra sensitive to smoke. Some other adults can be sensitive too. We are worried about her so we called her today."

"She said she called her OB/GYN doctor but the doctor wasn't in her office due to the fire. Her doctor had left a message with information for her patients and an emergency number so Alejandra called and set up a virtual visit with her."

- **Pregnancy is a vulnerable period for wildfire smoke and air pollution exposure**
- **Pre-existing health conditions increase wildfire smoke impacts in adults**
- **Health risks related to wildfires fall disproportionately on already at-risk communities**

WILDFIRE HEALTH IMPACTS Sofia's Story

Charles comes back in, and tells Jose the bad news. "The air quality right now is in the red 'unhealthy' range, so they are going to have to cancel soccer today."

"But Dad! I really wanted to play." Sofia cried. "And you're the coach, can't you just say that we're going to play? Couldn't we just wear masks?"

Charles shakes his head, "Certain kinds of masks protect us from some of the smoke, mija, but it's safer to stay inside with good air if we can. Masks could be used to protect us when we have to be outside — like to travel to school, but we shouldn't do extra things outside, like playing sports."

Brett starts to cough and says "Maybe he's right. The smoke is making me cough and I'm having trouble breathing. I'm not sure I could play right now."

- Infographic for the public about mask/ respirator use by children
- When considering a mask or respirator for a child, think about four questions
- Visualization of exposure decreases with mask use

For more info:

Western States Pediatric Environmental Health Specialty Unit (WSPEHSU)

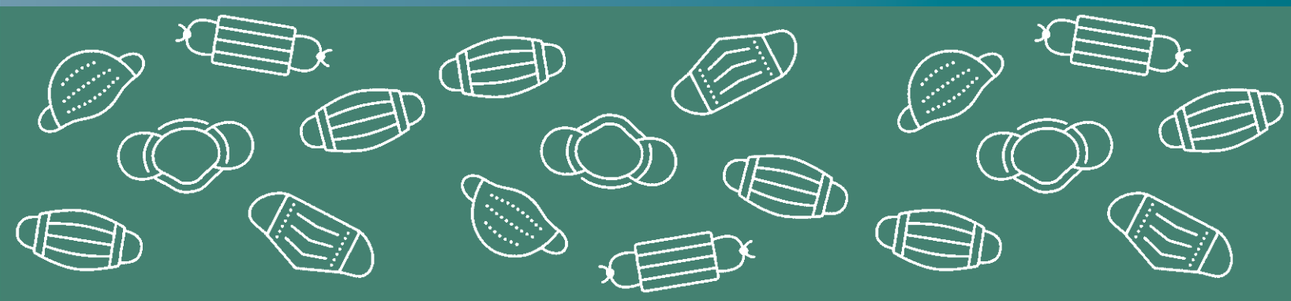
Can masks protect against wildfire smoke?

No mask or respirator eliminates wildfire smoke exposure for adults or children. Some masks may decrease exposure to particles, but likely will not protect from other components of wildfire smoke such as VOCs.

- Cloth masks should not be relied upon for protection from wildfire smoke.
- Medical masks may provide a small decrease in exposure for children, with more protection the better they fit.
- NIOSH-approved N95s (with or without an exhalation valve) will decrease exposure more, especially if they are well fitted.

When considering a mask or respirator for a child, you want to think about four questions:

- How well does the material filter?
- How easy is the material to breathe through?
- How tightly does the mask or respirator fit to my child's face? The mask or respirator should fully cover the nose and mouth without gaps around the nose, cheeks, and chin.
- Are these products regulated such that I can be confident in providing guidance to my patients?



WILDFIRE HEALTH IMPACTS Sofia's Story

Brett asks "Could I stay and play inside with Sofia since we don't have practice?"

Charles says sure and calls Brett's mom to double check.

"If the air quality is so bad that we can't play soccer, why is it okay to play inside?" asks Sofia.

"Well, Sofia," says Jose, "We actually do a lot of things related to indoor air quality where I work, so I know a lot about ways to keep the air inside cleaner than it is outside."

- **How does wildfire smoke get into the house?**
- **Mitigation techniques**
- **Look for the MERV rating on air filters**

For more info:

CARB certified air cleaners

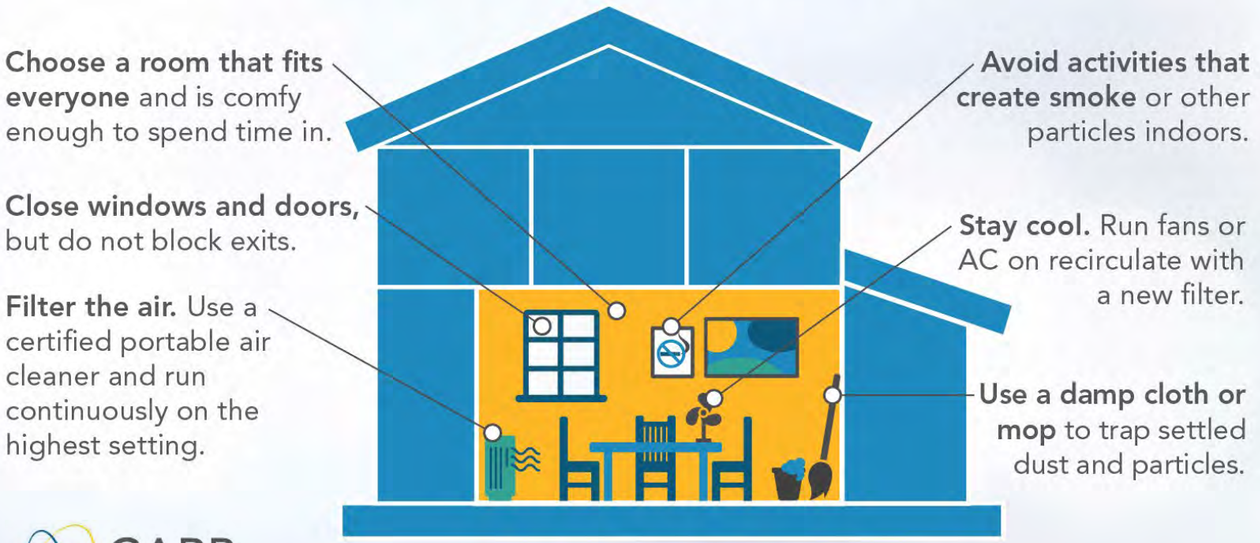
California Air Resources Board : **Protecting Yourself from Wildfire Smoke**

EPA: How Does Wildfire Smoke Affect Indoor Air Quality?

Mitigation techniques: Create a "Clean room" in your house

EPA's Wildfire Guide Indoor Air Filtration fact sheet

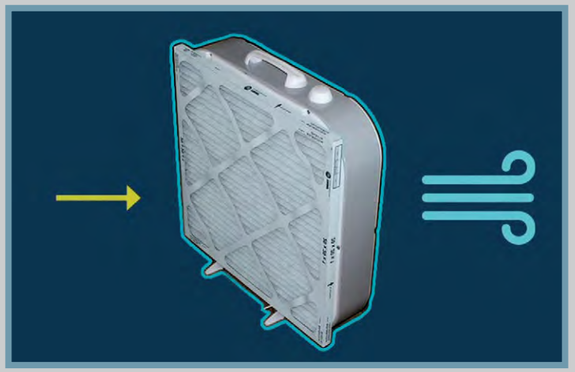
Create a Cleaner Air Space



CARB

Graphic courtesy of California Air Resources Board

Do It Yourself Air Filter Fan



Innovative appropriate technology solutions can provide some low-cost protection from wildfire smoke. An example is the "Do It Yourself Air Filter Fan."

Using an ordinary house fan and a MERV 13 filter, these can be made at much less cost than purchasing a room HEPA filter and thus provide an option for many in vulnerable low-income families where cost or availability may hamper protection efforts.

Information on how to make your own is available at the Puget Sound Clean Air Agency website. Their tests showed that in a small room a filter fan can reduce particulates by as much as 90%.

WILDFIRE HEALTH IMPACTS Sofia's Story

Later that evening, Brett's mom Kari comes to pick him up. "Thanks!" Brett says to Sofia and her dads for having him over to play.

Kari asks Jose if any of their family live close to where the fires are.

"Yes, actually," says Jose, "My younger sister Alejandra, who is pregnant, just heard that she and her family need to evacuate."

"Safe travels to her family," says Kari. "Let me know if I can help."

After Brett and Kari leave, Jose checks in with Sofia "Remember that we have a plan for emergencies?"

"Yes, I do, I remember what we practiced and where the emergency kit is," says Sofia.

- **Preparedness for potential wildfire evacuations**
- **Evacuation Alerts and Procedures**
- **Evacuation order checklist**

Download a printable version of this checklist at University of California Cooperative Extension, Fire in California.

For more info:

NIXLE Local Agency Alerts

This is an example of a private company that allows local agencies to provide alerts.

FEMA mobile device location alerts

Ready.gov family disaster planning (Spanish version)

American Academy of Pediatrics Family Readiness Kit

Firesafe Marin Example of a local evacuation checklist

Watch: Scott M. Needle MD discusses disaster preparedness

In this 5 minute excerpt of a lecture at the American Academy of Pediatrics National Conference, Dr. Needle discusses how healthcare providers can help their patients be prepared.

WILDFIRE HEALTH IMPACTS Sofia's Story

Later that evening Jose's sister Alejandra and her daughter Lucia arrive and they are anxious and worried. Alejandra's husband is a firefighter so he has stayed behind as part of the fire response.

"We didn't want to leave our home and Lucia's dad but the fires were getting so close and the smoke so bad that we were ordered to evacuate," says Alejandra. "But we were lucky to have transportation, some of our neighbors don't. And the smoke is especially hard on those with heart or lung disease."

"We love having you here and are so happy you are safe," Jose and Charles both say at once. "We'll watch what's happening and tell you if there is something you need to know."

"Muchas gracias," says Alejandra. "We are so tired and worried about Eduardo fighting the fire, and our house and everything happening in our community. But there's nothing we can do right now."

Communities need long-term mental health support after wildfires

Resources to help children/families cope with wildfires:

National Assn of School Psychologists **Helping Children After a Wildfire: Tips for Parents and Teachers**

Amer Psychological Assn Resources on Wildfires
Managing Distress Related to Wildfires

More wildfire resources:

National Child Traumatic Stress Network (NCTSN)

"Trinka" NCTSN Story book
Download in English
Download in Spanish

The Help Kids Cope app (from NTSCN) gives parents tips for supporting children before, during and after disasters, including wildfires.

WILDFIRE HEALTH IMPACTS Sofia's Story

The next day everyone was worried about family health issues regarding the fire, so they decided to call their family practitioner, Dr. Holm.

They asked a lot of questions and she was able to reassure them about some of their concerns, by showing them actions that they can take to decrease exposure to their family.

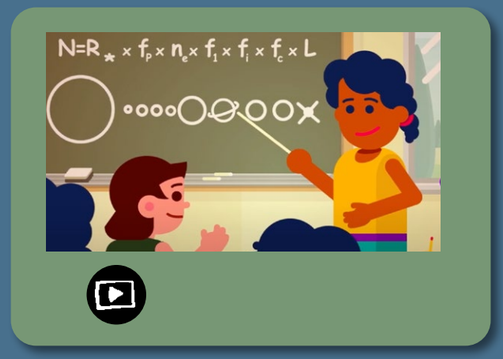
- Examples of frequently asked questions to healthcare providers part 1
- Examples of frequently asked questions to healthcare providers part 2

WILDFIRE HEALTH IMPACTS Sofia's Story

The next morning, everyone is up early to check on the fire status. They are all very relieved to see that the fire has been contained and that Alejandra and her family might go home soon. Jose and Sofia see Brett and Kari during school drop-off.

Kari knows that Jose works in public health and knows a lot about air pollution and wildfire smoke. She asks him how they know whether the air inside the children's school is safe for them to breathe?

Jose says that he was just headed into the office to share some information with the school principal on that exact topic.



Watch: The Importance of Ventilation in Schools (6 min)

A video from UC Davis energy about how ventilation of schools can improve children's health and learning.

- **Use of low cost sensors can aid in school decision making**
- **Two important things to consider when looking for a low-cost sensor to purchase**
- **Indoor air quality in schools and how to improve it**

Resources:

Washington State Department of Health
Guidance on wildfire smoke school closure, children's outdoor activities cancellation

AQ-SPEC
Air Quality Sensor Performance Evaluation Center

Air Quality Sensor Performance Evaluation Center (AQ-SPEC) Provides 3rd party evaluations of low-cost sensors

PurpleAir air quality map interface
(This is an example of a private company that manufactures low-cost sensors.)

EPA Creating Healthy Indoor Air Quality in Schools

Rengie Chan interview excerpt and photo via Berkeley Lab News Center

WILDFIRE HEALTH IMPACTS Sofia's Story

That evening when everyone returns from work and school they have dinner together.

Alejandra tells them that Eduardo called her — the local authorities have said it's safe to return to their home soon, which luckily has not been harmed by the fire!

"I hope that means we won't have any cleanup to do," she adds.

"There might still be some ash around your property. Let's ask Eduardo to check with the authorities about who is responsible for cleanup in your area," says Jose, "Children and pregnant women shouldn't be involved in cleanup of ash and debris so if there's anything you guys are responsible for, we'll come and help."

Stay safe after a wildfire

More comprehensive resources:

PEHSU Environmental Hazards for Children in the Aftermath of Wildfires

PEHSU Wildfire and Smoke Resources

(CDC) Stay safe after a wildfire

Red Cross Recovering after a fire

Red Cross Returning home after a wildfire safety checklist

WILDFIRE HEALTH IMPACTS Sofia's Story

Alejandra and her family stay for several days and then head back home after they've been told it's safe.

A week later it's soccer practice day again, but today the AQI is green (good).

When Charles picks Sofia and Brett up from school, Brett asks "Is your Aunt Alejandra still at your house Sofia?"

"No!" Sofia says excitedly, "because the fire got put out, they were able to go home a few days ago."

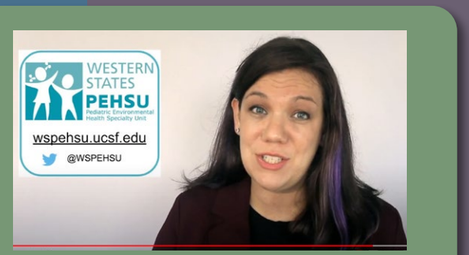
She explains to Brett how they knew it was safe to go home, and that she and her dads have been talking about how important it is to continue to be prepared for the next wildfire.

"OK," says Charles. "Let's play soccer!"

Protecting kids from wildfire smoke

Resources:

California Air Resources Board **List of CARB-Certified Air Cleaning Devices**



Watch: Protecting Children from Wildfire Smoke in the Pacific Southwest

In this 1 minute video from Region 9 of the federal EPA, WSPEHSU co-director Dr. Stephanie Holm explains options for protecting children from wildfire smoke exposure.

WILDFIRE HEALTH IMPACTS Sofia's Story

POLICY RECOMMENDATIONS

Although we have seen favorable decreases in particulate matter levels from industrial sources in recent years, our nation's increase in wildfires has made wildfire smoke a substantial contributor to overall particulate matter exposure. The National Bureau of Economic Research estimates that wildfires have accounted for up to 25% of $PM_{2.5}$ in recent years across the US, and up to half in some Western regions (Burke et al., 2020).

Some policy considerations for wildfire smoke prevention and mitigation are:

Climate Change

Decrease greenhouse gas (GHG) emissions

- Local, federal and multinational initiatives (e.g., The Paris Agreement)
- Renewable energy (e.g., solar, wind)
- Economic strategies: (e.g., emissions tax)
- Increased funding for research to best predict high-risk areas and better understand how climate change is affecting wildfire behavior

For further information on climate change and policy by the American Academy of Pediatrics please follow the links below:

- AAP Policy Statement on Global Climate Change and Children's Health
- How Climate Change Affects Children: AAP Policy Explained

Health and Infrastructure Assessment & Response

- Development of guidelines for school administrators for air quality recommendations (e.g., doh.wa.gov/)
- Air filtration standards for public buildings and schools
- Funding for state and local efforts for infrastructure hardening
- Funding and research on indoor air pollution monitoring and standards (e.g., low cost sensor initiatives)
- Funding for schools for maintenance and improvements to improve indoor air quality (eg., filtration)
- Health experts utilized as air resource advisors on fire incident teams

Forest Management

- Forest maintenance initiatives (federal and state), including mechanical clearing and prescribed burns
- Allocation of funding to allow for more focus on prevention (e.g., "The Fire Funding Fix" beginning in FY 2020)
- Reduction of building expansion adjacent to wooded areas (Wildland-Urban Interface)

Prescribed Burns

Cultural Burns

Listen: NPR: To Manage Wildfire, California Looks To What Tribes Have Known All Along

4-Minute Listen

'Good Fires' graphic: Pacific Northwest Research Station

WILDFIRE HEALTH IMPACTS Sofia's Story

SUMMARY: BE READY FOR WILDFIRE SEASON

As you've learned throughout Sofia's story, there can be health risks to you or your patients related to wildfires directly and from wildfire smoke. Below are some suggestions for you and your patients to prepare for wildfire season. Resources can be found throughout the story.

Know where to find air quality info

- Airnow.gov
- The Fire and Smoke Map
- The SmokeSense App

For healthcare offices

- Have a communication plan prepared for disasters so patients know how to get information (both about protecting their health and also availability of your office staff).
- Consider a plan for secondary power (e.g. to keep refrigerated medications cold).

Prepare for a cleaner indoor air space

- Replace your filters with MERV-13 rated filters or higher, and have extra filters on hand to change regularly during wildfire season.
- If you don't have central air, obtain a portable air cleaner or create a DIY box fan filter if commercial air cleaners are too expensive.
- Consider the use of a low-cost sensor to measure your indoor particulate matter levels compared to outdoor.

Disaster preparedness for your health care office

Excerpted from a presentation by Nelson Branco, MD, FAAP (see video link at right).

AAP-CA1 CALIFORNIA CHAPTER 1 American Academy of Pediatrics

Watch: AAP-CA1 video "Preparing your office for climate change natural disasters and emergencies"

Prepare for respirator use

- Purchase a few NIOSH certified N95 respirators to have at home, and try them on. Check for leakage, and consider trying multiple products/ styles to find the best fit for your face.
- If you have respirators from prior fire seasons, check that they are neither soiled nor deformed. Dispose of them if they are.
- If you have children, have them try the respirator on and wear it for a brief, supervised period so that the first time is not during an emergency.
- See page 11 for specific guidance.

Strengthen your home and/ or office against wildfires

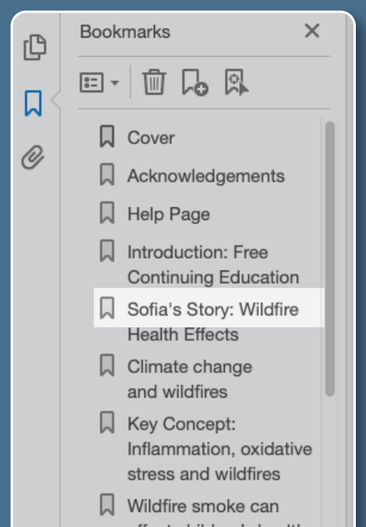
- Create a defensible space — clear flammable materials from the 30-foot area surrounding the building.
- Clean excess flammable materials regularly (e.g., keep gutters clean).
- Find an outdoor water source with a hose that can reach your entire property.
- When building or renovating, use less flammable building materials.

WILDFIRE HEALTH IMPACTS Sofia's Story

CONTINUING EDUCATION

We have linked to many useful resources in this story relevant to a wide range of audiences, including clinicians. To quickly access resources on specific topics in this story, use the Bookmarks toolbar on the left (which you can open or close), or return to the Help page for more details on other eBook features.

Register for FREE Continuing Education (CE) for *A Story of Health: Sofia's Story* for a variety of health professions. Free credits are offered by the Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry at this link.



Additional Resources

Pediatric Environmental Health Toolkit application for mobile devices

The Toolkit is an easy-to-use reference guide for health providers on preventing exposures to toxic chemicals and other substances that affect infant and child health. The new mobile device-ready online version of the PEHT includes links to many related online resources.

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