

Smoking Outside: Does It Eliminate Secondhand Smoke Risk?

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A Parent Asks

My mother-in-law cares for my 2 small children, and she is a smoker. She says she “always smokes outside” and therefore the smoke shouldn’t harm my children. Are my children at risk from secondhand smoke, even if my mother-in-law always smokes outside?

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The Parent Coach Advises

Secondhand smoke and thirdhand smoke are always a potential health risk when children are cared for by a smoker. In 1964, the US Surgeon General first reported on health effects of smoking tobacco.¹

According to the Center for Disease Control and Prevention, today 42 million American adults and nearly 3 million middle and high school students smoke.² Secondhand smoke remains a significant health threat to the children of this country. Half of all children in the United States between 3 and 18 years of age are exposed to cigarette smoke regularly, either at home or in places such as restaurants where smoking is still allowed.²

It is well established that exposure to secondhand smoke increases the rate of asthma attacks, respiratory tract infections, ear infections, and sudden infant death syndrome (SIDS).³⁻⁵

In the past 50 years in the United States, 100,000 babies have died from smoking-related prematurity, low birthweight, SIDS, or other conditions caused by exposure to chemicals in secondhand smoke during infancy or before birth.^{2,5}

Although more research is needed, emerging data points to secondhand tobacco smoke exposure in utero or in early childhood as an independent risk factor for neurobehavioral disorders, including attention-deficit/hyperactivity disorder (ADHD), learning disabilities, and conduct disorders.⁶⁻⁸

Additional research has shown that other chronic organ damage is linked to secondhand smoke, including decreased glomerular filtration rate⁹ and preclinical atherosclerosis.¹⁰⁻¹¹

Danger of Secondhand Smoke

Secondhand smoke has been defined as *sidestream smoke*—the smoke released from the burning end of a cigarette—and *exhaled mainstream smoke*—the smoke exhaled by the smoker.⁴ When compared with *mainstream smoke*—smoke inhaled directly by a smoker—sidestream smoke, because of its lower temperature, contains smaller particles and higher concentrations of many dangerous chemicals.¹²

Tobacco smoke contains more than 7000 chemicals, including hundreds that are toxic and approximately 70 that can cause cancer.³ These toxins include ammonia, formaldehyde, benzene, *N*-nitrosamines, aniline, acrolein, carbon monoxide, and hydrogen cyanide.¹²

Understanding Thirdhand Smoke

Many of the dangerous toxins and particles contained in secondhand smoke are present long after the smoke subsides.¹³⁻¹⁵ Thirdhand smoke comprises residual tobacco smoke pollutants that remain on surfaces and in dust after tobacco has been smoked and that react with other substances in the environment to release other toxic pollutants.¹³ It is estimated that infants and young children are 100 times more sensitive than are adults to pollutants in house dust because of such factors as their increased respiratory rate relative to body size and their immature metabolic capacity.^{13,15}

Nearly all particles released from smoking, including nicotine, are present on the clothes, hair, and skin of a caregiver after smoking, which could lead to potential exposure for children even when the smoking is done outside of the home.¹⁴ These pollutants can be inhaled, ingested, and absorbed through the skin.^{13,16} Research has shown that thirdhand smoke-mediated DNA strand breaks are highly persistent after 24-hour exposure, which may lead to increased mutations in cells upon exposure to thirdhand smoke and ultimately a higher cancer risk.¹⁶

Smoking Caregivers and Cotinine

There is an ongoing risk of thirdhand smoke exposure for children who live in the homes of people who smoke tobacco—this is in addition to the secondhand exposure the children already experience.¹³

Parents and caretakers who smoke are not always accurate in reporting a child's exposure to smoke.^{14,17-18} In one study, tobacco exposure at home declared by parents was 34.6%; however, this rate was detected to be 76% by the urinary cotinine levels of the children in the home.¹⁷ Studies done to assess a child's exposure to tobacco smoke often use cotinine levels as a way to determine true exposure to tobacco smoke. Cotinine, the primary metabolite of nicotine, is produced in the liver and can be tested in the urine, blood, or saliva, making it the test of choice for tobacco smoke exposure.^{14,17,19} Urine cotinine concentrations average 4-fold to 6-fold higher than those in blood or saliva, making urine a more sensitive matrix to detect low-concentration exposure.¹⁹

Smoking Outside and Smoke Exposure

Smoking outside of the home has long been thought to help reduce and even eliminate a child's exposure to tobacco smoke. But parents and caregivers often underreport exposure when they smoke outside the home.¹⁷

Seventy-six percent of mothers who said they smoked only outside reported that their children were not exposed to tobacco smoke.¹⁴ Actual tobacco smoke exposure, based upon cotinine levels, was 5 to 7 times higher in households of smokers who smoked outdoors than in households of nonsmokers.¹⁴ Detectable nicotine levels were found on nearly half of all surfaces as well as half of bedroom dust samples found in the homes of parents who reported only smoking outside.¹⁵

With regard to skin contamination, mothers who stated they smoked only outside were all found to have nicotine on their index fingers when tested.¹⁴ The loading dose of the nicotine found on the skin of those mothers who only smoked outside was as high as the nicotine loading on living-room surfaces of households where caregivers smoked inside the home.¹⁴

The concentrations of thirdhand smoke chemicals on fabrics such as cotton and polyester were found to be present for more than 1.5 years after the last exposure to smoke in one study.²⁰

One group of researchers recently demonstrated that nicotine and its derivatives, including 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (nicotine-derived nitrosamine ketone, or NNK), a known carcinogen, were rapidly extracted from cotton fabric in an aqueous medium that is similar in composition to saliva and sweat. It can be inferred, then, that an infant who mouths cloth that has been exposed to cigarette smoke will be exposed to significant amounts of cigarette smoke toxicants.²⁰

Take-Home Message

Secondhand and thirdhand smoke pose significant risks to a child's health. Parents and care providers who smoke, even when they only smoke outside, often underreport and underestimate smoke exposure to children.¹³⁻¹⁹ While smoking outside may lower tobacco smoke contamination and exposure, it does not do so to the levels of exposure found in homes of nonsmoking caregivers.¹⁴

Parents who are educated by pediatricians about thirdhand smoke are more likely to believe that it is dangerous to their children.^{21,22} Thirdhand smoke harm belief is associated with having strictly enforced smoke-free home and car policies by caregivers.²³ Evidence suggests that washing hands, changing or washing clothing, and other attempts to remove tobacco smoke particles can reduce exposure.²⁰

Recommendations for protecting children from the dangers of tobacco smoke have been highlighted by the American Academy of Pediatrics in its 2015 Clinical Practice Policy to Protect Children From Tobacco, Nicotine, and Tobacco Smoke.⁵ Exposure reduction measures include screening, counseling, and providing recommendations and referral for tobacco cessation of caregivers.⁵

It is worthwhile for clinicians to provide information to children's caregivers, because those caregivers who are referred for cessation are more likely to have thirdhand smoke harm beliefs.²¹ If parents and caregivers are not interested in cessation or therapy, they should be

counseled about reducing all degrees of smoke exposure for children in all environments, including in vehicles.⁵

It should be emphasized that elimination of tobacco smoke from a child's life is possible only when parents and caregivers do not smoke at all.⁵

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