

# The Impact of Environmental Tobacco Smoke on Children with Asthma

## BACKGROUND

Asthma is a chronic lung disease that inflames and narrows airways and causes symptoms such as wheezing, chest tightness, shortness of breath, and coughing.<sup>1</sup>

Irritants, including smoke and residue from burning tobacco products, referred to as secondhand and thirdhand tobacco smoke, can make asthma symptoms worse. Secondhand smoke is a combination of smoke from burning tobacco and smoke exhaled by tobacco smokers.

Thirdhand smoke is the residue that remains even after a cigarette is no longer burning. It is a mix of residual nicotine and other chemicals left on indoor surfaces and clothing. This residue clings to hair, skin, clothes, furniture, drapes, walls, bedding, carpets, dust, and other surfaces. Normal cleaning, airing out rooms, opening windows, using fans or air conditioners or confining smoking to only certain areas cannot prevent or eliminate thirdhand smoke residues.

Children are uniquely susceptible to the chemicals and particulates in thirdhand smoke. Children spend more time indoors and in areas where dust collects (such as on carpets and on floors). Young children put objects or their fingers in their mouths as they explore their environment, increasing their potential exposure to chemicals and particulates deposited from tobacco smoke.



A large national health study found that, among children with asthma, exposure to tobacco smoke resulted in nights with disturbed sleep, activity limitations, wheezing during exercise, and an increased number of missed school days.<sup>2</sup> Even a low level of exposure to tobacco smoke was associated with asthma symptoms among young children with asthma.<sup>2</sup>

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In addition to an increase in asthma symptoms and episodes, tobacco smoke exposure causes the *development* of new asthma cases among children. A review of evidence by the Institute of Medicine found sufficient evidence that tobacco smoke causes the development of asthma in pre-school children.<sup>3</sup>

A 2012 review of 70 research studies found that both pre- or post-natal exposure to secondhand tobacco smoke was associated with a 30% to 70% increased risk of new cases of wheezing and a 21% to 85% increase in new onset of asthma. In both reports, the strongest effect was from prenatal maternal smoking.<sup>4</sup>

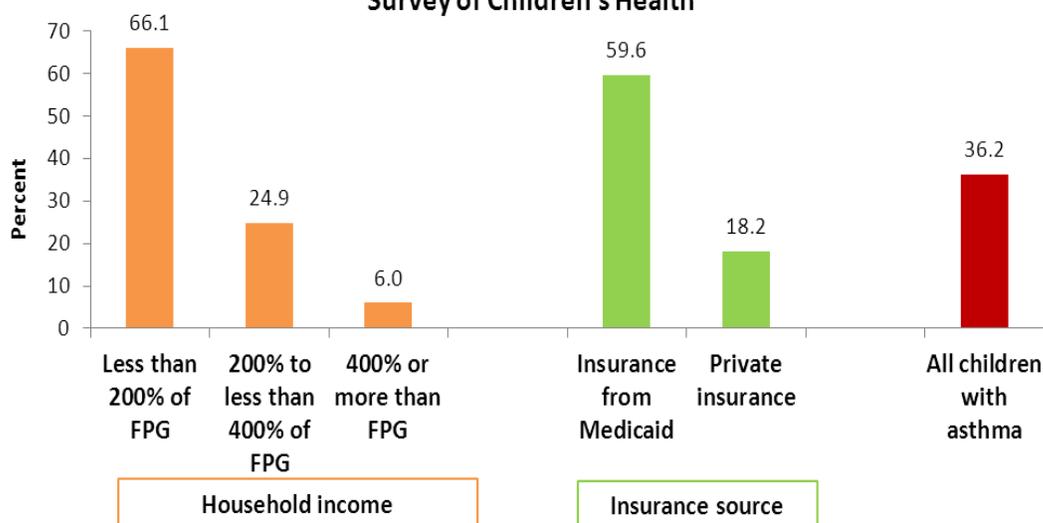
To better understand the burden of asthma related to second and thirdhand smoke among New Hampshire children, data from New Hampshire were examined and are summarized below.

## SUMMARY OF FINDINGS

### Prevalence of asthma and tobacco smoke exposure

In New Hampshire in 2012, an estimated 10 percent, or 28,000 children had current asthma (95 percent confidence interval: 8.5-12.1).<sup>5</sup> More than a third of these children lived with someone who smoked tobacco products including cigarettes, cigars, or pipe tobacco. Tobacco smoke exposure is strongly linked to household (HH) income levels and to health insurance source. More than half of New Hampshire children with current asthma having health insurance from a public source such as Medicaid lived in a home where someone smoked tobacco. This was compared with 18% of children covered by private health insurance.<sup>6</sup> In 2011 and 2012, two-thirds of New Hampshire's low income children with asthma lived in a home with a smoker.<sup>6</sup> This was ten times higher than the proportion of children with asthma in higher income families (Figure 1, Table 1).<sup>6</sup>

**FIGURE 1. Proportion of New Hampshire children with asthma living with someone who smokes tobacco products, 2011/2012 National Survey of Children's Health**



**TABLE 1**

New Hampshire children with current asthma living in a household where someone smokes cigarettes, cigars, or pipe tobacco, by Federal Poverty Guidelines (FPG)* and Insurance coverage National Survey of Children's Health, 2011/2012		
Characteristic	Percentage living with tobacco smoker	95% confidence interval for percent
Household income less than 200% of FPG	66.1	49.6-82.7
Household income 200% to less than 400% of FPG	24.9	6.9-42.9
Household income 400% or more than FPG	6.0	1.8-10.3
Insurance source was Medicaid	59.6	42.5-76.7
Private health insurance	18.2	7.0-29.3
<b>All children with asthma</b>	<b>36.2</b>	<b>25.8-46.5</b>

\*The Federal Poverty Guidelines are a simplification of the estimates of the poverty thresholds, which estimates number of Americans in poverty each year. In 2012, 100% of the FPG was equivalent to a household income of \$19,090 for a family of three. Four hundred percent of the FPG was equivalent to a household income of \$76,360 for a family of three.<sup>7</sup>

## TOBACCO SMOKE EXPOSURE AMONG HIGH SCHOOL STUDENTS

In 2011, more than half of New Hampshire high school students with current asthma reported they had been in a room where someone was smoking cigarettes in the past week and nearly a third of employed high school students reported they had breathed in tobacco smoke at work in the previous week (Table 2).<sup>8</sup>

TABLE 2

Tobacco smoke exposure among New Hampshire high school students with current asthma 2011 New Hampshire Youth Tobacco Survey		
	Percentage	95% Confidence Interval
In a room where someone was smoking, past 7 days	51.2	43.1-59.3
Breathed tobacco smoke at work, past 7 days	30.8	16.8-44.7
In a car where someone was smoking, past 7 days	39.1	30.6-47.5

New Hampshire data do not provide information on the occupations or employment locations of those working high school youth exposed to tobacco smoke. However, national employment data indicate that most workers aged 16 to 19 years worked in food preparation and serving (26%) and in sales and related occupations (24%) in 2012 (Table 3).<sup>9</sup> These types of businesses may be the best places to reach working high school youth with information about secondhand smoke exposure.

TABLE 3

Five occupations most commonly held by U.S. workers aged 16 to 19 years, 2012 Current Population Survey, U.S. Bureau of Labor Statistics	
Occupation	Percentage of Workers Ages 16 to 19
Food preparation and serving related occupations	26%
Sales and related occupations	24%
Office and administrative support occupations	11%
Personal care and service occupations	7%
Transportation and material moving occupations	7%

## EXPOSURE TO TOBACCO SMOKE IN MULTIUNIT HOUSING

Children living in multiunit housing are a special concern. The U.S. Department of Housing and Urban Development (HUD) reports that tobacco smoke can migrate between units in multifamily housing impacting the health of neighboring families.<sup>10</sup>

In 2009, HUD reported there were over 1.2 million residents living in public housing. Children between the ages of 0-17 represented 39 percent of public housing residents potentially at risk for exposure to second or thirdhand tobacco smoke.<sup>10</sup>

Responding to this, HUD encourages Public Housing Authorities to adopt non-smoking policies for all public housing units.<sup>10</sup>

There are more than 18,000 publicly subsidized housing units in New Hampshire located within an estimated 509 properties. This includes rent-assisted housing funded through permanent financing or rental assistance payment mechanisms but does not include the Housing Choice Voucher (Section 8) Program.<sup>11</sup> A survey of property managers of New Hampshire public and subsidized housing conducted in 2013 found that nearly two-thirds (61%) of property managers had adopted smoke-free policies for their properties. Thirty percent reported that all buildings on their properties were smoke-free, and 31% reported that one or more buildings (but not all) were smoke-free. This represents an estimated 54% of New Hampshire publicly subsidized housing covered under smoke-free policy.<sup>12</sup> As of May 2014, 80% of New Hampshire Public Housing Authority buildings were smoke-free.<sup>13</sup>

### COSTS

The Centers for Disease Control and Prevention (CDC) estimate that asthma in children costs New Hampshire \$32 million per year<sup>14</sup> (in 2014 dollars ).<sup>15</sup> This includes both medical costs such as hospitalizations, office visits, and medications (\$24 million), and costs associated with parental absenteeism due to asthma (\$8 million) (Figure 2).

Tobacco smoking increases maintenance costs associated with rental unit turnover, including those in public and subsidized housing. Costs include items such as additional paint to cover smoke stains, cleaning of the ducts, replacing stained window blinds, or replacing carpets damaged by cigarettes. In 2009, HUD reported costs associated with even light tobacco smoking were approximately three times the costs of turnover in a non-smoking unit (Table 4).<sup>10</sup>

FIGURE 2

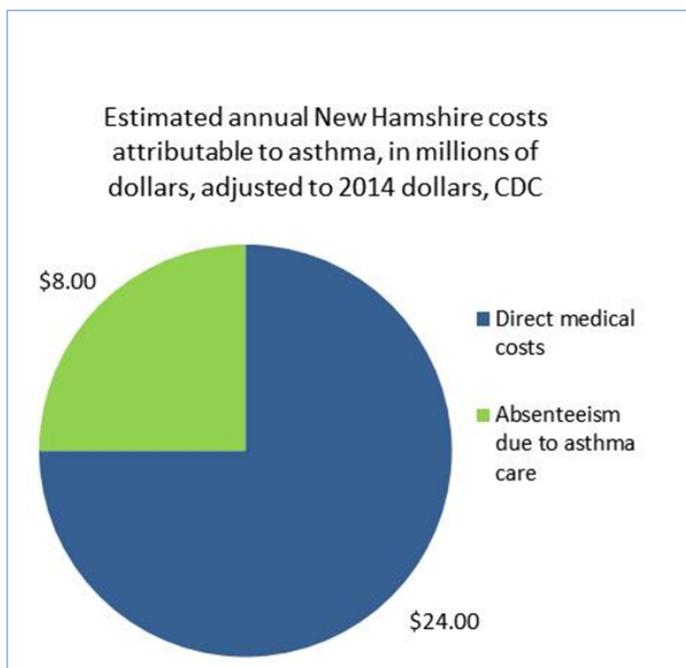


TABLE 4

Rental turnover maintenance costs associated with tobacco smoke, New England public and subsidized housing, U.S. Department of Housing and Urban Development, 2009			
	Non-Smoking	Light Smoking	Heavy Smoking
Cleaning	\$240	\$500	\$720
Painting	\$170	\$225	\$480
Flooring	\$50	\$950	\$1,425
Appliances	\$60	\$75	\$490
Bathroom	\$40	\$60	\$400
<b>Total</b>	<b>\$560</b>	<b>\$1,810</b>	<b>\$3,515</b>

## DISCUSSION

Analysis of New Hampshire data related to exposure of children with asthma to tobacco smoke and its by-products resulted in four major findings:

- In addition to increasing asthma symptoms, there is sufficient evidence of a causal role of tobacco smoke exposure in the development of new cases of asthma among children.
- Costs resulting from tobacco smoke are substantial. These include direct medical costs and lost productivity due to missed work days among parents and other caregivers, as well as increased maintenance costs resulting from tobacco smoke damage in rental units.
- Children in lower income homes are an especially vulnerable population. More than half of New Hampshire children with asthma that have health insurance from a



public source such as Medicaid lived in a home where someone smoked tobacco. Children make up 39 percent of public housing residents who may be involuntarily exposed to tobacco smoke migrating between units.

- New Hampshire high school students with asthma reported exposure to tobacco smoke at their workplaces. While it is not clear if the tobacco smoke exposure reported was from co-workers, customers, or other sources, or what types of businesses employ the NH students reporting exposure, U.S. data show that the occupations most frequently held by working youth include food preparation, serving, and sales.

## RECOMMENDATIONS

Tobacco-free policies have been shown to be effective in reducing exposure to tobacco smoke in locations such as homes, public places, and cars.<sup>16</sup> Policies generally begin with local action that over time expand to legislative actions. These might include:

- Limits on smoking in and around licensed child care businesses. Currently, smoking in child care areas is prohibited during the hours of operation. However, this does not prevent exposure to thirdhand tobacco smoke (e.g., from tobacco smoked in child care areas after hours).
- Voluntary business policies prohibiting tobacco smoking by employees or customers in or around businesses properties.
- Home smoking policies that forbid smoking inside of homes, especially in homes where children reside.



- Voluntary policies that prohibit smoking in vehicles when children are present.
- Laws that prohibit smoking in vehicles carrying children.
- Continued development and implementation of smoke-free policies in multi-unit public housing.

Other actions to reduce childhood exposure to tobacco smoke include providing resources for tobacco smokers wanting to quit. For many, tobacco use is an addiction and quitting is not an easy process. Evidence for effectiveness supports improved counseling by medical providers, referral, and access to resources to assist smokers wanting to quit. These include:

- Expansion of medical Quality Improvement Initiatives to increase the number of medical providers asking parents of pediatric patients about their smoking status and home policies and, where necessary providing assistance and referral for smokers ready to quit.<sup>17</sup>
- Reducing Out-of-Pocket Costs for treatments to help smokers quit. Reducing tobacco users' out-of-pocket costs involves policy or program changes that make evidence-based treatments, including medication, counseling, or both, more affordable. To achieve this, insurers may provide new benefits or reduce co-payments for these treatments.<sup>18</sup>
- Increasing resources for tobacco users wanting to quit, including the NH Tobacco Helpline (1-800-QUIT-NOW) or [www.TrytoStopNH.org](http://www.TrytoStopNH.org).



## REFERENCES

<sup>1</sup> National Institutes of Health, National Heart Lung and Blood Institute. What Is Asthma? Available at: <http://www.nhlbi.nih.gov/health/health-topics/topics/asthma/>. Accessed February 2014.

<sup>2</sup> Akinbami LJ, Kit BK, Simon AE. Impact of Environmental Tobacco Smoke on Children With Asthma, United States, 2003–2010. *Academic Pediatrics* 2013;13:508–516.

<sup>3</sup> National Academy of Sciences, Institute of Medicine. *Clearing the Air: Asthma and Indoor Air Exposures*. 2000. Available at: [www.nap.edu](http://www.nap.edu). Accessed June 2014.

<sup>4</sup> Burke H, Leonardi-Bee J, Hashim A, Pine-Abata H, Chen Y, Cook DG, Britton JR, McKeever TM. Prenatal and passive smoke exposure and incidence of asthma and wheeze: systematic review and meta-analysis. *Pediatrics*. 2012 Apr;129(4):735-44.

<sup>5</sup> Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2012

<sup>6</sup> Child and Adolescent Health Measurement Initiative (CAHMI). National Survey of Children's Health, 2011/2012 Indicator Data Set. Data Resource Center for Child and Adolescent Health. [www.childhealthdata.org](http://www.childhealthdata.org)

<sup>7</sup> U.S. Department of Health and Human Services, Office of Assistant Secretary for Planning and Evaluation. Frequently Asked Questions Related to the Poverty Guidelines and Poverty. Available at: <http://aspe.hhs.gov/Poverty/faq.cfm>. Accessed June 2014

<sup>8</sup> New Hampshire Department of Health and Human Services, Division of Public Health Service. 2011 Youth Tobacco Survey. Analysis by New Hampshire Asthma Control Program. Data Available from the Tobacco Prevention and Control Program.

<sup>9</sup> U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey. Employed persons by detailed occupation and age, 2012 annual averages. Available at: <http://www.bls.gov/cps/tables.htm>. Accessed February 2014.

<sup>10</sup> U.S. Department of Housing and Urban Development. HUD Encourages PHAs to Become SmokeFree. *EcoWise*. Volume 7, Issue 9. September 2009. Available at: [www.hud.gov/offices/pih/programs/ph/phecc/newsletter/newsletter.cfm](http://www.hud.gov/offices/pih/programs/ph/phecc/newsletter/newsletter.cfm). Accessed February 2014.

<sup>11</sup> New Hampshire Housing Finance Authority. Personal communication. February 2013.

<sup>12</sup> New Hampshire Department of Health and Human Services, Division of Public Health Services, Asthma Control Program. Cross-Sectional Survey of Smoke Free Publicly Assisted Housing in New Hampshire Findings and Recommendations. Prepared by Melissa Whalen, MPH Candidate May 9th, 2013.

<sup>13</sup> NH DHHS, Division of Public Health Services, Tobacco Prevention and Control Program. Personal Communication. March 2014

<sup>14</sup> Centers for Disease Control and Prevention. Chronic Disease Prevention and Health Promotion. Chronic Disease Cost Calculator, Version 2, April 2013. Available at: <http://www.cdc.gov/chronicdisease/resources/calculator/index.htm>. Accessed December 2013.

<sup>15</sup> U.S. Department of Labor, Bureau of Labor Statistics. Inflation Calculator. Available at: <http://data.bls.gov/cgi-bin/cpicalc.pl>. Accessed May 2014.

<sup>16</sup> The Guide to Preventive Services, Reducing Tobacco Use and Secondhand Smoke Exposure: Smoke-Free Policies. Available at: <http://www.thecommunityguide.org/index.html>. Accessed June 2014.

<sup>17</sup> U.S. Department of Health and Human Services. Community Guide to Preventive Services, Website, Reducing Tobacco Use and Secondhand Smoke Exposure. Available at: <http://www.thecommunityguide.org/tobacco/index.html>. Accessed March 2014.

<sup>18</sup> Fiore MC, Jaen CR, Baker TB, et al. Treating Tobacco Use and Dependence: 2008 Update. Clinical Practice Guideline. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service. May 2008. Available at: <http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/clinicians/>. Accessed March 2014.

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