

# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

**Effects of HEPA Air Cleaners on Unscheduled Asthma Visits and Asthma Symptoms for Children Exposed to Secondhand Tobacco Smoke**

Bruce P. Lanphear, Richard W. Hornung, Jane Khoury, Kimberly Yolton, Michelle Lierl and Amy Kalkbrenner

*Pediatrics* 2011;127;93-101; originally published online Dec 13, 2010;  
DOI: 10.1542/peds.2009-2312

The online version of this article, along with updated information and services, is located on the World Wide Web at:  
<http://www.pediatrics.org/cgi/content/full/127/1/93>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2011 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# Effects of HEPA Air Cleaners on Unscheduled Asthma Visits and Asthma Symptoms for Children Exposed to Secondhand Tobacco Smoke

**AUTHORS:** Bruce P. Lanphear, MD, MPH,<sup>a,b</sup> Richard W. Hornung, DrPH,<sup>b</sup> Jane Khoury, PhD,<sup>b</sup> Kimberly Yolton, PhD,<sup>b</sup> Michelle Lierl, MD,<sup>b</sup> and Amy Kaikbrenner, PhD<sup>c</sup>

<sup>a</sup>Child and Family Research Institute, British Columbia Children's Hospital and Faculty of Health Sciences, Simon Fraser University, Vancouver, British Columbia, Canada; <sup>b</sup>Cincinnati Children's Environmental Health Center, Department of Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio; and <sup>c</sup>Department of Epidemiology, School of Public Health, University of North Carolina, Chapel Hill, North Carolina

## KEY WORDS

asthma, children, secondhand smoke, air cleaner, randomized controlled trial, unscheduled asthma visits, exacerbations

## ABBREVIATIONS

HEPA—high-efficiency, particle-arresting

SHS—secondhand smoke

This trial has been registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (identifier NCT00006565).

[www.pediatrics.org/cgi/doi/10.1542/peds.2009-2312](http://www.pediatrics.org/cgi/doi/10.1542/peds.2009-2312)

doi:10.1542/peds.2009-2312

Accepted for publication Oct 1, 2010

Address correspondence to Bruce P. Lanphear, MD, MPH, 3415 Ash St, Vancouver, British Columbia, Canada V5Z 3E5. E-mail: [blanphear@sfu.ca](mailto:blanphear@sfu.ca)

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

**FINANCIAL DISCLOSURE:** The authors have indicated they have no financial relationships relevant to this article to disclose.

Funded by the National Institutes of Health (NIH).



**WHAT'S KNOWN ON THIS SUBJECT:** Exposure to secondhand smoke (SHS) is associated with asthma exacerbations in children. Anticipatory guidance has failed to reduce SHS in controlled trials. It is not known whether high-efficiency, particle-arresting (HEPA) air cleaners can reduce SHS or improve asthma symptoms in children.



**WHAT THIS STUDY ADDS:** HEPA air cleaners led to reductions in unscheduled asthma visits and fine airborne particle levels but not asthma symptoms or cotinine levels. HEPA air cleaners may be useful as part of a multifaceted strategy to reduce asthma morbidity among children.

## ABSTRACT



**OBJECTIVE:** The goal was to test the effects of high-efficiency, particulate-arresting (HEPA) air cleaners on unscheduled asthma visits and symptoms among children with asthma exposed to secondhand smoke.

**METHODS:** We enrolled 225 eligible children who were 6 to 12 years of age, had physician-diagnosed asthma, and were exposed to  $\geq 5$  cigarettes per day. We conducted a double-blind, randomized trial. Children were assigned randomly to receive 2 active or inactive HEPA air cleaners.

**RESULTS:** Of 225 enrolled children, 110 (49%) were assigned to the intervention group and 115 (51%) to the control group; 215 (95%) completed the trial. During the trial, there were 42 fewer unscheduled asthma visits among children in the intervention group (18.5% [95% confidence interval: 1.25%–82.75%];  $P = .043$ ), compared with those in the control group, after adjustment for baseline differences. There was a significant difference in the reductions of levels of particles of  $>0.3 \mu\text{m}$  according to group assignment; there was a 25% reduction in particle levels in the intervention group, compared with a 5% reduction in the control group ( $P = .026$ ). There were no significant differences in parent-reported asthma symptoms, exhaled nitric-oxide levels, air nicotine levels, or cotinine levels according to group assignment.

**CONCLUSIONS:** These results hold promise for using HEPA air cleaners as part of a multifaceted strategy to reduce asthma morbidity, but further research is necessary before they can be recommended routinely for the medical management of asthma. *Pediatrics* 2011;127:93–101