



Published in final edited form as:

Am J Prev Med. 2018 February ; 54(2): 320–322. doi:10.1016/j.amepre.2017.09.016.

It's Time to Track Health Outcomes of Smoke-Free Multi-Unit Housing

Lorna E Thorpe, PhD¹, Alexis M Feinberg, MPH¹, Brian Elbel, PhD¹, Terry Gordon, PhD¹, Sue Kaplan, JD¹, Katarzyna Wyka, PhD², Jessica Athens, PhD¹, and Donna Shelley, MD¹

¹NYU School of Medicine, Department of Population Health, NY, NY 10016

²City University of New York Graduate School of Public Health and Health Policy, NY, NY 10027

On November 30, 2016, the U.S. Department of Housing and Urban Development (HUD) issued a rule requiring all public housing agencies (PHA) to implement smoke-free policies by July 2018.¹ This policy has potential to have long-lasting effects on the health of millions of Americans. The regulation requires that any housing authorities administering low-income conventional public housing prohibit the use of smoking products like cigarettes, cigars, pipes, and hookah in all public housing living units and indoor common areas. From a health perspective, the scientific rationale for the HUD rule is strong. In the past 30 years, a growing body of evidence has documented health hazards from secondhand smoke (SHS) exposure.² Risks for adults include cancers, coronary artery disease, stroke, and serious respiratory problems. In children, SHS exposure elevates risk for congenital defects and sudden infant death syndrome; it also increases risk for lower respiratory infections, middle ear infections, and the number and severity of asthma attacks among children with asthma.³

Several factors have already led to significant reductions in SHS exposure in the U.S., including smoke-free laws in workplace and public spaces, adoption of voluntary smoke-free home policies, and decreases in smoking prevalence.⁴ As a result of these changes, the prevalence of SHS exposure, as measured by cotinine levels among non-smokers nationally, fell from 52% in 2000 to 25% in 2012.⁵ Despite this progress, 58 million non-smokers in the U.S. are still exposed to SHS, primarily at home.⁵

But why should public housing go smoke-free? Compared to the general public, residents in public housing are at greater risk for SHS exposure for two reasons: disparities in smoking prevalence and differential risks across housing environments.⁶ Despite overall nationwide declines in smoking over time, major disparities persist by income level, education, and race/ethnicity.⁷ Thus, smoking rates among residents living in public housing, a predominantly minority, lower-income population, are higher than in the general population. Indeed, a recent study found that compared to 16.8% of the general U.S. adult population,⁷ approximately one-third (33.6%) of adults receiving federal housing assistance were current

Corresponding Author: Lorna Thorpe, Professor and Director, Division of Epidemiology, 650 1st Avenue, New York, NY 10016, Telephone: 212-263-3327, Lorna.Thorpe@nyumc.org.

Conflict of interest statement: The authors declare that there are no conflicts of interest.

Financial disclosure: No financial disclosures were reported by the authors of this paper

cigarette smokers, placing family members of these residents at greater risk for SHS exposure.⁸ At the same time, public housing residents are more likely to live in multi-unit housing (MUH), a physical environment that facilitates smoke accumulation and dispersion, placing residents at elevated risk for involuntary exposure to SHS compared to residents living in detached housing.^{9,10} One study found that children of non-smoking families living in MUH have 45% higher cotinine levels than children who live in non-smoking single-family homes.¹¹

If the potential benefits of the smoke-free housing rule are so apparent, then one might conclude that studies to more rigorously capture its effects are unnecessary. Yet, the new rule currently only applies to public housing, leaving millions of residents residing in multi-unit housing in the private sector, Section 8, and other voucher programs without policies prohibiting indoor smoking. While we know enough about the dangers of SHS to justify the HUD ruling, it is important to build our knowledge to guide this and other future policies pertaining to housing and smoking. It's helpful to contrast SHS at this juncture with lead, a well-established neurotoxin; as policies banning lead-laden gasoline, paint, and solder lowered the amount of lead in the environment—subsequently reducing blood-lead levels among Americans—our knowledge of lead's more subtle and chronic effects began to grow.¹² Brought recently to national attention by the water crisis in Flint, Michigan, new studies regarding lead's long-lasting harm even decades post-exposure underscore the importance of careful and persistent monitoring, particularly as variations exist in compliance and enforcement.¹³ Evaluating the HUD policy presents an unprecedented opportunity to elucidate the health benefits and effectiveness of smoke-free air laws in residential settings. It would also allow for the capture of unintended consequences, such as whether the policy increases use of e-cigarettes as a substitute.

Precisely because smoke-free policies in public housing settings have strong potential for further reducing SHS exposure disparities, they require rigorous evaluation to establish effectiveness and health impact. One of the most direct influences such rulings have on health is the positive pressure to encourage residents who smoke to quit, and indeed initial studies monitoring quit attempts and cessation have shown early promising results.^{14,15} However, the larger impact may be on the non-smoking population. Several studies have examined the impacts of local smoke-free housing policies on self-reported SHS exposure, but only researchers in Boston and Philadelphia have evaluated the impact of smoking bans on objective SHS exposure levels in PHAs such as airborne nicotine concentration and particulate matter (PM_{2.5}).^{16–18} An early cross-sectional study in Boston, involving 32 non-smoking apartments, found significantly lower PM_{2.5} concentrations and airborne nicotine levels in buildings with smoke-free policies compared with buildings without a similar ban.¹⁷ However, longitudinal findings from their follow up studies to date have been less-than-definitive, documenting a modest and non-significant reduction in SHS exposure partly due to limited statistical power and potential delayed effects.^{16,19}

Beyond tracking SHS exposure, however, we now have an opportunity to examine actual health outcomes. While the potential for widespread health benefits from smoke-free housing regulations is clear, the actual short- and long-term health impacts of such a policy are unknown. Findings from several previous studies have shown protective associations

between smoke-free laws in workplaces and reductions in acute cardiac and cerebrovascular disease-related hospitalizations and on asthma-related emergency department visits.^{20,21} Yet to date, no studies have objectively assessed the health implications of SHS reductions in multi-unit housing settings, particularly in low-income housing. Only one small-scale study has examined self-reported changes in health outcomes among 115 Colorado PHA residents in three buildings, pre- and one year post-policy implementation, finding a significant decrease in self-reported breathing problems.¹⁴ Fortunately, we now have the opportunity to learn from the widespread adoption of this policy. When laws or rules such as this are introduced across many jurisdictions at the same time, researchers can evaluate the health impacts of policies that are otherwise more difficult to study in formal randomized experiments. Such methodologically rigorous natural experiments can help reduce selection biases that plague observational studies by exposing whole populations to an intervention while allowing for well-constructed comparison groups.

A rigorous, nationwide study on the health impacts of the policy is the ideal design, but studies in urban settings with large numbers of public housing residents could also generate credible scientific evidence to inform policies for other multi-unit residents not yet given the same protections. For example, the NYC Housing Authority is the largest housing authority in the U.S.; its more than 400,000 residents comprise a substantial proportion of all public housing residents in the country. One approach to avoid logistical challenges and potential biases associated with consenting and enrolling large numbers of participants is to employ data linkage approaches, matching large healthcare datasets with geospatial shapefiles for public housing developments, either within or potentially across urban jurisdictions. Comparison communities can be constructed using propensity score matching and difference-in-difference modeling can compare change in healthcare encounters over time pre- and post-policy. Such studies require follow up periods that are longer than 12 months, as well as multisectoral collaborations. There are several potential funding sources for this research. The National Institutes of Health has released program announcements that are aligned with this work, but the imminent implementation of the ruling is a challenge. Leveraging foundation support or the research and evaluation infrastructure of the CDC Prevention Research Center Network, particularly to capture baseline measures, may allow researchers to be more nimble. HUD should also be encouraged to allocate funding for evaluation of this landmark ruling.

Though many questions remain regarding how such a rule will be implemented and enforced, what is clear is that the right to live free from tobacco smoke should be afforded to all individuals if persistent harms are documented, regardless of income. With little recourse before in preventing involuntary SHS exposure, public housing residents will soon be protected from the adverse effects of tobacco exposure. By critically determining the effectiveness and actual health benefits of this policy, an important knowledge gap will be filled that will help support and inform future smoke-free housing policy development and practice.

Acknowledgments:

The authors thank Seongeun Chun for her valuable suggestions for this manuscript. The efforts of Dr. Thorpe are supported in part by the Centers for Disease Control and Prevention (CDC) Grant U48DP001904.

References:

1. U.S. Department of Housing and Urban Development (HUD). Instituting Smoke-Free Public Housing. 2016; <https://www.federalregister.gov/documents/2016/12/05/2016-28986/instituting-smoke-free-public-housing>.
2. U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health;2006.
3. U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health;2014.
4. Jamal A, Agaku IT, O'Connor E, King BA, Kenemer JB, Neff L. Current cigarette smoking among adults--United States, 2005–2013. *MMWR Morb Mortal Wkly Rep*. 2014;63(47):1108–1112.2014. [PubMed: 25426653]
5. Homa DM, Neff LJ, King BA, et al. Vital signs: disparities in nonsmokers' exposure to secondhand smoke--United States, 1999–2012. *MMWR Morb Mortal Wkly Rep*. 2015;64(4):103–108.2015. [PubMed: 25654612]
6. Geller AC, Rees VW, Brooks DR. The Proposal for Smoke-Free Public Housing: Benefits, Challenges, and Opportunities for 2 Million Residents. *Jama*. 2016;315(11):1105–1106.2016. 10.1001/jama.2016.1380 [PubMed: 26882206]
7. Jamal A, Homa DM, O'Connor E, et al. Current cigarette smoking among adults - United States, 2005–2014. *MMWR Morb Mortal Wkly Rep*. 2015;64(44):1233–1240.2015. <http://dx.doi.org/10.15585/mmwr.mm6444a2> [PubMed: 26562061]
8. Helms VE, King BA, Ashley PJ. Cigarette smoking and adverse health outcomes among adults receiving federal housing assistance. *Prev Med*. 2017;99:171–177.2017. 10.1016/j.ypmed.2017.02.001 [PubMed: 28192095]
9. Nguyen KH, Gomez Y, Homa DM, King BA. Tobacco Use, Secondhand Smoke, and Smoke-Free Home Rules in Multiunit Housing. *Am J Prev Med*. 2016;51(5):682–692.2016. 10.1016/j.amepre.2016.05.009 [PubMed: 27423656]
10. Snyder K, Vick JH, King BA. Smoke-free multiunit housing: a review of the scientific literature. *Tob Control*. 2016;25(1):9–20.2016. 10.1136/tobaccocontrol-2014-051849 [PubMed: 25566811]
11. Wilson KM, Klein JD, Blumkin AK, Gottlieb M, Winickoff JP. Tobacco-smoke exposure in children who live in multiunit housing. *Pediatrics*. 2011;127(1):85–92.2011. 10.1542/peds.2010-2046 [PubMed: 21149434]
12. National Toxicology Program. NTP Monograph on Health Effects of Low-Level Lead. Research Triangle Park, NC: U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Environmental Health Sciences, Office of Health Assessment and Translation Division of the National Toxicology Program;2012.
13. Bellinger DC. Childhood Lead Exposure and Adult Outcomes. *Jama*. 2017;317(12):1219–1220.2017. 10.1001/jama.2017.1560 [PubMed: 28350907]
14. Young W, Karp S, Bialick P, et al. Health, Secondhand Smoke Exposure, and Smoking Behavior Impacts of No-Smoking Policies in Public Housing, Colorado, 2014–2015. *Prev Chronic Dis*. 2016;13:E148.2016 10.5888/pcd13.160008 [PubMed: 27763830]
15. Pizacani BA, Maher JE, Rohde K, Drach L, Stark MJ. Implementation of a smoke-free policy in subsidized multiunit housing: effects on smoking cessation and secondhand smoke exposure. *Nicotine Tob Res*. 2012;14(9):1027–1034.2012. 10.1093/ntr/ntr334 [PubMed: 22318686]

16. Levy DE, Adamkiewicz G, Rigotti NA, Fang SC, Winickoff JP. Changes in Tobacco Smoke Exposure following the Institution of a Smoke-Free Policy in the Boston Housing Authority. *PLoS One*. 2015;10(9):e0137740.2015 10.1371/journal.pone.0137740 [PubMed: 26360258]
17. Russo ET, Hulse TE, Adamkiewicz G, et al. Comparison of indoor air quality in smoke-permitted and smoke-free multiunit housing: findings from the Boston Housing Authority. *Nicotine Tob Res*. 2015;17(3):316–322.2015. 10.1093/ntr/ntu146 [PubMed: 25156526]
18. Klassen A, Lee N, Pankiewicz A. Secondhand Smoke Exposure and Smoke-free Policy in Philadelphia Public Housing. *Tobacco Regulatory Science*. 2017;3(2):192–203.2017. <http://dx.doi.org/10.18001/trs.3.2.7> [PubMed: 28944277]
19. MacNaughton P, Adamkiewicz G, Arku RE, Vallarino J, Levy DE. The impact of a smoke-free policy on environmental tobacco smoke exposure in public housing developments. *Sci Total Environ*. 2016;557–558:676–680.2016. 10.1016/j.scitotenv.2016.03.110
20. Mackay D, Haw S, Ayres JG, Fischbacher C, Pell JP. Smoke-free legislation and hospitalizations for childhood asthma. *N Engl J Med*. 2010;363(12):1139–1145.2010. 10.1056/NEJMoa1002861 [PubMed: 20843248]
21. Rayens MK, Burkhart PV, Zhang M, et al. Reduction in asthma-related emergency department visits after implementation of a smoke-free law. *J Allergy Clin Immunol*. 2008;122(3):537–541 e533.2008. 10.1016/j.jaci.2008.06.029 [PubMed: 18692884]