



Published in final edited form as:

*Am J Prev Med.* 2013 June ; 44(6): 631–634. doi:10.1016/j.amepre.2013.01.024.

## Cost Savings Associated with Prohibiting Smoking in U.S. Subsidized Housing

Brian A. King, PhD, MPH, Richard M. Peck, PhD, and Stephen D. Babb, MPH

The Office on Smoking and Health, Epidemic Intelligence Service, CDC, Atlanta, Georgia,  
Department of Economics, University of Illinois at Chicago, Chicago, Illinois

### Abstract

**Background**—Tobacco smoking in multiunit housing can lead to secondhand-smoke (SHS) exposure among nonsmokers, increased maintenance costs for units where smoking is permitted, and fire risks. During 2009–2010, approximately 7.1 million individuals lived in subsidized housing in the U.S., a large proportion of which were children, elderly, or disabled.

**Purpose**—This study calculated the annual economic costs to society that could be averted by prohibiting smoking in all U.S. subsidized housing.

**Methods**—Estimated annual cost savings associated with SHS-related health care, renovation of units that permit smoking, and smoking-attributable fires in U.S. subsidized housing were calculated using residency estimates from the U.S. Department of Housing and Urban Development and previously reported national and state cost estimates for these indicators. When state estimates were used, a price deflator was applied to account for differential costs of living or pricing across states. Estimates were calculated overall and by cost type for all U.S. subsidized housing, as well as for public housing only. Data were obtained and analyzed between January and March 2011.

**Results**—Prohibiting smoking in all U.S. subsidized housing would yield cost savings of approximately \$521 million per year, including \$341 million in SHS-related healthcare expenditures, \$108 million in renovation expenses, and \$72 million in smoking-attributable fire losses. Prohibiting smoking in U.S. public housing alone would yield cost savings of approximately \$154 million per year.

**Conclusions**—Efforts to prohibit smoking in all U.S. subsidized housing would protect health and generate substantial cost savings to society.

### Introduction

Exposure to secondhand smoke (SHS) from burning tobacco products causes disease and premature death among nonsmokers.<sup>1</sup> With the increasing number of U.S. states prohibiting tobacco smoking in indoor public places, private settings are becoming relatively larger

Address correspondence to: Brian A. King, PhD, MPH, Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway, MS K-50, Atlanta GA 30341. [baking@cdc.gov](mailto:baking@cdc.gov).

No financial disclosures were reported by the authors of this paper.

contributors to total SHS burden.<sup>1,2</sup> This may be particularly true for residents of multiunit housing, where SHS can infiltrate smokefree living units from units that permit smoking and shared areas.<sup>3–6</sup> In addition to SHS-related healthcare costs, smoking in multiunit housing can lead to excess expenses from property renovation and smoking-attributable fires.<sup>7,8</sup>

Approximately 7.1 million Americans lived in subsidized housing during 2009–2010.<sup>9</sup> Among these individuals, 2.1 million lived in public housing, which is housing either owned or operated by a Housing Authority.<sup>9</sup> In 2009, approximately 32.7% of adult subsidized-housing residents were current cigarette smokers,<sup>10</sup> compared with 20.6% of U.S. adults.<sup>11</sup> This high smoking prevalence is a concern, considering that a large proportion of subsidized housing is occupied by individuals who are particularly sensitive to SHS, including children, the elderly, and the disabled.<sup>1,9</sup> The current study calculated the costs associated with SHS-related health care, renovation of units where smoking is permitted, and smoking-attributable fires that could be averted by prohibiting smoking in U.S. subsidized housing.

## Methods

### Healthcare Costs Related to Secondhand Smoke

Expenditures for health care related to secondhand smoke were calculated using previously published cost estimates among all nonsmoking Minnesota residents that were derived using claims data from the state's largest health insurer.<sup>12</sup> Because Minnesota's smoking prevalence (16.8%) is approximately half that of subsidized housing residents (32.7%),<sup>10,11</sup> the annual per capita savings reported for Minnesota (\$44.00) was adjusted to \$85.00 (32.7/16.8 multiplied by \$44). To account for differences in living costs, \$85.00 was multiplied by a price deflator, which was calculated by dividing each state's cost of living index by Minnesota's.<sup>13</sup> This value was multiplied by the state-specific number of subsidized housing residents and an adjustment for the proportion of total SHS exposures occurring in the home (0.584).<sup>9,14</sup> Alaska was excluded because of lack of data.<sup>9</sup>

### Costs of Renovation of Units That Permit Smoking

Turnover of units where smoking is permitted was calculated by multiplying the state-specific number of occupied subsidized housing units (excluding Alaska) by the average annual turnover rate for subsidized housing (0.20)<sup>9</sup>; the estimated prevalence of adult smoking in subsidized housing (0.327)<sup>10</sup>; and an adjustment for the approximately 30% of smokers with smokefree-home rules (0.70).<sup>15</sup> These state-specific turnover estimates were multiplied by an estimate of the excess cost of renovating a single unit that permits smoking (\$820), which was obtained from the Smoke-Free Housing Coalition of Maine.<sup>16</sup> Renovation costs were adjusted for differential pricing across states using a price deflator.

### Smoking-Attributable Fires Costs

The cost associated with smoking-attributable fires was calculated by multiplying the number of subsidized housing residents by National Fire Protection Association estimates of the annual per capita loss from all U.S. fires (\$203) and the proportion of fires caused by cigarettes (0.05).<sup>17,18</sup> The per capita loss estimate includes \$62 from property damage and \$141 from deaths and injuries.<sup>17</sup>

## Sensitivity Analysis

A sensitivity analysis was performed to develop a range around each cost estimate. For healthcare costs, the range of per capita SHS expenditures from Waters et al.<sup>12</sup> was used (\$55.87–\$121.21); the assumed average fraction of time spent in public housing was 0.438–0.730. For renovation costs, it was assumed that per-unit costs and turnover rates were 75%–125% of baseline figures (\$820 and 0.20). For fire costs, it was assumed that per capita loss from all fires and the proportion of smoking-related fires were 75%–125% of baseline figures (\$203 and 0.05).

## Results

The estimated cost savings from prohibiting smoking in all U.S. subsidized housing would be \$521 million (range: \$270–\$892) per year, including \$341 million (range: \$169–\$611) in SHS-related health care; \$108 million (range: \$61–\$169) in renovation expenses; and \$72 million (range: \$41–\$113) in smoking-attributable fire losses (Table 1). The estimated cost savings from prohibiting smoking in U.S. public housing alone would be \$154 million (range: \$80–\$265) per year, including \$101 million (range: \$50–\$181) in SHS-related health care; \$32 million (range: \$18–\$50) in renovation expenses; and \$21 million (range: \$12–\$33) in smoking-attributable fire losses (Table 1).

## Discussion

Smokefree policies are favored by a majority of tenants and legally permissible in subsidized and market-rate housing.<sup>19–22</sup> The U.S. Department of Housing and Urban Development has encouraged Public Housing Authorities, and owners and managers of multifamily housing rental assistance programs such as Section 8, to implement smokefree policies in their properties.<sup>23,24</sup> As of January 2012, more than 250 Public Housing Authorities across the U.S. have instituted such policies, including all 20 in Maine.<sup>25</sup> Nonetheless, smokefree policy prevalence remains low, and many multiunit housing operators have misconceptions about implementation barriers.<sup>26–28</sup> Therefore, efforts are needed to educate these individuals about the health and economic benefits of prohibiting smoking in this environment.

Concerns have been raised that smokefree policies in subsidized housing could exacerbate socioeconomic disparities by adversely affecting low-income people and displacing residents who refuse to comply.<sup>20</sup> However, these policies prohibit the act of smoking, not the occupation of units by people who smoke. Moreover, research suggests that such policies do not lead to increases in voluntary tenant turnover in subsidized housing and can actually help motivate smoking cessation and reduce cigarette consumption.<sup>29</sup> Residents who quit smoking in response to smokefree policies likely would experience improved health and realize cost savings through reduced use of healthcare services and tobacco purchases, the latter of which can comprise a substantial portion of low-income smokers' income.<sup>30</sup> These benefits can be maximized if policy implementation is coupled with the provision of evidence-based smoking cessation resources to subsidized housing residents.<sup>20,22</sup>

To the authors' knowledge, the current study is the first to assess the costs that could be averted by prohibiting smoking in U.S. subsidized housing. The findings suggest that such efforts would generate cost savings of approximately \$521 million annually, including \$341 million in SHS-related healthcare expenditures, or approximately 7% of all direct healthcare costs from SHS in the U.S. each year.<sup>31</sup> Nonetheless, at least four study limitations should be noted. First, all cost figures are based on estimates and assumptions, which are subject to uncertainty and variation. For example, some estimates were based on state-specific data, which may not be generalizable to the entire U.S. However, adjustments were made to account for variations across states, and conservative estimates were used in all instances.

Second, this analysis did not account for all societal costs associated with smoking. The inclusion of additional factors, such as long-term healthcare costs, indirect costs related to time lost because of illness, or the benefits associated with smokers who quit due to smokefree policies, would result in higher estimates. Third, the study could not differentiate between costs due to secondhand smoke and residual tobacco smoke pollution, or thirdhand smoke.<sup>32</sup> Finally, the analysis did not account for potential costs associated with policy enforcement. However, research suggests that most multiunit housing operators who have implemented smokefree policies report having no difficulty with policy enforcement, with most employing methods that require little investment of money or staff time, such as sending written warning letters.<sup>28</sup> These multiunit housing operators also report that the staff time devoted to managing buildings either stayed the same or decreased following policy implementation.<sup>28</sup>

## Conclusion

The current study found that prohibiting smoking in all U.S. subsidized housing would yield cost savings of approximately \$521 million per year, including \$154 for public housing. Efforts to prohibit smoking in all U.S. subsidized housing would protect health and generate substantial cost savings to society.

## Acknowledgments

There were no sources of funding, direct or indirect, for the reported research. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

## References

1. DHHS. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Atlanta GA: DHHS, CDC, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention & Health Promotion, Office on Smoking and Health; 2006.
2. CDC. State smoke-free laws for worksites, restaurants, and bars—U.S. 2000–2010. *Morb Mortal Wkly Rep.* 2011; 60(15):472–5.
3. Kraev TA, Adamkiewicz G, Hammond SK, Spengler JD. Indoor concentrations of nicotine in low-income, multi-unit housing: associations with smoking behaviors and housing characteristics. *Tob Control.* 2009; 18:438–44. [PubMed: 19679890]
4. King BA, Travers MJ, Cummings KM, Mahoney MC, Hyland AJ. Secondhand smoke transfer in multiunit housing. *Nicotine Tob Res.* 2010; 12(11):1133–41. [PubMed: 20889473]
5. Levy DE, Rigotti NA, Winickoff JP. Tobacco smoke exposure in a sample of Boston public housing residents. *Am J Prev Med.* 2013; 44(1):63–6. [PubMed: 23253651]

6. Hewett MJ, Ortland WH, Brock BE, Heim CJ. Secondhand smoke and smokefree policies in owner-occupied multi-unit housing. *Am J Prev Med.* 2013; 43(5S3):S187–S196. [PubMed: 23079216]
7. Markowitz, S. Where there's smoking, there's fire: the effects of smoking policies on the incidence of fires in the U.S. Working Paper 16625. National Bureau of Economic Research; 2010. [www.nber.org/papers/w16625](http://www.nber.org/papers/w16625)
8. Ong MK, Diamant AL, Zhou Q, Park HY, Kaplan RM. Estimates of smoking-related property costs in California multiunit housing. *Am J Public Health.* 2012; 102(3):490–3. [PubMed: 21852657]
9. U.S. Department of Housing and Urban Development. Resident characteristic report as of March 31, 2012. <https://pic.hud.gov/pic/RCRPublic/rcrmain.asp>
10. CDC. National Health Interview Survey. 2009. data release. [www.cdc.gov/nchs/nhis/nhis\\_2009\\_data\\_release.htm](http://www.cdc.gov/nchs/nhis/nhis_2009_data_release.htm)
11. CDC. Vital signs: current cigarette smoking among adults aged 18 years—U.S. 2009. *Morb Mortal Wkly Rep.* 2010; 59(35):1135–40.
12. Waters HR, Foldes SS, Alesci NL, Samet J. The economic impact of exposure to secondhand smoke in Minnesota. *Am J Public Health.* 2009; 99(4):754–9. [PubMed: 19197082]
13. Top 50 States. Cost of living by state. [www.top50states.com/cost-of-living-by-state.html](http://www.top50states.com/cost-of-living-by-state.html)
14. Klepeis NE, Nelson WC, Ott WR, et al. The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *J Expo Anal Environ Epidemiol.* 2001; 11(3):231–52. [PubMed: 11477521]
15. National Cancer Institute. 2006–2007 tobacco use supplement to the current population survey. [www.riskfactor.cancer.gov/studies/tus-cps](http://www.riskfactor.cancer.gov/studies/tus-cps)
16. Smoke-Free Housing Coalition of Maine. How much does secondhand smoke cost a landlord?. [www.smokefreeforme.org/presentation/maintenance\\_cost.pdf](http://www.smokefreeforme.org/presentation/maintenance_cost.pdf)
17. Hall, JR. The total cost of fire in the United States. Quincy MA: National Fire Protection Association, Fire Analysis and Research Division; 2010. [www.nfpa.org/assets/files/PDF/totalcostsum.pdf](http://www.nfpa.org/assets/files/PDF/totalcostsum.pdf)
18. Ahrens, M. Home structure fires. Quincy MA: National Fire Protection Association, Fire Analysis and Research Division; 2010. [www.scfirechiefs.com/PDF%20Files/Home%20Structure%20Fires.pdf](http://www.scfirechiefs.com/PDF%20Files/Home%20Structure%20Fires.pdf)
19. Licht AS, King BA, Travers MJ, Rivard C, Hyland AJ. Attitudes, experiences, and acceptance of smoke-free policies among U.S. multiunit housing residents. *Am J Public Health.* 2012; 102(1):1868–1871. [PubMed: 22897557]
20. Drach LL, Pizacani BA, Rohde KL, Schubert S. The acceptability of comprehensive smoke-free policies to low-income tenants in subsidized housing. *Prev Chronic Dis.* 2010; 7(3):1–3.
21. Schoenmarklin, S. Tobacco Control Legal Consortium. Infiltration of secondhand smoke into condominiums, apartments and other multi-unit dwellings: 2009. Oct. 2009 [publichealthlawcenter.org/sites/default/files/resources/tclc-syn-condos-2009\\_0.pdf](http://publichealthlawcenter.org/sites/default/files/resources/tclc-syn-condos-2009_0.pdf)
22. Winickoff JP, Gottlieb M, Mello MM. Regulation of smoking in public housing. *N Engl J Med.* 2012; 362(24):2319–25. [PubMed: 20554988]
23. U.S. Department of Housing and Urban Development. Non-smoking policies in public housing. 2009. [www.hud.gov/offices/pih/publications/notices/09/pih2009-21.pdf](http://www.hud.gov/offices/pih/publications/notices/09/pih2009-21.pdf)
24. U.S. Department of Housing and Urban Development. Optional smoke-free housing policy information. 2010. [portal.hud.gov/hudportal/documents/huddoc?id=10-21hsgn.pdf](http://portal.hud.gov/hudportal/documents/huddoc?id=10-21hsgn.pdf)
25. Smoke-Free Housing Coalition of Maine. Government subsidized housing. 2012. [www.smokefreeforme.org/landlord.php?page=Government+Subsidized+Housing](http://www.smokefreeforme.org/landlord.php?page=Government+Subsidized+Housing)
26. King BA, Cummings KM, Mahoney MC, Hyland AJ. Intervention to promote smoke-free policies among multiunit housing operators. *J Public Health Manag Pract.* 2011; 17(3):E1–E8. [PubMed: 21464678]
27. Hewett MJ, Sandell SD, Anderson J, Niebuhr M. Secondhand smoke in apartment buildings: renter and owner or manager perspectives. *Nicotine Tob Res.* 2007; 9(S1):S39–S47. [PubMed: 17365725]
28. Cramer ME, Roberts S, Stevens E. Landlord attitudes and behaviors regarding smoke-free policies: implications for policy change. *Public Health Nurs.* 2011; 28(1):3–12. [PubMed: 21198809]

29. 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):1027–34. [PubMed: 22318686]
30. Farrelly MC, Nonnemaker JM, Watson KA. The consequences of high cigarette excise taxes for low-income smokers. *PLoS One.* 2012; 7(9):e43838. [PubMed: 22984447]
31. Behan, DF.; Eriksen, MP.; Lin, Y. Economic effects of environmental tobacco smoke report. Schaumburg IL: Society of Actuaries; 2005. [www.actuary.org/pdf/health/smoking\\_oct06.pdf](http://www.actuary.org/pdf/health/smoking_oct06.pdf)
32. Hovell MF, Robusto KM, Matt GE. When is it appropriate to scream fire in a crowded theater or public housing? *Am J Prev Med.* 2013; 44(1):93–5. [PubMed: 23253657]

**Table 1**

Estimated annual cost savings associated with prohibiting smoking in U.S. subsidized housing, by cost type

Cost type	All subsidized housing		Public housing only	
	Cost savings (\$ million)	Sensitivity analysis range (\$ million)	Cost savings (\$ million)	Sensitivity analysis range (\$ million)
Secondhand smoke–related health care	341	169–611	101	50–181
Renovation of units where smoking is permitted	108	61–169	32	18–50
Smoking-attributable fires	72	41–113	21	12–33
Total	521	270–892	154	80–265