

Children and Adolescents' Exposure to Secondhand Smoke in Ohio Households: Disparities and
Trends

Rachel Beam, SN

The Ohio State University

Abstract

Purpose:

Exposure to secondhand smoke increases health risk in children and adolescents, including asthma, ear infections, and respiratory infections. In 2007, the National Survey of Children's Health found that 16% of children and adolescents in Ohio were exposed to secondhand smoke in the home compared to 7.6% nationwide and that socioeconomic disparities in exposure were prevalent. The purpose of this study is: (1) to describe the status of exposure to secondhand tobacco smoke in the home among children and adolescents in Ohio, including socioeconomic disparities in exposure using 2011/2012 data, and (2) to explore the change in outcomes from 2007 and 2011/2012.

Methods:

A descriptive study design was employed using secondary data from the 2007 and 2011/2012 National Survey of Children's Health. The outcome measure of interest was exposure to secondhand tobacco smoke in the home (yes/no) and the independent variables included indicators of socioeconomic status (e.g. household income to poverty ratio and caregiver level of education). Descriptive analyses were conducted using the Data Resource Center for Child and Adolescent Health- an online analysis program.

Results

In 2011, 10.3% of children and adolescents in Ohio were exposed to secondhand tobacco in the home compared to 16% in 2007. However, Ohio's prevalence was higher than the 2011 national average (4.9%). Children from lower socioeconomic households were more likely to be exposed to secondhand smoke in the home compared to those in more socioeconomically advantaged

households; findings consistent to those in 2007. In addition, the prevalence of exposure increased as socioeconomic status decreased across the socioeconomic gradient.

Conclusions

Although rates of exposure to secondhand smoke have declined, large disparities were found between the nation and Ohio and among socioeconomic groups. Thus, efforts to decrease exposure are needed, such as healthcare providers increasing awareness about the dangers of secondhand smoke exposure in the home and programs that target lower income households.

Introduction

Secondhand smoke has been the subject of many research studies for 30 years now. The first United States Surgeon General report about secondhand smoke was delivered in 1986 linking secondhand smoke to diseases such as heart disease, stroke, and various types of cancer (Surgeon General Report, 2014). Children and adolescents are particularly vulnerable, especially those from lower socioeconomic households with numerous studies linking secondhand smoke exposure to various disease processes, including respiratory infections, inner ear infections, asthma, and sudden infant death syndrome (US Department of Health and Human Services (USDHHS), 2010). For example, a recent study of 451 mother-infant dyads in Tennessee found that 57% of the infants were exposed to secondhand smoke, and that those who were exposed were at highest risk for bronchiolitis. In addition, infants exposed to secondhand smoke were more likely to have been low birth weight, less likely to have been breastfed, have a mother with lower education, and enrolled in Medicaid (Carroll, K. N., Lemke, M., Hartert, T., & Gebretsadik, T., 2013)). Using the information found by these studies we know there are many links between secondhand smoke exposure in the home and children's health.

However, despite the substantial evidence on the negative health effects of secondhand smoke exposure on pediatric and adolescent populations, a 2010 study by the Centers for Disease Control and Prevention found that approximately 32 million U.S. youth aged 3 to 19 years were exposed to secondhand smoke during 2007-2008 alone (Kaufmann, R., Asman, K., Bishop, E., Tyman, M., & Caraballo, R, 2010) and significant geographic and socioeconomic disparities in secondhand smoke exposure among youth also have been identified. For example, research from the 2007 National Survey of Children's Health (NSCH) found that 16% of children and adolescents in Ohio were exposed to secondhand smoke in the home compared to 7.6%

nationwide, the 3rd highest rate in country (NSCH, 2007) In addition, socioeconomic disparities within Ohio were also evident as the prevalence of secondhand smoke exposure was nearly 36% among children and adolescents in which the highest educational level among caregivers in the household was less than a high school degree compared to 7% in which the highest education level among caregivers was more than a high school degree (NSCH, 2007). Similarly, 35% of children and adolescents in households with an income to poverty ratio <100% were exposed to secondhand smoke exposure versus 3% in households with an income to poverty ratio 400% or higher (NSCH, 2007). However, in the years since the NSCH 2007 study was conducted, Ohio's rates of smoking have decreased from 16.3% to 10.3% and legislative changes prohibiting smoking in public space have been enacted. Specifically, in Ohio Issue 5 was passed in 2006 prohibiting smoking in the workplace and in public places with the legislative change enforced in 2007 (ODH, 2008). Despite these legislative changes there were no legal changes to prohibit smoking in private homes or vehicles where children are present. Because of the legal changes and these trends, research exploring changes in children and adolescent secondhand smoke exposure in homes is warranted.

Therefore, the purpose of this study is: (1) to describe the 2011 prevalence of exposure to secondhand tobacco smoke in the home among children and adolescents in Ohio compared to nationwide, including socioeconomic disparities in exposure, and (2) to explore changes in exposure from 2007 and 2011.

Methods

Theoretical Framework

The study was informed by Flaskerud and Winslow's conceptual framework on vulnerable populations and health risk. Within this framework there are 3 core ideas 1) health

status, which looks at disease prevalence, morbidity, and mortality, 2) resource availability which looks at the “availability of socioeconomic and environmental resources” (p. 69) such as unemployment rates and living conditions; 3) relative risk related to exposure which the article states as the “ratio of the risk of poor health status among groups who do not receive resources and are exposed to risk factors compared to those who do receive resources and are not exposed to these risk factors” (p. 69). Using this framework we explored prevalence in exposure to secondhand smoke in the home among children and adolescents - a vulnerable developmental phase in the life course, along with attention to resource availability increasing vulnerability for youth in lower socioeconomic households.

Study Design and Sample

This study utilized secondary data from the 2007 and 2011/2012 National Survey of Children’s Health (NSCH 2007, NSCH 2011/2012) available from the Data Resource Center for Child and Adolescent Health. Parents/caregivers of children aged 0 to 17 years were who selected by the NSCH via random-digit-dialing. In 2007, only landline phones were called, but the 2011/2012 data set included cell phones in addition to landlines. If the household included more than one child within the targeted age range, one child from that specific household would be randomly selected for the interviewee to answer the questions. In 2007, the NSCH conducted a total of 91,642 interviews and with approximately 1,725 to 1,932 interviews per state. The same process was used for the 2011/2012 data set where NSCH interviewed 95,677 families nationally, and between 1,811 and 2,200 per state. Surveys were conducted in English, Spanish, Mandarin, Cantonese, Vietnamese, or Korean with questions on the child’s health status, health care (insurance, screening), school and activities, child’s family, and child and family’s neighborhood. The median interview time was 33 minutes long. The sample sizes of the youth

aged 0 to 17 years in this study available from the Data Resource Center used were: Nationwide: 90,961 youth in 2007 and 94,748 in 2011/2012 and Ohio 1,749 in 2007 and 1,897 in 2011/2012 (NSCH 2007, NSCH 2011/2012). The IRB at Ohio State University found this study to be exempt, as the data were publically available.

Measure

Dependent Variable-Secondhand Smoke Exposure

The survey assessed for secondhand smoke exposure in the home in 2007 and 2011. According to American Cancer Society define secondhand smoke as “a mixture of 2 forms of smoke that come from burning tobacco: sidestream smoke – smoke from the lighted end of a cigarette, pipe, or cigar or mainstream smoke – the smoke exhaled by a smoker.(American Cancer Society, 2014).” To capture secondhand smoke exposure the 2007 and 2011/2012 NSCH surveys asked the interviewee “Does anyone living inside of [child name]'s home smoke inside the home?” The answers were then categorized as either 1) No one in the household uses tobacco, 2) Someone uses tobacco, but not inside the children's home, 3) Someone uses tobacco inside child’s home.

Independent Variables: Socioeconomic Status

Two measures were used to assess socioeconomic status “*highest education level of caregiver in the household*” and *household income level to poverty ratio*. The 2007 and 2011/2012 survey inquired about household income level by asking “Please think about your total combined FAMILY income during the last calendar year for all members of the family. Can you tell me that amount before taxes? What was that amount?” Then the interviewer determined the Federal Poverty level which is determined by the total household income and the number of people in the household. The Federal Poverty level is calculated each year by the Department of

Health and Human Services to determine the “poverty threshold” and is used to determine finance eligibility for various federal programs (2013 Federal Poverty Guidelines).

The 2007 and 2011/2012 surveys asked about highest educational of the caregiver but asking the question: “What is the highest grade or year of school the child’s mother/father/guardian have completed?” The responses options were: less than high school, high school diploma, and more than a high school diploma in which the latter included Certifications and/or Associate, Bachelors, Master’s, or Doctoral degree (National Survey of Children’s Health CATI Instrument).

Results

Trends in Secondhand Smoke Exposure in the Home, Nationwide and State of Ohio

The prevalence of secondhand smoke exposure among youth aged 0 to 17 decreased from 2007 to 2011/2012 nationwide as well as for the state of Ohio. Specifically, rates of secondhand smoke exposure dropped from 7.6% to 4.9% nationwide and 16.3% to 10.3% in the state of Ohio (Table 1).

Table 1 General Exposure Trends 2007 to 2011/2012

	Nationwide		Ohio	
	2007	2011/2012	2007	2011/2012
General SHS exposure, %				
No one in the household uses tobacco	73.8	75.9	63.4	67.3
Someone uses tobacco, not inside home	18.6	19.2	20.2	22.3
Someone uses tobacco, inside child's home (SHS)	7.6	4.9	16.3	10.3

Trends in Secondhand Smoke Exposure in the Home, Nationwide and State of Ohio by Socioeconomic Disparities

With respect to level of education, the nationwide prevalence of secondhand smoke exposure in the home in 2007 was 15.4% for youth in households in which the caregiver had less than a high school degree, 13% in which the caregiver had a high school degree, and 4% in

which the caregiver had more than a high school degree. Nationwide, the rates were 6.9%, 9.4%, and 3.3% respectively in 2011/2012 (Table 2).

In 2007, the prevalence of secondhand smoke exposure in the home among youth living in the state of Ohio was approximately 35.7% for those whose caregiver had less than a high school degree, 20.3% of those whose who had a caregiver with a high school degree, and 7% for those whose caregiver had more than a high school degree. The 2011/2012 rates declined to 22.7%, 20.9%, and 5.8% respectively (Table 2).

Table 2 Exposure to Secondhand Smoke by Highest Level of Caregiver’s Education

	Nationwide		Ohio	
	2007	2011/2012	2007	2011/2012
Educational Level of Caregiver, %				
Less than high school diploma	15.4	6.9	35.7	22.7
High School diploma	13.05	9.4	20.3	20.9
More than high school diploma	4.44	3.3	7.0	5.8

Similar results were found for household incomes with higher rates of secondhand smoke exposure for children and adolescents living in households with lower income to poverty ratios compared to those in more socioeconomically advantaged households. In addition Ohio’s rates were higher than the national rates across all income brackets. Specifically the 2007 prevalence of secondhand smoke exposure nationwide by household income to poverty ratio was 13.7% (0-99%), 11.0% (100-199%), 6.6% (200-399%), and 2.3% (400% and higher) compared to the prevalence in Ohio at 35.1% (0-99% FPL), 27.6% (100-199%), 8.8% (200-399%) and 2.9% (400% FPL and higher). In 2011/2012, the prevalence of secondhand smoke exposure was lower nationwide and in the state of Ohio across all income to poverty ratios, but socioeconomic disparities were still evident. For example, 22% of children and adolescents in the state of Ohio who lived in households in which the income to poverty ratio was 0-99% were exposed to

secondhand smoke exposure compared to 0.9% of those in households in which the income to poverty ratio was 400% or higher. (Table 3)

Table 3 Exposure to Secondhand Smoke by Household Income Level to Poverty ratio

	Nationwide		Ohio	
	2007	2011/2012	2007	2011/2012
Household Income Level based on Federal Poverty level, %				
0-99%	13.7	9.6	35.1	22.2
100-199%	11.0	7.1	37.6	10.7
200-399%	6.6	3.2	8.8	8.6
400% +	2.3	1.2	2.8	0.9

DISCUSSION

The findings of this study provide evidence of an overall decrease in secondhand smoke exposure among youth nationwide and in the state of Ohio from 2007 to 2011/2012. The government has increased the number of laws prohibiting smoking in certain public places in hopes of decreasing secondhand smoke exposure (Consumer Booklet, 2013). However, despite the decline in secondhand smoke exposure over the years, geographic and socioeconomic disparities in exposure still exist. Our study showed marked differences between Ohio and the national rates of secondhand smoke exposure. The NSCH estimates that 275,064 Ohio children are impacted by secondhand smoke exposure in the home. These numbers fail to factor in the number of Ohio household exposed to secondhand smoke without children in the home. Even with the 6% decline over the three to four year period Ohio's secondhand smoke exposure rates are more than double the national rates of secondhand smoke exposure.

This study shows that there are disparities in the nationwide rates of secondhand smoke exposure for children and adolescents in households with lower income to poverty ratios and among those whose primary caregiver had a high school diploma or less. However, when you

compare the nationwide differences to the Ohio differences there is a much greater gap. For example, when you look at the 2011/12 data for caregivers with less than a high school diploma, the nationwide rates are at 6.9% compared to Ohio's rate of 22.7% (Table 2). This shows that much more emphasis on interventions targeting these vulnerable populations is needed in order to help reduce these disparities.

As mentioned previously there has been a recent political and public health push for the banning of smoking in public but little has been done with the advocacy against smoking in households. The "Smoke-free Homes" initiative was one of the few public campaigns against smoking in the home. "Smoke-free Homes" is an initiative by the Environmental Protection Agency (EPA) to help parents and caregivers understand the harmful consequences that secondhand smoke exposure can have on their children. This program includes a brochure (English and Spanish), a fact sheet, and a community action kit, however this educational tool is not tailored to population sub-groups (e.g. low income). One study conducted in Armenia by Dr. Arusyak Harutyunyan and endorsed by the American Academy of Pediatrics tested interventions to decrease secondhand smoke exposure in the home. This study identified that the changes in legislation on smoking in public places has had limited impact on smoking in private homes and consequently, tested interventions to help parents quit smoking and decrease children's secondhand smoke exposure in the home. The study included 250 households with children age 2 to 6 years old and at least one daily smoker who lived in the home. This findings showed groups who were given counseling, educational materials, and counseling telephone calls at 1 month and 2 month post-intervention had decreased hair cotinine levels(Arusyak Harutyunyan, Narine Movsisyan, Varduhi Petrosyan, Diana Petrosyan, and Frances Stillman, 2013).

This has many implications for nurses, public health officials, and primary care providers. This study identifies that more effort is need to target these socioeconomic disparities to help decrease the overall SHS exposure in Ohio. Efforts can be made to decrease secondhand smoke exposure through screening children and families and then referring parents/guardians for resources to help them quit smoking. A research study found that nicotine levels can be detected among residents in multi-unit homes due to poor ventilation systems and other factors even when there is no direct exposure to secondhand (Kraev, T., Adamkiewicz, G., Hammond, S., & Splenger, J.. 2009). Lower income families are more likely to live in such housing units which place them at even higher rates of secondhand smoke exposure. Health care officials should be advocating more for the cessation of smoking in such facilities or advocate with the property owners to improve ventilation of the facilities. Furthermore, this data allows for further analysis using interventions identified above targeting the areas of disparities in Ohio.

This study includes limitations. For example, the study does not measure exposure to smoking in enclosed vehicles which can cause similar effects as smoking in the home. The study was also limited by the low responses rate. The 2007 overall response rate was 46.7% (Blumberg, S., Foster, E., Skalland, B., Chowdhury, S., & O'Conner, K, 2009) and the 2011/2012 overall response rate was the 38.2% for landline sample and 15.5% for the cellphone sample. With these levels of responses it is difficult to determine the accuracy of this information.

The study design was cross-sectional which looks at different samples from two periods in time, from this we cannot determine causality. Future studies should consider longitudinal studies to determine causality and to determine effectiveness of interventional changes. The final

limitation identified was that secondhand smoke exposure may be underreported by parents. Specifically, a 2014 study found that parental reports of children's secondhand smoke exposure were lower than exposure rates determined by cotinine levels in the child's hair and saliva (Kahn, R. S., A. Howrylak, J., Spanier, A. J., Huang,, B., A. Peake, R. W., Kellogg, M. D., 2014).

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