

# Life Course Indicator: Exposure to Secondhand Smoke Inside the Home

## The Life Course Metrics Project

As MCH programs begin to develop new programming guided by a life course framework, measures are needed to determine the success of their approaches. In response to the need for standardized metrics for the life course approach, AMCHP launched a project designed to identify and promote a set of indicators that can be used to measure progress using the life course approach to improve maternal and child health. This project was funded with support from the [W.K. Kellogg Foundation](#).

Using an RFA process, AMCHP selected seven state teams, Florida, Iowa, Louisiana, Massachusetts, Michigan, Nebraska and North Carolina, to propose, screen, select and develop potential life course indicators across four domains: Capacity, Outcomes, Services, and Risk. The first round of indicators, proposed both by the teams and members of the public included 413 indicators for consideration. The teams distilled the 413 proposed indicators down to 104 indicators that were written up according to three data and five life course criteria for final selection.

In June of 2013, state teams selected 59 indicators for the final set. The indicators were put out for public comment in July 2013, and the final set was released in the Fall of 2013.

### Basic Indicator Information

**Name of indicator:** Exposure to Secondhand Smoke Inside the Home (LC-28)

**Brief description:** Percent of children living in a household where smoking occurs inside home.

**Indicator category:** Family Well-being

**Indicator domain:** Risk/Outcome

**Numerator:** Number of children who live in a household with someone who smokes and smoking occurs inside home

**Denominator:** Children age zero to 17 years

**Potential modifiers:** When the Exposure to Secondhand Smoke in Home measure was administered in its most recent form, in the 2011/12 National Survey of Children's Health, the survey included a number of child demographic variables that allow for stratification of the findings by possible vulnerability:

- Age
- Gender
- Geographic location- State, HRSA Region, National level Rural Urban Commuter Areas (RUCA)
- Race/ethnicity
- Health insurance- type, consistency
- Primary household language
- Household income
- Special Health Care Needs- status and type

**Data source:** National Survey of Children's Health (NSCH)

**Notes on calculation:** Analysts who use the raw datasets should apply the appropriate survey weights to generate the final estimates.

**Similar measures in other indicator sets:** HP 2020 Focus area TU-11; NQF measure 1346; MIECHV Benchmark Area Improvements in School Readiness and Achievement: Child's physical health and development

## Life Course Criteria

### **Introduction**

Secondhand smoke consists of the smoke from the burning end of a cigarette, pipe, or cigar, as well as the smoke exhaled out of the smoker's lungs. Secondhand smoke contains more than 7,000 different chemicals and chemical compounds, of which 250 are known to be harmful and 70 of which are known carcinogens including arsenic, benzene, and chromium [3, 23]. There is no safe level of exposure to secondhand tobacco smoke. The U.S. Environmental Protection Agency (EPA), the U.S. National Toxicology Program, the U.S. Surgeon General, and the International Agency for Research on Cancer have all labeled secondhand smoke as a known cancer-causing agent [23]. Secondhand smoke is a cause of more than 7,500 lung cancer deaths in nonsmokers each year [3], however, cancer is not the only negative health outcome attributed to secondhand smoke. Since 1964, 2.5 million nonsmokers have died from various causes as a result of secondhand smoke [24]. Second hand smoke has damaging effects on the heart and blood vessels which may increase the risk of heart disease and stroke [3]. Children suffer from serious health risks due to second hand smoke exposure including new cases of asthma and exacerbation of asthma symptoms, Sudden Infant Death Syndrome (SIDS), pneumonia, bronchitis, and middle ear infections [4]. Health issues caused by secondhand smoke create a personal, societal, and economic burden through morbidity and mortality that could be greatly reduced by smoking behavior changes in the home, the place where children are most commonly exposed [4]. Programs, services, and policies in a variety of sectors have the ability to reduce the percentage of children exposed to secondhand smoke and could alleviate significant individual health risks and public health disease burden if leveraged appropriately.

### **Implications for equity**

In the United States, the percent of children who live in a household where someone uses cigarettes, cigars, or pipe tobacco was reduced between 2007 and 2011 (26.2 percent to 24.1 percent of children) [7,25]. Additionally, the overall percent of children living in a household where someone smokes tobacco inside the child's home declined from 7.6 percent in 2007 to 4.9 percent in 2011 [7,25]. Although reductions are encouraging, risk of exposure to secondhand smoke is disproportionately higher in certain populations.

Two of the most important predictors of childhood exposure to secondhand smoke in the home are socioeconomic status and race/ethnicity. Poverty, a marker for socioeconomic status, has significant systematic effects on child exposure to secondhand smoke within the home, with low-income children facing the greatest odds of exposure to secondhand smoke across all racial/ethnic groups [7]. Compared to children living at 400 percent FPL or greater, children living below 100 percent FPL, have 3.23 times the odds of exposure to secondhand smoke inside the home [7]. Nationally, the percentage of African American children who live in a household where someone uses cigarettes, cigars or pipe tobacco (25.0 percent) is lower than White non-Hispanic children (26.1 percent), however, African American children are at a significantly higher risk of being exposed to tobacco smoke inside their homes than non-Hispanic White or Hispanic children[25]. In 2011, 1.9 percent of Hispanic children, 5.2 percent of White children and 9.0 percent of Black children were exposed to secondhand smoke inside the home [25]. Gilpin et al (1999) found only 24 percent of African American smokers in California reported a smoke-free home which was far lower than Hispanic (58 percent), Asian (43 percent), or non-Hispanic White (32 percent) smokers. Overall, fifty percent of African American children and more than one-third of children from low-income families in smoking households are exposed to secondhand smoke inside the home [7].

Secondhand smoke exposure in the home also varies by geographic location and age of the child. Children living in rural locations are more likely to be exposed to secondhand smoke inside the home than children living in urban areas (12.4 vs. 6.5 percent)[7]. Prevalence of exposure to secondhand smoke inside the home also increases as children get older. For example, 4.8 percent of children age 0-5 years, 7.4 percent of children age 6-11 years and 10.4 percent of children age 12-17 years are exposed to secondhand smoke inside the home [7-8].

A child who lives in household where someone smokes is also more likely to begin using tobacco products in adolescence. [9-10]. While secondhand smoke exposure has been shown to lead to adverse health consequences, a lifetime of tobacco product use has a larger impact on risk for heart disease, stroke, and cancer [11]. The cyclical nature of the exposure to both the effects of secondhand smoke and modeled behavior leads to the socioeconomic and racial disparities in tobacco use, secondhand smoke exposure, and consequently, health outcomes.

### **Public health impact**

Prevention of child exposure to secondhand smoke in the home is in the best interest of infants, children, and adolescents as exposure has been correlated with childhood health issues, onset of diseases in adulthood, barriers to educational achievement, and onset of adolescent use of tobacco products [12]. Secondhand smoke is a contributor to some of the most costly and prevalent chronic diseases in the United States. Each year second hand smoke causes 8,000 deaths from stroke, 34,000 premature deaths from heart disease, and 7,300 lung cancer cases among U.S. nonsmokers [3]. In addition, secondhand smoke contributes to infant mortality through increasing the risk of SIDS for infants who are exposed to secondhand smoke after birth. Infants who have died from SIDS have been found to have higher levels of biological markers for secondhand smoke than infants who died of other causes [3].

Exposure to secondhand smoke has been associated with increased health service utilization and negative health consequences, including increased number of sick visits to outpatient providers [13] and increased severity of illness [14]. Asthmatic children exposed to secondhand smoke have greater risk for emergency department utilization [26]. Overall, children who are exposed to environmental secondhand smoke had a higher frequency of sick visits and to the pediatrician's office [13]. Secondhand smoke exposure also increased a child's need for intensive care services when diagnosed with influenza [14]. For children who were hospitalized for influenza, those who also had secondhand smoke exposure were more likely to require intensive care, intubation, and require longer stays in the hospital [14]. Reducing exposure to secondhand smoke among children should also lead to a reduction in emergency department utilization, intensive care service need, and health care costs.

Increased utilization of health services and severity of health problems can reduce individual productivity as children, including engagement in school and later as adults in the form of missed work days. Interventions for parental cessation of smoking or counseling future parents to quit smoking can have a public health impact through both a reduction in smoking rates and a reduction in child secondhand smoke exposure. Preventing individuals from starting to smoke and increasing the opportunities for successful smoking cessation are critical to reducing exposure of children and other vulnerable populations to secondhand smoke exposure.

### ***Leverage or realign resources***

Smoking cessation interventions for parents designed to be implemented in family homes, pediatric clinics, and hospitals can encourage and assist parents in their efforts to quit smoking [15]. These interventions were most successful when providing high levels of follow-up with the parents, as well as nicotine replacement medication to assist in the cessation process [15]. However, success rates for cessation were less than one in four parents, which indicates a need for programs with greater efficacy and stronger education components to teach parents how to keep children safe from secondhand smoke in homes with an adult who smokes tobacco products.

Pediatric outpatient clinics have the opportunity to both monitor the child as well as provide educational materials to parents. The Clinical Effort Against Secondhand Smoke Exposure (CEASSE) intervention utilizes evidence-based practices to support identification of children exposed to secondhand smoke, identification of parental stage and intent to quit, and treatment program management [16]. This program presents an opportunity to bring not only identification and education into the child health visit, but also engage the parent in behavior modification to improve child outcomes.

Another approach is to implement tobacco control policies, such as cigarette excise taxes and smoke-free home legislation [17]. The impact of cigarette excise taxes has shown that for every \$1.00 increase, there is a 4 percent decrease in household tobacco use; however, no impact was shown for smoke-free home legislation. Legislation that limits smoking in work places and public places can also impact smoking cessation. A review of eleven studies found smoke-free work place policies were associated with a median 6.4 percent increase in smoking cessation among workers [28]. Through the Communities Putting Prevention to Work (CPPW) initiative, the American Lung Association worked with other national partners to develop an online curriculum on how to implement a smokefree policy in multi-unit housing properties like apartments and condominiums [35]. CDC's Healthy Homes and Lead Poisoning Branch has produced a manual for implementing smokefree policies in multi-unit housing for use by state and local Healthy Homes programs looking to reduce exposure to secondhand smoke [36].

The Environmental Protection Agency (EPA) supports Smoke-Free Home Pledge Campaigns that encourage individuals to designate that smoking cannot occur within their home [5]. The EPA also has partnered with the Department of Health and Human Services to encourage Head Start Centers to use tools such as these pledges to help low income families

learn about secondhand smoke health consequences and commit to smoke-free homes and cars [29]. Assessment of the success of the Oregon Smoke-Free Home Pledge Campaign found that one-third of households were able to implement a household smoking ban over the two-year study. While more than 90 percent of households indicated support for a ban of smoking in households with children, greater success in implementation was found for those who quit smoking or reduced consumption [18]. The EPA also provides a free bilingual (English & Spanish) educational brochure called *Secondhand Tobacco Smoke and the Health of Your Family*. The brochure is available for download at [epa.gov/smokefree/](http://epa.gov/smokefree/) and is designed to educate parents on the dangers of secondhand smoke and how to protect their families [30].

### ***Predict an individual's health and wellness and/or that of their offspring***

A meta-analysis of the research on effects of secondhand smoke exposure in children found correlations with SIDS, asthma, altered respiratory function, infection, cardiovascular effects, behavior problems, sleep difficulties, increased cancer risk, and a higher likelihood of smoking initiation [19]. Secondhand smoke has serious effects on children with asthma. Children regularly exposed to high levels of secondhand tobacco smoke are more likely to have moderate or severe asthma and decreased lung function than children with low levels of tobacco smoke exposure [26]. Secondhand smoke is also associated with sleep problems in asthmatic children including longer sleep-onset delay, sleep-disordered breathing parasomnias, daytime sleepiness, and overall sleep disturbance [27]. Exacerbation of asthma symptoms can lead to serious negative health effects that accompany poorly controlled asthma including weight gain, anxiety, depression, and loss of lung function [31,32]. Respiratory effects occurring later in life, including presence of chronic obstructive pulmonary disease (COPD), have also been associated with exposure to childhood secondhand smoke, even when controlling for current smoking and exposure as adults [21]. While many have considered individual smoking to be a larger factor in developing of heart and respiratory conditions in adulthood, exposure to secondhand smoke has been shown to have nearly the same impact as active smoking [22].

Children exposed to secondhand smoke in the home are more likely to have two or more neurobehavioral disorders, including learning disabilities, attention-deficit/hyperactivity disorder, behavioral and conduct disorders, and conditions requiring mental health counseling/treatment, even after controlling for sociodemographic variables [19]. Neurobehavioral conditions have been associated with higher likelihood to repeat a grade and show problem behaviors. Additionally, they have lower likelihood of being engaged in school and exhibiting positive social behaviors [20]. The presence of these adverse outcomes can cause lower educational attainment, limited earnings, substance abuse and trouble with the law.

In addition to secondhand smoke, children who are exposed to in home tobacco smoke are also exposed to thirdhand smoke. Thirdhand smoke is residual tobacco smoke contamination that lingers on skin, clothes, hair, home surfaces such as furniture and rugs, and even dust particles long after a cigarette is extinguished. While the issue of thirdhand smoke is still being researched, early findings show lingering tobacco smoke contaminants form new carcinogens (tobacco-specific nitrosamines)[33]. These carcinogens on dust particles and rugs/floors are of particular concern for young children as they spend more time in close contact with household floors than adults [34].

## **Data Criteria**

### ***Data availability***

The National Survey of Children's Health (NSCH), sponsored by the Maternal and Child Health Bureau of the Health Resources and Services Administration, examines the physical and emotional health of children ages zero to 17 years of age. The survey is administered using the State and Local Area Integrated Telephone Survey (SLAITS) methodology, and it is sampled and conducted in such a way that state-level estimates can be obtained for the 50 states, the District of Columbia, and the Virgin Islands. The survey has been designed to emphasize factors that may relate to the well-being of children, including medical homes, family interactions, parental health, school and after-school experiences, and safe neighborhoods. The Maternal and Child Health Bureau leads the development of the NSCH and NS-CSHCN survey and indicators, in collaboration with the National Center for Health Statistics (NCHS) and a national technical expert panel. The expert panel includes representatives from other federal agencies, state Title V leaders, family organizations, and child health researchers, and experts in all fields related to the surveys (adolescent health, family and neighborhoods, early childhood and development etc.). The most recent data set, the 2011-2012 NSCH, encompasses a sample size of more than 95,000 children with approximately 1,800 interviews completed in each of the 50 states and the District of Columbia.

MCH programs can readily gain immediate access to the data through datasets released by the National Center for Health Statistics, and on the MCHB sponsored Data Resource Center for Child and Adolescent Health website (childhealthdata.org). Data from the 2011/2012 NSCH were made available in early 2013. The survey questionnaire and raw dataset are available for download on the CDC's NCHS website in SAS format. The Data Resource Center (DRC) website provides data nationwide, for all 50 states and the District of Columbia. Additionally, both the raw datasets and the website allow users to stratify measures by sociodemographic groups, including but not limited to age, sex, race/ethnicity, primary household language, household income, and special health care needs. Cleaned, state-specific datasets with new variables that include national and state indicators are available at no cost in SAS and SPSS formats. For information on how to order state-specific sets, contact cahmi@ohsu.edu. Local data is not searchable. The NSCH is not administered annually. Over the past decade, the NSCH has been administered four times.

Data on child exposure to secondhand smoke inside home is currently collected every four years for the 50 states and the District of Columbia. The numerator is calculated from data reported by parents on (1) whether child lives in household with someone who smokes, and (2) whether smoking occurs inside the home. Parents are asked about the "current" status of smoking in the household.

### ***Data quality***

The Maternal and Child Health Bureau leads the development of the NSCH and NS-CSHCN survey and indicators, in collaboration with the National Center for Health Statistics (NCHS) and a national technical expert panel. The expert panel includes representatives from other federal agencies, state Title V leaders, family organizations, and child health researchers, and experts in all fields related to the surveys (adolescent health, family and neighborhoods, early childhood and development etc.).

The main limitation of the NSCH is that the information provided is from parent recollection of screenings received and perception of child's health and development over the past year. The survey methodology does not provide an opportunity for confirmation with medical records or physical measurements. The NSCH is weighted to represent the national population of non-institutionalized children age zero to 17 years. According to the survey documentation, missing data for income were relatively high for 2011-2012 data, and a study of nonresponse patterns indicated that excluding records with missing income could impact the representativeness of the remaining data; therefore, a data file with imputed values for income is provided to be used with the datasets.

The NSCH documentation presents both response rates and completion rates. For 2011-2012 data, the combined national response rate for both landline and cell phone samples was 23 percent. The completion rate, which is calculated as the proportion of households known to include children that completed all sections up to and including Section 6 (for children less than six years of age) or Section 7 (for children six to 17 years of age), was 54.1 percent for the landline sample and 41.2 percent for the cell-phone sample.

Qualitative testing of the entire 2007 National Survey of Children's Health was conducted by the National Center for Health Statistics. They conducted cognitive interviews with the 2007 NSCH Computer-Assisted Telephone Interview (CATI) to make sure the entire survey instrument was functioning properly. N=640 interviews were completed over 3 days in December 2006. The questionnaire was then revised and finalized based on feedback from participants in these interviews.

Previously validated questions and scales are used when available. All aspects of the survey are subjected to extensive literature and expert review. Respondents' cognitive understanding of the survey questions is assessed during the pretest phase and revisions made as required. All final data components are verified by NCHS and DRC/CAHMI staff prior to public release. Face validity is conducted in comparing results with prior years of the survey and/or results from other implementations of items.

The measure is utilized by the federal Maternal and Child Health Bureau (MCHB) in their children's health chartbook following the 2007 NSCH data release [1].

### ***Simplicity of indicator***

The level of complexity in calculating and explaining this indicator is low. The numerator and denominator are simple. Data weighting, indexing, or adjustments are not required and the statistical formula is straightforward. Reducing child exposure to secondhand smoke is a common focus area among professionals and communities and one that community members can understand. In fact, numerous government, national, and community groups have been addressing child exposure to secondhand smoke:

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