

Life Course Indicator: Adolescent Smoking

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: Adolescent Smoking (LC-23)

Brief description: Percent of adolescents who smoked cigarettes in the past 30 days.

Indicator category: Family Well-being

Indicator domain: Risk/Outcome

Numerator: Total ninth through 12th graders who smoked cigarettes ≥ one day during the past 30 days

Denominator: Total population of ninth through 12th graders

Potential modifiers: Race, ethnicity, age, education, socioeconomic status

Data source: Youth Risk Behavior Surveillance System (YRBSS)

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: Preconception Health Indicator E1; HP 2020 Focus area TU-2 (TU-2.2 is a Leading Health Indicator); CDC Winnable Battle (Decrease the percentage of youth who smoke cigarettes by 11 percent); MIECHV Benchmark Area Improved Maternal and Newborn Health: Parental use of alcohol, tobacco, or illicit drugs; Chronic Disease Indicator

Life Course Criteria

Introduction

Cigarette smoking has long been recognized as having high mortality, morbidity, and economic costs (OSH, 2004; Thorne, 2007). Because of the addictive nature of nicotine (OSH 2001; Fiore, 2000), preventing cigarette smoking is an especially important societal goal (OSH, 2000; WHO, 2002), and has recently been identified by the Centers for Disease Control and Prevention (CDC) as a Winnable Battle that will have a significant impact on our nation's health (CDC, 2012).

Data on the longand short-term effects of cigarette smoking is vast and compelling. Since the publication of the Surgeon General's first report on smoking, an extensive amount of evidence has been identified to support the detrimental effect that smoking cigarettes has on those who engage in the behavior, particularly the lifelong health effects and price tag associated with the treatment of smoking-related diseases, such as lung cancer and chronic obstructive pulmonary disease (COPD).

Although there is some evidence that the age of initiation may be increasing, most regular smokers smoke their first cigarette by age 18 years. (Lantz, 2003; OAS, 2006). Because smoking initiation rarely occurs at later ages, the critical time for prevention occurs in adolescence and early adulthood (Musto, 1999; Giovino, 2002).

Implications for equity

Smoking behaviors within a given geographic location are related to both compositional factors (socioeconomic and demographic characteristics of individuals/households) and contextual factors (area characteristics and policies). Compositional characteristics associated with smoking include poverty, education, occupation, race, nativity, gender, marital status and age (Acevedo-Garcia et al., 2005, Barbeau et al., 2004, Geronimus et al., 1993, Pampel, 2009, Siahpush et al., 2005 and Williams and Jackson, 2000). Contextual characteristics have shown to be associated with smoking after controlling for individual covariates; these include neighborhood poverty, proximity of cigarette advertisements, and rules of smoking in workplaces and homes (Diez Roux et al., 1997, Duncan et al., 1999, Kandula et al., 2009, Reijneveld, 1998, Ross, 2000 and Tseng et al., 2001).

Of note, racial/ethnic minorities in the United States experience a disproportionate burden of smoking-related diseases, including cancer and heart disease, despite having larger proportions of light and intermittent smokers and generally lower adult smoking prevalence rates than non-Hispanic Whites (Jemal, et al., 2008; Trinidad et al., 2009). Racial/ethnic minorities are also less likely to quit smoking successfully than are non-Hispanic Whites (Okuyemi et al., 2007; Cokkinides et al., 2008).

Despite the fact that Black smokers smoke fewer cigarettes per day than White smokers, there is ample evidence that Black smokers are more susceptible than White smokers to smoking-related health consequences such as lung-cancer, heart disease and stroke (Haiman et al., 2006; Hebert, 2005; U.S. Department of Health and Human Services, 1998). The adverse public health consequences of smoking among Latinos are severe, as three of the four leading causes of death among Latinos are smoking-related (i.e., cancer, heart disease, and stroke (CDC, 2009).

Moreover, evidence shows that cigarette smoking is a major contributor to mortality according to education level (Jemal et al., 2008; Lauderdale, 2001; Pappas et al., 1993; Warren and Hernandez, 2007): smoking, which has become increasingly concentrated in low education groups (e.g., Pampel, 2005), greatly increases the risk of premature adult mortality (e.g., Rogers et al., 2005).

Among addictive behaviors, cigarette smoking is the one most likely to become established during adolescence (DASH, NCCDPHP, CDC, 2008). Each day in the United States, approximately 3,800 young people under 18 years of age smoke their first cigarette, and an estimated 1,000 youth in that age group become daily cigarette smokers (USDHSS, 2011). More specifically, the percentage of middle school students who were current cigarette smokers in 2009 was 3.9 percent. Of these, 3.2 percent were female students and 4.6 percent were male students. Racial and ethnic differences are present among this population of middle school students who were current smokers: 4.7 percent were black, non-Hispanic students, 1.4 percent were Asian, non-Hispanic students, 6.2 percent were Hispanic students and 3.0 percent were white, non-Hispanic students (CDC, 2010).

Public health impact

From 2000 to 2004, cigarette smoking and exposure to tobacco smoke resulted in at least 443,000 premature deaths, approximately 5.1 million years of potential life lost (YPLL), and \$96.8 billion in productivity losses annually in the United States (USDHHS, 2008). Lightwood and colleagues (2008) examined the economics of tobacco use and revealed that investments in tobacco control programs led to substantial savings in health care expenditures. The authors showed that the \$1.8 billion spent on California's tobacco control programs over 15 years (1989–2004) yielded a 50-fold return (\$86 billion) in reduced health care costs. In addition to effectively reducing smoking – a significant public health goal in itself – the benefits of the programs included “substantial, rapid, and growing reductions in per capita state health care expenditures” (Lightwood et al., 2008).

Policies to combat smoking have resulted in substantial progress with national smoking prevalence declining from 24.5 percent in 1992–1993 to 18.5 percent in 2006–2007 (Giovino, Chaloupka, and Hartman, 2009). However, tobacco remains a leading cause of preventable and premature death, killing more than 1,200 Americans every day. For every tobacco-related death, two new young people under the age of 26 become regular smokers. Nearly 90 percent of these replacement smokers try their first cigarette by age 18, and approximately three out of four high school smokers continue to smoke well into adulthood (USDHSS, 2012).

Smoking during adolescence and young adulthood can have immediate adverse health effects and lasting impacts throughout the life course. Additionally, exposure to tobacco can also impact future generations. This broadened concern reflects the emergence of a body of evidence linking risk exposures in early life, even in the antenatal period, to risk for chronic disease in adulthood (USDHSS, 2006).

Leverage or realign resources

There are a number of opportunities to use resources to improve the adolescent smoking indicator. These opportunities include:

- School administrators and counselors working with parents of adolescents to development awareness campaigns and also create a smoking cessation plan for adolescents who smoke
- Community and school programs, policies and interventions coordinated and implemented in conjunction with efforts to create tobacco-free social norms
- Prohibiting smoking on school grounds, and in worksites and public places
- Care managers/coordinates working with providers to target education and self-education
- Using home visiting as an opportunity to share education and smoking cessation information
- Engage stakeholders in the key actions from the CDC Winnable Battles for Tobacco, including: Monitor tobacco use and prevention policies; Protect people from secondhand smoke; Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco

Schools and workplaces are both stakeholders in reducing adolescent smoking because complications from smoking are responsible for absenteeism from both school and work. The CDC Winnable Battles progress report indicates that school programs to prevent smoking among middle- and high-school students are a good investment: every dollar invested in school tobacco prevention programs saves almost \$20 in medical care costs (CDC 2013). While adolescents may not be part of the workforce yet, it is understood that their future involvement in the economy will have a significant effect on the cost for society at large. Therefore, given the changing environment of health care in the United States, private as well as public entities could benefit from a joint effort to curb smoking initiation in adolescents.

Lastly, adolescent smoking is a major risk factor for chronic diseases later in life. As such, chronic disease programs may invest in adolescent smoking prevention programs that may ultimately help to reduce the incidence of future adult chronic diseases.

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

Smoking is a leading risk factor for mortality, cardiovascular disease, respiratory disease, and a variety of other health outcomes, contributing to an estimated 443,000 deaths annually in the United States (CDC, 2007). Smoking also has a detrimental effect on reproductive health. For instance, smoking during pregnancy is associated with increased risk for premature rupture of membranes, abruptio placentae (placenta separation from the uterus), and placenta previa (abnormal location of the placenta, which can cause massive hemorrhaging during delivery. Additionally, smoking also is

associated with a modest increase in risk for preterm delivery (CDC, 2001). Moreover, infants born to women who smoke during pregnancy have a lower average birth weight and are more likely to be small for gestational age than infants born to women who do not smoke. Low birth weight is associated with increased risk for neonatal, perinatal, and infant morbidity and mortality. The longer the mother smokes during pregnancy, the greater the effect on the infant's birth weight. The risk for perinatal mortality, both stillbirths and neonatal deaths, and the risk for sudden infant death syndrome (SIDS) are higher for the offspring of women who smoke during pregnancy (CDC, 2001).

The adverse health effects of smoking can accumulate over the lifetime of the smoker. Moreover, those who quit smoking will, over time, see a significant reduction in the adverse effects with some disappearing entirely (Trannah et al, 2011, USDHHS, 2010). Therefore, it is clear that the opportunity to intervene when smoking behaviors are initiated, which is most often during adolescence, can potentially avoid the cost of treating future poor health outcomes.

Data Criteria

Data availability

Data on adolescent smoking prevalence in the United States is vast and readily available. The majority of the data is generated by the CDC, through its office on Smoking and Health. More specifically, The *Youth and Young Adult Data* Youth Risk Behavior Surveillance System (YRBSS) monitors priority health-risk behaviors and the prevalence of obesity and asthma among youth and young adults. The YRBSS includes a national school-based survey conducted by the CDC, state, territorial, and local education and health agencies and tribal governments. YRBSS monitors six categories of priority health-risk behaviors among youth and young adults, including behaviors that contribute to unintentional injuries and violence; sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, including HIV infection; alcohol and other drug use; tobacco use; unhealthy dietary behaviors; and inadequate physical activity. In addition, YRBSS monitors the prevalence of obesity and asthma.

The YRBSS is administered every other year (odd years), generally in the spring semester in schools via a pencil and paper mode. The YRBSS survey contains no skip patterns. In the even-numbered years, CDC leads a process of examining and revising the questionnaire, using both expert opinion and votes from the YRBS coordinators in states. The final result is a standard questionnaire that can be modified by states to meet their needs, but modifications must be within certain parameters.: 1) the modified questionnaire must contain at least two-thirds of the original standard questionnaire, 2) questions that are added are limited to 8 mutually exclusive response options, 3)the questionnaire may not have skip patterns or fill in the blanks, and 4) the questionnaire may not exceed 99 questions, and the state must retain the height and weight questions. The 2011 YRBSS included a national school-based survey conducted by CDC and 47 state surveys, six territory surveys, two tribal government surveys, and 22 local surveys conducted among students in grades nine through 12 during October 2010–February 2012. Data collected by CDC represent both public and private schools with students in grades nine through 12; data collected by states, territories, tribes, and localities represents primarily public school students.

This measure does not require the linkage of datasets. MCH programs can readily gain immediate access to the data on an annual basis and possibly provisionally. The survey question of interest is “During the past 30 days, on how many days did you smoke cigarettes?”

Data quality

From the available YRBSS documentation, the 2011 national YRBS school response rate was 81 percent; the student response rate was 87 percent; and the overall response rate was 71 percent. Comparisons between estimates for states and districts from the national data collection effort and the surveys collected by states, territories, tribes, and localities can be found on the CDC YRBSS website. Each jurisdiction reached a minimum site response rate of 60 percent and therefore had weighted data for that year. Weighted data allows a jurisdiction to make statements from the data that generalize to all high school students in that jurisdiction.

Studies by CDC and others indicate that data about risk behaviors can be gathered as credibly from adolescents as from adults. YRBSS performs internal reliability checks to help identify the small percentage of students who falsify their answers. To obtain truthful answers, students must perceive the survey as important and know procedures have been developed to protect their privacy and allow for anonymous participation.

A test-retest study of the 1999 version of the questionnaire (Brener 2002) found that 47 percent of items had at least “substantial” reliability, with kappa statistics of agreement of 61 percent or greater, and 93 percent of items had at least “moderate” reliability, with kappas of 41 percent or greater. The study found no differences in reliability by gender, grade, or race/ethnicity. The study found that items related to tobacco use, alcohol and other drug use, and sexual behavior had the highest reliability. By comparison, items asking about dietary behaviors, physical activity, and other health-related topics were less reliable. A study of mode and setting using the YRBSS questions (Brener 2006) determined that students were more likely to report risk behaviors when they took the survey at school compared with taking the survey at home.

Data availability and quality for the YRBS varies by year and it depends on the participation status for states, districts, territories, and tribal governments (CDC, 2013). Survey response rates can vary substantially by jurisdiction. In the Brener (2002) study, the smoking indicator had “substantial” reliability (Brener, et. al, 2002). The prevalence of “Smoked cigarettes \geq one day during the past 30 days,” which can be used as an indicator of current adolescent smoking, was 27.2 at Time 1 and 27.5 at Time 2. The kappa statistic was 81.9.

Simplicity of indicator

The level of complexity in calculating and explaining this indicator is relatively low. YRBS results do require statistical weighting provided by CDC to approximate representativeness of the student population. Although somewhat controversial, adolescent smoking prevalence is calculated based on daily smoking. For instance, evidence suggests that adolescents have a varied perception of what constitutes different classifications of smokers and smoking. For example, Leatherdale and McDonald (2006) found that approximately 52 percent of students who were categorized by researchers as “regular smokers” and 98 percent categorized as “experimenters” did not actually consider themselves to be smokers. Evidence also suggests that less frequent smoking, being younger, and social smoking, are related to less likelihood of an individual identifying themselves as a smoker (Berg et al., 2009; Levinson et al., 2007; Moran, Wechsler, & Rigotti, 2004).

However, the standard manner in which YRBS assesses adolescent smoking may circumvent these issues. The survey asks respondents to state whether or not they “smoked cigarettes \geq 1 day during the past 30 days.” This number is divided by the number of nine through 12 grade respondents. Also, to better capture frequency or intensity, YRBS also prompts students to state whether they “smoked \geq 20 cigarettes per day on the days smoked during the past 30 days” (Brenner, et. al., 2002).

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