Asthma Slide Rule

A Tool for Managing a Child’s Physical Activity During Air Pollution Episodes

Rapid population growth, urban expansion, increased automobile traffic, and accelerating commercial and industrial development in the Treasure Valley of Idaho has resulted in a significant reduction of regional air quality. Epidemiologic studies demonstrate a strong correlation between increasing levels of ambient air pollution and mounting asthma illness. In response to public concerns, the Idaho Department of Environmental Quality (DEQ) is working with Boise State University to develop new approaches to community education and outreach.

One of the outcomes of this initiative is a new instrument called the Asthma Slide Rule. The purpose of this new tool is to provide practical guidance to parents and school teachers in protecting “vulnerable” children during air pollution episodes. The tool provides a simple means for determining acceptable physical activity levels during air pollution episodes in southwest Idaho.

Foundation of the Slide Rule

The basis of the Asthma Slide Rule is the EPA air quality index (AQI). This is a nationally accepted index for characterizing ambient air quality conditions. The AQI is derived through a series of arithmetic computations involving ambient concentrations of ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. The air quality index is divided into six pollution categories, which are incorporated in the Asthma Slide Rule.

The Asthma Slide Rule incorporates the user’s assessment of the child’s current respiratory health status. Using, in part, the National Institutes of Health (NIH) criteria, three respiratory health classifications were created. Children without symptoms and children with well-managed asthma formed one category, and children with moderate and severe symptoms formed the other two categories.

The Asthma Slide Rule provides physical activity options considered appropriate to each child’s respiratory health status, based on the identified AQI. Three intensity levels are given, including light, moderate, and vigorous energy expenditure similar to those defined by the US Department of Agriculture.

The Asthma Slide Rule differentiates indoor from outdoor locations when considering a child’s physical activities. Although it cannot be assumed that school indoor air quality conditions will be better than the outdoor conditions, guidelines by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommend that air filters in schools be capable of removing particulate matter, pollens, and additional allergens. This may improve the overall indoor air quality. The Asthma Slide Rule assumes that schools have such technologies.

The Asthma Slide Rule has three panels. The front panel (see figure 1) illustrates the overall...

A Web Special from Northwest Public Health
nwpublichealth.org
decision flow chart logic. This panel slides over the second, or center, panel. The front panel requires the user to choose the appropriate respiratory health status of a child, and the chart then displays the appropriate physical activity intensity levels for either indoor or outdoor locations.

The second panel (shown in figure 2) is the “data” panel, which exhibits the six EPA air quality categories (green through maroon) as well as the appropriate activity locations and activity intensity levels. (Note: Activity levels that exceed recommended limits are indicated by gray. No statement is made regarding hazard.)

The third panel, located on the back of the Slide Rule (see Figure 3), is the information panel. It provides the user with basic information about the Asthma Slide Rule input.

This panel has three columns. The first column lists all six Air Quality indices in color with a brief health hazard description. The second column
Figure 3. Back panel of Asthma Slide Rule.

The Asthma Slide Rule lists the three respiratory health status categories (A, B, and C) with a brief written description. Also provided are examples of “typical” asthma symptoms and examples of asthma triggers. The third column lists three physical activity intensities and gives examples of each.

Using the Asthma Slide Rule

**Step 1**
Select the current ambient air quality Index. This information is available from the US Environmental Protection Agency (http://www.epa.gov/oar/data/), the state Department of Environmental Quality, or from the news media. The information will be an index number between 0 and 500 with a corresponding color code (green, yellow, orange, red, purple, or maroon). The Asthma Slide Rule requires only the use of the color code.

**Step 2**
Move the front panel to the left or right until the appropriate Air Quality Index color is shown through the Air Quality Index window.

**Step 3**
The child’s current respiratory health status determines the appropriate respiratory health description (A, B, or C), listed on top of the third column. A is used for children with no respiratory or asthma symptoms, B is used for children with few respiratory or asthma symptoms, and C is used for children with daily respiratory or asthma symptoms.

**Step 4**
The activity levels recommended as safe are indicated in the respiratory health status column with an “OK.” This level is matched to the appropriate indoor or outdoor activity locations. The user of the Asthma Slide Rule can review all of the other combinations of respiratory health status and physical activity levels. (See the figures on the next page for examples of the Slide Rule in position.)

The Asthma Slide Rule is intended to serve as a guide for parents and teachers seeking to help their children or students better manage their respiratory health during air pollution episodes. We believe that our instrument can become a learning tool for parents by helping them understand the management of asthma effects on their child’s ability to engage in physical activities indoors and outdoors.

**Authors**
Uwe Reichl, PhD, MD, is a professor of Health Sciences at Boise State University. Conrad Colby, PhD, RRT, is a professor emeritus of Health Sciences, also at Boise State University. For more information about the Asthma Slide Rule, contact Professor Colby at ccolby@boisestate.edu.
Example 1: Child with few asthma symptoms

Example 2: Child with daily asthma symptoms

Resources

American Lung Association Air Pollution and Exercise
www.lungusa.org/site/pp.asp?c=dvLUK00E&b=36292&solutions

Air Now
http://airnow.gov
A cross-agency federal Web site for air quality

AQI Calculator: Concentration to AQI
http://airnow.gov/index.cfm?action=aqi.conc_aqi_calc

Kids Air with interactive AQI game
http://airnow.gov/index.cfm?action=aqikids.games

Guidelines for the Diagnosis and Management of Asthma—Update on Selected Topics 2002
http://www.nhlbi.nih.gov/guidelines/asthma/index.htm

Managing Asthma in Schools—What Have We Learned?
http://www.cdc.gov/HealthyYouth/asthma/josh/

This cutting-edge publication provides updated information on developing, implementing, and evaluating school-based asthma programs.

Asthma and Allergy Foundation of America
www.aafa.org/search_process.cfm?id=3

AirData: Access to Air Pollution Data
www.epa.gov/oar/data/

Controlled Exposures of Asthmatics to Air Pollutants, Chapter 37 by Peden BD, in Air Pollution and Health, edited by Holgate T.S, Samet MJ, Hillel, SK, and Maynard LR.