

Modeled Air Quality: Ozone – Days Above Regulatory Standard

Type of EPHT Indicator	Hazard
Measures	<ol style="list-style-type: none"> 1. Number of days with maximum 8-hour average ozone concentration over the National Ambient Air Quality Standard 2. Number of person-days with maximum 8-hour average ozone concentration over the National Ambient Air Quality Standard
Derivation of Measures	Refer to the how-to guide (contact CDC for the latest version of this document)
Units	<ol style="list-style-type: none"> 1. Exceedance Days 2. Population-weighted exceedance days
Geographic Scope	Iowa
Geographic Scale	County
Time Period	2001-2006
Time Scale	Calendar year
Rationale	<p>According to the published literature, air pollution is associated with premature death, increased rates of hospitalization for respiratory and cardiovascular conditions, adverse birth outcomes, and lung cancer (2, 3). Air pollution places a large economic burden on the country. In a report prepared for the American Lung Association,(2) estimated that air pollution related illness was estimated to cost approximately \$100 billion annually (2) (1988 dollars) in the United States, with an estimated number of excess deaths ranging from 50,000 to 100,000 annually (3). More than half of the U.S. population, approximately 159 million persons, live in counties with unhealthy levels of air pollution in the form of either ozone or particulate matter (1). Elevated pollution levels depend on sources, transport, season geography, and atmospheric conditions. Each part of the country has its own level of pollution concentrations that can be exacerbated by many conditions, including stagnation, fire, or wind. The seasons for peak concentrations also vary between geographical regions.</p> <p>The Clean Air Act, which was last amended in 1990, requires EPA to set NAAQS for widespread pollutants from numerous and diverse sources considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including visibility impairment and damage to animals, crops, vegetation, and buildings.</p> <p>Our indicator is based on comparing measured and modeled levels of ozone by county to the primary NAAQS for ozone (as well as other established health-based ambient air quality standards for 8-hour ozone levels). Modeled estimates are used to fill-in for days when monitoring does not occur and in counties where monitors don't exist. The Clean Air Act requires periodic review of the science upon which the standards are based and the standards themselves. Primary air quality standards indicate the acceptable level of substances in the air before harm will occur, based on proven scientific and medical research. State governments also set air quality standards. In several cases, California's standards or other benchmarks are</p>

	more stringent than the EPA NAAQS.
Use of Measure	<p>The indicator for the number of days with maximum 8-hour average ozone concentration over the standard is similar to EPA's analyses on number of days with air quality index (AQI) levels above 100 (for ozone) — www.epa.gov/airtrends/aqi_info.html. In addition, this indicator can be used to inform policy makers and the public of the degree of hazard within a state (by county or MSAs with monitors) during a year. For example, the number of days per year that ozone is higher than the NAAQS can be used to communicate to sensitive populations (such as asthmatics) the number of days that they may be exposed to unhealthy levels of ozone; this is the same level used in the air quality alerts that inform these sensitive populations when and how to reduce exposure. See www.epa.gov/air/airtrends/2007/report/groundlevelozone.pdf and www.epa.gov/air/airtrends/aqtrnd00/pdffiles/aqioz.pdf</p> <p>In the use of the measure, it is important to explain that not all counties have monitors although most populated areas are monitored.</p>
Limitations of The Measure	<p>The number of high ozone days per year varies, which makes tracking trends over time difficult to analyze or interpret. The variability results from the following: a) the number of high ozone days is related to temperature; there will be more high days in hotter summers; and b) there are a small number of events per year, so for statistical reasons this type of measure will bounce around more than an average. The model predictions are used to fill-in air quality estimates in areas and at times without monitoring data. For counties without monitoring data, temporal (seasonal) and spatial (regional) biases in the modeled estimates, can influence the accuracy of the measures.</p> <p>The relationship between ambient concentrations and personal exposure is largely unknown and variable depending upon pollutant, activity patterns, and microenvironments.</p> <p>Variation within counties may exist but will not be captured in this measure. Larger areas will have a broader range of pollution values and perhaps more monitors that may measure a high value on a given day. Thus, day and person-day estimates for larger areas may be biased higher than estimates for smaller areas. The relative variation among county populations in many states may be large enough relative to the variation in the number of days greater than the ozone NAAQS that the population component can dominate the calculation of the number of person-days. Thus, careful investigation of the underlying data to properly identify changes in population and air quality is needed when comparing person-days in space and time.</p> <p>The number of days that exceed the EPA NAAQS or other health benchmarks does not provide information regarding the severity (max concentrations) of potential exposures.</p> <p>This indicator is not for use compliance determination with NAAQS or reasonable further progress toward attaining compliance.</p>
Data Sources	<p>Air quality monitoring data: EPA Air Explorer http://www.epa.gov/airdata/</p> <p>Air quality modeled data: http://www.epa.gov/heads/sources/projects/CDC/index.html</p>

	Census population data: http://www.census.gov/popest/data/historical/2000s/vintage_2008/index.html
Limitations of the Data Sources	The effort required to obtain all the data may indicate that a central system is needed to gather the data and calculate the measures. The comprehensive geographic coverage provided by the modeled ozone estimates must be balanced against its tendency for under prediction or over prediction near the NAAQS.
References	<ol style="list-style-type: none"> 1. American Lung Association. State of the Air 2004; 2004 [cited 2008 Dec 4]. Available from: http://ephtracking.cdc.gov/docs/SOTA_2004.pdf 2. Cannon J. The Health Costs of Air Pollution: A Survey of Studies Published 1984– 1989. New York: American Lung Association; 1990. 3. Dockery DW and Pope CA. Acute respiratory effects of particulate air pollution. Annu Rev Public Health 1994;15:107–132. 4. US Environmental Protection Agency. US EPA general site on ozone effects. Available from: http://www.epa.gov/air/ozonepollution/health.html 5. Criteria document for ozone NAAQS: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=149923