

Variations in pollen counts between Indianapolis, IN, and Dayton, OH, in spring 2013 and 2014

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Approximately 20-40 percent of the US population suffers from allergic rhinitis. As pollens contribute significantly to allergic rhinitis, monitoring local pollen counts can help patients and providers better manage this condition (1). Identification of local pollens can help the clinician more accurately select allergens for testing and immunotherapy, and improve advice to sensitized patients on environmental control measures.

Certified pollen counting stations can be found on the webpage of the National Allergy Bureau (NAB). Currently, there are 82 NAB stations in the United States, but none in Indiana. The closest station to Indianapolis on the NAB webpage is 120 miles east, in Dayton, Ohio (2).

Dayton and Indianapolis are considered to be in the Appalachian floristic province, within the North Atlantic region. Pollen counts in cities in the same region are assumed to be similar (3). Prior work comparing pollen counts between cities eleven kilometers apart found similarities in pollen counts (4). However, pollen counts can be affected by precipitation, temperature, wind, and other environmental factors (5).

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To determine if pollen reports from 120 miles away correctly reflect local pollen activity, we compared differences in pollen species and pollen counts between Indianapolis and Dayton, from April through June, in 2013 and 2014. We chose the spring season because this timeframe is associated with peak public interest in pollen allergies (6).

Pollen data for Indianapolis were collected from the semi-rural backyard of a pediatric allergist, via Rotorod sampler (Model 40, Rotorod, IMS, Plymouth Meeting, PA). The sampler was located on an unobstructed flat surface, one story above ground, as per the NAB-American Academy of Allergy, Asthma, and Immunology (AAAAI) guidelines (7). One allergist, who has studied pollen counting through the AAAAI, and is eligible for the AAAAI aerobiology certification exam, counted and recorded all pollen data. Pollen counts were posted daily to his website (8). The Regional Air Pollution Control Agency collected and reported the data for Dayton to the NAB, using a Burkard sampler at the public library in downtown Dayton (2). The lab technician performing the 2013 and 2014 pollen counts for Dayton was not NAB-certified (A Roth, personal communication, February 29, 2016). Both sites reported daily overall pollen count (grains/m³ of air), as well as counts for each tree, grass, and weed species collected. Meteorological data were obtained from the website of the Midwestern Regional Climate Center from the University of Illinois (9). Analyses were performed using SAS v9.3 (SAS Institute, Cary, NC), with Wilcoxon non-parametric tests being used due to data skewness.

Pollen data for Dayton was available for 62 days for the time periods in 2013 and in 2014.

Pollen data for Indianapolis was available for 84 days in 2013 and 89 days in 2014. Pollen counts were available for 20 to 22 days each month for Dayton. Tree, grass and weed pollens were detected in Indianapolis and Dayton during this time period, in both 2013 and 2014 (Figure 1). In 2013, the daily median pollen count was significantly higher in Dayton (232.5grains/m³ vs 154.5grains/m³; p=0.018). Dayton's daily median pollen count was higher in 2013 compared to 2014 (232.5grains/m³ vs 123 grains/m³; p=0.023).

Indianapolis had a higher total number of grass pollen days in 2013 (57/84 days [68%] vs 31/62 days [50%], p<0.001), with grass pollens present almost daily in May. Additionally, Indianapolis had more days in June where weed pollens were identified (11/28 days, vs 0/20 days, p<0.001). In contrast, tree pollens were detected on significantly more days in Dayton in June (20/20 days vs 8/28 days, p<0.002).

In 2014, weed pollens were identified more frequently in Indianapolis compared to Dayton (29/89 days [33%] vs 10/62 days [16%], p<0.001). In addition, during June in Indianapolis, grass and weed pollens were identified on most of the days sampled (29/30 days vs 14/21 days for grasses, and 22/30 days vs 6/21 days for weeds, p<0.002 for each pollen). In contrast, tree pollens were noted on significantly more in Dayton during June (21/21 days vs 13/30 days, p<0.04). There were no significant differences in either city, between 2013 and 2014, when comparing the number of days that tree, grass or weed pollens were present.

Between the two years and the two cities, there were similarities and differences in the species identified. Maple was the most common tree pollen identified in both cities. In Indianapolis, weed pollens, English plantain and nettle, were detected in June 2014, but only the former was present in June 2013.

To determine if weather differences between the two cities contributed to the differences in pollen counts, we compared differences in mean rainfall; preceding winter temperatures and snowfall; and temperatures of the timeframes studied for both years. A significant difference did not exist between the two cities in 2013 or 2014 (9).

A few limitations to this study should be noted. Though weather and precipitation did not significantly vary between the two cities, these factors can contribute to differences noted in pollen counts. A prospective study comparing rain and weather patterns, day-by-day, and relating them to daily pollen counts, is in process. Next, though the pollen counters used differed between the two areas, daily pollen counts have been positively correlated between Burkard and Rotorod counters for the most abundant pollens. The Rotorod and Burkard are equal in collecting particles over ten microns, which were the particle sizes involved in this study. (10,11). Finally, nettle is a plant more commonly found in rural, marshy areas (12). The semi-rural location of the Indianapolis pollen counter may have contributed to greater nettle identification, than the urban location of the counter in Dayton.

In summary, pollen variety and activity differed between two cities, 120 miles apart, in the same floristic zone. Weed and grass pollens were found at different times in the two areas, suggesting that pollen differences at other times of the year should also be studied. A clinician in central Indiana using NAB data from Dayton may miss critical timing of therapy for nasal allergy and may not be able to match exposure to sensitization.

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