

# Risk factors associated with serum IgE sensitization to tree pollens in 3 million U.S. patients



Matthew Robinson, MS<sup>1</sup>; Stanley Letovsky, PhD<sup>1</sup>; Andrew H. Liu, MD<sup>2</sup>; Jill M. Rafalko, MS<sup>1</sup>; Andre Valcour, PhD<sup>1</sup>; <sup>1</sup>Labcorp, Burlington, NC, USA; <sup>2</sup>Children’s Hospital Colorado, Aurora, CO, USA

## Introduction

- Allergic sensitization to tree pollen is commonly assessed by measuring specific immunoglobulin E (sIgE) levels in serum.
- To assess risk factors associated with sensitization to a wide variety of tree pollens, we examined sIgE positivity rates in a sizable cohort of patients who had testing at one U.S.-based clinical laboratory.

## Methods

- Results of sIgE testing for sensitization to pollen from 31 tree species were analyzed from test orders originating from January 2014 - December 2023 at a single U.S. clinical laboratory.
- Measurement of sIgE was performed using ImmunoCAP™ assay (ThermoFisher Scientific, Uppsala, Sweden); a positive result was defined as a concentration of sIgE antibody ≥0.10 kUa/L, consistent with recent recommendations; positivity rates were also assessed at the historical threshold (≥0.35 kUa/L) for purposes of comparison.
- Positivity rates were analyzed by sex, age, and ICD-9/-10 code(s), as well as level of urbanization based on the patient’s 5-digit zip code.
- Information in the data was recorded in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects and was deemed exempt from IRB regulations by the Western Institutional Review Board.

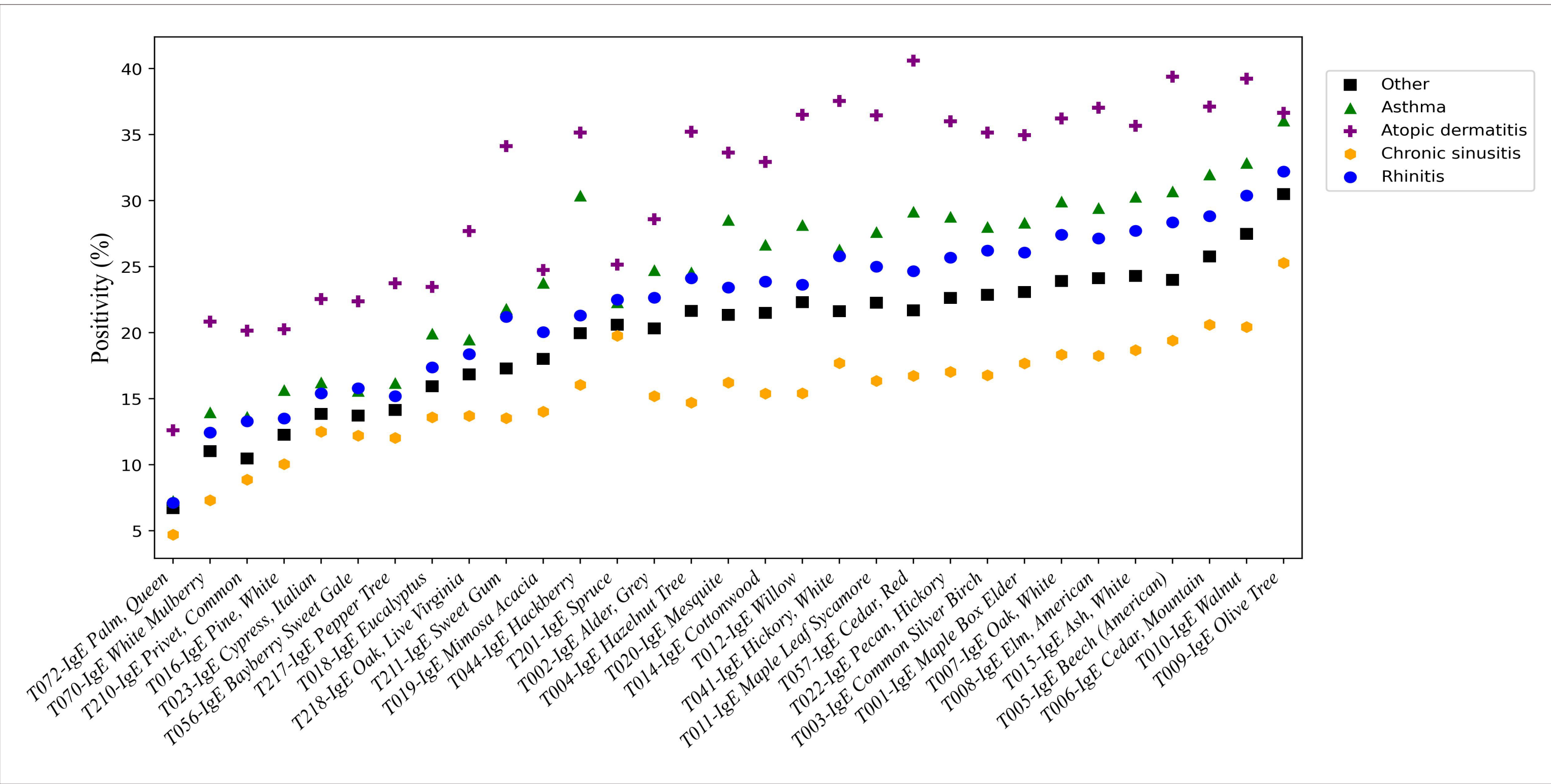


Figure 3. Positivity rates by ICD-9/-10 code.

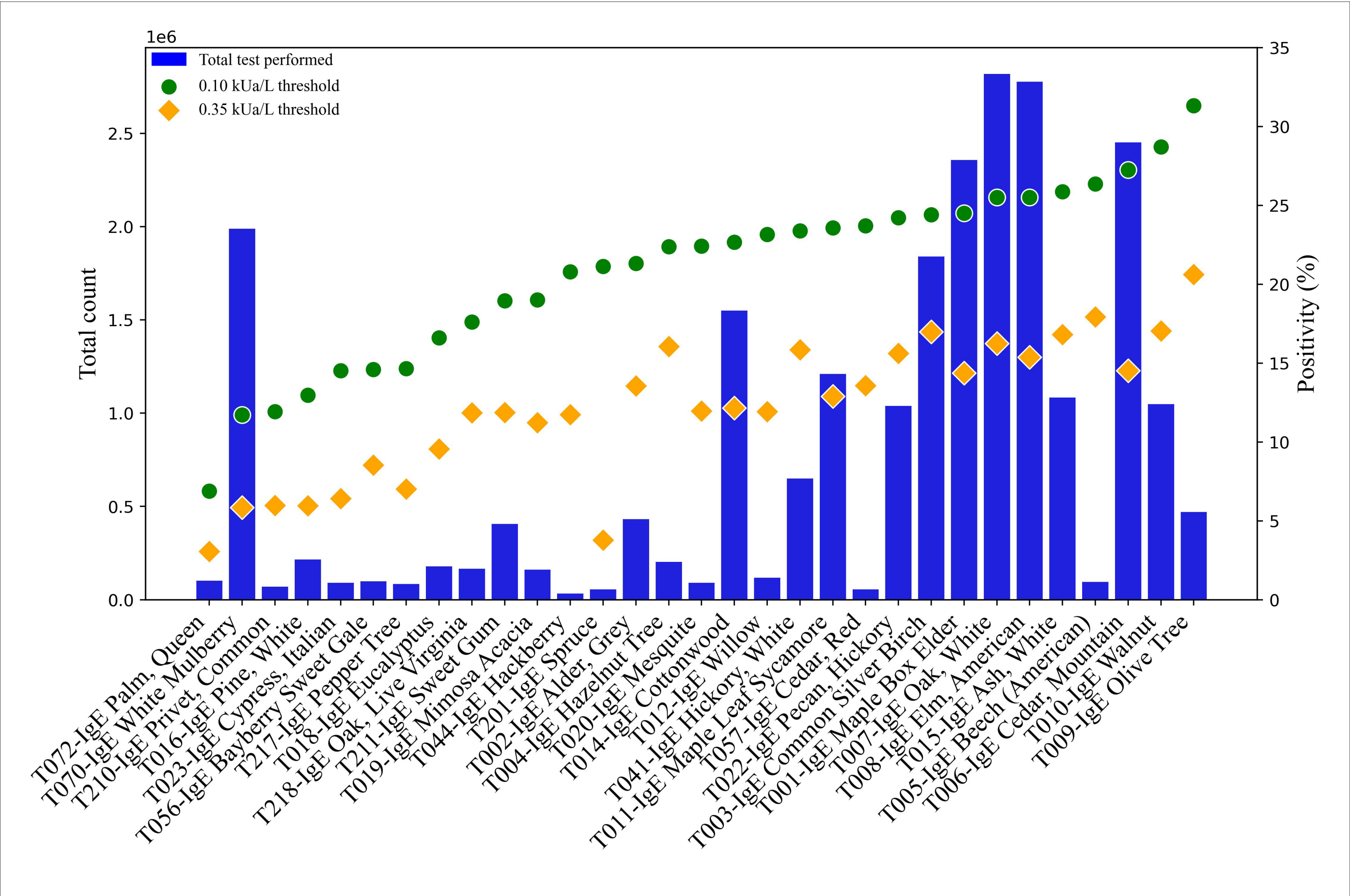


Figure 1. Total number of test orders and sIgE positivity rates at contemporary (≥0.10 kUa/L) and historical (≥0.35 kUa/L) thresholds for the 31 tree species studied. (Note: The four-digit code beginning with T, prior to the tree species name, corresponds to the ThermoFisher allergen code for that tree pollen).

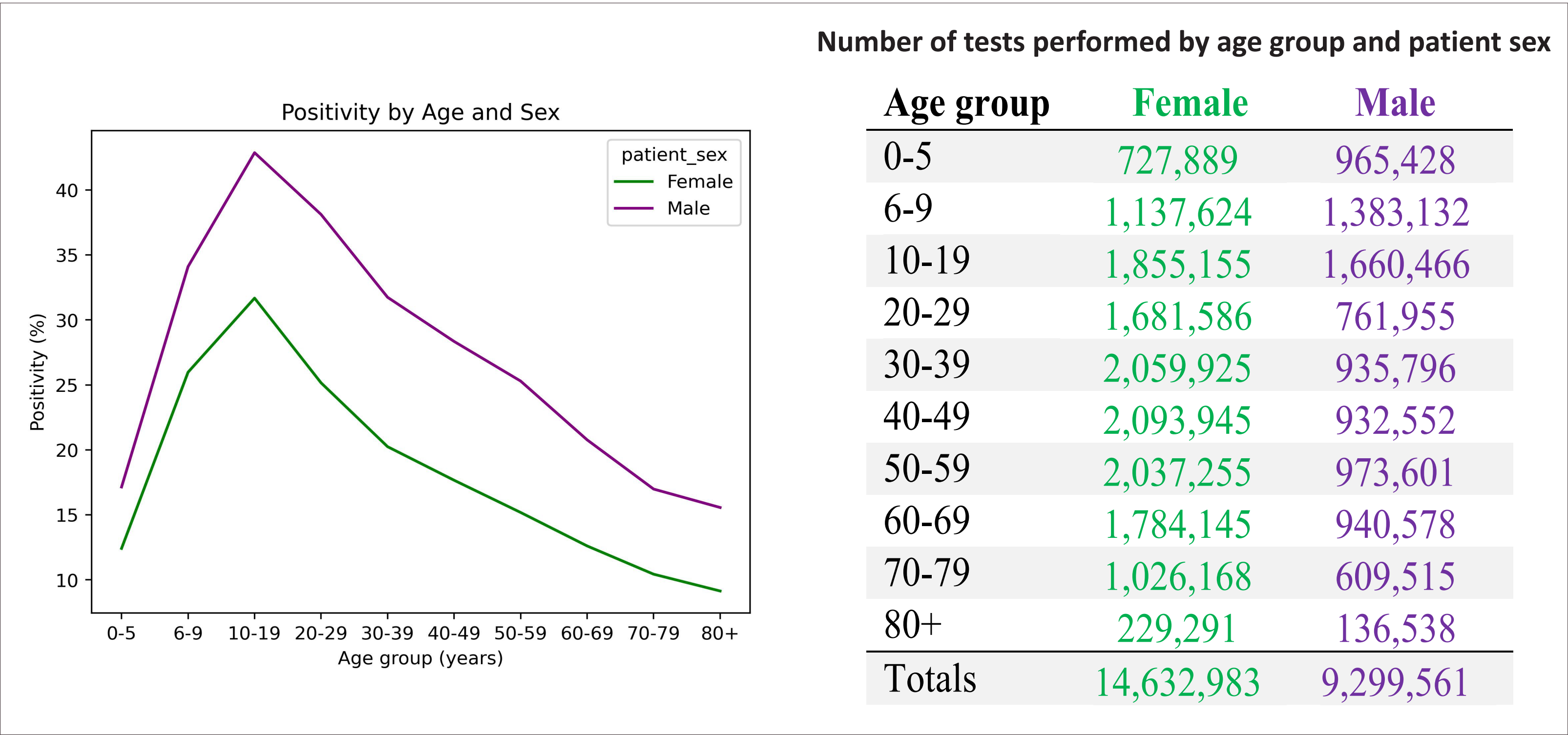




Figure 2. Mean positivity rates by age group in males and females across the 31 tree species studied.

## Results


- Over the 10-year study period, a total of 23,932,544 test orders originated from 3,068,051 unique patients.
- Most orders (96%) were for regional allergen panels (which include testing for tree species common to that region), as opposed to orders for specific tree species.
- The top five tree species by total test orders were: White Oak, American Elm, Mountain Cedar, Maple Box Elder and White Mulberry (Figure 1).
- Of all patients tested, 38.7% were sensitized to at least one tree pollen species; the average was 1.8 positive results per patient.
- The mean positivity rate across 31 tree species was 20.9%. Positivity ranged from 6.9% for Queen Palm to 31.3% for Olive Tree (Figure 1).
- Risk factors for sensitization:




**SEX:** Males had a significantly higher positivity rate than females (P<0.01), with higher rates of sensitization for all tree species and across all age groups. **Figure 2**



**AGE:** In both males and females, positivity rates were relatively low in young children (age 0-5), peaked in the teen years (age 10-19), and decreased thereafter. **Figure 2**



**DIAGNOSIS:** Positivity rates were highest in patients with atopic dermatitis, and lowest in chronic sinusitis. Rates of sensitization were, on average, 1.57-fold (atopic dermatitis), 1.24-fold (asthma), and 1.13-fold (rhinitis) higher than rates for individuals without allergy-related ICD codes. **Figure 3**



**URBANIZATION:** Patients with home zip codes corresponding to more urban areas had higher overall positivity rates (21.4%) compared to those in more rural areas (17.8%).\*

\*Patients were assigned to “urban” vs. “rural” zip codes based on degree of urbanization reported in the 2010 U.S. Census, as follows: <50% rural (“urban”) and >50% rural (“rural”)

## Conclusions

- Independent risk factors for tree pollen sensitization included male sex, teen ages, and geographic area of the patient’s home zip code. The highest rates of sensitization were seen in patients with atopic dermatitis, followed by asthma and rhinitis.
- An understanding of factors associated with positivity rates from sIgE testing may be helpful to clinicians in patient counseling, and to laboratorians in the design of allergen testing panels.