Epidemiologic Analysis of Pediatric Emergency Department Visits for Otitis Media from 1992-2022

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Abstract

Introduction: Acute otitis media (AOM) is one of the most frequently diagnosed infections of childhood. With the introduction of pneumococcal conjugate vaccines, the incidence of AOM has significantly decreased. The National Hospital Ambulatory Medical Care Survey (NHAMCS) provided national data on emergency department visits from 1992-2022. Our objective is to evaluate the available data from the NHAMCS for changes in pediatric ED presentations for AOM over time.
Methods: Review of ED data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) was conducted from 1992-2022. Pediatric visits were identified by age (0-17). Visits containing diagnoses for OM were identified using appropriate numeric, ICD-9, and ICD-10 diagnostic codes. Data was arranged into groupings based on respective availability of pediatric pneumococcal conjugate vaccination: pre-PCV7 (1992-1999), PCV7 (2000-2009), and PCV13 (2010-2019). Data analysis utilized descriptive statistics, linear regression analysis, and two-sample t-tests. Data from 2020-2022 was excluded from certain analysis due to effects from the COVID-19 pandemic.
Results: NHAMCS data accounted for 837,528 total ED visits, 199,556 pediatric ED visits, and 18,034 OM-related visits, with patient weights available for national-level data estimates. Analysis of weighted data from 1992-2019 showed a significant decrease in both total number of pediatric OM ED visits ($p < 0.001$) as well as percentage of pediatric ED visits for OM ($p < 0.001$). Between the pre-PCV7 and PCV13 eras, average annual total visits dropped by 1,265,186 ($p < 0.001$) and percentage of pediatric visits dropped by 48% ($p < 0.001$).
Conclusion: Following the introduction of pneumococcal conjugate vaccines, pediatric diagnoses of OM in the ED setting consistently decreased and continued to decrease as additional generations of vaccines were released.

Introduction

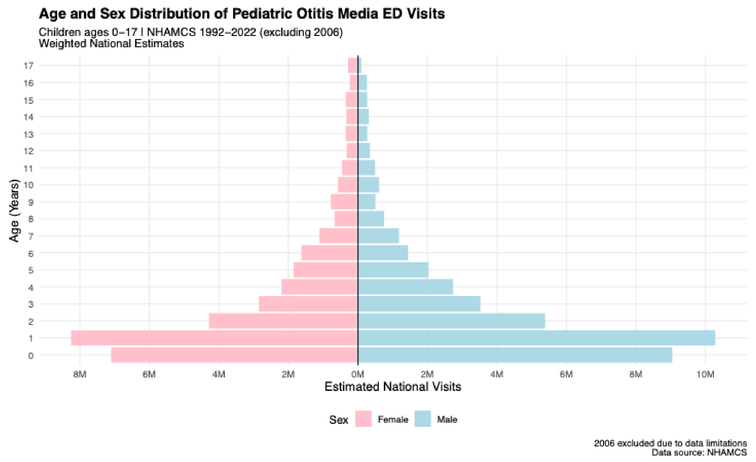
- Otitis media (OM) is one of the most frequently diagnosed conditions of childhood, with approximately 15 million cases diagnosed annually in the United States.[1]
- By age two, up to 41% of children will have been affected by acute otitis media (AOM), the most common presentation of OM.[1,2]
- Pneumococcal conjugate vaccines (PCVs) have substantially reduced the total burden of OM. The 7-valent pneumococcal conjugate vaccine (PCV7), which was licensed in 2000, was associated with up to a 40% reduction in OM-related office visits in observational studies.[3]
- The subsequent introduction of the 13-valent pneumococcal conjugate vaccine (PCV13) in 2010 was associated with further declines, with population-level studies demonstrating a 47–51% reduction in all-cause OM visits among children under two years of age.[4,5]
- Despite these changes, national trends in pediatric ED utilization for OM across the pre-PCV7, PCV7, and PCV13 eras remain inadequately characterized.

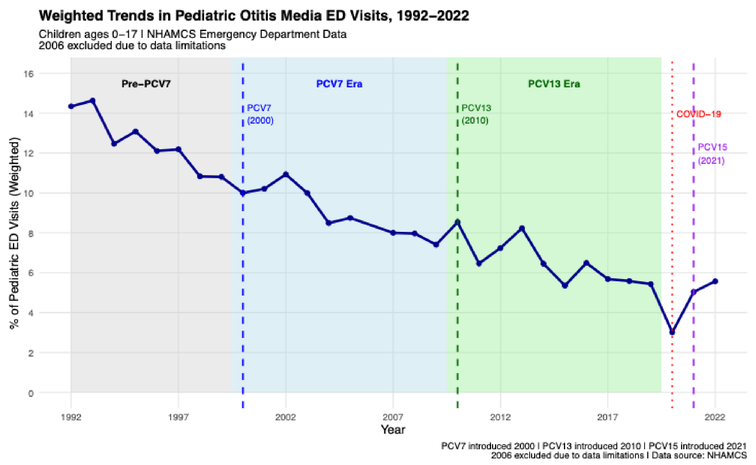
Methods and Materials

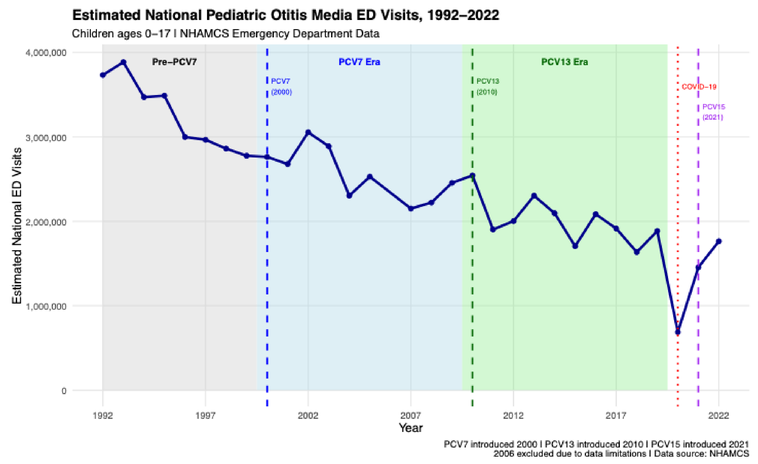
- The NHAMCS was an annual survey by the National Center for Health Statistics conducted from 1992-2022. The NHAMCS collected data on ambulatory care including EDs, outpatient departments, and hospital-based ambulatory surgery centers
- We obtained ED-level data for each year from 1992-2022 for visits for otitis media.
- Visits for ages 17 and under were used to target the pediatric population. Patient visit weights were utilized for each datapoint in our compilation and subsequent analysis of relevant data.
- Of note, the decision was made to exclude data from the year 2006 in our analysis due to improper patient weight estimates. In addition, demographic data regarding payer status from the years 1995-1996 was excluded due to differences in coding data.

Results

- When adjusting with appropriate survey weights (excluding 2006), this data provides estimates for over 3.5 billion total ED visits and over 855 million pediatric ED visits. Over 73 million pediatric patient visits with diagnoses for OM were calculated.
- Overall, diagnoses of OM showed predominance for male sex and age less than 2 years. (Figure 1)
- Linear regression analysis of weighted data over time showed a significant decrease in the percentage of pediatric ED visits with diagnoses of OM ($p < 0.001$)(table 2, figure 2), as well as total pediatric ED visits with diagnoses of OM ($p < 0.001$)(table 2, figure 3).
- Average decreases of 0.318 percent and 67,830 visits per year were observed (table 2).
- When comparing these same datapoints across the different vaccine eras constructed, significant differences were observed between each era. The largest differences observed were between the pre-PCV7 era and the PCV13 era, with differences in average annual percentage of pediatric OM visits and average annual pediatric OM visits of 48 percent (6.01 percentage points) ($p < 0.001$) and 1,265,186 visits ($p < 0.001$) respectively (tables 3 and 4).







Conclusions

- Since their introduction at the turn of the century, PCVs have played a crucial public health role as a defense for the pediatric population against pneumococcal disease.
- Over recent decades, one of the most common presentations of pediatric pneumococcal disease, OM, has been on the decline in the United States. Our data has shown that since their introduction, pediatric diagnoses of OM in American EDs have been decreasing.
- We believe that this data provides just one of many examples of the efficacy and public health benefits widespread implementation of childhood vaccination offers society.
- At the same time, increased vaccine skepticism and decreased coverage in the post-pandemic era threaten to undermine some of the progress that has been made.
- With that in mind, continued epidemiological research monitoring trends in both vaccination rates and disease incidence is of high importance and should be encouraged by both public and private institutions.

References

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