Prevalence of Potential Adult Chronic Rhinosinusitis Symptoms in the United States

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

Abstract
Objective. To determine the prevalence of chronic rhinosinusitis–related symptoms in the United States.


Setting. Representative sampling of the US adult population.

Subjects and Methods. The National Health and Nutrition Examination Survey data set, taste and smell supplement 2013-2014 was analyzed for sinonasal question responses regarding discolored nasal mucus, nasal blockage, sinus pain, and dysosmia. The individual prevalences as well as the prevalence of 2 or more of these symptoms (which would be compatible with a diagnosis of chronic rhinosinusitis) were determined for the US population.

Results. After excluding adults with an intercurrent head cold, 113.5 million adults (mean age 58.2 years; 52.6% female) were analyzed. Individual symptom prevalences were dysosmia (9.17 million, 8.1%), nasal blockage (6.9 million, 6.0%), sinus pain (2.37 million, 2.1%), and discolored mucous (1.28 million, 1.1%). Overall, 14.8 million (13.0%) adults had exactly 1 sinonasal symptom, and 2.37 million adults (2.1%) responded with 2 or more cardinal symptoms for chronic rhinosinusitis. With respect to sex, 1.9% of males reported 2 or more symptoms compatible with chronic rhinosinusitis vs 2.2% of females (\(P = .690\)), which is not statistically significant.

Conclusion. Of US adults, 2.1% meet symptom criteria for the potential diagnosis of chronic rhinosinusitis at any given time. Further objective corroboration with a physical exam and determination of duration of symptoms would be required to determine the true prevalence of chronic rhinosinusitis, but this point prevalence represents the potential population at risk for chronic rhinosinusitis in the United States.

Keywords
sinusitis, chronic rhinosinusitis, facial pain, nasal discharge, nasal obstruction, nasal endoscopy, CT scan, acute rhinosinusitis, upper respiratory infection

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The true prevalence of chronic rhinosinusitis (CRS) has been the matter of some controversy, with figures ranging from 2.1% of pediatric visits between 2005 and 20121 to 4.9% of adults having a diagnosis of CRS in 2007.2 A survey of Canadian households reported the prevalence of CRS to be 5%,3 whereas in 2006, 14% of adults surveyed for the National Health Interview Survey had been told by a doctor or other health professional that they had “sinusitis,” the chronicity of which was not specified.4 Another study noted a prevalence of sinusitis of unspecified chronicity as ranging from 10% to 12%.5

CRS remains a largely a clinically based diagnosis initially based on symptoms and duration of symptoms and then corroborated by computed tomography (CT) and/or nasal endoscopy.6 Symptom criteria according to published guidelines for the diagnosis of CRS include 12 weeks of 2 or more of the symptoms of decrease in sense of smell, nasal obstruction, mucopurulent nasal discharge, and/or facial pressure or pain.7-10

However, most prior studies regarding the prevalence of CRS have been based on care-seeking patients using diagnosis codes. Therefore, we hypothesized that there may be a reservoir of undiagnosed patients with CRS in the general population of the United States because presumably not all patients with symptoms would seek medical care. Alternatively, prior estimates may somewhat overestimate CRS prevalence because they are based on a care-seeking population. No study to date has analyzed the US general population, cross-sectionally, to determine the prevalence of CRS and/or its symptoms.

We sought to determine the potential symptom manifestations of CRS in the general US population that might form a basis for determining which patients are potentially

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likely to have CRS leading to diagnostic confirmation if the person sought medical care. Looked at another way, it is unlikely that the prevalence of CRS would in fact exceed the prevalence of CRS symptoms at the population level.

**Methods**

The National Health and Nutrition Examination Survey (NHANES) data set for 2013-2014 served as the data source for this study. This study was reviewed by our hospital’s committee on clinical investigations and deemed exempt from review as a publicly available, de-identified data set. Within the NHANES data set, a special survey module pertaining to taste and smell disorders included specific symptom-related questions regarding the presence or absence of sneezing frequently, discolored nasal mucus, nasal blockage (further characterized as unilateral or bilateral), a runny nose, sinus pain, and having a problem with the sense of smell. The surveyed population for these specific sinonasal symptoms was both men and women aged 40 to 150 years. Respondents were excluded from further analysis if they had a head/chest cold within the 30 days prior to surveyed.

Demographic and symptom data were extracted and imported into SPSS (version 22.0; SPSS, Inc, an IBM Company, Chicago, Illinois) for analysis. Data validation and verification were conducted. As the NHANES uses a stratified and weighted sampling methodology, statistical methods that incorporate these survey methods were used to compute nationally representative statistics at the US population level. We applied sampling weights to obtain correct standard errors based on the stratified and weighted survey design. We considered estimates based on more than 30 observations or those with a standard error of <30% of the point estimate to be reliable. First, demographic data were tabulated and then the prevalence of each individual sinonasal symptom was tabulated. As current guidelines recommend 2 or more cardinal symptoms for the clinical symptom definition of CRS, the number of cases manifesting 2 or more of the symptoms of nasal blockage, sinus pain, discolored nasal mucus, and/or dysosmia was tabulated. Comparisons for the symptoms’ prevalence of CRS-compatible symptoms according to sex were also conducted. Statistical significance was set at P = .05. Data for nationally representative statistics are presented as the mean ± standard error of the estimate.

**Results**

For the NHANES 2013-2014 taste and smell module, an estimated 133.0 ± 2.1 million adults were sampled (raw N = 3708). After exclusion of 19.4 million adults with an intercurrent head cold, 113.5 ± 6.9 million adults remained for symptom prevalence analysis.

The overall prevalences of the individual symptoms compatible with a diagnosis of CRS are presented in Table 1. Among those reporting nasal blockage, 51% of respondents characterized their nasal blockage as unilateral vs 49% bilateral. A problem with the sense of smell was the most common cardinal symptom reported followed by nasal blockage. In addition, 10.0% of respondents reported a runny nose and 3.9% of patients reported frequent sneezing.

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Table 1. National Estimates for US Adults Reporting Individual Cardinal Symptoms of Chronic Rhinosinusitis.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. (Millions)</th>
<th>SEa</th>
<th>%</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smell problem</td>
<td>9.17</td>
<td>1.10</td>
<td>8.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Nasal blockage</td>
<td>6.85</td>
<td>0.71</td>
<td>6.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Sinus pain</td>
<td>2.37</td>
<td>0.54</td>
<td>2.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Discolored mucous</td>
<td>1.28</td>
<td>0.27</td>
<td>1.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

aSE, standard error of the national estimate.

Table 2. Distribution of Number of Sinonasal Symptoms Reported by US Adults.

<table>
<thead>
<tr>
<th>No. of Chronic Rhinosinusitis Symptoms</th>
<th>No. (Millions)</th>
<th>SEa</th>
<th>%</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>96.38</td>
<td>6.16</td>
<td>84.9</td>
<td>1.3</td>
</tr>
<tr>
<td>1</td>
<td>14.78</td>
<td>1.49</td>
<td>13.0</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>2.23</td>
<td>0.48</td>
<td>2.0</td>
<td>0.4</td>
</tr>
<tr>
<td>3</td>
<td>0.15</td>
<td>0.05</td>
<td>0.1</td>
<td>0.0</td>
</tr>
</tbody>
</table>

aSE, standard error of the national estimate.
With respect to sex, 1.9% of men reported 2 or more symptoms compatible with CRS vs 2.2% of women ($P = .690$), which was not statistically significant.

**Discussion**

The current cross-sectional data from NHANES demonstrated that 2.1% of the adult population of the United States reported symptoms potentially compatible with CRS. It should be noted that this figure represents the point prevalence (not lifetime prevalence) of CRS. This may be contrasted to a previous Canadian study of symptoms of CRS that found a higher CRS prevalence of 5% as well as another analysis of diagnosis codes in the United States based on chronic rhinosinusitis in 2007 that showed a prevalence of 4.9%. The latter figure does, however, incorporate a selection bias as these were individuals seeking medical care as opposed to a household-based general population analysis.

Several clinical panels have convened to standardize the diagnosis and treatment of CRS. These have included the clinical practice guideline of the American Academy of Otolaryngology—Head and Neck Surgery Foundation, the clinical practice guideline of the Canadian Society of Otolaryngology—Head and Neck Surgery, the position paper of the European Rhinologic Society and the European Academy of Allergy and Clinical Immunology, and the consensus statement of the American Rhinologic Society. According to these documents, symptom criteria for the diagnosis of CRS include 12 weeks of 2 of the 4 symptoms of decrease in sense of smell, nasal obstruction, mucopurulent nasal discharge, and facial pressure or pain. If 2 of these symptom criteria are present, then nasal endoscopy or CT-positive findings confirm the diagnosis. Our population then represents the group from which true CRS cases might be obtained after confirmation of symptom duration for 12 weeks, nasal endoscopy, or CT confirmation, although, of course, not all individuals will seek treatment. This symptomatic population is a significant number, approximating 2.38 million Americans as a point prevalence. The lifetime prevalence would likely be significantly higher.

The major strength of this study is that it uses a nationally representative household-based survey rather than a treatment population or office-based survey. Specific questions were asked about the cardinal symptoms of CRS as part of the smell survey module. We found that loss of sense of smell is the most commonly reported cardinal symptom of CRS at 8.1%, which is slightly lower than the 10.6% reported in a previous study. Nasal blockage was the second most common cardinal symptom of CRS, which, as a significantly prevalent problem, merits further study. Using these cardinal symptoms to screen for patients with CRS in the clinical setting helps distinguish patients with CRS from patients who are commonly misdiagnosed who have other diseases such as vasomotor rhinitis, allergic rhinitis, headache, and laryngopharyngeal reflex. We also found more CRS symptoms in women compared to men, and this is consistent with findings in previous studies.

A specific limitation of this study is that we estimated the point prevalence in the age group 40 to 150 years based on the NHANES study design and administration. A comparative study from Canada found that sinusitis was most common in the 30- to 39-year-old age group. Other US-based survey studies have identified patients being diagnosed at a mean age of 46.1 years. Thus, we may fail to capture an additional portion of the US population with CRS symptoms at a younger age. Future national household surveys could be augmented to include younger as well as older patients for a more representative analysis.

Another limitation is that although we have excluded all patients with a head/chest cold within the past 30 days, because the duration of symptoms is not assessed in the survey data, it is possible that we may have included some patients with subacute rhinosinusitis. Our numbers may reflect a higher prevalence as some patients may have had symptoms for greater than 30 days but less than 12 weeks. Future national household surveys could be augmented to include duration of symptoms for a more representative analysis.

**Conclusion**

At least one of the chronic rhinosinusitis symptoms is present in 13% of the population, with 2.1% of the adult population of the United States having the symptom criteria for CRS. A significant number of Americans may have latent CRS, possibly benefiting from further diagnosis and treatment.

**Author Contributions**

Neil Bhattacharyya, study concept and design, data acquisition and data analysis, critical revision of the manuscript for content, final approval of the version published and agreed to be accountable for all aspects of the work; Sapideh Gilani, study concept and design, data acquisition and data analysis, critical revision of the manuscript for content, final approval of the version published and agreed to be accountable for all aspects of the work.

**Disclosures**

**Competing interests:** Neil Bhattacharyya, Intersect ENT (consultant) and Sanofi Inc (consultant).  
**Sponsorships:** None.  
**Funding source:** None.

**References**


