

Research Article

Asthma on Reunion Island: A Descriptive Analysis of Data from Different Surveillance Sources

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Abstract

This article presents a descriptive review of asthma data from different surveillance sources in Reunion Island: mortality, hospitalisations, use of emergency departments, and population prevalence. Over a period of 10 years, between 2003 and 2012, 237 asthma-related deaths were registered, of which 39 (16%) were aged under 45 years. A decreasing mortality rate was observed over this period, from 4.8 to 2.6 per 100 000 inhabitants which was more pronounced for women than for men. Between 2005 and 2013, 10,035 hospital admissions for asthma were recorded. Over this period, the annual admission rate for asthma increased among children under 15 years and decreased among adults. Between 2010 and 2014, 11,845 asthma-related visits in emergency departments were registered, 64% were children under 15 years. Among these, rates of emergency department visits were higher for boys (61 %) than for girls while for those over 15 years they were higher for women (66%). In 2016 a cross-sectional study estimated the prevalence of current asthma among 18-44 years old at 5.4% and the cumulative prevalence at 23.5%. The results confirm the public health importance of asthma in Reunion Island and the need to carry on efforts to improve the medical care and therapeutic education of asthmatic patients.

Keywords

Asthma; Epidemiology of Asthma; Emergency Visits; Hospitali-

sation; Prevalence; Mortality; Reunion Island

Abbreviations

Eds	:	Emergency departments
ICD-10	:	International Classification of Diseases
INSEE	:	French National Institute of Statistics and Economic Studies
INSERM	:	French National Institute of Health and Medical Research
IRDS	:	Institute for Research and Documentation in health economics study
OSCOUR	:	Coordinated Health Surveillance of Emergency Departments
PMSI	:	Medical information system program database
WHO	:	World Health Organisation

Introduction

According to the World Health Organisation (WHO), in 2017 235 million people suffer from asthma worldwide [1]. In Europe,

asthma affects approximately 30 million people [2]. Because of its high prevalence (especially among children), its potential severity, and the high cost involved in treating it, asthma is a public health priority. In France, the national surveys conducted in 2003 estimate the cumulative asthma prevalence (asthma attack during life) at over 10% in children under ten years old and a current prevalence rate (asthma attack or treatment for asthma in the last 12 months) of 6 to 7% in adults [3-5].

Reunion, a French overseas department, is a 2,512 km² island in the Indian Ocean with a population of 850,996 (2016 population estimate based on the French National Institute of Statistics and Economic Studies (INSEE) census). Epidemiological studies implemented on Reunion Island between 2003 and 2012 indicate that this department is particularly affected by asthma. The mortality rate is twice as high as in mainland France [6,7], the cumulative prevalence of diagnosed asthma in school adolescents aged 13 to 14 is estimated at 19% [8], and care and treatment for the condition is insufficient [9,10]. The objective of this article is to provide a synthesis of descriptive analyses of asthma data from Reunion Island, including: mortality, hospitalisations, use of emergency departments, and prevalence in the general population. The time periods analysed were slightly different for the different sources based on availability of data.

Mortality from asthma

The mortality data was provided by the French National Institute of Health and Medical Research (INSERM) which records medical causes listed on death certificates. The analysis includes all deaths that occurred on Reunion Island between 1 January 2003 and 31 December 2012 for which asthma was mentioned as the underlying cause of death (codes J45.0, J45.1, J45.8, J45.9, and J46 in the 10th edition of the International Classification of Diseases (ICD-10)). The demographic data used for calculating rates came from census data from INSEE. The analysis of asthma mortality trends over time accounts for changes in the population's age structure by calculating standardised rates, using the French population on 1 January 2012 as the reference population.

There were a total of 237 deaths due to asthma between 2003 and 2012 among people residing in Reunion; the majority (54%) were women. Of the 237 people who died, 39 were under 45 years old (16%) (Table 1). The crude average annual mortality rate for people 45 and older over the study period was 8.5 per 100,000 inhabitants; this rate was 3.8 per 100,000 inhabitants for mainland France from 2005 to 2007 [7]. The median age of people who died from asthma on Reunion between 2003 and 2012 was 73 years (72 for men and 73 for women). We observed a decrease in crude annual asthma mortality rates over time, from 4.8 per 100,000 inhabitants in 2003 to 2.6 per 100,000 inhabitants in 2012. The lowest value was 1.3 per 100,000 inhabitants in 2011 and the average for the study period was 2.9 per 100,000 inhabitants.

For people under 55 years, the age group specific average annual

mortality rates were higher in women than in men for all age groups except those aged 0 to 4 and 25 to 34 years. For people above 55 years (an age range where there are more deaths), age group specific mortality rates were higher for men than for women (Figure 1).

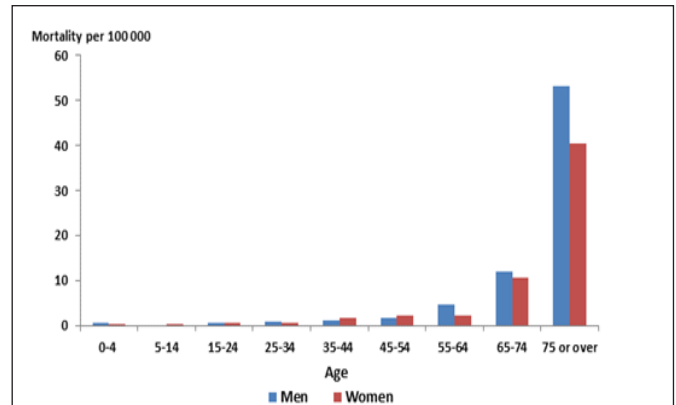


Figure 1: Age group specific asthma mortality rates by sex, 2003 - 2012, Reunion.

	n	%
Sex		
Men	108	45.6
Women	129	54.4
Age		
<15 years old	5	2.1
15-44 years old	34	14.3
45-64 years old	42	17.7
65-74 years old	44	18.6
75 years old or over	112	47.3
Year of death		
2003	36	15.2
2004	33	13.9
2005	34	14.3
2006	19	8.0
2007	24	10.1
2008	15	6.3
2009	21	8.9
2010	22	9.3
2011	11	4.6
2012	22	9.3

Table 1: Characteristics of asthma-related deaths, 2003 - 2012, Reunion.

The standardised asthma mortality rates on Reunion by gender over the study period is presented in Figure 2. We observed an overall downward trend for the whole period which was more pronounced in women than in men. From 2003 to 2012, the variation in the asthma mortality rate was -70% for women and -27% for men. The asthma mortality gap between men and women increased over time (from 4.0% in 2003 to 8.4% in 2012, peaking at 9.3% in 2010).

The standardised annual mortality rates due to asthma on Reunion were higher than those measured in mainland France (8.5 versus 3.8 per 100,000 inhabitants). Compared to the average

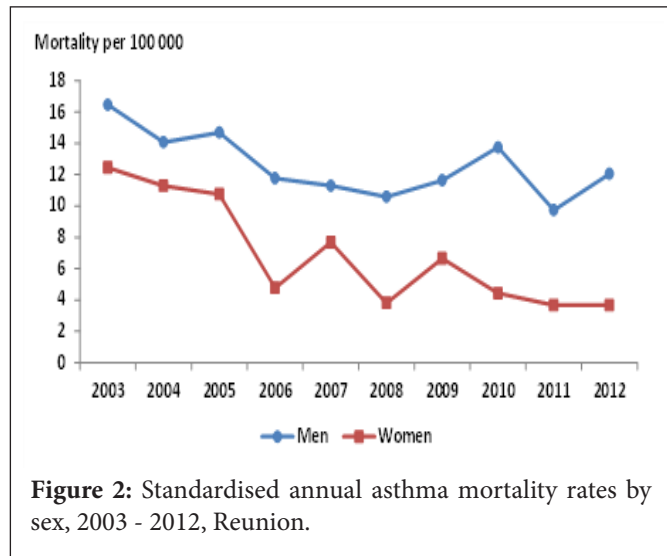


Figure 2: Standardised annual asthma mortality rates by sex, 2003 - 2012, Reunion.

asthma mortality from 2005 to 2007 in France, on Reunion the rate was 2 to 3.5 times higher depending on sex [7]. These results probably reflect the differences in asthma disease prevalence in the populations, and the poorer control of this disease in Reunion, as observed in the survey conducted in 2000 - 2001 by the local branch of the medical department of Reunion's Social Security. The results of this survey underscored the issue of uncontrolled asthma, showing a predominance of severe forms of the condition and many people not following care recommendations [9]. Data on deaths of older adults should be interpreted with caution, since the attribution of deaths to asthma may be incorrect as it could be confounded with other respiratory conditions, such as chronic obstructive pulmonary disease.

Asthma-related admissions

The data on hospital admissions comes from the "Programme de médicalisation des systèmes d'information" (PMSI). This system measures hospital activity and was implemented for the purpose of medical and economic analyses. The analysis included all admissions in short-term stay departments of 11 public and private hospitals that occurred on Reunion Island between 1 January 2005 and 31 December 2013, period for which asthma was recorded as the primary diagnosis (using codes J45.0, J45.1, J45.8, J45.9 or J46 of the ICD-10). Data extraction was performed by the PMSI unit of the French Regional Health Agency - Indian Ocean. The analysis of trends in asthma-related admissions over time accounts for changes in the population's age structure by calculating standardised rates, using the French population on 1 January 2008 as the reference population. Standardised annual rates of hospital admissions for asthma were also calculated by sex as were specific rates by sex and age group. Average length of hospital stay was calculated by age group and sex.

The total number of asthma-related admissions in Reunion during the study period was 10,035. The annual average rate was 1.4 per 1,000 inhabitants. From 2005 to 2013, the annual age-standardised rate increased from 2.9 to 3.7 admissions per 1,000 in-

habitants for people under 15 years old. It decreased in adults from 1.1 to 0.6 per 1,000 inhabitants (Figure 3).

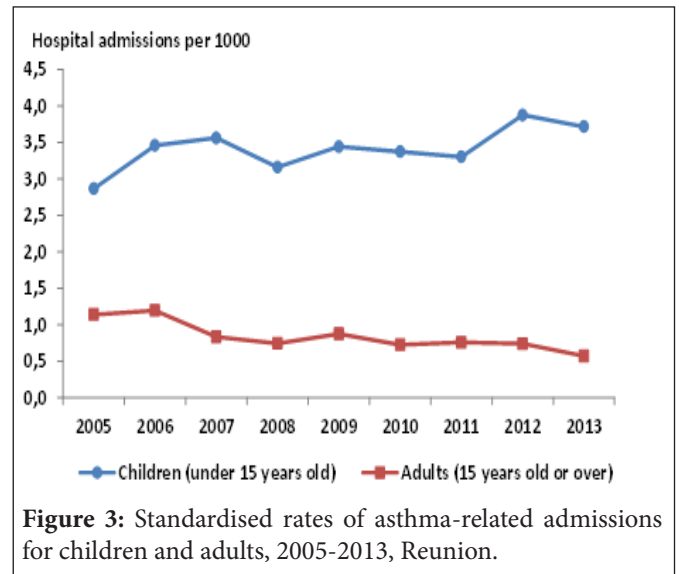


Figure 3: Standardised rates of asthma-related admissions for children and adults, 2005-2013, Reunion.

The average annual rates of asthma-related admissions by sex and age group are presented in Figure 4. Overall, rates decreased from childhood to 30 - 34 years of age, then progressively trended upwards with age for both sexes. Children under 15 years represented close to two-thirds of hospitalisations (63%) and most of these children were boys (62%). Among those over 15 years, most hospitalisations concerned women (69%).

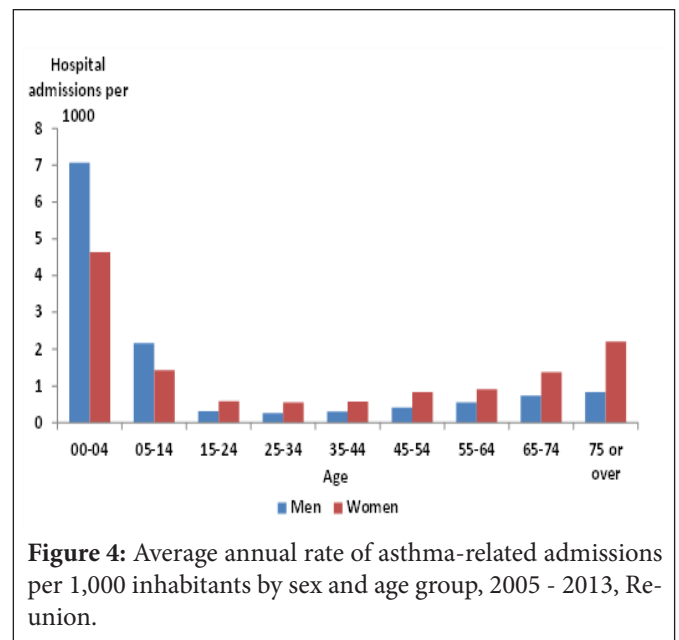


Figure 4: Average annual rate of asthma-related admissions per 1,000 inhabitants by sex and age group, 2005 - 2013, Reunion.

The average length of a stay was 2.5 days and the median was two days. The majority (92%) of admissions lasted less than one week (Figure 5). The average length of stay increased with age, from two days for children less than 4 years old to six days for people aged over 65. It was higher for women than for men.

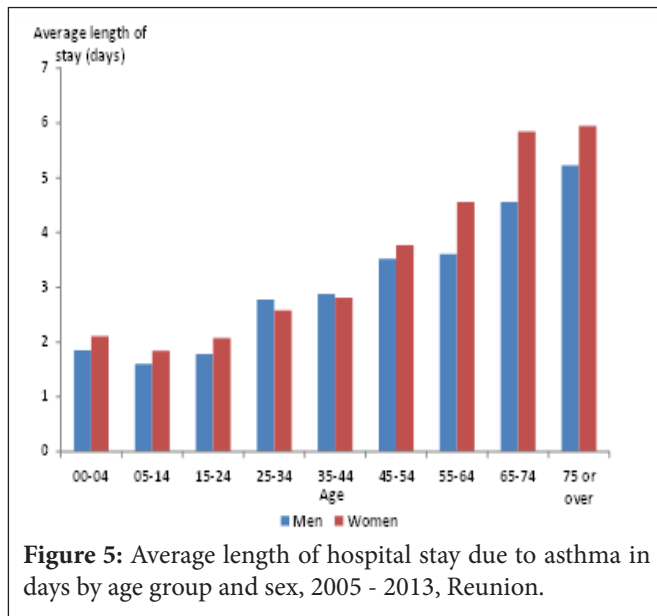


Figure 5: Average length of hospital stay due to asthma in days by age group and sex, 2005 - 2013, Reunion.

The crude average rate of asthma-related admissions from 2005 to 2013 decreased, in contrast to a previous study from 1998 to 2002 (14 admissions per 10,000 inhabitants, versus 20 per 10,000) [6]. Nevertheless, this rate is still higher than that in mainland France, where it was 7.2 admissions per 10,000 inhabitants for 2005 to 2007 and 9.5 per 10,000 inhabitants in 2015 [7, 11]. As with asthma mortality, the asthma-related admission rate may reflect the prevalence of the condition as well as the quality of care.

The data from the PMSI, a system implemented for non-epidemiological purposes, has certain limitations. The analysed morbidity data only included hospital admissions for which asthma was recorded as the primary diagnosis. Other codes, especially the code for acute respiratory failure, may have been used as primary diagnoses with asthma as secondary diagnosis, which could have led us to underestimating the asthma admission rate. Similarly, if a patient had a cardiovascular complication during their hospital stay, that condition would have probably been recorded as the primary diagnosis because it required mobilising more resources, and asthma would be recorded as a secondary diagnosis, meaning these cases would also not be included in the analysis. As with asthma deaths, an overestimation of the number of asthma-related admissions in older people is possible due to overlap of the diagnosis with chronic obstructive pulmonary disease. Inversely, for young children under 2 years for whom a differential diagnosis with bronchiolitis is difficult, an overestimate of asthma-related admissions is likely. It should also be noted that the data from the PMSI corresponds to hospital stay episodes and not hospitalised individuals. Several hospital stays might therefore be recorded for a single patient.

Emergency department visits for asthma

Reunion Island has four public hospitals including six emergency departments (EDs). All EDs contribute to a national syndromic

system surveillance called the OSCOUR network - 'Organisation de la surveillance Coordonnée des Urgences' (Coordinated Health Surveillance of Emergency Departments). Anonymous data are collected daily directly from the patients' computerised medical files that are completed during medical consultations. Collected information includes diagnosis (according to the ICD-10), date and time of arrival at the ED, outcome orientation (hospitalization or discharge), age, gender and postal code.

A retrospective, descriptive analysis of ED visits for asthma on Reunion was conducted based on data from the OSCOUR network. It examined ED visits occurring between the 1 January 2010 and the 31 December 2014 for residents in Reunion whose principal diagnosis code was asthma (i.e., codes J45.0, J45.1, J45.8, J45.9, and J46 from the ICD-10). Crude annual rates of ED visits were calculated as well as specific average annual rates for the period based on sex and age group.

During the study period, 11,845 asthma-related visits were recorded in EDs of Reunion Island, including 6,066 by women and 5,779 by men. Of all visits, 7,559 (64%) were children under 15 years. The crude annual rate of ED visits for asthma varied from 26 per 10,000 inhabitants in 2010 to 28 per 10,000 inhabitants in 2014, with a maximum value of 31 per 10,000 inhabitants in 2012 (Table 2).

Year	Number of visits	Population	Rate per 10,000 inhabitants
2010	2 146	821 136	26
2011	2 322	828 581	28
2012	2 543	834 780	31
2013	2 485	840 974	30
2014	2 349	845 000	28
Average	2 369	834 780	28

Table 2: Crude annual rate of emergency department visits for asthma, Reunion, 2010 - 2014 (n = 11,845).

The annual rates for ED visits for asthma by sex and age group for 2010 to 2014 are presented in Figure 6. Rates decreased from childhood up to 40 - 44 years, then trended upwards with age for both sexes. For those less than 15 years old, ED's visits were more common for boys (61% of visits) than girls, while for those over 15 years, visits were more common for women (66%) than men.

More than half of all ED visits for asthma, when information on this variable was available (n = 8083) ended in admissions (51%).

As cited previously, diagnosing asthma in children under 2 and adults over 45 is not straightforward, the data corresponding to these age groups should be considered with caution [12].

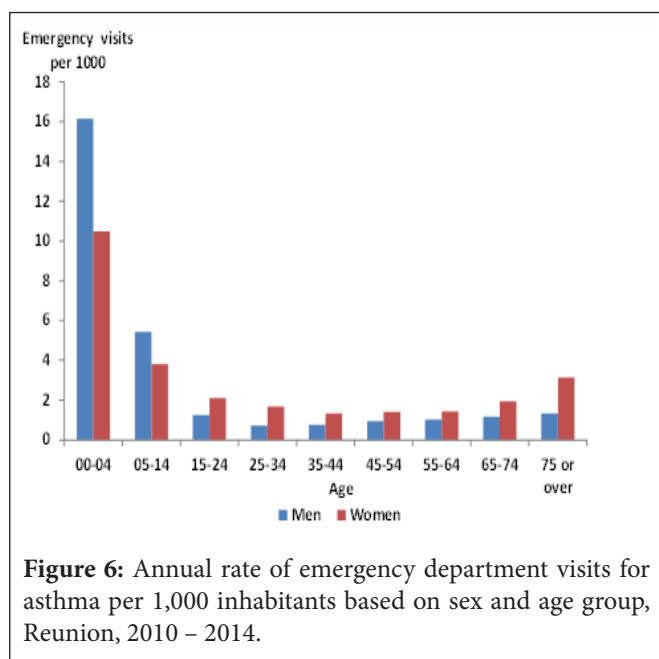


Figure 6: Annual rate of emergency department visits for asthma per 1,000 inhabitants based on sex and age group, Reunion, 2010 – 2014.

Prevalence of asthma

Children and adolescents

A cross-sectional survey conducted in 2000 that examined over 2,000 adolescents aged 13 to 14 attending school on Reunion estimated that the cumulative prevalence of diagnosed asthma was 19% [9]. The health survey conducted in 2003 in mainland France among adolescents aged 11 to 14 years estimated a prevalence of 12.7% [4]. A national survey was conducted in schools on Reunion in 2004 - 2005 to provide estimates of the asthma prevalence in kindergarten pupils. The results showed an asthma prevalence of 13.2% in this population compared to one of 8.7% for all of France [13]. These surveys also showed that Reunion is one of the French regions with the higher asthma rates among children and adolescents.

Adults

A cross-sectional study was conducted in 2016 to estimate the prevalence of asthma in the general adult population of Reunion. A random sample of 2,419 individuals aged 18 to 44 were questioned over the phone using a standardised questionnaire. The objectives were to collect information on respiratory symptoms, to describe asthma attacks and triggering factors for those who reported suffering from asthma, and to gather data on the environment both in and outside their residences.

The following case definitions were used: current asthma applies to any person who at the time of the study answers that he/she already had asthma at some point during his/her life and whose asthma was confirmed by a doctor; he/she must also have had an asthma attack during the past 12 months or have been treated for asthma during the past 12 months. Suspected current asthma applies to any person who answers that he/she has had one or

more groups of symptoms suggestive of asthma consistent with the literature in the 12 months preceding the study [14]. Cumulative asthma applies to any person who at the time of the study answers that he/she ever had an asthma attack at some point during his/her life.

The prevalence of current asthma was estimated at 5.4% (95% CI: 4.3 - 6.5) and the prevalence of cumulative asthma was 23.5% (95% CI: 21.5 - 25.5). Suspected current asthma was estimated at 12.0% (95% CI: 10.2% - 13.8%) of the study population. Of the 12.0% suspected current asthma cases, 8.8% were not classified as people with current asthma. Furthermore, 2.2% of those classified as people with current asthma did not report any symptoms suggestive of asthma in the last 12 months. In total, 14.2% (95% CI: 12.3 - 16.1) of participants aged 18 to 44 reported having current asthma or symptoms suggestive of asthma.

The prevalence of current asthma for 18 - 44 year olds is similar to the prevalence for mainland France of 6.0% (95% CI: 5.7 - 6.4) for individuals of 15 and over in the health survey conducted in 2003 [15]. This prevalence was 6.7% (95% CI: 6.4 - 7.1) for all ages in the 2006 Institute for Research and Documentation in health economics Study (IRDS) [16] and 7.1% for those aged 15 and older in the 2012 IRDES study [17]. However, the current asthma case definition used in the Reunion survey was more restrictive as, in addition to an asthma attack and/or treatment during the last 12 months, the criteria of having previously suffered from asthma during the person's life and a diagnosis of asthma by a doctor were included. These last two criteria were not included in case definitions of the national studies. Therefore the prevalence in Reunion might have been underestimated due to the more specific case definitions.

Important differences in cumulative asthma in mainland France and Reunion were observed. It was estimated at 23.5% (95% CI: 21.4 - 25.5) for Reunion compared to 10.2% (95% CI: 9.7 - 10.6) for mainland France according to the 2006 IRDES study and at 8.9% (95% CI: 8.5 - 9.4) in people 15 and older according to the health survey conducted in 2003. The results of this study show that the prevalence of current asthma in adults is similar in mainland France and Reunion. Other studies show clear differences in the prevalence of asthma in young children between the two territories [3, 8, 13]. This result raises the hypothesis that the percentage of children on Reunion whose asthma disappears when they reach adolescence is greater than in mainland France; this idea merits further examination through complementary studies.

Conclusion

The presented results from different data collection sources confirm that asthma is an important public health issue for Reunion. Mortality rates due to asthma are 2 to 3 times higher than in mainland France and hospital admissions for asthma are 1.5 times more common. Every year, there are over 2,000 emergency department visits for asthma and over half of these patients are

hospitalized. While for 2005 to 2013 we observed a decrease in asthma-related admissions rates among adults, rates increased for children under 15 years among whom the prevalence for asthma is higher compared to that in mainland France.

These results are consistent with the data provided by the Social Security Administration from healthcare prescriptions which show that chronic respiratory diseases (excluding cystic fibrosis) represented in 2013 the second most common pathology in Reunion after diabetes with standardized rates higher than those observed in whole France (72 per 1,000 inhabitants in Reunion versus 52 per 1,000 in France) [18].

This observation highlights the need to continue efforts to improve medical care and therapeutic education of asthmatic patients. In view of the relatively high percentage (8.8%) of participants in the cross-sectional study reporting symptoms suggestive of asthma who have not been diagnosed with asthma, a strategy for asthma screening on Reunion Island could be useful, specifically if this could be implemented by general practitioners. Developing networks of care and exchange between physicians, reinforcing of awareness raising and educating patients about this condition and encourage them to follow their chronic treatment plans are crucial to decrease the burden of asthma on Reunion.

Conflicts of interest

The authors have no conflicts of interest to disclose relating to this article.

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