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Descriptive Epidemiology of Asthma in Trinidad, West Indies

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Key words: Asthma; Caribbean; Lesser-developed country; Demographics; Epidemiology; Tropics

ABSTRACT

This cross-sectional study documents the demographic features of asthmatics seeking acute asthma care at four institutions on the island of Trinidad from January 1 to December 31, 1997. More than 15,000 (15,035) different patients made 27,353 visits during the study period. Pediatric and adolescent male patients outnumbered females, but this was reversed in patients aged 20–69 years. Frequency of visits per patient ranged from 1 to 242. Significant variation in monthly admissions was observed; admission rates were highest in the last quarter of the year but were lowest in July and August. The overall crude prevalence rate was estimated at 1.71 per 100 (range 1.16–2.34).

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INTRODUCTION

Asthma is increasing in developing countries that reportedly once had a lower prevalence of this disease than the developed world (1). In the Caribbean, data from Barbados suggest that the prevalence of asthma among Barbadian children increased from 1.06% (2) to more than 15% (3) between 1970 and 1995. Unfortunately, similar estimates of asthma prevalence in different island territories including Trinidad and Tobago are lacking. Thus, it is difficult to determine whether the Barbadian experience reflects the situation in other island territories, which may differ substantially from Barbados in environmental and population characteristics.

Trinidad is the most southerly of the Caribbean islands and is situated between 61° and 62° west longitude and between 10° and 11° north of the equator with an area of 1763 square miles. Trinidad has a multiethnic population of approximately 1.3 million persons. It differs from most of the other islands including Barbados in having oil and gas reserves. These have been exploited since the turn of the century and Trinidad boasts a thriving petrochemical industry, which contributed to an annual per capita gross national product of \$3740 U.S. dollars in 1994 (4). The presence of a petrochemical industry and the ethnic composition of its people, with an almost equal mix of persons of African and South Asian descent (39.8% African, 40.4% South Asian, 18.5% mixed, 0.81% Syrian/Lebanese, 0.65% Caucasian, 0.39% Chinese, and 0.10% not stated) (5), makes the island unique in the region with regard to environmental and ethnic composition.

As far as we are aware, there have been no published population-based surveys of asthma patients in Trinidad. This study aimed to establish a database of asthmatics seeking emergency care at four accident and emergency (A&E) departments in different parts of the island of Trinidad. Data were analyzed to obtain information on patient demographics and compare crude prevalence rates by county on the island.

METHODOLOGY

Definition of Asthma

In this survey, an asthmatic patient was defined as an adult or child who received bronchodilator nebulization in an A&E setting.

Study Design

A cross-sectional survey of patients attending for bronchodilator nebulization was conducted during the period January 1 to December 31, 1997. The survey was conducted at four centers on the island.

Study Centers

The four study sites included San Fernando General Hospital, a 700-bed institution that provides secondary and tertiary care to the population in the southern half of the island. It is situated on the southwestern coast of the island in the city of San Fernando, which is the second largest city and commercial center in the island. The second site was Arima Healthcare Facility (AHF), which provides primary and secondary level care to the borough of Arima and its environs. The town of Arima is situated in the north of the island approximately 16 miles in a southeasterly direction from the capital, Port-of-Spain. The town of Arima is the third most important commercial center in the island. Sangre Grande District Hospital provides secondary level services to the population along the whole eastern coast of the island. The hospital is situated in the small, bustling town of Sangre Grande. Chaguanas Accident and Emergency Centre provides acute emergency services to the busy and densely populated town of Chaguanas, which is situated in the heart of the sugar cane growing areas of Caroni. The town is also located close to the island's largest industrial estate and port, the Point Lisas estate, where many of the island's large petrochemical plants are situated.

PATIENT DATA

Patient data were transcribed from nebulization records and/or A&E files of each patients. Data included patient's name, age, gender, address, date and time of visit.

DATABASE AND STATISTICAL ANALYSIS

Data were entered into a Microsoft Excel database. Double data entry by two separate workers was done to minimize data-entry errors. Data discrepancies were cross-checked against patients' hospital records and modifications were made to the database as required.

The Microsoft Access program was used for further data analysis. The χ^2 test was used to determine statistical significance of associations between categorical variables. The Komolgorov-Smirnov test was used to determine the significance of variation of monthly visits. Statistical significance was determined at a p value of less than or equal to 0.05.

Calculation of Crude Prevalence Rates by Ward

Estimates of crude prevalence rates were calculated as follows:

$$\text{Crude prevalence/100 population} = \frac{\text{no. of patients from a county attending for acute asthma care}}{\text{population of that county}} \times 100 \quad (5)$$

Calculation of the crude prevalence for Nariva/Mayaro county included 483 additional persons who attended the A&E service at the Mayaro Health Centre during 1997.

RESULTS

Fifteen thousand thirty-five different patients, ranging in age from 3 months to 100 years, sought acute asthma care at the four study sites during 1997 (Table 1). These patients made 27,353 visits during the study period, giving an average of 2279 visits per month.

Table 1. Number of Patients Seeking Acute Care at Study Sites During 1997

HOSPITAL	NO. OF PATIENTS
Arima	3300
Chaguanas	3288
San Fernando	6987
Sangre Grande	1460
Total	15,035

Patient gender was significantly associated with age (Fig. 1). Pediatric and adolescent patients aged 0–19 years accounted for 51.8% of 14,859 patients for whom gender and age data were available. Males outnumbered females in the pediatric and adolescent populations (M/F = 1.47:1). In contrast, the gender ratio was reversed with a predominance of female patients in the age groups 20–69 years (M/F = 1:1.85). The association between gender and age groups in these patients was highly significant ($p < 0.001$).

Monthly admission rates were highest in the last quarter of the year at all study sites. Monthly admission numbers varied significantly ($p < 0.001$) throughout the year (Fig. 2). Admission numbers averaged 2088.8 per month during the first quarter (January to April) of 1997. This decreased to a mean admission rate of 1923.8 for the period May to August and then rose markedly in the last quarter (September to December) to average 2825.8 visits per month. The highest monthly admission number (2870 visits) was recorded in October. The lowest number of visits (1730 visits) occurred in August.

A similar pattern of monthly variation was noted in all study sites (Fig. 3). Analysis of monthly visits for different age groups up to age 59 years revealed that the monthly variation retained significance for all age groups up to 49 years of age ($p < 0.001$ for the following age groups: 0–9 years, 10–19 years, 20–29 years, 30–39 years, 40–49 years, and $p = 0.10$ for 50–59 years).

There was wide variation in the frequency of visits per person in the different age groups (Table 2). The majority of patients in each age group attended one to three times during the

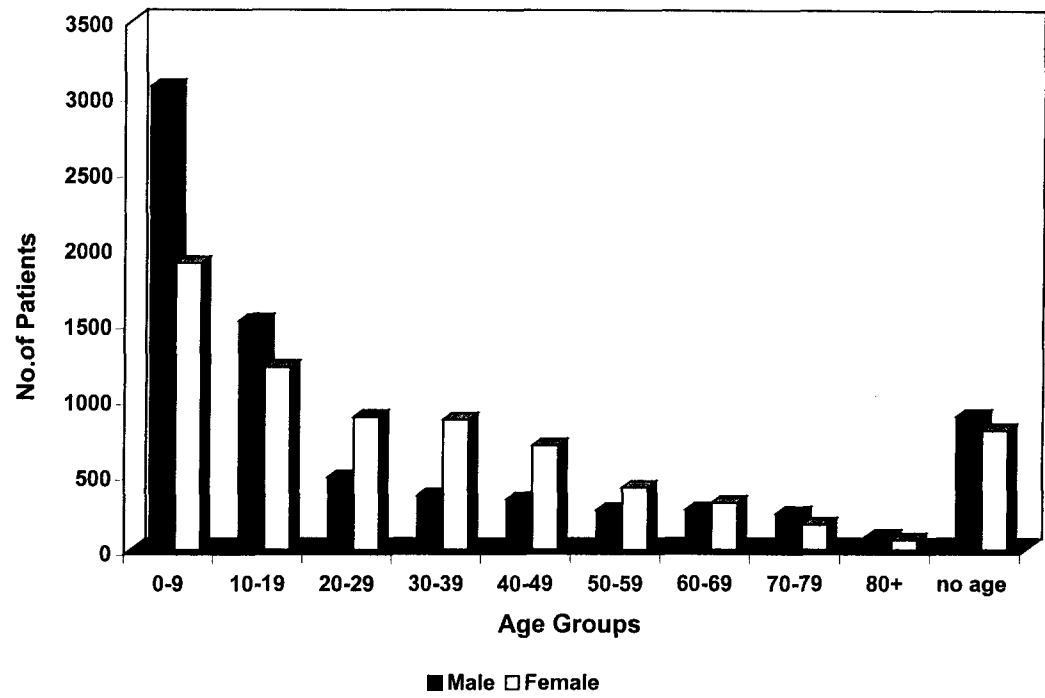


Figure 1. Age and gender distribution of asthmatic patients (χ^2 , $p < 0.001$).

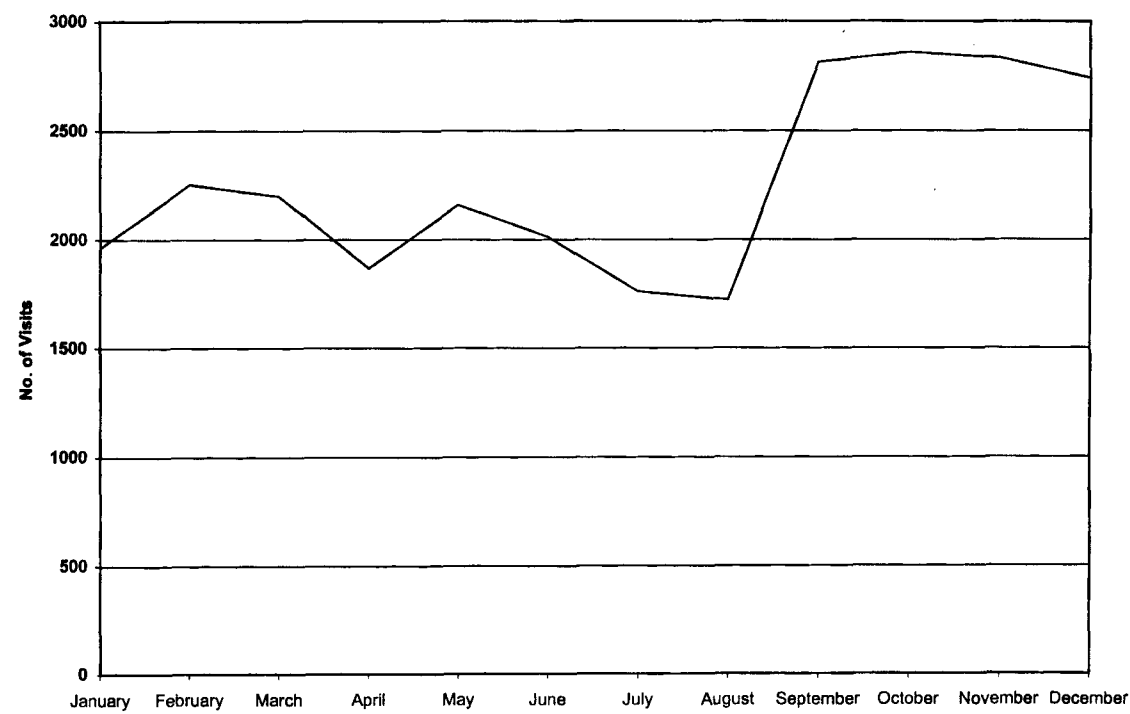


Figure 2. Monthly acute asthmatic emergency room admissions (Kolmogorov-Smirnov test, $p < 0.001$).

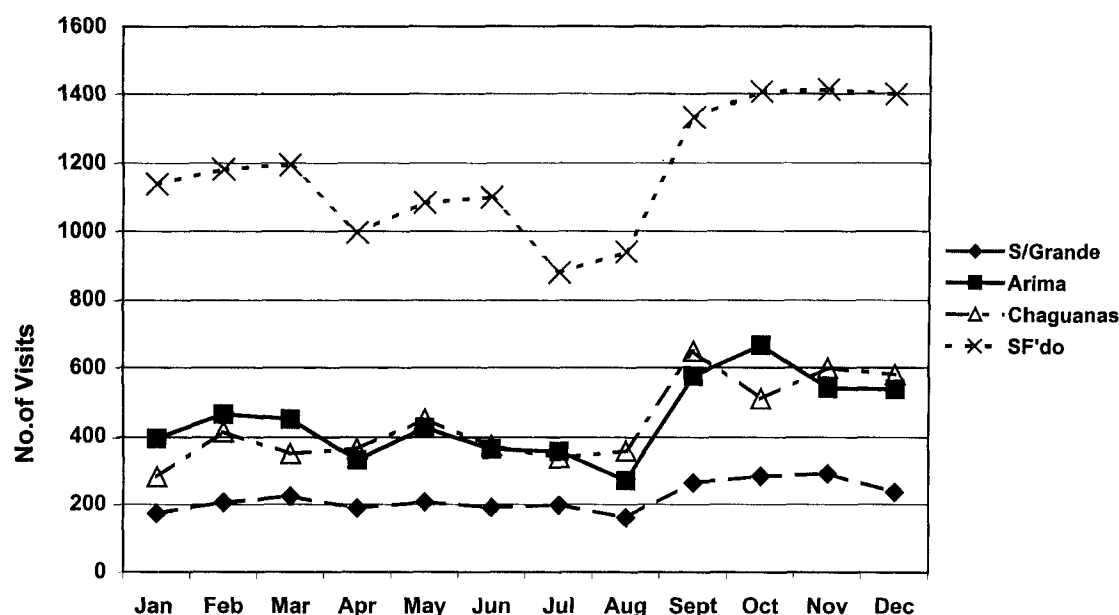


Figure 3. Patterns of monthly asthma admissions at the four study sites.

study period for acute asthma management. For example, 91.3% of children aged 0–9 years and 93.4% of patients aged 10–19 years visited 1–3 times in 1997. The range of visits per person varied by age group and extended from 1 to 242 (range of visits by age group: 0–9 years, 1–35; 10–19 years, 1–44; 20–29 years, 1–29; 30–39 years, 1–44; 40–49 years, 1–77; 50–59 years, 1–242; 60–69 years, 1–61; 70–79 years, 1–51; 80 years and older, 1–26).

Further analysis of patients attending seven or more times revealed that an average 2.9% (range 0.8%–7.5%) of all patients attended at that frequency. There was a tendency for more frequent visits among older patients. Thus,

0.8% of patients aged 0–9 years attended 10 or more times during the study period and this increased to 0.9% for 10–19 year olds, 1.1% for 20–29 year age group, 1.9% among 30–39 year olds, 3.3% for 40–49 year olds, 5.0% for 50–59 year olds, 6.2% among 60–69 year olds, and 7.5% among patients 70–79 years old.

Estimates of crude prevalence rates by county reveal significant variation across the island (Fig. 4). Variation in crude prevalence rates was noted throughout the island. These ranged from 1.16 per 100 in St. Patrick county in the southwestern part of the island to 2.34 per 100 persons in St. Andrew and St. David counties, which comprise the northeastern

Table 2. Frequency of Visits by Age Group (0–70 Years)

AGE GROUP (NO. OF PATIENTS)	RANGE OF VISITS	% OF PATIENTS WHO MADE 1–3 VISITS	% OF PATIENTS WHO MADE 4–6 VISITS	% OF PATIENTS WHO MADE 7–9 VISITS	% OF PATIENTS WHO MADE 10 OR MORE VISITS
0–9 years (4836)	1–35	91.3	6.8	1.1	0.8
10–19 years (2668)	1–44	93.4	4.7	1.0	0.9
20–29 years (1330)	1–29	92.7	4.4	1.8	1.1
30–39 years (1203)	1–44	90.0	5.8	2.3	1.9
40–49 years (1005)	1–77	86.8	7.3	2.6	3.3
50–59 years (659)	1–242	83.5	8.2	3.3	5.0
60–69 years (561)	1–61	82.7	5.7	5.4	6.2

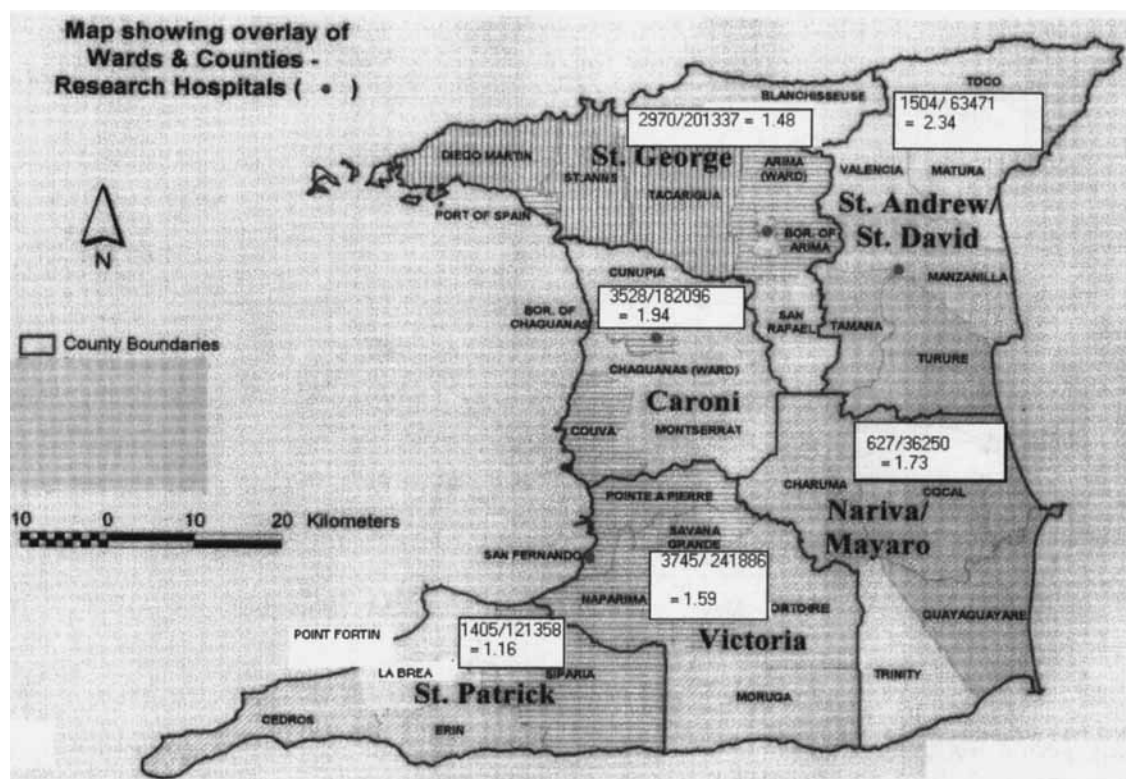


Figure 4. Crude prevalence rates of asthma by county during 1997.

portion of Trinidad. Average prevalence rate (1.94/100) for the counties in the northern half of the island (St. George, Caroni, St. Andrew, and St. David) was higher than that for the three southern counties of St. Patrick, Victoria, Nariva/Mayaro (average crude prevalence rate, 1.49 per 100). The overall crude prevalence rate of persons seeking acute asthma management was estimated at 1.71/100 population.

DISCUSSION

This database of asthmatics attending A&E departments throughout the island of Trinidad is the largest that has been compiled in the English-speaking Caribbean. Previous reports of asthmatics attending emergency departments in the region (6,7) have reported on asthmatics as a percentage of all emergency cases over short intervals without consideration of the demographic features of this population. In Barbados, annual asthmatic patient

attendance at the emergency facility of the 547-bed Queen Elizabeth Hospital has been estimated at between 8000 and 10,000 admissions (4). Attendance rates were also high at the San Fernando General Hospital, the institution in our study that has a comparable bed capacity, which recorded more than 14,000 asthmatic admissions to the A&E department during 1997.

Asthma is primarily a disease of childhood (8). In this study, pediatric and adolescent patients account for approximately 52% of all cases. This percentage is higher than that reported by Pearson (2) in his study of 143 Barbadian asthmatic patients, 42% of whom were 19 years old or less. In the Barbadian study, most of the young population was 10–19 years old (27%) with only 15% less than 10 years old. This contrasts markedly with our data in which children less than 10 years old comprised 33.5% of the total population, with only 18.4% adolescents. One explanation for this difference may be due to the large difference

in the numbers of the asthmatics in the two studies; 60 children and adolescents in the Barbadian study compared with 7818 persons of similar age in this study. Alternatively, a survey of 2731 school-children aged 5–15 years conducted in Barbados in 1970 found a prevalence of 1.06%. The low representation of pediatric patients in the Barbadian study compared with this survey may be suggestive of an increased prevalence of asthma in this age group. This explanation is supported by results of an International Study of Allergy and Asthma in Childhood (ISAAC)-based survey conducted in Barbados in 1996, which revealed a prevalence of 16.5% of doctor-diagnosed asthma among 6–7 year olds (3).

Gender variation with age found in this study is similar to that described in other parts of the world, i.e., a male predominance among pediatric patients which changes to a female predominance in adults (9). Carrasco, in his description of asthma in Latin America, noted that there was “a tendency towards higher figures for asthma in females in older age groups” (10).

Monthly variation in asthma admissions to emergency departments has been previously observed in several West Indian islands including Antigua (Dr. L. Simon, personal communication) and Barbados (11). Pediatric asthmatic in-patient admissions in Trinidad also varied throughout the year (12). A trend toward higher admission rates the last quarter of the year was noted in these previous reports and in this study. Depradine and Naidu (11) found that average admission rates to the Queen Elizabeth Hospital were similar during a 15-year interval from 1976 to 1993. Briefly, admission rates were high in January and February and then fell to their lowest level in April. This nadir was followed by a surge in numbers in May with a slight decline in June, and then a sustained rise from July / August to maximum admission numbers in October through December. Data from our study also showed low admission numbers in April but differs from the Barbadian pattern in that low admission numbers were also noted in July and August.

At present, it is unknown why there should be an increase in asthma admission in several Caribbean islands at the end of each year. This

increase coincides with the rainy, humid season of the southern Caribbean when relative humidity is higher. Cameron (12) compared pediatric asthma admissions with change in relative humidity from dry season (average humidity 79.4%, range 77%–82%) to the wet season (average humidity 85.3%, range 85%–86%). He concluded that the variation in relative humidity was too small to account for the nine-fold increase in admissions from September to December. In contrast, Pearson (2) hypothesized that increased atmospheric moisture in the last quarter of the year favored an increase in house dust mite populations, leading to mite-induced exacerbation of asthma. However, Hansen et al. (13) measured dust mite concentrations in homes of asthmatic patients in St. Lucia and found that mite allergen levels remained constantly high throughout the year. Depradine and Naidu (11) reported that a combination of relative humidity greater than 80% coupled with low wind speeds was associated with increased asthma admissions. These climatic variables gave an explained variance of 37% by regression analysis, suggesting that climatic influences might indeed have a role in inducing asthma attacks.

The wide variation in visits found in this study in each age group has not been previously reported in the regional literature. However, there is a trend noted among many West Indian patients to use emergency hospital facilities as primary healthcare centers (7), and it is possible that the high frequency of visits by the patients in this study may be explained by this tendency.

Other possible factors that have been reported in other countries and which may contribute to frequent hospital admissions among Trinidadian asthmatics include preference by patients for nebulizer therapy, inadequate prophylactic anti-inflammatory medications, over-reliance on bronchodilators, and delay in seeking medical help during disease exacerbation (9). Higher frequency in admissions among older patients may reflect misdiagnosis due to a higher prevalence of other chronic lung and heart diseases known to exist among this age group.

Variation in asthma prevalence is well documented for different countries worldwide and

in different cities and region of the same country (14). Variation in disease prevalence throughout an island has not been previously described in any Caribbean territory. The island of Trinidad, though less than 1800 square miles, does have considerable variation in flora, population distribution, urbanization, and socioeconomic status across its six counties. Further analysis of these factors is currently in progress to determine any possible associations with disease prevalence. The overall crude prevalence rate of 1.71 per 100 population falls in the range defined for different territories in Central and South America that extended from 1.15% in Monterrey, Mexico, to 4.3% in Porto Alegre, Brazil (9). However, the prevalence rates reported from Latin America were not calculated solely from asthma admissions to emergency departments.

In summary, we reported on a large database of asthmatic patients seeking acute asthma management at centers throughout the island of Trinidad. Analysis of this database has revealed some similarities with profiles of asthmatics in other countries, such as the predominance of pediatric patients and a larger number of male cases in childhood and female patients among adults. The significant monthly variation that was found in this study is similar to that reported by other West Indian territories. This variation is significant for all ages up to 49 years of age, suggesting that the factors that influence variation in admission rates are not confined to one or a few age groups. A very wide variation in the number of visits per person has not been documented previously in the Caribbean and merits further investigation, because frequent use of hospital facilities in the management of asthma has been shown to be more expensive than preventative strategies. The significant variation in crude prevalence rates on the island also merits further investigation; this approach may help identify local environmental or ethnic factors that may contribute to asthma in a Caribbean setting.

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