Incidence, prevalence, and trends of general practitioner–recorded diagnosis of peanut allergy in England, 2001 to 2005

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Background: Previous descriptions of the epidemiology of peanut allergy have mainly been derived from small cross-sectional studies.

Objective: To interrogate a large national research database to provide estimates for the incidence, prevalence, and trends of general practitioner (GP)–recorded diagnosis of peanut allergy in the English population.

Methods: Version 10 of the QRESEARCH database was used with data from 2,958,366 patients who were registered with 422 United Kingdom general practices in the years 2001 to 2005. The primary outcome was a recording of clinician-diagnosed peanut allergy.

Results: The age-sex standardized incidence rate of peanut allergy in 2005 was 0.08 per 1000 person-years (95% CI, 0.07-0.08), and the prevalence rate was 0.51 per 1000 patients (95% CI, 0.49-0.54). This translated into an estimated 4000 incident cases (95% CI, 3500-4600) and 25,700 prevalent cases (95% CI, 24,400-27,100) of GP-recorded diagnosis of peanut allergy in England in 2005. During the study period, the incidence rate of peanut allergy remained fairly stable, whereas the prevalence rate doubled. In those under 18 years of age, the crude lifetime prevalence rate was higher in males than females. A significant inverse relationship between prevalence and socioeconomic status was found.

Conclusion: These data on GP-recorded diagnosis of peanut allergy from a large general practice database suggest a much lower prevalence in peanut allergy than has hitherto been found. This difference may in part be explained by underrecording of peanut allergy in general practice. Further research is needed to assess the true frequency of peanut allergy in the population and whether there has been a true increase in recent years. (J Allergy Clin Immunol 2011;127:623-30.)

Key words: *Peanut allergy, incidence, prevalence, time trend, primary care, demographic associations, consultation rate*

The peanut is a widely distributed nutritious aliment that is associated with food allergy in some individuals. About 34 million tons of peanuts were produced worldwide in 2009.[1] Peanuts contain many important nutrients (including vitamin E, niacin, folate, calcium, phosphorus, magnesium, zinc, and iron) and are a good source of protein. Unfortunately, peanuts are also the most common food-related cause of IgE-mediated allergic reactions.[2] Peanut allergy is also one of the most severe food allergies because it can cause life-threatening anaphylaxis and because only a minority of people who have allergic reactions to peanuts early in life will outgrow their allergy.[3] People who are allergic to peanuts can react to smaller doses of food than people with other food allergies.[2] For instance, an allergic reaction may be triggered by breathing the dust from peanuts or eating foods that have been processed with machines that have previously processed peanuts.

The frequency of peanut allergy has been reported in several previous studies.[4-14] The estimated prevalence rates in children ranged from 0.4% to 1.9%, and some studies[6,9,11,13] found an increasing trend in prevalence, whereas others[4,12] did not. However, most of these estimates have been based on data from cross-sectional surveys of samples from the population. These offer the opportunity for detailed assessments to identify those with peanut allergy correctly; however, the methods used for the recruitment of participants into these surveys (ie, priming of respondents toward research on food allergy) as well as nonresponse may have introduced selection bias, whereas the use of geographically limited sampling frames and the small sample sizes may have reduced the generalizability of findings for the total population. Another limitation of cross-sectional designs is that it is very difficult to estimate accurately the incidence rates of the disease. Mounting large-scale representative national birth cohort studies would overcome these limitations, but the costs and logistics of such endeavors are likely to prove prohibitive.

We used a different methodology in an attempt to obtain insights into the epidemiology of peanut allergy in the English population by interrogating one of the largest anonymized aggregated health databases in the world (QRESEARCH). Some major advantages of this approach are the use of representative data of the English population, a longitudinal assessment of the disease, and large numbers of cases, which potentially allow a more precise calculation of population estimates. A limitation is that the data are routinely collected by primary clinicians for patient care and not primarily for research purposes.

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Abbreviations used
EMIS: Egton Medical Information Systems
GP: General practitioner
UK: United Kingdom

This study builds on our ongoing program of work to assess the epidemiology of allergic diseases.[15-21] The overall aim was to describe the frequency of peanut allergy as seen in primary care and the associated use of primary care services for patients with a diagnostic label of peanut allergy. More specifically, we wanted to obtain estimates of the incidence and prevalence of a general practitioner (GP)–recorded diagnosis of peanut allergy in England for the years 2001 to 2005. Furthermore, we aimed to assess associations of theses rates with demographic characteristics (age, sex, and level of socioeconomic deprivation).

METHODS

We used version 10 of the QRESEARCH database for this analysis (http://www.qresearch.org). The database has been developed by the University of Nottingham in conjunction with Egton Medical Information Systems (EMIS), the largest supplier of general (family) practice computer systems in the United Kingdom (UK). The data quality has been examined and found to be high (data quality reports are available from http://www.emis-online.com).

General practices were included in the analysis if they had transmitted complete data to the central QRESEARCH repository for the whole of January 1, 1999, through December 31, 2005. Practices were required to have been using EMIS for at least 2 years before the start of the study period to give the practices sufficient time to become accustomed to using their computer system for routine work. The analysis was based on a set of fixed practices to eliminate the possibility that trends in rates across the 5-year study period could be a result of the inclusion of different practices in each analysis year. Although QRESEARCH does have practices in Wales, Scotland, and Northern Ireland, this analysis was restricted to practices based in England. This yielded a total of 422 practices and 2,958,366 patients.

Patients were included in each year of analysis if they were registered for the whole of the analysis year in question. Thus, patients who might have had incomplete data available for the analysis year (ie, temporary residents, newly registered patients, and those who left or died during the year) were excluded from the analysis.

Main outcomes

We considered patients to have peanut allergy if they had a computer-recorded diagnosis of peanut allergy (Read code SN582) in their electronic health record during the study period. Thus, our case definition of peanut allergy was dependent on patients with peanut allergy presenting to primary care and then being correctly diagnosed and recorded as such by their primary care clinicians or the diagnosis being made in a specialist setting and this diagnosis being communicated to primary care clinicians and recorded onto their electronic health record systems.

The reported incidence refers to the number of new cases of peanut allergy diagnosed in each study year, with the number of person-years as the denominator term (calculated from the number of patients registered with practices and their length of registration). The lifetime prevalence refers to the number of people ever recorded with peanut allergy on at least 1 occasion in the general practice records, with the number of registered patients as the denominator term.

We determined the GP or nurse consultation rate per person per year for patients with peanut allergy. The total number of consultations for patients with peanut allergy, which included consultations in the surgery, by telephone, at home, and at other locations (which accounted for 84%, 9%, 4%, and 3% of consultations, respectively, in the general population in 2005),[22] was included in the numerator term, and the total number of patients with peanut allergy was included in the denominator term. We compared this rate with the overall consultation rate of the general population, with the total number of consultations in the surgery, by telephone, at home, and at other locations in the numerator term and all current registered patients in the denominator term.

Covariates

The patient's age, sex, and level of deprivation were included as covariates in our study. The level of deprivation was defined using the Townsend Index, which is derived from the patient's postcode and is calculated by combining 4 census variables: households without a car, overcrowded households, households not owner-occupied, and persons unemployed.[23] The higher the number on this index, the greater the measure of deprivation.

Statistical analyses

Incidence and prevalence rates were standardized by using sex and 5-year age bands. The estimated midyear population in England for each year was used as the reference population (50.466 million in 2005).[24] We calculated 95% CIs around these estimates. We also scaled up the results to give the estimated number of patients with a recorded diagnosis of peanut allergy in England in 2005. Where appropriate, χ^2 tests were used to test whether there were statistical associations between categorical variables and to test whether there was a trend across time.

RESULTS

Incidence of GP-recorded diagnosis of peanut allergy

In 2005, the crude incidence rate of GP-recorded diagnosis of peanut allergy was 0.07 per 1000 person-years (95% CI, 0.06-0.08). The median age of diagnosis was 8 years old, and the highest incidence rates were found in boys 0 to 4 years old (0.64/1000; 95% CI, 0.45-0.84) and girls (0.38/1000; 95% CI, 0.22-0.53). Fig 1 shows differences in crude incidence rates between males and females within various age bands. Across all ages, the crude incidence rate was higher in males (0.08/1000; 95% CI, 0.06-0.09) than females (0.07/1000; 95% CI, 0.05-0.08), but this difference was not statistically significant ($P = .27$). Furthermore, the crude incidence was higher in the most affluent group of patients (0.08/1000; 95% CI, 0.06-0.10) than in the least affluent group (0.06/1000; 95% CI, 0.04-0.08), but the overall association between incidence and level of deprivation was only marginally statistically significant ($P = .06$).

The age-sex–standardized incidence rate of peanut allergy was 0.08 per 1000 person-years (95% CI, 0.07-0.08), which translated into an estimated 4000 people (95% CI, 3500-4600) with a new diagnosis of peanut allergy in England in 2005. The age-sex–standardized incidence rates are presented stratified by age and level of deprivation in Table I.

Prevalence of GP-recorded diagnosis of peanut allergy

In 2005, the crude lifetime prevalence rate of GP-recorded diagnosis of peanut allergy was 0.49 per 1000 registered patients (95% CI, 0.46-0.51). Most patients presenting to primary care with peanut allergy were under 20 years of age (1.59/1000; 95% CI, 1.49-1.68). The highest rates were found in boys 5 to 9 years

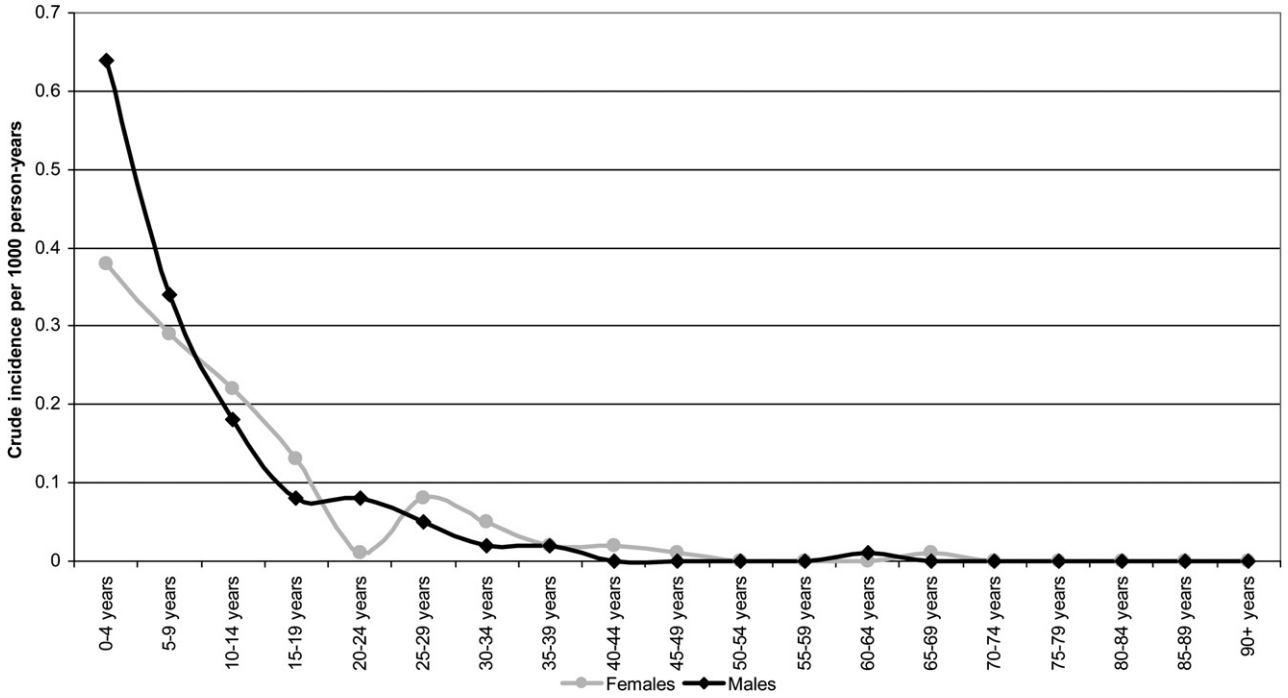

FIG 1. Crude incidence rate of GP-recorded diagnosis of peanut allergy in England in 2005, stratified by age and sex.

TABLE I. Age-sex-standardized incidence of GP-recorded diagnosis of peanut allergy in England in 2005, stratified by sex, age, and level of deprivation

Stratum	Total patients (N)	Incident cases (N)	Standardized rate per 1000 patient-years	95% CI
Sex				
Female	1,485,738	98	0.07	0.06-0.09
Male	1,472,628	114	0.09	0.07-0.11
Age band (y)				
0-4	125,020	64	0.51	0.39-0.64
5-9	173,923	55	0.32	0.23-0.40
10-14	187,861	37	0.20	0.13-0.26
15-19	181,864	19	0.10	0.06-0.15
20-24	167,994	8	0.05	0.01-0.08
25-29	181,230	12	0.07	0.03-0.10
30+	1,940,474	17	0.01	0.00-0.01
Deprivation (quintiles)				
1st	648,634	50	0.09	0.07-0.12
2nd	580,431	53	0.11	0.08-0.14
3rd	552,702	44	0.09	0.07-0.12
4th	515,271	25	0.06	0.04-0.08
5th	567,835	33	0.06	0.04-0.08

Level of deprivation based on Townsend Index with 1st quintile representing the most affluent group of patients. Crude rates are reported by age bands.

old (2.51/1000; 95% CI, 2.18-2.84) and girls (2.07/1000; 95% CI, 1.76-2.37; Fig 2). In the age group 0 to 19 years, the crude lifetime prevalence rate was higher in males (1.77/1000; 95% CI, 1.63-1.91) than females (1.39/1000; 95% CI, 1.27-1.52; $P < .001$). In the age group 20 years and older, however, the crude lifetime prevalence rate was lower in men (0.13/1000; 95% CI, 0.11-0.15) than women (0.19/1000; 95% CI, 0.17-0.22; $P < .001$). We also found a significant inverse relationship between recorded peanut allergy prevalence and socioeconomic status ($P < .001$), with the highest prevalence found in the most affluent group (0.65/1000; 95% CI, 0.58-0.71).

The age-sex–standardized lifetime prevalence rate of GP-recorded peanut allergy was 0.51 per 1000 registered patients (95% CI, 0.49-0.54), which translated into an estimated total of 25,700 people (95% CI, 24,400-27,100) with a recorded diagnosis of peanut allergy in England in 2005. The age-sex–standardized lifetime prevalence rates are presented stratified by age and level of deprivation in Table II.

Trends in incidence and prevalence of GP-recorded diagnosis of peanut allergy from 2001 to 2005

Table III shows age-sex–standardized incidence rates, lifetime prevalence rates, and corresponding estimated incident and prevalent cases of recorded peanut allergy in England for each year in the period of 2001 to 2005. There was little variation in incidence rates and estimated number of newly diagnosed cases of peanut allergy. The prevalence rates, however, roughly doubled from 0.24 per 1000 patients in 2001 (95% CI, 0.22-0.26) to 0.51/1000 in 2005 (95% CI, 0.49-0.54). The increase was highest in the age group 10 to 14 years and higher in males compared to females.

GP/nurse consultation rate

Fig 3 shows the overall crude GP and nurse consultations rates compared with those for patients with a recorded diagnosis of peanut allergy in 2005. Consultation rates in patients with peanut allergy tended to be higher than the overall consultation rate.

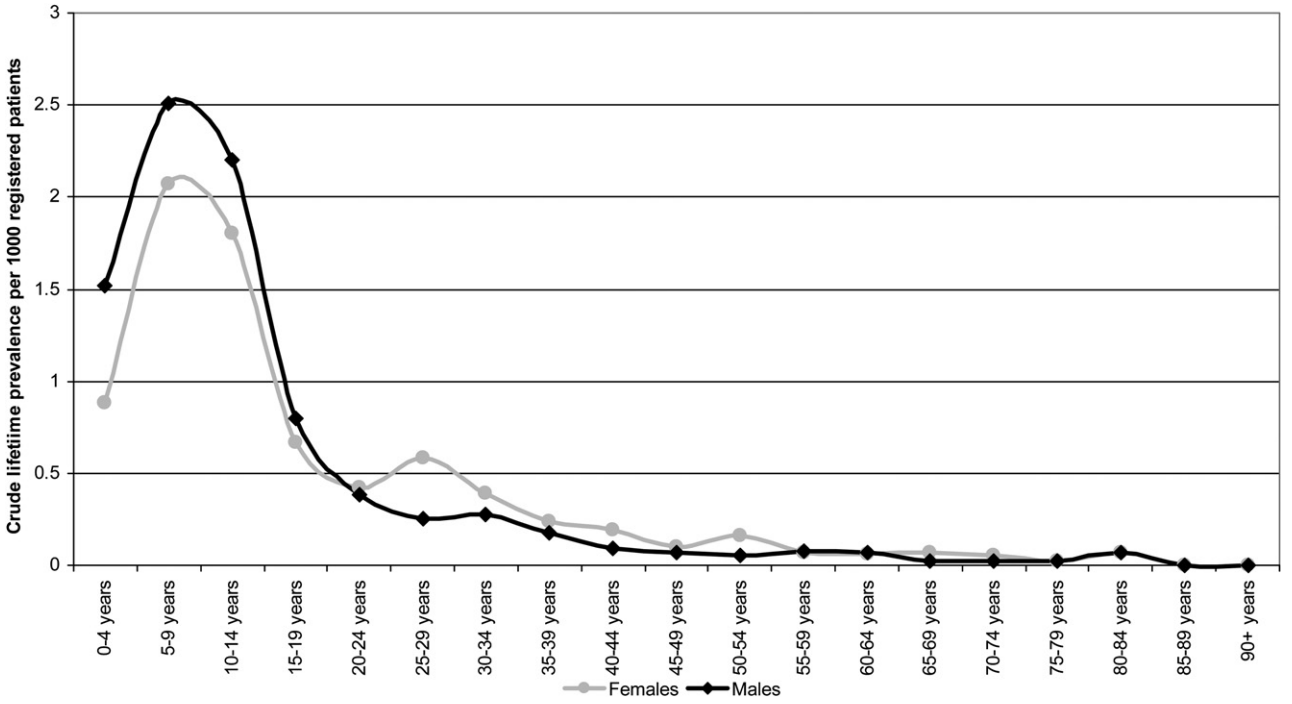

FIG 2. Crude lifetime prevalence rate of GP-recorded diagnosis of peanut allergy in England in 2005, stratified by age and sex.

TABLE II. Age-sex-standardized lifetime prevalence of GP-recorded diagnosis of peanut allergy in England in 2005, stratified by sex, age, and level of deprivation

Stratum	Total patients (N)	Prevalent cases (N)	Standardized rate per 1000 patients	95% CI
Sex				
Female	1,485,738	680	0.47	0.44-0.51
Male	1,472,628	758	0.55	0.52-0.60
Age band (y)				
0-4	125,020	151	1.21	1.02-1.40
5-9	173,923	399	2.29	2.07-2.52
10-14	187,861	377	2.01	1.80-2.21
15-19	181,864	134	0.74	0.61-0.86
20-24	167,994	67	0.40	0.30-0.49
25-29	181,230	75	0.41	0.32-0.51
30+	1,940,474	235	0.12	0.11-0.14
Deprivation (quintiles)				
1st	648,634	419	0.70	0.64-0.78
2nd	580,431	297	0.57	0.50-0.63
3rd	552,702	292	0.57	0.51-0.64
4th	515,271	179	0.36	0.31-0.42
5th	567,835	215	0.36	0.31-0.41

Level of deprivation based on Townsend Index with 1st quintile representing the most affluent group of patients. Crude rates are reported by age bands.

DISCUSSION

By using data from the QRESEARCH general practice database, we estimated that in England in 2005, the age-sex–standardized incidence rate of GP-recorded diagnosis of peanut allergy was 0.08 per 1000 person-years, and lifetime prevalence was 0.51 per 1000 registered patients. This translated into an estimated 4000 people (ie, 11/d) newly recorded with a diagnosis of peanut allergy. An estimated 25,700 people were found to have a recorded diagnosis of peanut allergy in England. This was most prevalent in boys and girls 5 to 9 years old (2.29/1000). Under the age of 20 years, where the majority of patients presented with peanut allergy, rates tended to be higher in males than in females. Also, patients from the most socioeconomically affluent group had the highest prevalence of recorded peanut allergy. Over the study period, whereas the incidence remained fairly stable, we observed a substantial increase in the lifetime prevalence rate of recorded peanut allergy.

This work in the context of previous research: frequency of peanut allergy

Several studies have previously reported data on the frequency of peanut allergy in the UK (see this article's Table E1 in the Online Repository at www.jacionline.org). Among the studies using a clinician-diagnosed outcome measurement, Grundy et al[6] investigated 1218 children age 3 to 4 years and registered with a GP on the Isle of Wight in 1994 and 1273 children in 2000 and reported prevalence rates of peanut allergy of 4.93 per 1000 children (95% CI, 0.99-8.86) and 10.21 per 1000 (95% CI, 4.69-15.74), respectively. In 2005, Venter et al[12] repeated this study in 891 children and found a prevalence rate of 12.35 per 1000 (95% CI, 5.10-19.60). In the years 2002 to 2003, Pereira et al[10] investigated 1532 schoolchildren on the Isle of Wight and reported a prevalence rate of 10.32 per 1000 (95% CI, 3.21-17.44) in 11-year-olds and 7.93 per 1000 (95% CI, 1.61-14.24) in 15-year-olds. Hourihane et al[7] recruited 1072 children through primary schools in Southampton and Manchester in the years 2003 to 2005 and reported a prevalence rate of 18.66 per 1000 (95% CI, 10.56-26.76) at age 4 to 5 years.[7] In the most recent study, Nicolaou et al[14] reported an incidence rate of peanut

TABLE III. Age-sex-standardized lifetime prevalence and incidence of GP-recorded diagnosis of peanut allergy in England from 2001 to 2005

	Incidence				Prevalence			
Year	Standardized rate per 1000 person-years	95% CI	Estimated numbers in England	95% CI around estimated no.	Standardized rate per 1000 patients	95% CI around rate	Estimated number in England	95% CI around estimated no.
2001	0.06	0.05-0.07	2,900	2,400-3,400	0.24	0.22-0.26	11,700	10,800-12,600
2002	0.08	0.07-0.09	4,000	3,500-4,600	0.32	0.30-0.34	15,700	14,700-16,800
2003	0.08	0.07-0.09	3,900	3,400-4,500	0.39	0.37-0.42	19,700	18,500-20,900
2004	0.08	0.07-0.09	3,800	3,300-4,400	0.45	0.43-0.48	22,600	21,400-23,900
2005	0.08	0.07-0.09	4,000	3,500-4,600	0.51	0.49-0.54	25,700	24,400-27,100

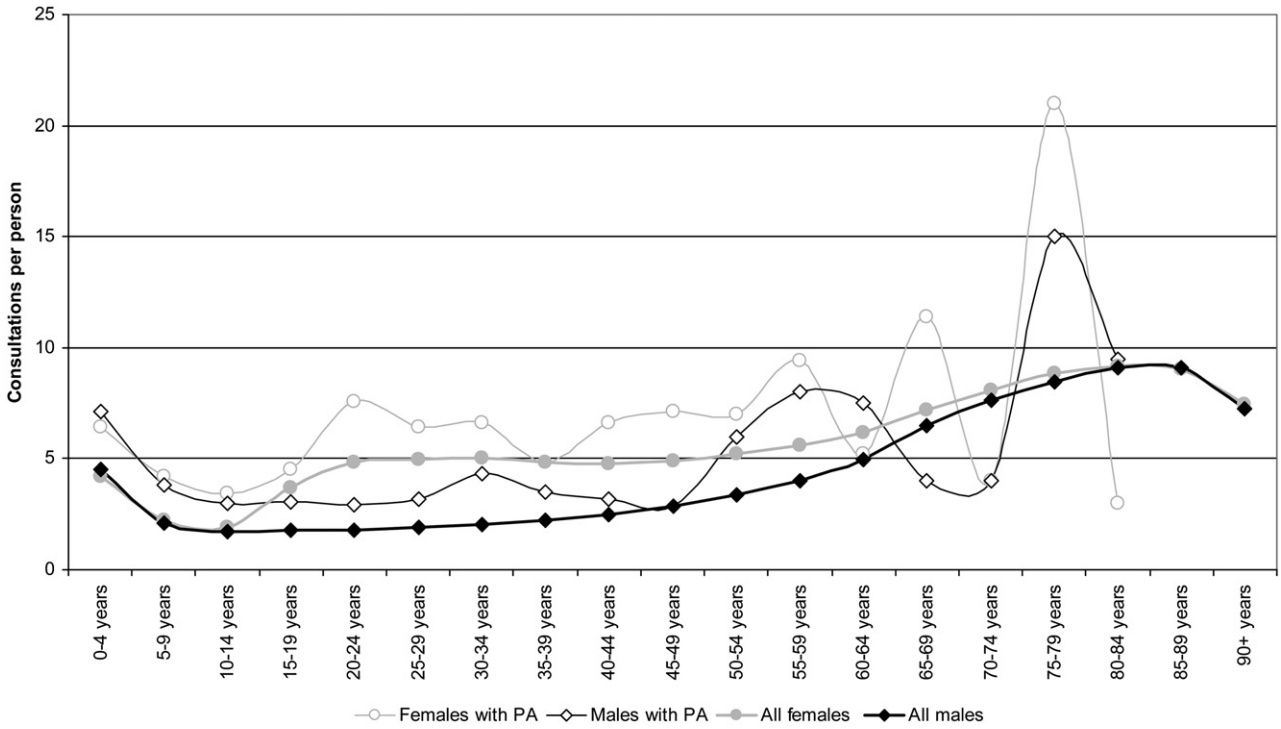

FIG 3. Crude GP and nurse consultation rates for the total group compared with patients with GP-recorded diagnosis of peanut allergy in England in 2005, stratified by age and sex. *PA*, Peanut allergy.

allergy of 18.46 per 1000 (95% CI, 10.24-26.69) at age 8 years. One study used a self-reported outcome measurement: Du Toit et al[5] investigated 3943 schoolchildren from Jewish schools in Greater London from 2004 to 2005 and found a prevalence of self-reported peanut allergy of 23.08 per 1000 (95% CI, 17.33-29.43) at ages 4 to 12 years and 10.29 per 1000 (95% CI, 5.11-15.47) at ages 12 to 18 years.[5]

A few other studies on the frequency of peanut allergy have been conducted outside the UK in the past decade. In Canada, Kagan et al[8] and Ben-Shoshan et al[4] investigated peanut allergy in schoolchildren from Montreal (mean age, 7.4 years), respectively in the years 2000 to 2002 and 2005 to 2007. They found a prevalence of clinician-diagnosed peanut allergy of 15.0 per 1000 (95% CI, 11.60-19.20) during the first survey and 16.3 per 1000 (95% CI, 13.0-20.2) during the second. Sicherer et al[11] performed a telephone survey among a random sample of 13,493 people from the general population in the United States in 2002. They measured self-reported prevalence rates of peanut allergy of 6.23 per 1000 (95% CI, 4.90-7.55) in the total sample, 8.31 (95% CI, 5.13-11.50) in children under 18 years, and 5.87 (95% CI, 4.36-7.38) in adults. The authors repeated this survey in 2008 among 13,534 respondents and found prevalence rates of 11.38 per 1000 (95% CI, 9.53-13.22) in the total sample, 14.47 (95% CI, 10.13-18.82) in children under 18 years, and 10.46 (95% CI, 8.45-12.47) in adults.[13]

The prevalence rates reported in these studies are all substantially higher (roughly 10-20/1000) than the rates we found using the QRESEARCH general practice data: 1.21 per 1000 (95% CI, 1.02-1.40) in children 0 to 4 years, 2.29 per 1000 (95% CI, 2.07-2.52) in children 5 to 9 years, and 2.01 (95% CI, 1.80-2.21) in children 10 to 14 years. One explanation why these GP data may be an underestimation of the true prevalence of peanut allergy in the population relates to the fact that our case definition was based on a routinely recorded diagnosis by primary care clinicians. Not all people who have peanut allergy present to primary care; furthermore, peanut allergy may not always be diagnosed

correctly, and a diagnosed case of peanut allergy may not always be recorded in a correct and uniform way. For example, although most patients with peanut allergy assessed by specialist allergy clinics or discharged back into the community by secondary care services will be managed by primary care–based physicians, not every GP may record a patient who has been diagnosed by a specialist as having peanut allergy. Furthermore, physicians may apply differing thresholds before recording a diagnosis in the patient's record, and it is therefore possible that the parent Read code "food allergy" (SN58.) is used. Once data become available, future work should also include an assessment of confirmed specialist diagnosis in the GP records.

Whereas our methodology probably led to an underestimation, the methodology used in previous studies may have resulted in an overestimation of the true prevalence of peanut allergy in the population. Surveys performed in specific subgroups of the population limit the generalizability of findings to the whole population. Furthermore, when information letters for the recruitment of participants include information on the goal of the study (assessment of allergy), selection bias may occur because people at high risk of allergy are more likely to respond. Differences in prevalence rates are also related to differences in sample size. Because of the relatively small sample size in the previous studies (about 1000-3000 subjects), there is substantially greater statistical uncertainty about the reported prevalence estimate, resulting in wider CIs around the estimate. The lower CIs reported (2-5/1000) are quite close to our estimate. Taking these methodologic considerations together, we tend to assume that the true estimate of peanut allergy in the population is likely to lie somewhere between the estimates provided in this and previous studies.

This work in the context of previous research: associations with demographic factors

Data from our study suggest that peanut allergy may be more common in males in the age group under 20 years and in women in the age group over 20 years. The only other UK study that presented prevalence rates stratified by sex was published by Du Toit et al,[5] showing no differences between males and females.[5] In the Canadian studies by Kagan et al[8] and Ben-Shoshan et al,[4] however, the percentage male schoolchildren was higher in the group that was allergic to peanuts than in the group than was not allergic to peanuts: 59.4% versus 48.6% ($P = .086$) from 2000 to 2002, and 63.0% versus 49.2% from 2005 to 2007 ($P = .01$). Similar to our study, the US study by Sicherer et al[11] reported a significantly higher prevalence rate of peanut allergy in boys under 18 years of age (0.98% vs 0.20% in girls; $P = .02$), but a lower rate in men over 18 (0.28% vs 0.44% in women; $P < .001$). Such differences may be a result of sex-specific changes in illness perception and health behavior but also different disease mechanisms including the role of sex steroids, as has been suggested with regard to the presentation of asthma.[25]

Our data also suggests that peanut allergy may be more common in people with higher socioeconomic backgrounds. This finding is unlikely to be explained simply by primary care clinicians recording more details or more diagnoses in this group of patients overall, because the recording of other diseases in this database is more common in patients with lower socioeconomic backgrounds (including, for example, asthma[20] and chronic obstructive pulmonary disease[26]). We are not aware of any other study analyzing associations between socioeconomic status and the frequency of peanut allergy. However, higher socioeconomic status seems to be linked to an increased risk of anaphylaxis in general.[27] Furthermore, a meta-analysis found that children in families with higher educational level had an increased risk of food allergy.[28] That meta-analysis did not find an association with household income, but an increase in the number of children in the household decreased the risk of food allergy.

This work in the context of previous research: time trends

During the 5-year period of our study, the incidence rate of GP-recorded diagnosis of peanut allergy remained the same, whereas the prevalence rate roughly doubled from 0.24 per 1000 patients in 2001 to 0.51 in 2005. There may be multiple reasons for this increase in prevalence. Improved patient and clinician awareness of food allergy could have resulted in an increased use of primary care health services for those with previously diagnosed peanut allergy. However, because this increase mainly occurred in males and children approaching their teenage years, it could also indicate a trend of fewer children outgrowing their peanut allergy. Several other studies that used repeated cross-sectional surveys reported an increase in prevalence across the years of observation. In the UK, Grundy et al[6] reported a 2-fold increase in prevalence during a 6-year interval (0.5% in 1994; 1.0% in 2000). There was, however, no further increase 2 years later (1.2% in 2005).[12] In the United States, Sicherer et al observed a 2-fold increase of self-reported peanut allergy in children during a 5-year interval, from 0.4% in 1997 to 0.8% in 2002,[11] and a further increase to 1.4% in 2008.[13] Aggregated data from 2 US national surveys showed that other types of food allergy also increased from 1997 to 2007 in children under 18 years.[29] Mullins et al[9] performed a retrospective study among patients diagnosed with peanut allergy at a community-based specialist allergy practice in the Australian Capital Territory. The estimated incidence of peanut allergy by age 6 years rose from 0.73% for those born in 2001 to 1.15% for those born in 2004, and the number of newly diagnosed patients with peanut allergy increased more than 10-fold from 1995 to 2007.

Not all studies reported an increase in the frequency of peanut allergy, however. In Canada, Ben-Shoshan et al[4] measured stable prevalence rates of peanut allergy in the 5-year period between 2000 to 2002 and 2005 to 2007. A recent review concluded that it is unclear whether food allergies in general are increasing because of a lack of uniformity for diagnostic criteria.[30]

This work in the context of previous research: consultation rates

We found indications that primary care physician and nurse consultation rates were higher in patients with peanut allergy than in patients from the general primary care population. Under the age of 40 years, female and male patients with a recorded diagnosis of peanut allergy consulted their GP or nurse on average about 1.5 times more often per year. To the best of our knowledge, no other studies have reported and compared consultations rates specifically for patients with peanut allergy. However, different studies using the QRESEARCH database found that consultation rates for patients with eczema[19] and patients with multiple allergic disorders[18] were also higher than mean consultation rates. The

reason for higher GP or nurse consultations for patients with peanut allergy compared with the general population is unclear. It is possible that the symptoms and consequences of this disease and the probable presence of other allergy-related comorbidities may require greater involvement in the day-to-day treatment of patients by primary care.

General strengths and limitations of this work

The major strength of the current study is that it is based on data from one of the largest anonymized aggregated health databases in the world. The large number of patients in this database offers the potential for a more reliable estimation of frequency measures than previous studies that involved small samples. This resulted in much smaller CIs around the estimates in the current study. Furthermore, the practices included in the database are broadly representative of practices in England in terms of the age-sex structure of the death rates, birth rates, and prevalence of other chronic diseases. This suggests the findings are likely to be highly generalizable to England.

The major limitation of this work is that our analyses are based on diagnoses entered in the GP clinical computer system by a health care professional. This methodology may underestimate the true frequency of disease because not every patient with a diagnosis of peanut allergy will also have a physician-assessed diagnosis of peanut allergy. Furthermore, we cannot be certain about the validity of the diagnosis of peanut allergy because the gold standard for assessment is a double-blind placebo-controlled food challenge. Although the high rate of primary care encounters found will have provided greater opportunities for primary care clinicians to ascertain peanut allergy in these patients, it was not possible from this analysis of routinely collected data from general practices to distinguish reliably between a true increase in a disease measure, better screening, and better ascertainment or improved recording of disease on the clinical computer system.

The system that was used for the coding of the diagnosis peanut allergy was the Read Clinical Classification system. An advantage of this system is that it was produced for clinicians in primary care and is used by the majority of primary care electronic patient record systems. A disadvantage of this system is the limited number of food allergy concepts available.[31] It is therefore possible that a great wealth of information on a patient's allergy status is entered as free text.

We conclude that the prevalence of a GP recorded diagnosis of peanut allergy is much lower than previous estimates from cross-sectional surveys of samples from the population. Nevertheless, more than 25,000 people in England have peanut allergy and show increased primary health care use. More research is now needed to assess whether there has been a true increase in the prevalence of the disease in recent years and which factors might be associated with such a trend. Such research would benefit from consistency in the collection, analysis, and reporting of data, clearly distinguishing between estimates of peanut allergy derived from self-reports, self-reports of clinician diagnosis, clinician diagnosis, clinician-recorded diagnosis, and oral food challenge or its variants (Table E1).

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Key messages

- **The prevalence of a GP-recorded diagnosis of peanut allergy is considerably lower than the 0.4% to 1.9% estimates derived from cross-sectional surveys.**
- **The prevalence of GP-recorded diagnosis of peanut allergy is more common in boys than in girls and in more affluent than in more deprived people.**

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TABLE E1. Summary of previous studies reporting on the frequency of peanut allergy

Study	Location data	Year data	Design	Sample characteristics	Response rate	Sample size	Outcome measurement	Prevalence of PA*
Grundy (2002)[6]	UK: Isle of Wight	Sample 1: 1992-1993; sample 2: 1997-2000	Cross-sectional survey	Children age 3-4 y and registered with a GP on the Isle of Wight	Sample 1: 79%; sample 2: 43%	Sample 1: 1,218; sample 2: 1,273	History, SPT, OFC (only in sample 2)	Sample 1: 0.5%; sample 2: 1.0%
Kagan (2003)[8]	Canada: Montreal	2000–2002	Cross-sectional survey	Schoolchildren age 5-9 y from randomly selected schools	56%	4,339	History, SPT, IgE, DBPCFC	1.5%
Sicherer (2003)[11]	United States: national	Sample 1: 1997; sample 2: 2002	Cross-sectional telephone survey	Random sample of the population	Sample 1: 67%; sample 2: 52%	Sample 1: 12,032; sample 2: 13,493	Self-reported symptoms of PA	Sample 1: 0.6% (total), 0.4% (age <18 y), 0.7% (age ≥18 y); sample 2: 0.6% (total), 0.8% (age <18 y), 0.6% (age ≥18 y)
Perreira (2005)[10]	UK: Isle of Wight	2002–2003	Cross-sectional survey	Schoolchildren: sample 1: age 11 y; sample 2: age 15 y	Sample 1: 48%; sample 2: 50%	Sample 1: 775; sample 2: 757	History, SPT, OFC, DBPCFC	Sample 1: 1.0%; sample 2: 0.8%
Hourihane (2007)[7]	UK: Southampton, Manchester	2003–2005	Cross-sectional survey	Primary school children age 4-5 y	21%	1,072	History, SPT, IgE, DBPCFC	1.8%
Du Toit (2008)[5]	Sample 1: UK: London; sample 2: Israel: Tel Aviv	2004–2005	Cross-sectional survey	Jewish school children age 4-18 y	Sample 1: 82%; sample 2: 83%	Sample 1: 3,943; sample 2: 4,657	Self-reported (validated with SPT, IgE or OFC in subsample)	Sample 1: 1.9%; sample 2: 0.2%
Ben-Shoshan (2009)[4]	Canada: Montreal	2005–2007	Cross-sectional survey (repetition of Kagan 2003[8])	Schoolchildren age 5-9 y from randomly selected schools	64%	5,161	History, SPT, IgE, DBPCFC	1.6%
Mullins (2009)[9]	Australia: Australian Capital Territory	1995–2007	Retrospective cohort study	Children age 0-6 y from a community-based specialist allergy practice	Not applicable	348	History, SPT	Children born in 2001: estimated IR, 0.73%; children born in 2004: estimated IR, 1.15%
Venter (2010)[12]	UK: Isle of Wight	2004–2005	Cross-sectional survey (repetition of Grundy 2002[6])	Children age 3-4 y and registered with a GP on the Isle of Wight	Not stated	891	History, SPT, OFC	1.2%
Sicherer (2010)[13]	United States: national	2008	Cross-sectional telephone survey (repetition of Sicherer 2003[11])	Random sample of the population	42%	13,534	Self-reported symptoms of PA	1.1% (total), 1.4% (age <18 y), 1.0 (age ≥ y18)
Nicolaou (2010)[14]	UK: South Manchester and Cheshire	2004	Prospective cohort study	Birth cohort of children age 8 y	95%	1,029	History, SPT, IgE, OFC, DBPCFC	IR, 1.9%

DBPCFC, Double-blind placebo-controlled food challenge with peanut; *OFC,* open food challenge.
*Prevalence of peanut allergy *(PA)* unless otherwise stated (*IR*, incidence rate).