Crohn's Disease Among Ethnic Groups in a Large Health Maintenance Organization

JOHN H. KURATA, SANDRA KANTOR-FISH, HAROLD FRANKL, PAUL GODBY, and CONSTANCE M. VADHEIM

Department of Family Medicine, San Bernardino County Medical Center, San Bernardino, California, and Division of Family Medicine, UCLA School of Medicine, Los Angeles, California; Department of Family Medicine, San Bernardino County Medical Center, San Bernardino, California; Department of Gastroenterology, Kaiser Permanente Medical Care Program, Los Angeles, California; Department of Gastroenterology, Kaiser Permanente Medical Care Program, Fontana, California; and Center for Vaccine Research, Harbor/UCLA Medical Center, Torrance, California

The epidemiology of Crohn's disease (CD) was investigated among ethnic groups in a 2-million-member health maintenance organization. Between 1982 and 1988 there were 909 hospitalizations for CD. Annual hospitalizations per 100,000 were much lower for Hispanics (0.6) than those for whites (10.2) and blacks (10.2), and rates were higher among women (8.3) than men (6.0) ($P < 0.001$). Bimodal age distributions were found for both sexes with peaks identified in the 20-29-year and ≥60-year age groups. Annual age-adjusted hospitalizations per 100,000 decreased from 1982 (8.3) through 1988 (5.4) ($P < 0.05$). A mail survey and medical records were used to collect data from the 169 CD patients who were identified at two sites within the organization. Prevalence rates per 100,000 for Hispanics (4.1) and Asians (5.6) were much lower than those for whites (43.6), blacks (29.8), and "others" (8.4). The distribution of age at diagnosis was bimodal, and the average age at diagnosis was 36 years. Patients reported an average of 3.7 outpatient visits and 13.3 days lost from work per year. Current cigarette smokers reported significantly more days troubled by symptoms during a one-month period (15.4 days) than nonsmokers (5.0 days) ($P < 0.001$).

The majority of past epidemiological research on Crohn's disease (CD) has focused primarily on groups of white patients or on comparisons between white and nonwhite populations. Studies using nonwhite comparison groups usually do not specify which ethnic groups this category comprises, whereas others have limited the nonwhite category to black patients. Several published reports have not mentioned the ethnic distribution of the study samples, although presumably the majority are made up of whites based on the geographical regions in which the data were collected. Although past studies provide interesting and important information on the similarities and differences in incidence, prevalence, and the course of the disease between such groups, very little is known about CD among the two fastest-growing populations in the United States, Hispanics and Asians. Therefore, it is important to document the occurrence of CD among this segment of the population, especially in California, where Hispanics and Asians/Pacific Islanders currently make up 26% and 10% of the population, respectively.

A feature of previous investigations that has hindered the ability to generalize results is that most have limited the source of data to patients from specialized centers or to patients hospitalized for CD. Past research has suggested that many patients with CD are never admitted to the hospital. Reliance on hospitalization data for computing incidence and prevalence rates may greatly underestimate the true occurrence of the disease. Several community-based studies have been reported that include information on patients treated on an inpatient or outpatient basis. Studies such as these help broaden the scope of understanding of the disease. However, none has provided a description of CD among various ethnic groups using hospitalization, outpatient, and self-reported data.

The purpose of the present investigation was to compare the descriptive epidemiology of CD for different ethnic groups in the Southern California Kaiser Permanente Medical Care Program (KPMCP). This is a large health maintenance organization (HMO) in which patients from various ethnic backgrounds have equal access to care. We examined cases hospitalized for CD among the members of the entire Southern California KPMCP. We also studied
medical history and life-style characteristics for a subset of the Southern California KPMCP membership who had received inpatient or outpatient care for CD at the Sunset Medical Center in Los Angeles or the Fontana Medical Center in San Bernardino County. For these patients, questionnaire data as well as inpatient and outpatient medical records were analyzed. The study was approved by the KPMCP institutional review board.

Materials and Methods

Southern California KPMCP Hospitalizations

In 1988, there were 1,994,054 members of the Southern California KPMCP. For the period 1982 through the first quarter of 1989, a computer search identified all primary diagnosis CD-related hospital discharges for the Southern California KPMCP. ICD-9-CM codes used to identify cases included 555.0, 555.1, 555.2, and 555.9, all of which are specific forms of regional enteritis (CD). The inpatient data listing contained information on diagnosis, age at hospitalization, hospitalization site, sex, ethnic status, and patient medical record number.

Annual age-adjusted hospitalization rates (per 100,000) were calculated for the entire Southern California KPMCP for 1982 through 1988. CD cases for the numerator value came from the computer-generated inpatient listing. The denominator values were annual Southern California KPMCP membership figures. Age-adjusted hospitalization rates were computed by the direct method using the 1970 U.S. Census population as the standard (unpublished data).

Estimates of the ethnic distribution of the Southern California KPMCP were used as the denominator to calculate ethnicity-specific CD hospitalization rates for 1987–1988. These estimates were based on a random sample of 3506 adult Southern California KPMCP members who participated in a 1986 childhood immunization study. To control for possible ethnic differences in overall use of health care services, ethnic distributions of all Southern California Kaiser hospitals in 1987 and all outpatient visits during a 3-week period at the Sunset Medical Center Family Practice clinics were also used as denominators.

Sunset and Fontana Study

A detailed study was conducted of patients who had received inpatient or outpatient care for CD at the Sunset or Fontana Medical Centers. Medical records were reviewed, and cases with a definite or probable diagnosis of CD were sent a mail survey of life-style and medical history characteristics. About one third of the regional membership (approximately 627,000 members) were allocated to receive care at the Sunset Medical Center or the Fontana Medical Center.

CD patients were identified through the hospital computer system or the gastroenterology departments’ outpatient identification systems. Information abstracted from the medical records included demographics, year of diagnosis, family history of inflammatory bowel disease (IBD), symptoms, and number of CD-related hospitalizations, outpatient visits, and procedures. An outpatient visit was included in the count if the patient was seen by the gastroenterology department specifically for CD or if the patient was seen by a physician from another department (e.g., family practice, dermatology, gynecology) and there were clinical notes indicating CD was a primary reason for the visit.

Two senior gastroenterologists, one from each site, reviewed the medical record information and rated the diagnostic accuracy of each case. Applying strict diagnostic criteria, cases were rated as definite, probable, or possible, using previously established guidelines based on pathology, endoscopy, or radiology reports. Cases were rated as definite if there was a positive histological report from an operative or autopsy specimen. Probable criteria included (a) a laparotomy report of characteristic naked-eye appearances of the small bowel but no specimen of gut resected for histology, (b) an equivocal histological report from an autopsy specimen with characteristic macroscopic features, (c) a colonoscopic report compatible with CD and biopsy with features strongly suggestive of CD, or (d) a radiological examination strongly suggestive of intestinal or chronic inflammatory disease with obstructive or fistulous features. The diagnostic criteria for a case to be rated as possible included a medical record with a discharge diagnosis of CD, regional enteritis, or granulomatous colitis; no findings, clinical or radiologic, inconsistent with the diagnosis; and an acceptable history.

A self-administered mail survey was sent to all patients with a definite or probable diagnosis to obtain supplemental information unavailable in the medical records. The survey included questions related to the clinical history and course of the disease, current disease activity, and suspected risk factors. (See Appendix A for a list of survey items.)

Annual incidence and prevalence rates (both per 100,000) were computed for Sunset and Fontana combined using the annual membership allocation as the denominator. Calculation of incidence was limited to 1987 and 1988. Patients were considered incident cases if they were diagnosed with CD for the first time as outpatients in 1987 or 1988 or if they were hospitalized for CD during this time with no prior admissions since 1982. Prevalence was calculated for 1984 through 1988 using annual membership allocation as the denominator. Prevalence cases were limited to those with definite or probable diagnosis of CD.

Data Analysis

Data were analyzed using BMDP biomedical statistical programs for the personal computer. Student’s t test was used to test for differences in means of continuous variables. The Pearson χ² statistic was used to test association of categorical variables. An F test of linear trends of age-adjusted hospitalization rates was also conducted. The level of significance chosen for all tests was P = 0.05.

Results

Southern California KPMCP Hospitalization Rates

In the Southern California KPMCP between 1982 and 1988, there were 909 hospitalizations for
Hospitalization rates were 6.0 and 8.3 per 100,000 for males and females, respectively (P < 0.001). There was a significant decrease in the annual age-adjusted hospitalization rates from 1982 (8.3 per 100,000) through 1988 (5.4 per 100,000; P < 0.05) (Figure 1).

Age-specific hospitalization rates were higher for females than males except for the under-20- and over-80-year age groups (Figure 2). Female rates reflect a bimodal distribution, showing peaks for the 20-29- and 60-69-year age groups. Hospitalization rates for men peaked for 20-29-year-olds and generally declined thereafter, with a second peak noted in patients aged 80 years and older.

Compared with other ethnic groups, Hispanics had the lowest hospitalization rates per 100,000 in the Southern California KPMCP for 1987 and 1988 combined (Table 1). Rates for Asians, although higher than those for blacks and whites, were also much lower than those for blacks and whites. These results were found when rates were calculated for both sexes combined, as well as separately. In comparison with males, hospitalization rates were higher among females in each of the ethnic categories. White males had higher rates than nonwhite males. Black females had higher rates than females of other ethnic groups.

However, blacks and whites had identical rates when both sexes were combined (10.2 per 100,000).

Sunset and Fontana Study

Identification of cases. Two hundred thirty-five potential cases were identified; 172 were identified through the hospital computer system, and 63 were identified through outpatient files. Two hundred seven charts (88%) were available for review. One hundred sixty-nine cases (82%) were rated as having a definite or probable diagnosis of CD and were considered prevalence cases. Whites were

Table 1. Hospitalization Rates for CD by Sex and Ethnicity, 1987–1988

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>Male (n)</th>
<th>Female (n)</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>9.2 (77)</td>
<td>11.1 (97)</td>
<td>10.2 (174)</td>
</tr>
<tr>
<td>Black</td>
<td>8.4 (26)</td>
<td>12.2 (37)</td>
<td>10.2 (63)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.3 (2)</td>
<td>0.9 (6)</td>
<td>0.6 (8)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.6 (1)</td>
<td>3.4 (6)</td>
<td>2.0 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>— (0)</td>
<td>6.3 (2)</td>
<td>2.6 (2)</td>
</tr>
</tbody>
</table>

NOTE. Rates for Southern California KPMCP. Rates are per 100,000.
the predominant ethnic group (74.1%), followed by blacks (18.4%), Hispanics (5.1%), Asians (1.3%), and “other” (1.3%). Patients ranged in age from 7 to 84 years, with an average age of 46.4 years. The male-female ratio was 1:1.4.

Surveys were mailed to 163 patients (six patients were deceased). After two mailings, 110 were returned for a response rate of 67.5%. Respondents were significantly older than nonrespondents, (47.8 years vs. 41.7 years, respectively; P < 0.05). There were no significant differences between respondents and nonrespondents for ethnic status, sex, number of outpatient visits, and hospitalizations per year, or number of years elapsed since the initial diagnosis.

**Incidence and prevalence.** Overall, there were 44 incident cases at Sunset and Fontana combined during 1987 and 1988, with an average incidence of 3.6 per 100,000. Prevalence remained rather steady from 1984 through 1988 (range, 25.1–26.7 per 100,000). (See Appendix B for details.) Prevalence by ethnicity was based on 158 cases with valid data. Whites had the highest prevalence rate per 100,000 (43.6), whereas Hispanics and Asians had the lowest rates per 100,000 (4.1 and 3.7, respectively) (Table 2). With approximately 31% of the Southern California KPMCP membership Hispanic, the observed prevalence rate for CD among Hispanics was much lower than would be expected in this population.

**Clinical characteristics.** The average age at diagnosis was 36 years (Table 3). The age distribution was bimodal with rates peaking for the 20–29-year age group (35.5 per 100,000) and for the 50–59-year age group (27.8 per 100,000) (Figure 3). Half of the patients experienced symptoms for longer than one year prior to being diagnosed (Table 3). Patients reported experiencing extraintestinal manifestations such as ankylosing spondylitis (3.4%), peripheral arthritis (15.1%), and other forms of arthritis (43.8%). Colon cancer, bowel cancer, and toxic megacolon occurred infrequently (0.9%, 0.9%, and 3.3%, respectively), whereas more than half of the patients (54.0%) experienced intestinal blockage. Patients reported an average of 3.7 outpatient visits and 13.3 days lost from work during the preceding 12 months.

**Figure 3.** Sunset and Fontana KPMCP Crohn’s disease rates by age at diagnosis.

Controlling for year of diagnosis and year of KPMCP enrollment, patients were hospitalized for CD an average of 0.5 times per person per year from January 1984 through September 1989. Patients reported an average of 1.4 non-Kaiser hospitalizations for CD. Only 0.4% had never been hospitalized.

Compared with whites and blacks, Hispanics were older at diagnosis; more Hispanics reported having symptoms for > 1 year before diagnosis. They also reported far fewer days troubled by symptoms during the month preceding survey completion (Table 3). Blacks reported the greatest number of days lost from work in the past year resulting from CD. Whites had the fewest outpatient visits compared with blacks or Hispanics, whereas for inpatient visits, blacks were admitted more times per person per year than whites or Hispanics.

61% of the patients smoked cigarettes before diagnosis, and rates were three times lower for Hispanics than whites and blacks (Table 4). Current cigarette smoking rates decreased to 32%, which was half as high as prediagnosis rates. When comparing prediagnosis and current consumption patterns, the average number of cigarettes smoked...
Table 3. Selected Clinical Characteristics by Ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>White</th>
<th>Hispanic</th>
<th>Black</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age at diagnosis (yr)</td>
<td>36.3</td>
<td>40.0</td>
<td>33.8</td>
<td>35.9</td>
</tr>
<tr>
<td>Symptom duration &gt;1 yr prediagnosis</td>
<td>46.9%</td>
<td>80.0%</td>
<td>55.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Average number of days symptoms recur per month</td>
<td>7.9</td>
<td>3.3</td>
<td>11.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Average number of days lost from work during past 12 mo</td>
<td>9.4</td>
<td>12.5</td>
<td>18.5</td>
<td>13.3</td>
</tr>
<tr>
<td>Average number of outpatient visits during prior 12 mo</td>
<td>3.3</td>
<td>4.0</td>
<td>4.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Average number of KPMCP hospitalizations for CD per year</td>
<td>0.5</td>
<td>0.6</td>
<td>0.8</td>
<td>0.5</td>
</tr>
</tbody>
</table>

NOTE. Based on Fontana and Sunset mail survey.
*Includes Asians and others, excludes one case missing ethnic data.

Of the 13 patients (11.8%) who reported having a positive family history of IBD, the majority wore white (n = 11). Only one Hispanic patient and one black patient reported having relatives affected with CD or ulcerative colitis. Table 5 shows the distribution of IBD among family members. The prevalence of IBD among first-degree relatives was 3.4% (17 first-degree relatives with IBD per 500 total first-degree relatives). The male-female ratio was 1:1 for CD and 1:3:1 for ulcerative colitis.

Discussion

This study was undertaken in an effort to learn more about the epidemiology of CD among ethnic groups. Our primary finding was that CD prevalence and hospitalization rates are much lower for Hispanics and Asians than for whites and blacks. This is consistent with previous reports showing that CD prevalence rates are much lower in Japan (1.9 per 100,000) than in Western countries (28.0–105.7 per 100,000). Similarly, low prevalence rates have been reported in Spain (3.5–21.4 per 100,000). However, because the majority of the population in Spain is of European descent, it is difficult to compare these rates with those of the Hispanic population in the southwestern United States, which comprises primarily Mexican descendants. To our knowledge, only one study has examined the distribution of CD among white, black, Hispanic, and Asian groups in the same population. In a study of 1.5 million members of the Northern California KPMCP, Hiatt et al. found no cases of CD among

Table 4. Cigarette Smoking Behaviors of CD Patients by Ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>White</th>
<th>Hispanic</th>
<th>Black</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage who smoked before CD diagnosis</td>
<td>65.4%</td>
<td>20.0%</td>
<td>66.7%</td>
<td>61.0%</td>
</tr>
<tr>
<td>Percentage who smoke currently</td>
<td>33.3%</td>
<td>20.0%</td>
<td>35.0%</td>
<td>31.8%</td>
</tr>
<tr>
<td>Average number of cigarettes smoked per day before CD diagnosis</td>
<td>20.1</td>
<td>3.0</td>
<td>13.2</td>
<td>18.4</td>
</tr>
<tr>
<td>Average number of cigarettes currently smoked per day</td>
<td>18.6</td>
<td>3.0</td>
<td>13.3</td>
<td>17.0</td>
</tr>
</tbody>
</table>

NOTE. Based on Fontana and Sunset mail survey.
*Includes Asians and others, excludes one case missing ethnic data.

Table 5. Percent of Patients With Positive Family History of IBD

<table>
<thead>
<tr>
<th>Relationship to patient</th>
<th>Patients Who Had Relatives With CD (n)</th>
<th>Ulcerative colitis (n)</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father</td>
<td>0.9 (1)</td>
<td>0.9 (1)</td>
<td>2.7 (3)</td>
</tr>
<tr>
<td>Mother</td>
<td>0.9 (1)</td>
<td>—</td>
<td>0.9 (1)</td>
</tr>
<tr>
<td>Total parents</td>
<td>1.8 (2)</td>
<td>0.9 (1)</td>
<td>3.6 (4)</td>
</tr>
<tr>
<td>Brother</td>
<td>4.3 (5)</td>
<td>—</td>
<td>4.5 (5)</td>
</tr>
<tr>
<td>Sister</td>
<td>3.6 (4)</td>
<td>1.8 (2)</td>
<td>6.4 (7)</td>
</tr>
<tr>
<td>Half-brother</td>
<td>—</td>
<td>0.9 (1)</td>
<td>0.9 (1)</td>
</tr>
<tr>
<td>Half-sister</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total siblings</td>
<td>7.3 (8)</td>
<td>2.7 (3)</td>
<td>10.0 (11)</td>
</tr>
<tr>
<td>Total*</td>
<td>0.2 (9)</td>
<td>3.6 (4)</td>
<td>11.0 (15)</td>
</tr>
</tbody>
</table>

NOTE. Based on Fontana and Sunset mail survey.
*Documentation was insufficient to determine whether relatives of two index cases had CD or ulcerative colitis. These cases are not included in the “CD” or “Ulcerative colitis” columns but are included in the “Total” column.
*Because some index cases had multiple family members with IBD, values for disease categories may not sum to totals.
Hispanics and Asians despite the fact that approximately 10% and 7% of the study population were Hispanic and Asian, respectively. The significance of not finding any cases of CD among Hispanics and Asians in this previous study has been largely overlooked. Although the authors stated that IBD was rare in Asians, they also concluded that they “did not find any notable racial differences in the rate of inflammatory bowel disease. . . .” Perhaps the authors de-emphasized data on racial differences because it was difficult to define “Hispanic.” (The authors note that survey respondents of Hispanic descent were included in other racial groups.) To overcome this problem, in the present study we verified ethnic status and obtained information on current disease activity, life-style, and medical history through a mail survey.

In this study, all sources of information (chart, self-report, or hospitalization) consistently indicated that a relatively low proportion of patients with CD were Hispanic or Asian. The validity of this finding is dependent on having an accurate estimate of all cases of CD and the population at risk. These needs were facilitated by a centralized record-keeping system and a computerized listing of hospital discharges by diagnoses. In addition, because access to medical care is uniform in this HMO, differences in socioeconomic status among ethnic groups probably did not affect our findings.

Our estimate of the ethnic distribution of the Southern California Kaiser membership is comparable with that reported by the 1990 U.S. Census for Southern California. Whether we used U.S. Census data or Kaiser special study data as the denominator to calculate ethnicity specific CD rates for the Kaiser population, the results were similar. Using U.S. Census data for the denominator, hospitalization rates for Hispanics and Asians were 11 and 4 times lower, respectively, than rates for whites. When hospitalization rates were age-adjusted using the indirect method, the differences between Hispanics and whites decreased but were still more than 10 times lower for Hispanics than whites.

Our overall CD rates are similar to those reported by others who have studied U.S. populations (Appendix B). The annual CD incidence rate in our study (3.6 per 100,000) is almost identical to the weighted average of rates reported by others (3.4 per 100,000). Our prevalence rate (25.9 per 100,000) is slightly below the range (28.0–105.7 per 100,000) reported by others.

Consistent with most previous reports, hospitalization rates were higher for females than males, irrespective of ethnicity. Of note is the interaction between sex and ethnicity for hospitalization rates. In this study, white males have higher rates than black males, whereas the reverse is true for females. This result is in agreement with the findings of Calkins et al. for the Baltimore area. Of further interest is that, while others have noted that black rates have increased and approached that of whites, this is the first study to show equal rates for the two ethnic groups.

The age-specific rates of hospital admissions for both sexes showed a bimodal age distribution with peaks identified in early adulthood and again later in life. Of note is the statistically significant decrease in hospitalization rates from 1982 through 1988. This is consistent with national data that also show a decreasing trend for CD-related hospitalizations during the 1980s.

Our results are similar to those reported by others for the length of time patients experienced symptoms before diagnosis. In a study of patients with...
IBD. Simsek et al.16 found that the average length of time from onset of symptoms to diagnosis was 12 months in patients with CD. Although others have reported the duration from onset of symptoms to diagnosis, there is a lack of consistency in the methods used to categorize time intervals.3,32 This makes it difficult to compare results among studies.

The percentage of patients in our study who reported cigarette smoking before CD was diagnosed (61%) is higher than the national average of current and former smokers combined (52%).34 This high rate of smoking is consistent with findings of Sutherland et al.35 Hispanics showed the lowest smoking rates among the different ethnic groups, which is consistent with national data.34 Because smoking rates decreased by almost half when comparing prediagnosis smoking behavior with current usage, it is possible that having CD caused the patients to quit smoking. However, this change in smoking behavior also might merely reflect the national trend toward lower smoking rates across time in the general population.

Clinical indicators
Age at diagnosis
Duration of symptoms before diagnosis
Frequency of symptoms
Physician diagnosed extraintestinal manifestations

Morbidity
Days lost from work
Number of outpatient visits
Number of hospitalizations

Risk factors
Past and present smoking behavior
Oral contraceptive/postmenopausal estrogen use
Family history of IBD
Ethnic status
Religious affiliation

Our results show that more relatives (n = 11) were affected with CD than ulcerative colitis (n = 4), which implies concordance of disease.36 Furthermore, both first- and second-degree relatives have a greater risk of developing IBD than would be expected in the general population. The percentage of patients with a positive family history in this study (11.8%) falls within the range cited by others (6.6%-22.3%).23,35-36 The variability among studies in the percentage of relatives affected with IBD may be due to several factors. For example, studies may include both first- and second-degree relatives or only first-degree relatives. Additionally, CD and ulcerative colitis may be combined or separate in reported results.

Using self-report and medical record information, data presented in this paper provide descriptive information on the epidemiology of CD among ethnic groups. CD rates were lower for Hispanics and Asians than whites and blacks. In general, demographic characteristics of patients in our study were consistent with those reported by others, especially with regard to the sex ratio and age at diagnosis.1-3,6,14,18,32,44,45 The results point to several areas that would benefit from additional research. In particular, the role of genetics, smoking habits, dietary practices, nonsteroidal anti-inflammatory drugs, oral contraceptives, infectious agents, and socioeconomic status in the differential development of CD among ethnic groups need to be examined. Furthermore, ethnic differences in rates of extraintestinal complications, perianal disease, and surgery need to be explored more fully.

Appendix A. List of Mail Survey Items

Clinical indicators
Age at diagnosis
Duration of symptoms before diagnosis
Frequency of symptoms
Physician diagnosed extraintestinal manifestations

Morbidity
Days lost from work
Number of outpatient visits
Number of hospitalizations

Risk factors
Past and present smoking behavior
Oral contraceptive/postmenopausal estrogen use
Family history of IBD
Ethnic status
Religious affiliation

Appendix B. CD Incidence and Prevalence

<table>
<thead>
<tr>
<th>Study</th>
<th>Time period</th>
<th>Incidence (N)</th>
<th>Prevalence (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study</td>
<td>1984</td>
<td>25.1 (147)</td>
<td></td>
</tr>
<tr>
<td>Fontana and Sunset combined</td>
<td>1985</td>
<td>25.4 (153)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>26.2 (159)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>26.7 (182)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1988</td>
<td>26.0 (163)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.6 (44)</td>
<td>25.9 (169)</td>
</tr>
<tr>
<td>Sedlack, 1980</td>
<td>1935-1954</td>
<td>1.9 (17)</td>
<td></td>
</tr>
<tr>
<td>Olmsted County, Minnesota</td>
<td>1955-1964</td>
<td>4.0 (24)</td>
<td>105.7 (94)</td>
</tr>
<tr>
<td></td>
<td>1965-1975</td>
<td>6.6 (62)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1976</td>
<td>Total</td>
<td>4.2 (103)</td>
</tr>
<tr>
<td>Sedlack, 1972</td>
<td>1935-1964</td>
<td>2.1 (19)</td>
<td>28.0 (13)</td>
</tr>
<tr>
<td>Rochester, Minnesota</td>
<td>1965</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nunes, 1983</td>
<td>1971</td>
<td>5.9 (10)</td>
<td></td>
</tr>
<tr>
<td>Spokane, Washington</td>
<td>1981</td>
<td>8.8 (15)</td>
<td></td>
</tr>
<tr>
<td>Garland, 1981</td>
<td>1973</td>
<td>2.4 (23)</td>
<td></td>
</tr>
<tr>
<td>U.S. professional activity study areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gollop, 1988</td>
<td>1943-1962</td>
<td>1.4 (15)</td>
<td></td>
</tr>
<tr>
<td>Olmsted County, Minnesota</td>
<td>1963-1982</td>
<td>5.2 (88)</td>
<td>90.5 (62)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.8 (103)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calkins, 1984</td>
<td>1960-1963</td>
<td>1.2 (45)</td>
<td></td>
</tr>
<tr>
<td>Baltimore, Maryland</td>
<td>1973</td>
<td>2.2 (62)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1977-1979</td>
<td>3.1 (180)</td>
<td></td>
</tr>
<tr>
<td>Hiatt, 1988</td>
<td>Oakland KPMCP</td>
<td>1980-1981</td>
<td>7.0 (11)</td>
</tr>
<tr>
<td>Northen California KPMCP</td>
<td>1971-1982</td>
<td>4.8 (985)</td>
<td></td>
</tr>
<tr>
<td>Stowe, 1990</td>
<td>1970-1979</td>
<td>5.4 (358)</td>
<td></td>
</tr>
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NOTE. Data from selected U.S. studies (per 100,000).
CROHN'S DISEASE AMONG ETHNIC GROUPS IN AN HMO

June 1992

References


Received June 27, 1991. Accepted November 12, 1991.
Address for reprints to: John Kurata, Ph.D., Director, Division of Research, 755 East Gilbert Street, San Bernardino, California 92404.