

A BRIEF ORIGINAL CONTRIBUTION

Ethnic Variation in the Incidence of Stomach Cancer in Illinois, 1986–1988

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Wide ethnic and geographic variation in stomach cancer incidence has been reported in Eastern and Western countries. Stomach cancer is reported to be the most common malignant neoplasm in Asia, specifically, China, Japan, and Korea. In contrast, stomach cancer incidence in the United States among Caucasians is low and among blacks, moderate to low. Only one other study has directly compared the rates of stomach cancer in the three ethnic groups (i.e., white, African American, and immigrant Korean) living in the same region. The authors extend their investigation by comparing the incidence rate of stomach cancer among the same three ethnic groups in the state of Illinois from 1986 to 1988. In this study, the incidence of stomach cancer was observed to be lowest in whites, intermediate in African Americans, and highest in immigrant Koreans. The overall 3-year cumulative incidence rate from 1986 to 1988 was 62.6/100,000 (95% confidence interval (CI) 38.6–86.7), 28.2/100,000 (95% CI 25.7–31), and 22.5/100,000 (95% CI 21.5–23.5) for immigrant Koreans, African Americans, and whites, respectively. The 3-year age-adjusted cumulative incidence rate for immigrant Koreans (172/100,000) was approximately four- and eightfold higher than for African Americans (41/100,000) and whites (21/100,000). The incidence of stomach cancer increased as a function of age in both sexes. Although a higher rate was observed in males than in females, these rates were four- and eightfold higher in African Americans and immigrant Koreans, when compared with their white counterparts in both sexes. Despite a substantial reduction of stomach cancer incidence in the United States and other Western countries, it remains the most frequent malignancy in native and immigrant Koreans. The high rate of stomach cancer in immigrant Koreans compared with African Americans and white populations residing in Illinois indicates either a drastically disproportionate undercount of immigrant Koreans in the 1990 census or a profound genetic-environmental interaction. *Am J Epidemiol* 1996;144:661–4.

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Stomach cancer is the second most commonly occurring neoplasm in Asians (1), with marked geographic and ethnic variation in incidence and mortality (2–6). The incidence of stomach cancer is low in Caucasian people (7), and females are thought to be

at lower risk than males (7, 8). Among white and African-American populations in the United States, stomach cancer accounts for a small proportion of total cancer incidence (9). Data from the Surveillance, Epidemiology, and End Results program of the National Cancer Institute further indicated that the incidence of stomach cancer in blacks is approximately twofold higher than in whites in both sexes (10). The incidence and mortality rates of stomach cancer are declining in the Western world (11–14); in the United States, stomach cancer incidence declined approximately 73 percent during the period 1950–1985 (14). However, stomach cancer is still prevalent in Asians and remains the leading cause of cancer death (15, 16). Stomach cancer incidence and mortality rates in the United States are reported to be higher in populations of Asian origin (Japanese, Chinese, and Native Hawaiians) than for whites (10).

This study is, to our knowledge, the first comparison of stomach cancer incidence in the three ethnic groups living in the state of Illinois. Specifically, this paper

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Abbreviation: CI, confidence interval.

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examines the racial/ethnic-, sex-, and age-specific variations in the incidence of stomach cancer in the state of Illinois for the white, African-American, and immigrant Korean populations.

MATERIALS AND METHODS

Data were obtained for all stomach cancer cases entered in the Illinois State Cancer Registry, a population-based incidence registry mandated by statute for all Illinois residents. Registration began in 1985 and, since 1986, all hospitals have participated fully with the exception of two Veterans Administration hospitals. Case identification was supplemented using death certificate searches. The 1985 cases had a low degree of ascertainment. Thus, this investigation focused only on cases identified from 1986 to 1988.

Case information on age, race and/or place of birth, sex, and cancer site was extracted from the registry. Stomach cancer cases were selected using appropriate codes from the *International Classification of Diseases*, Ninth Revision (code 151). Race for whites and African Americans was identified through the race variable in the registry. Immigrant Koreans were identified by the race variable (Asian) as well as the place of birth indicated in the registry. The analysis was limited to cases among individuals between the ages of 40 and 80 years as the disease is very rare among younger individuals in all populations and, in this population, no cases were reported among immigrant Koreans older than 80 years of age.

The denominator used to calculate the incidence rate, the resident population of Illinois in 1990, was provided by the state Bureau of the Census (17) and was tabulated by age, sex, and race. Age-specific and age-adjusted incidence rates in Illinois were calculated using 10-year intervals (i.e., <10, 10–19, 20–29, etc.). All age-adjusted rates were computed by the direct method and were standardized to the total population distribution of the state of Illinois in the 1990 census (18, 19). Most comparisons utilized 3-year cumulative incidence rates in order to provide more stable estimates. A 95 percent confidence interval (CI) for data was derived using a Poisson distribution (20).

RESULTS

Table 1 presents the study population by sex, ethnicity, and age group. The population distributions are similar among the three ethnic groups, except the immigrant Korean population is somewhat younger. Approximately 40 percent of immigrant Koreans are less than 20 years of age compared with 27 percent for whites and 37 percent for African Americans. At the older ages, 4 percent of immigrant Koreans are 60

TABLE 1. Study population stratified by ethnicity, sex, and age group, state of Illinois, 1986–1988*

Sex	Age group (years)	Immigrant Korean (no.)	White (no.)	African American (no.)
Male	<10	4,836	626,575	156,233
	10–19	3,377	596,263	157,683
	20–29	2,246	704,187	134,735
	30–39	4,113	752,535	123,907
	40–49	2,991	570,653	82,929
	50–59	744	406,225	59,242
	60–69	349	373,922	46,183
	70–79	187	232,848	22,822
Female	<10	5,126	594,333	153,449
	10–19	3,335	560,965	152,544
	20–29	4,267	692,172	149,780
	30–39	5,544	748,377	152,305
	40–49	2,417	581,203	104,182
	50–59	771	427,764	75,285
	60–69	797	437,100	60,934
	70–79	403	347,828	35,794
Total		41,503	8,652,950	1,668,007

* The 1990 census reports.

years or older compared with 19 percent of whites and 11 percent of African Americans.

Between 1986 and 1988, a total of 2,808 stomach cancer cases were identified among the three ethnic groups (26 cases in immigrant Koreans, 533 cases in African Americans, and 2,248 cases in whites). The crude annual incidence rate was 24.8 per 100,000 immigrant Korean males and 17.7 per 100,000 females. The crude 3-year cumulative incidence rates in immigrant Koreans were 2.8 and 2.2 times higher than in whites and African Americans, respectively. These ratios were more dramatic in females (3.4 and 2.8 for whites and blacks, respectively) than in males (2.5 and 1.9 for whites and blacks, respectively). In females, the highest cumulative incidence rate was seen in immigrant Koreans (53/100,000, 95 percent CI 23–82.9), followed by African Americans (19.1/100,000, 95 percent CI 16.2–22) and whites (15.6/100,000, 95 percent CI 14.4–16.7). These ethnic variations persist in males, albeit to a lesser degree. The excess incidence in males as compared with females was very similar in whites and African Americans (male:female ratio = 2:1) but lesser in immigrant Koreans (male:female ratio = 1.4:1).

The age-adjusted 3-year cumulative incidence rate in immigrant Korean men was approximately eight- and fourfold higher than in white and African-American men, respectively; for immigrant Korean women, the cumulative incidence was from 10-fold to 5.5-fold higher than in white and African-American women, respectively. The age-specific crude annual stomach cancer incidence per 100,000 males and females aged

40 years or older is depicted in figure 1 and in figure 2, respectively. As shown in these figures, in all age groups stomach cancer incidence rates are highest in immigrant Koreans and lowest in whites. The highest rate was observed among immigrant Korean men aged 60–69 years (478/100,000; 95 percent CI 439–523) and was 5.4 and 12.6 times higher than in African-American men (89/100,000; 95 percent CI 72–110) and white men (38/100,000; 95 percent CI 27–52), respectively. The smallest difference was observed in the oldest age group (i.e., 70–79 years) and was 2.7- and 1.4-fold higher in immigrant Koreans (178/100,000; 95 percent CI 154–207) than in African Americans (130/100,000; 95 percent CI 109–155) and whites (66/100,000; 95 percent CI 51–87), respectively.

A similar finding of higher stomach cancer rates in immigrant Koreans versus African-American and white males was also obtained in females. However, unlike with males, the stomach cancer incidence rate continued to increase linearly even in the oldest age group (70–79).

DISCUSSION

Koreans have been reported to exhibit one of the highest incidence rates of stomach cancer in the world (21). Epidemiologic studies, such as a recent case-control investigation in Korea (22), generally support a hypothesis of dietary or other environmental factors as playing a major etiologic role in the genesis of this disease. Studies of migrant populations, such as Koreans in Japan (23), and of Japanese migrants to Hawaii (24) and Los Angeles (25) have demonstrated that, in general, migrants tend to take on the risk levels of their new home, a finding that supports an environ-

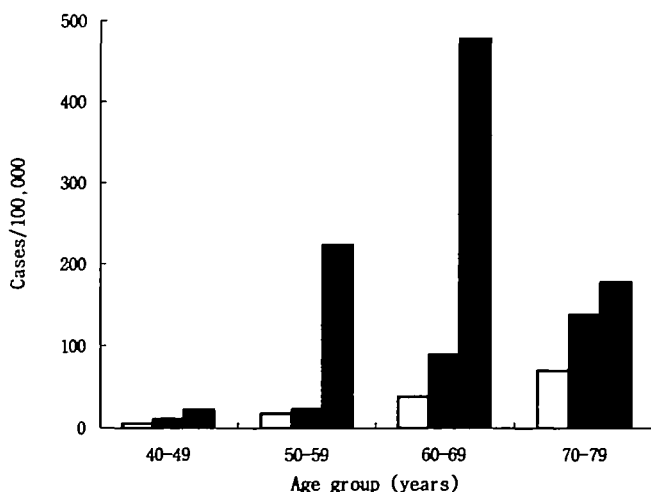


FIGURE 1. Annual incidence rates in males by race and age groups, Illinois, 1986–1988. □, white; ■, African American; ■, Immigrant Korean.

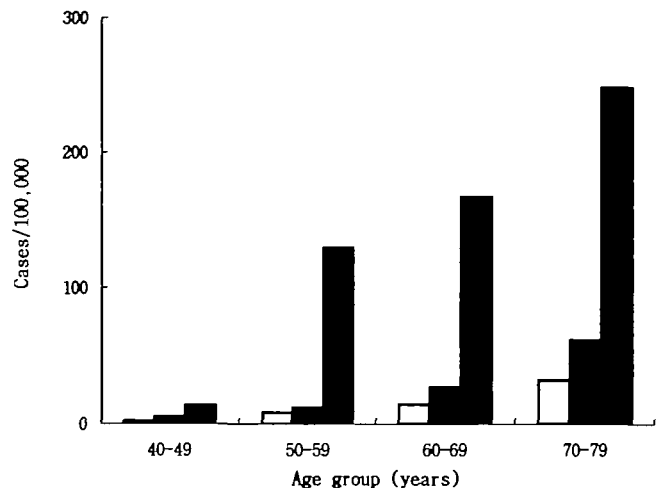


FIGURE 2. Annual incidence rates in females by race and age groups, Illinois, 1986–1988. □, white; ■, African American; ■, Immigrant Korean.

mental etiology. This study extends the previous investigations in migrant populations and is the first report of the incidence of stomach cancer in immigrant Koreans and other races (i.e., African Americans and whites) in the state of Illinois.

The average age-adjusted annual stomach cancer incidence rates for whites and African Americans in the United States from 1978 to 1982 were 11.9/100,000 and 21.3/100,000 in males, respectively, and 5.2/100,000 and 8.3/100,000 in females, respectively (7). These rates are comparable with the results of the current study, which found the incidence rates for whites and African Americans in Illinois from 1986 to 1988 to be 10.2/100,000 and 20.4/100,000 in males, respectively, and 5.7/100,000 and 11.4/100,000 in females, respectively. Unfortunately, national estimates of the incidence of stomach cancer for immigrant Koreans were not available to compare with the Illinois rate. However, the findings from this study were consistent with previously reported data from Los Angeles County (9), which had found significant differences in the rate of stomach cancer among whites, African Americans, and Korean Americans. In the Los Angeles study, the incidence in Korean American males was 20.6/100,000 and for females was 14.4/100,000 (10). These rates are slightly lower than the Illinois rates, 24.8/100,000 males-year and 17.7/100,000 females-year, for immigrant Koreans. It is not clear whether the Los Angeles study included American-born as well as native Koreans. The inclusion of second-generation Koreans could account for the lower incidence in the Los Angeles study, as their risk might be expected to be somewhat lower than the risk in the immigrant generation. Nevertheless, comparison

of the respective 95 percent confidence intervals revealed no intergroup variation.

Given the high incidence observed in immigrant Koreans in relation to African Americans and whites in the current investigation, the possibility of a disproportionate undercount of immigrant Koreans in the 1990 Illinois census, which would artificially increase the estimates of incidence, was investigated. A second source of population data for immigrant Koreans was identified. The Korean Consulate of Chicago provided census data that were based on information from the Department of External Affairs in Seoul, which estimated that approximately 83,000 Korean immigrants resided in the state of Illinois. The validity of this estimate is also questionable because it counts individuals according to their original destination and does not account for subsequent moves. However, even using the Korean Consulate of Chicago census data as the denominator, the incidence of stomach cancer in immigrant Koreans remained high (i.e., 28.6 and 38.0 per 100,000 in men and women, respectively).

The current investigation, in conjunction with the earlier data from Los Angeles and Korea, further supports a hypothesis of a largely environmental etiology for stomach cancer. It is of interest to note that African Americans also appear to have significantly higher risk for stomach cancer relative to whites residing in Illinois. The etiology of the significantly higher rate of stomach cancer in the immigrant Korean population in Illinois is unclear and warrants further investigation.

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