Cancer Incidence in the United States and Puerto Rico

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Summary

This study compares cancer incidence in the United States National Survey areas and Puerto Rico for the period of 1969 to 1971. There are several differences between the 2 areas. Puerto Rico has a higher incidence of cancer of the mouth, pharynx, esophagus, stomach, cervix uteri, vulva, and penis. The Survey areas have higher incidences of cancer of the colon, rectum, lung, corpus uteri, female breast, and ovary. The differences between sexes are more or less the same as in other countries.

Introduction

In the literature one frequently finds differences in cancer incidence among countries and, many times, even among areas of the same country (1, 7). It is well known that the migration of population groups has altered the frequency of certain primary cancer sites in subsequent generations of migrants (4, 5). These findings have been used for international epidemiological studies in order to improve the knowledge of the etiology of this disease.

Puerto Rico has been associated politically, economically, and socially with the United States for the past 77 years. These interrelationships have given rise to modifications in the pattern of living from a Latin American culture in a developing country to one resembling the American way of living, in terms of dietary and smoking habits, occupation, and environment. The hypothesis that these modifications may have influenced the pattern of cancer incidence has led us to study the distribution of malignant tumors in Puerto Rico as compared to that of the United States.

Materials and Methods

Incidence data for the United States were taken from the Preliminary Report of the Third National Cancer Survey (1969 to 1971) conducted by the National Cancer Institute in 7 metropolitan areas and 2 states (8). Data from the 2 previous National Surveys, 1937 and 1947, (2, 3) were also used to compare trends in some cancer sites. Data from Puerto Rico were not included in those reports, but were taken from a special tabulation of the report of the Central Cancer Registry, where all cancer cases diagnosed by physicians in all hospitals and clinics in the island are reported. In addition to the legal requirements of reporting cancer cases, the Registry maintains a systematic search for unreported ones. The Third National Survey presents 181,036 diagnosed cancer cases (50.2% in men and 49.8% in women). For the same period of time, the data of Puerto Rico include 11,520 diagnosed cancer cases (53.1% in men and 46.9% in women) (Table 1). Both groups include all malignant tumors except cases of carcinoma in situ and skin carcinomas other than melanomas. Death certificates were the sole sources of information in 2.1% of the Survey cases and in 4.6% of the cases from Puerto Rico. Microscopic confirmation, identified through the records of hospitals and physicians, was obtained in 92% of the United States Survey cases and in 91% of cases in Puerto Rico. For classification of sites and types of tumors, the Manual of Tumor Nomenclature and Coding, 1968 Edition, published by the American Cancer Society, was utilized. The adjustment of rates was done using the United States 1950 Census Population as standard.

Results

Frequency. The rank order of malignant tumors by system is different between sexes and between the 2 areas (Chart 1). The main difference between the males in the 2 study groups is the predominance of cancer in the mouth and pharynx and digestive organs in Puerto Ricans, in contrast to respiratory and urinary systems in males of the United States Survey areas. The striking difference in females is the predominance of cancer of the breast in the United States Survey areas and of cancer of the genital organs in Puerto Rico. Tumors of the digestive system rank number 1 in men and number 2 in women in both the United States Survey and Puerto Rico, but the frequency order of cancer in specific organs of this system is very different (Chart 2). In Puerto Rico the malignant tumors in the upper alimentary tract (esophagus and stomach) predominate, in contrast to those of cancer in the lower organs of the system (colon and rectum) in the United States Survey.

Age-adjusted Incidence Rates. Age-adjusted incidence rates for all cancer sites are nearly 60% higher in the Survey areas than in Puerto Rico (Table 1). Puerto Rico shows significantly higher age-adjusted incidence rates of cancer of the mouth and pharynx (Chart 3); esophagus and stomach (Chart 4); and cervix uteri (Chart 5). In the United States Survey the rates are greater for cancer of the lip (Chart 3); colon, rectum, and pancreas.
Table 1
Cancer cases and crude and age-adjusted rates (U.S. 1950 population) by site and sex [Third National Survey (all races) and Puerto Rico, 1969–1971]

<table>
<thead>
<tr>
<th>Site</th>
<th>Male Cases</th>
<th>Male Crude rate</th>
<th>Male Adjusted rate</th>
<th>Female Cases</th>
<th>Female Crude rate</th>
<th>Female Adjusted rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites combined</td>
<td>90,927</td>
<td>297.2</td>
<td>305.2</td>
<td>90,109</td>
<td>277.9</td>
<td>252.1</td>
</tr>
<tr>
<td>Lip</td>
<td>1,043</td>
<td>3.4</td>
<td>3.5</td>
<td>90</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Tongue</td>
<td>855</td>
<td>2.8</td>
<td>2.9</td>
<td>383</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Salivary gland</td>
<td>351</td>
<td>1.2</td>
<td>1.2</td>
<td>328</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Gum and mouth</td>
<td>1,065</td>
<td>3.5</td>
<td>3.6</td>
<td>611</td>
<td>1.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>241</td>
<td>0.8</td>
<td>0.8</td>
<td>104</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Other pharynx</td>
<td>1,093</td>
<td>3.6</td>
<td>3.7</td>
<td>365</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Esophagus</td>
<td>1,516</td>
<td>5.0</td>
<td>5.1</td>
<td>518</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Stomach</td>
<td>3,844</td>
<td>12.6</td>
<td>12.7</td>
<td>2,421</td>
<td>7.5</td>
<td>6.0</td>
</tr>
<tr>
<td>Small intestine</td>
<td>340</td>
<td>1.1</td>
<td>1.1</td>
<td>268</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Colon except rectum</td>
<td>8,463</td>
<td>27.8</td>
<td>28.3</td>
<td>9,979</td>
<td>30.8</td>
<td>25.5</td>
</tr>
<tr>
<td>Rectum and rectosigmoid</td>
<td>4,558</td>
<td>14.9</td>
<td>15.3</td>
<td>3,551</td>
<td>11.0</td>
<td>9.2</td>
</tr>
<tr>
<td>Liver</td>
<td>875</td>
<td>2.9</td>
<td>3.0</td>
<td>471</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Gallbladder and other biliary</td>
<td>690</td>
<td>2.3</td>
<td>2.3</td>
<td>1,085</td>
<td>3.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3,251</td>
<td>10.6</td>
<td>10.9</td>
<td>2,541</td>
<td>7.8</td>
<td>6.5</td>
</tr>
<tr>
<td>Larynx</td>
<td>2,217</td>
<td>7.3</td>
<td>7.6</td>
<td>301</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Lung and bronchus</td>
<td>19,248</td>
<td>62.9</td>
<td>65.6</td>
<td>4,762</td>
<td>14.7</td>
<td>13.5</td>
</tr>
<tr>
<td>Breast</td>
<td>192</td>
<td>0.6</td>
<td>0.7</td>
<td>24,478</td>
<td>75.5</td>
<td>70.9</td>
</tr>
<tr>
<td>Cervix invasive</td>
<td>5,537</td>
<td>17.1</td>
<td>17.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corpus uterus</td>
<td>6,638</td>
<td>20.5</td>
<td>19.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterus not otherwise specified</td>
<td>785</td>
<td>2.4</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ovary</td>
<td>4,609</td>
<td>14.2</td>
<td>13.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulva</td>
<td>596</td>
<td>1.8</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All sites combined</td>
<td>90,109</td>
<td>277.9</td>
<td>252.1</td>
<td>5,308</td>
<td>127.4</td>
<td>160.3</td>
</tr>
</tbody>
</table>

Age-specific incidence by sex. For all cancer sites combined, women from 25 to 54 years of age have higher rates due to genital cancer predominance in both the United States Survey and Puerto Rico. After this age, men have higher rates in every age group. This is generally the pattern in most of the countries where reliable cancer information is available.

In Puerto Rico, rates for cancer of the mouth, pharynx, esophagus, and stomach are higher than in the United States Survey for every age group in both men and women, with the exception of rates for cancer of the mouth in women of the Survey areas aged 30 to 55 years, which are lower than in women in Puerto Rico. Age-specific incidence rates start increasing rapidly at an earlier age than in Puerto Rico than in the United States Survey. Rates of cancer of the colon are considerably higher in the United States Survey for both men and women. At 80 years of age, the highest incidence is observed, the ratio between the United States Survey and Puerto Rico is 8:1 in men and 3:1 in women. The highest incidence in Puerto Rican males is at age 70, equal to that already reached by United States Survey males at age 50. In Puerto Rican women the highest rate occurs at age 85+, whereas this value is reached by United States Survey women at age 65. After age 70, where the rates for both men and women in Puerto Rico are the same, the rate of colon cancer in males remains stable while that of females goes on increasing.
Chart 1. Frequency of cancer cases (all races) by systems and sex, United States Survey and Puerto Rico, 1969 to 1971. Oth., other.

Chart 2. Frequency of cancer cases in the digestive organs (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971. Oth., other; Digest., digestive.

Chart 3. Average annual age-adjusted incidence rates (U. S. 1950 population) for cancer of the mouth and pharynx (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971. Oth., other.

Chart 4. Average annual age-adjusted incidence rates (U. S. 1950 population) for cancer of the digestive organs (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971. ex. R., except rectum; R.S., rectosigmoid; S., small.
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Chart 5. Average annual age-adjusted incidence rates (U.S. 1950 population) for cancer of selected genitourinary organs and female breast (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971. Fem., female; NOS, not otherwise specified.

Chart 6. Average annual age-adjusted incidence rates (U.S. 1950 population) for cancer of selected respiratory and other organs (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971. B., bronchus; Oth. N. Syst., other nervous system.

Chart 7. All sites. Average annual age-specific cancer incidence rates (all races) by sex, United States Survey and Puerto Rico, 1969 to 1971.


In both cancer of the rectum and pancreas, rates are higher in the United States Survey but in lesser degree than rates in colon cancer (Charts 12 and 13). Malignant tumors of the liver and of the gallbladder and biliary ducts combined do not show appreciable differences between sexes or between areas.

For cancer of the cervix uteri (invasive), women in the United States Survey show higher rates than do women in Puerto Rico for ages 20 to 30, after which the rates are strikingly higher in Puerto Rico. The highest incidence is observed at 85 years of age, where the rate is 4 times that of the United States Survey women. The highest age-specific rate in the United States Survey is at age 70, but it is lower than that of Puerto Rican women at age 40 (Chart 15).

Age-specific incidence rates for other sites are higher in the United States Survey. Charts 14 and 16 to 20 show the distribution of these rates for cancer of lung and bronchus, corpus uteri, breast and ovary, prostate, urinary bladder...


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and leukemias and lymphomas for both the United States Survey and Puerto Rico.

Trends. The analysis of trends of cancer incidence of several primary sites shows similar patterns in some and different ones in others in Puerto Rico, as compared with data from the 3 United States Survey areas. These discrepancies merit a separate study in which we also intend to include cancer data from other countries.

Discussion

The magnitude of the difference in cancer incidence between Puerto Rico and the United States Survey cannot be totally explained on the basis of differences in diagnosis and reporting of cases. Variations in exposure or susceptibility to carcinogenic agents of the 2 study groups could be considered as a possible explanation.

The predominance of malignant tumors of the mouth, pharynx, and upper alimentary tract in Puerto Rico reflects different nutritional and drinking habits from those in the Survey areas. These findings are usually associated to low socioeconomic status. In a previous case-control study for cancer of the mouth, pharynx, and esophagus in Puerto Rico (6), a low consumption of fresh vegetables, meats, eggs, and milk was found in both cases and control groups. A higher consumption of straight alcoholic beverages, including moonshine rum, was found in the cancer cases study group as compared to the control group. The low incidence of cancer of the large intestine in Puerto Rico is characteristic of countries the diets of which are deficient in animal protein. A case-control study is under way at present to find the determinant of this low incidence.

In the respiratory organs, the differences in incidence between the groups studied could be due to different concentrations of carcinogens inhaled by the 2 populations, both in the environment (urban industries) and in the cigarettes smoked per capita (Bureau of Excise Taxes, Department of Treasury, Government of Puerto Rico, personal communication, 1966).

The differences in cancer incidence between the United States Survey and Puerto Rico justify more international cooperative studies with Puerto Rico in order to utilize, share, and benefit from the 25 years of cancer data stored in the Central Cancer Registry of Puerto Rico. These studies will contribute to the knowledge of the etiophatogenesis of this disease.

References

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