

Cancer among indigenous people in the Amazon basin of Ecuador, 1985–2000

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ABSTRACT

Objective. To provide some of the first data on cancer incidence among indigenous people in the Amazon basin of Ecuador, and to compare that incidence with the level found among nonindigenous persons living in that same area.

Methods. From the study area 1 207 cancer cases were reported to the National Cancer Registry over the 1985–2000 period. Frequency and relative risks were calculated for the indigenous residents and for the nonindigenous residents of the area.

Results. Cancer of the testes and leukemia were the most common cancer types among indigenous men, and cancer of the cervix uteri was the most common among indigenous women. Indigenous men were at significantly lower risk for cancer of the stomach, skin, prostate, and lymph nodes and for leukemia than were nonindigenous men. Indigenous women were at significantly lower risk for cancer of the stomach, skin, breast, cervix uteri, and lymph nodes than were nonindigenous women.

Conclusion. Our data from the Ecuadorian Amazon indicate the need to develop appropriate mechanisms to register the indigenous population in the national census as well as in the National Cancer Registry. Also needed are cancer early detection programs, more health education efforts, and stronger health services that are adapted to the local conditions. Future research should focus on factors that may help to explain the different cancer patterns found among indigenous persons and nonindigenous persons.

Key words

Neoplasms; Indians, South American; health services accessibility; health services, indigenous; risk factors; Ecuador.

It has been estimated that cancer incidence and mortality worldwide will

double by 2020 and that more than 70% of new cancers will occur among people in the developing world (1). Information is lacking on the cancer situation in populations of the Amazon region of South America. An active search of cancer cases during an exploratory study in the late 1950s in several indigenous groups of the Amazon area of Brazil found no cases (2). Recently, some studies have focused on risk factors for cervical and breast

cancer in indigenous groups from Brazil's Amazon region (3–5). One case study explored the occurrence of a cancer cluster in 1992 among young indigenous adults in Brazil who were living in an Amazonian village near power transmission lines (6).

Deficiencies in data on the health of indigenous people have been recognized for a long time, particularly in developing countries (7–9). In Ecuador the health of indigenous people has

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been identified as a priority concern (10). However, no effective and culturally appropriate health programs for that population have been developed nationally. There is a need for good information to identify problems, develop policies, and implement programs related to this issue in Ecuador.

The objective of this study was to provide some of the first data ever on cancer incidence among indigenous people in the Amazon basin of Ecuador, and to compare that incidence level with the level found among non-indigenous persons living in that same area.

POPULATION AND METHODS

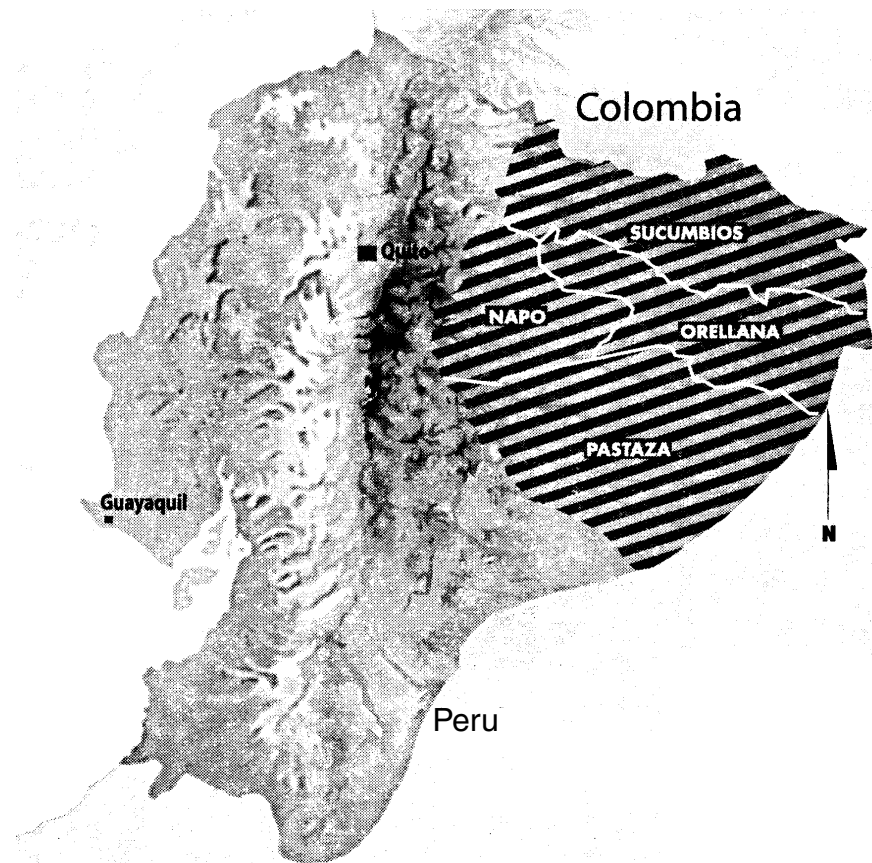
Area of study

The study was carried out in the provinces of Sucumbios, Napo, Orellana, and Pastaza, which are situated in the eastern part of Ecuador (Figure 1). The population of the four provinces numbered 356 406 in the year 2000. Of that total, 106 025 of them (29.7%) belonged to one of the eight indigenous groups in the area. The rest were non-indigenous settlers who moved there from Ecuador's coastal and highland regions (11).

The indigenous people live in small communities scattered along the rivers, and they make their living from hunting, fishing, and subsistence agriculture. The nonindigenous people arrived in the area in the 1970s along paths opened by petroleum companies. Approximately one-third of these nonindigenous people live in small villages, where trading and petroleum-related services are the main activities. The other two-thirds live in rural communities and make their living from agriculture and cattle-raising.

The physical infrastructure in the Amazon basin of Ecuador is poor. The majority of the inhabitants, including ones living in villages and in towns with up to 15 000 residents, lack electricity and piped drinking water. In each province there is a provincial hospital, and each county (*cantón*) has a health center. The hospitals have no

FIGURE 1. Map of Ecuador, showing the four provinces included in the study of cancer among indigenous and nonindigenous people, 1985–2000



Source: Instituto Geográfico Militar.

histopathological services and no access to radiotherapy or chemotherapy treatment.

Cancer data

No cancer registry is available in the Amazon region of Ecuador. Suspected cancer cases are referred from these provinces to Quito, the capital. All cases diagnosed in Quito are registered in the National Cancer Registry (NCR) (12). We used the NCR data for our study.

During the 1985–2000 period 1 207 cancer cases were reported to the NCR from the provinces of Sucumbios, Orellana, Napo, and Pastaza. The NCR information includes the patient's name,

gender, age at diagnosis, cancer site, histology (according to the 10th *International Classification of Diseases*), year of diagnosis, residence at diagnosis, and education. Approximately 97% of the cases are confirmed histologically, hematologically, or cytologically.

Population data

We used population estimates from the four provinces for the year 1993 that included information on gender and ethnicity (indigenous vs. non-indigenous). These estimates were made by the National Institute of Statistics and Census (NISC), based on the 1990 National Census (13). Data on age distribution were not available.

Ethnicity

The NISC defined an individual as being indigenous when that person could speak an indigenous language. For our study, local experts assigned ethnicity for individual cancer cases after a careful visual inspection of their two family names (that is, the surname from the father and the surname from the mother). When a person had two indigenous family names, that individual was considered as indigenous. Of the 1 207 cancer cases, 10 of them (0.83%) were excluded because they had just one indigenous family name.

Statistical analysis

We calculated the frequency of site-specific cancers by ethnicity and by gender. We also calculated relative risk (RR), along with the 95% confidence interval (CI), for the indigenous persons and the nonindigenous persons by gender.

RESULTS

Table 1 presents the distribution of cancers by site for the indigenous and nonindigenous persons who were diagnosed with cancer between 1985 and 2000. There were 48 cases among the indigenous men and 62 cases among the indigenous women. For indigenous men, cancer of the testes (10.4%) and leukemia (10.4%) were the most common cancer types. Cancers of the penis (8.3%), stomach (8.3%), liver (6.3%), and lymph nodes (6.3%) next followed in frequency.

Among nonindigenous men, cancer of the stomach (21.7%) was the most frequently diagnosed cancer. Leukemia (12.1%) and cancer of the lymph nodes (10.5%) were also common. Nonindigenous men had a higher frequency of skin cancer (9.6% versus 4.2% among indigenous men) and prostate cancer (7.8% versus 4.2% among indigenous men).

For indigenous women, cancer of the cervix uteri (22.6%) was the most

TABLE 1. Frequency distribution of cancer by site for indigenous persons and nonindigenous persons, by gender, Amazon basin of Ecuador, 1985–2000

	Indigenous				Nonindigenous			
	Men		Women		Men		Women	
	No.	%	No.	%	No.	%	No.	%
Oral cavity	1	2.1	1	1.6	3	0.7	2	0.3
Other pharynx	0	0.0	1	1.6	1	0.2	0	0.0
Esophagus	0	0.0	0	0.0	7	1.6	3	0.5
Stomach	4	8.3	3	4.8	95	21.7	43	6.6
Colon	0	0.0	3	4.8	14	3.2	8	1.2
Rectum	1	2.1	0	0.0	4	0.9	3	0.5
Liver	3	6.3	1	1.6	8	1.8	7	1.1
Gallbladder	1	2.1	1	1.6	2	0.5	12	1.9
Pancreas	0	0.0	0	0.0	5	1.1	1	0.2
Larynx	0	0.0	0	0.0	6	1.4	1	0.2
Lung	1	2.1	0	0.0	15	3.4	4	0.6
Skin	2	4.2	2	3.2	42	9.6	36	5.6
Melanoma (skin)	0	0.0	4	6.5	12	2.7	6	0.9
Penis	4	8.3	NA ^a		6	1.4	NA	
Prostate	2	4.2	NA		34	7.8	NA	
Testes	5	10.4	NA		14	3.2	NA	
Breast	0	0.0	1	1.6	1	0.2	55	8.5
Cervix uteri, in situ	NA		3	4.8	NA		88	13.6
Cervix uteri, invasive	NA		14	22.6	NA		186	28.7
Corpus uteri	NA		1	1.6	NA		8	1.2
Uterus, part unspecified	NA		0	0.0	NA		2	0.3
Ovary	NA		3	4.8	NA		17	2.6
Placenta	NA		2	3.2	NA		6	0.9
Bladder	2	4.2	0	0.0	5	1.1	2	0.3
Kidney	0	0.0	0	0.0	6	1.4	3	0.5
Eye and adnexa	4	8.3	0	0.0	6	1.4	2	0.3
Nervous system	0	0.0	1	1.6	2	0.5	1	0.2
Brain	0	0.0	1	1.6	5	1.1	4	0.6
Thyroid	1	2.1	2	3.2	7	1.6	16	2.5
Lymph nodes	3	6.3	1	1.6	46	10.5	23	3.5
Leukemia	5	10.4	9	14.5	53	12.1	40	6.2
Other cancers	9	18.8	8	12.9	39	8.9	70	10.8
Total	48		62		438		649	

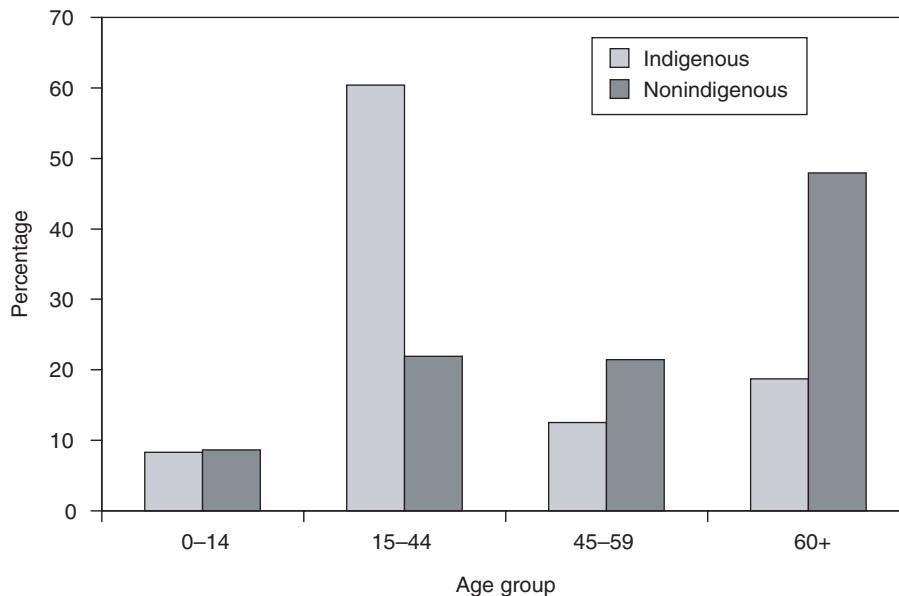
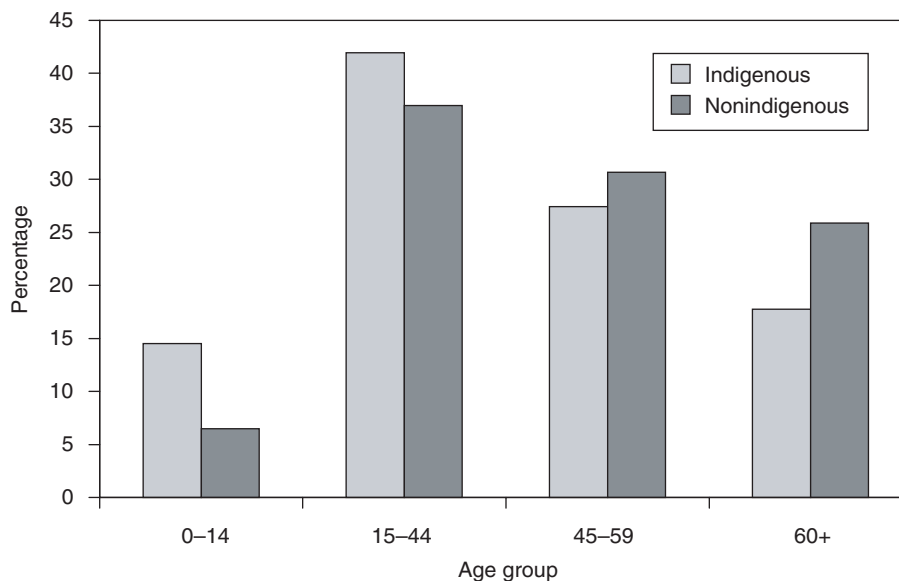
^a NA = not applicable.

common cancer diagnosed. Next in frequency were leukemia (14.5%), skin melanoma (6.5%), and stomach cancer and colon cancer (both 4.8%). In nonindigenous women, cancer of the cervix uteri (28.7%) was also the most common form of cancer. Nonindigenous women had a higher frequency of breast cancer (8.5%) than did indigenous women (1.6%). Stomach cancer (6.6%) and leukemia (6.2%) then followed in frequency for the nonindigenous women. The relationship between invasive and in situ cancer uteri was 4.7:1 among indigenous women and 2.1:1 among nonindigenous women.

Cancers of the esophagus, pancreas, larynx, and kidney were not diagnosed among either indigenous men or women, but they were found in the nonindigenous group.

Figure 2 shows the distribution of overall cancer frequency among the men studied, classified by age group and ethnicity. Figure 3 provides similar information for the women. Noticeable peaks were found in indigenous men and in indigenous women in the age group of 15–44 years and in nonindigenous men more than 60 years old.

Table 2 compares the risk of cancer among indigenous persons and nonindigenous persons during the 1985–

FIGURE 2. Frequency of all combined cancer sites among men, by age group and ethnicity, Amazon basin of Ecuador, 1985–2000**FIGURE 3. Frequency of all combined cancer sites among women, by age group and ethnicity, Amazon basin of Ecuador, 1985–2000**

2000 period. Indigenous men were at significantly lower risk for cancer of the stomach (RR: 0.10; 95% CI: 0.04–0.27), skin (RR: 0.11; 95% CI: 0.03–0.45), prostate (RR: 0.14; 95% CI: 0.03–0.58), and lymph nodes (RR: 0.15; 95% CI: 0.05–0.48) and for leukemia (RR:

0.22; 95% CI: 0.09–0.55). Compared to nonindigenous women, indigenous women were at significantly lower risk of cancer of the stomach (RR: 0.16; 95% CI: 0.05–0.52), skin (RR: 0.13; 95% CI: 0.03–0.54), breast (RR: 0.04; 95% CI: 0.01–0.29), cervix in situ (RR: 0.08;

95% CI: 0.03–0.25), cervix uteri invasive (RR: 0.18; 95% CI: 0.10–0.31), and lymph nodes (RR: 0.10; 95% CI: 0.01–0.74).

DISCUSSION

The cancer data that we have presented here provide preliminary baseline information on site-specific relative frequency and the relative risk of cancer among indigenous populations of the Amazon basin of Ecuador.

Some limitations in the data need to be considered. Because of the geographical and socioeconomic difficulties that indigenous persons and nonindigenous persons in the Ecuadorian Amazon have in accessing adequate health care, cancer rates may be underestimated in both of those groups, but especially in the indigenous group. In addition, it is difficult for indigenous people to travel to Quito, the capital, where they could be diagnosed. This is because of the high costs involved and also the fear of leaving the family for an unknown, and often untrusted, environment.

Methods of ascribing ethnicity are inevitably prone to error. The NISC designation of persons as being indigenous is based on their self-reported knowledge of an indigenous language. In addition, the National Cancer Registry does not differentiate by ethnicity. Although the local experts designated ethnicity to an individual person rather than a small geographical area, some misclassification may have occurred.

The lack of information on age distribution in the indigenous population and the nonindigenous population made it impossible to adjust for differences; however, it is believed that both groups have a similar age distribution.

There were some notable differences between the indigenous and nonindigenous groups in the frequency distribution and relative risks of cancer. The frequency pattern of cancer found in the nonindigenous population in the Ecuadorian Amazon resembles the distribution in the Quito population, in both men and women (12). In Quito the most frequent cancer sites in men are

TABLE 2. Relative risk (RR) of cancer, with 95% confidence interval (95% CI), in indigenous men and women relative to nonindigenous men and women, Amazon basin of Ecuador, 1985–2000

	Men		Women	
	RR	95% CI	RR	95% CI
Oral cavity	0.70	0.08–7.50	1.18	0.11–13.01
Other pharynx	NA ^a	NA	NA	NA
Esophagus	NA	NA	NA	NA
Stomach	0.10	0.04–0.27	0.16	0.05–0.52
Colon	NA	NA	0.88	0.23–3.32
Rectum	0.59	0.07–5.28	NA	NA
Liver	0.89	0.24–3.35	0.34	0.04–2.76
Gallbladder	1.18	0.11–13.02	0.20	0.03–1.54
Pancreas	NA	NA	NA	NA
Larynx	NA	NA	NA	NA
Lung	0.16	0.02–1.21	NA	NA
Skin	0.11	0.03–0.45	0.13	0.03–0.54
Melanoma (skin)	NA	NA	1.57	0.44–5.56
Penis	1.57	0.44–5.56	NA	NA
Prostate	0.14	0.03–0.58	NA	NA
Testes	0.84	0.44–1.62	NA	NA
Breast	NA	NA	0.04	0.01–0.29
Cervix uteri, in situ	NA	NA	0.08	0.03–0.25
Cervix uteri, invasive	NA	NA	0.18	0.10–0.31
Corpus uteri	NA	NA	0.29	0.04–2.32
Uterus, part unspecified	NA	NA	NA	NA
Ovary	NA	NA	0.42	0.12–1.43
Placenta	NA	NA	0.79	0.16–3.91
Bladder	0.95	0.18–6.10	NA	NA
Kidney	NA	NA	NA	NA
Eye and adnexa	1.57	0.44–5.56	NA	NA
Nervous system	NA	NA	2.36	0.15–37.73
Brain	NA	NA	0.59	0.07–5.29
Thyroid	0.34	0.04–2.76	0.30	0.07–1.30
Lymph nodes	0.15	0.05–0.48	0.10	0.01–0.74
Leukemia	0.22	0.09–0.55	0.53	0.26–1.09
Other cancers	0.54	0.26–1.11	0.27	0.13–0.56
Total	0.26	0.19–0.35	0.23	0.18–0.29

^a NA = not applicable.

the prostate, skin, stomach, hematopoietic system, and lung. In women the most frequent sites are the cervix uteri, breast, skin, and stomach (12).

The high relative frequency of cancer among indigenous men 15–44 years old is explained by the high proportion of cancer of the penis and testes. The reason for these high rates among the indigenous men is not clear and needs to be further explored. A study on the Yanomami indigenous group in Venezuela's Amazon area described a high incidence of penis cancer and testes cancer. This was attributed to certain cultural practices such as the use of a penis foreskin string (14). The peak in frequency in nonindigenous men 60

and older is explained by a relatively high frequency of stomach and prostate cancers, which are almost inexistent in their counterparts in the indigenous population.

The low risk for stomach cancer among indigenous persons may be attributed more to nutritional habits than to alcohol intake, which is high among both the indigenous and nonindigenous populations. In general, indigenous people have a diet based on hunting, fishing, and subsistence agriculture, while nonindigenous people are more exposed to a Western-style diet. In the Ecuadorian Amazon a high incidence of stomach cancer has been reported in areas where oil exploita-

tion occurs (15). Nonindigenous persons have suffered more from oil pollution, which could also explain part of the excess that we found in this study. Cigarette smoking is not common in these two populations, and there was a low frequency of lung cancer in both of them. The lower relative risk of skin cancer among indigenous persons might be explained by their having a higher concentration of skin melanin and thus better protection from the tropical climate.

Interestingly, breast cancer was common among nonindigenous women, but only one indigenous woman had been diagnosed with this type of cancer. The reasons for this difference are unknown. As in other developing countries, cervical cancer was the most common of all malignancies among women in the Amazon basin of Ecuador (16). When comparing the invasive/in situ relationship for women in the Amazon basin to that for women living in Quito (which is 1.65/1), the relationship was higher among women living in the Amazon basin. This was particularly true for the indigenous group (12). A prompt diagnosis of cervical cancer in situ usually prevents development to the invasive stage. These results suggest that in the Amazon region the diagnosis was made very late. A high prevalence of cervical conditions among indigenous populations in the Amazon basin of Brazil has been reported (4), with 1% of the women studied presenting with invasive carcinoma and 3% presenting with premalignant lesions. In addition, 84% presented with inflammatory atypia, resulting from sexually transmitted genital infections (4).

Our data from the Ecuadorian Amazon indicate several possible directions for future research. First, there is a need to develop appropriate mechanisms to register the indigenous population in the national census as well as in the National Cancer Registry. Second, research should focus on factors that may help to explain the different cancer patterns that the indigenous and nonindigenous groups have.

The public health implications of our findings are readily apparent, given

the high relative risk of preventable cervical cancer among both indigenous and nonindigenous women. There is an urgent need for early detection programs, better health education efforts,

and stronger health services that are adapted to the local conditions. It is time for national and local health services to face this challenge in the Amazon basin of Ecuador.

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RESUMEN

El cáncer en la población indígena de la cuenca amazónica del Ecuador, 1985-2000

Objetivo. Proporcionar los primeros datos sobre la incidencia de cáncer en la población indígena de la cuenca amazónica del Ecuador y comparar dicha incidencia con la hallada en la población no indígena que habita en la misma zona.

Métodos. En la zona estudiada se notificaron 1 207 casos de cáncer al Registro Nacional de Cáncer en el período de 1985-2000. Se calcularon las respectivas frecuencias y riesgos relativos de los residentes indígenas del territorio y de los residentes no indígenas.

Resultados. El cáncer testicular y la leucemia fueron los cánceres más comunes en los hombres de raza indígena, y el cáncer de cuello uterino fue el más frecuente en las mujeres de esa raza. Los hombres indígenas tuvieron un riesgo menor de cáncer de estómago, piel y próstata, así como de linfomas y leucemias, que los hombres de raza no indígena. Las mujeres indígenas también mostraron un riesgo menor de cáncer de estómago, piel, mama y cuello uterino, así como de linfomas y leucemias, que las mujeres no indígenas. En ambos casos las diferencias entre una raza y otra fueron estadísticamente significativas.

Conclusión. Nuestros datos obtenidos en la cuenca amazónica del Ecuador apuntan a la necesidad de crear mecanismos adecuados para inscribir a la población indígena en el censo nacional y en el Registro Nacional de Cáncer. También hacen falta programas para la detección temprana del cáncer, nuevas iniciativas de educación sanitaria y mejores servicios de salud adaptados a las condiciones locales. Las investigaciones realizadas en un futuro deberán centrarse en aquellos factores que podrían explicar las diferencias en la frecuencia de distintos cánceres en personas indígenas y no indígenas.