DESCRIPTIVE EPIDEMIOLOGY OF CANCER OF THE BREAST AND UTERINE CERVIX IN COSTA RICA[1]

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INTRODUCTION

Cancer is currently the second leading cause of death in Costa Rica, with malignant tumors of the stomach, uterus, lung, and breast (in that order) causing the most deaths. In terms of incidence, cancers of the uterine cervix, breast, and skin are the commonest among the female population. Each year more than 600 new cases of cervical cancer are diagnosed, and about 100 deaths from this cause are reported. The corresponding figures for breast cancer are over 200 diagnoses and around 70 deaths.

This article seeks to describe patterns of breast and cervical cancer incidence and mortality in Costa Rica. For this purpose mortality is defined as the number of deaths in a given year (or the average number per year over a longer period) divided by the population at the middle of the year or other period involved. Incidence is defined as the number of new cases detected each year (or the average number detected per year over a longer period) divided by the population at the middle of the year or period involved. In both cases the population in question is the female population 20 years of age and over, since breast and uterine cancers very rarely occur in younger women.

MATERIALS AND METHODS

The data on deaths employed here were obtained from *Vital Statistics* published by Costa Rica's General Census and Statistics Bureau *(1)*. These data, especially those regarding cancer deaths, are considered reliable.

The mortality data for cancer of the uterus include cancers at all uterine sites. Many of these were recorded as being "other malignant tumors of the uterus, part unspecified," most of which are presumed to have been cancers of the cervix. In 1960 half of the deaths ascribed to uterine cancer were caused by tumors whose sites were not specified, whereas by 1983 this proportion had

dropped to 20%. It can be assumed that the greater part (more than 90%) of all deaths from cancers of the uterus are caused by cervical cancers.

The data on cancer incidence were obtained from the National Register of Tumors established by Costa Rica's Ministry of Health in 1977. From 1980 onward the coverage provided by this register is considered good. The data in it are derived from the following sources:

- a tumor information sheet that is completed for every hospital discharge involving cancer and that may also be used for cancer-related outpatient consultations;
  - biopsy reports;
  - autopsy reports;
  - death certificates.

The data are processed manually. The authors observed that the National Register of Tumors was administered carefully and responsibly, that there were no backlogs, and that management of the paperwork involved was properly organized and standardized. They also found good cooperation to exist with regard to the transmittal of information by hospitals and pathologists.

With a view to evaluating the completeness of the National Register of Tumors data, 133 hospital discharges of patients with breast, uterine, and ovarian cancers were given a detailed examination. These discharges, which gave the full name of each patient, constituted all the discharges involving these cancers in the first quarter of 1983. The data were obtained from the computerized archives of the Costa Rican Social Security System with the assistance of Dr. Oscar Fallas. Only three discharges were found to be missing from the National Register of Tumors, indicating only slight underrecording (on the order of 2%).

While this degree of completeness appears satisfactory, it should also be noted that the register was found to have certain shortcomings. For one thing, the date of the first diagnosis was not clearly stated. As a result, new cases reported to the register were considered to date from the time when the information about them reached the register, rather than from the time they were first diagnosed. Hence, about 10% of the new cases recorded for any given year were in fact diagnosed in the previous year.

Also, some duplications were found. Since the information included in the register came from various sources, and since names were sometimes imprecisely recorded, at times the same case appeared as two different cases. Out of a total of 1,100 new cases recorded in 1982–1983, 15 such duplications were observed.

RESULTS

Mortality

As Table 1 shows, in each year from 1980 through 1984 some 12 to 16 of every 100,000 Costa Rican women over age 20 died of breast cancer, and some 17 or 18 died of uterine cancer. Breast cancer mortality appears to have been slightly lower before 1980, while uterine cancer mortality was considerably higher (see Figure 1).

There is insufficient evidence to determine whether the slight upward trend observed in the breast cancer mortality figures indicates a genuine increase or merely reflects improved statistics. If the upward trend is real, that would sug-

TABLE 1. Mortality from breast and cervical cancer in Costa Rica per 100,000 women over 19 years of age,[a] 1960-1984.

Type of cancer and age group (in years)	1960[b]	1965[b]	1970[b]	1975[b]	1980	1981	1982	1983	1984
Breast cancer:									
20–29	0	1	0	0	1	1	0	1	0
30–39	6	5	4	4	0	4	5	5	9
40–49	11	12	10	13	12	15	14	12	19
50–59	19	23	24	22	30	18	21	29	31
60–69	35	17	31	38	40	51	52	43	46
≥ 70	51	74	47	55	83	58	66	70	96
Total (≥ 20 years)	10	11	10	11	12	12	12	13	16
Uterine cancer:									
20–29	3	4	1	2	1	1	0	1	0
30–39	16	16	10	11	7	8	5	1	4
40–49	49	45	25	20	20	23	19	14	20
50–59	71	74	54	32	29	25	33	40	35
60–69	93	97	59	65	51	44	61	52	46
≥ 70	148	141	146	130	98	120	94	130	140
Total (≥ 20 years)	35	36	25	21	17	17	17	17	18

Source: General Census and Statistics Directorate. *Vital Statistics (1).*
[a] During the period studied the age composition of the female population over 19 remained nearly constant, so there was no need to standardize the data for this variable.
[b] Moving three-year averages.

FIGURE 1. Breast and uterine cancer mortality in Costa Rica, 1960-1983.
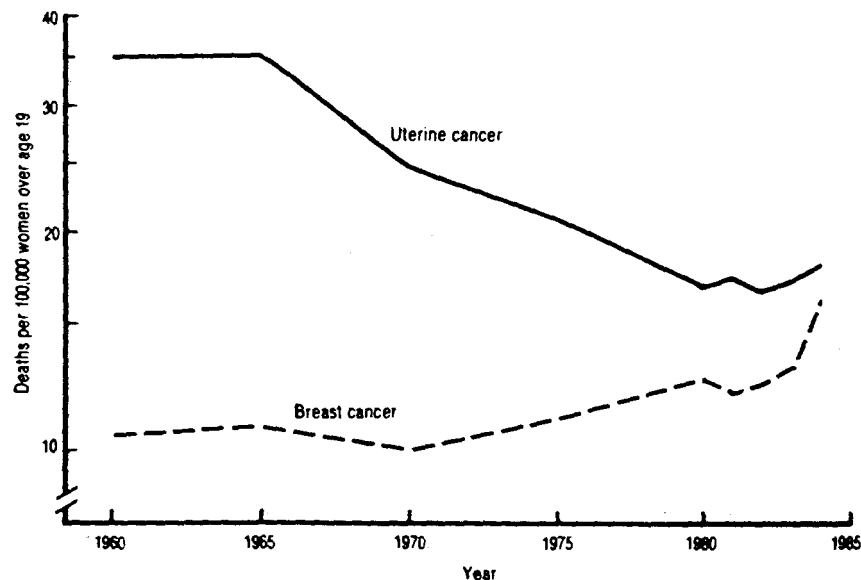
gest a sharp rise in the incidence of breast cancer, because medical care improvements have reduced the lethality of this disease. Such an increase in the incidence of breast cancer, which is plausible, could be associated with socioeconomic improvements and reduced fertility, factors known to increase the risk of contracting the disease. Indications of slight upward trends in the incidence of breast cancer have also been found in other countries (2). Table 1 shows that the apparent increases in Costa Rica have occurred among older women, especially those over age 60.[4]

Figure 1 shows a marked downward trend in uterine cancer mortality beginning in the second half of the 1960s. Overall, mortality fell from 36 to 17 per 100,000 between 1965 and 1980, a considerable reduction that parallels reductions observed in certain other countries including the United States (3). The reductions in Costa Rica have occurred among all the age groups studied, but have been least pronounced in the oldest women. That is, as indicated in Table 1, the reduction among women over 70 was around 30%, while among groups under 60 the reduction exceeded 55%. The factors responsible for this trend are most likely socioeconomic improvements within the country and actions taken to detect the disease early.

Studies made in other countries have shown uterine cancer to be a "disease of the poor" (3). It is distinctly more common among groups having less education, receiving lower incomes, and residing in less-developed regions or countries. Therefore, there is good reason to suppose that the considerable economic and social advances achieved by Costa Rica over the past few decades have reduced the risk of developing this cancer.

It should also be noted that family planning programs begun at the end of the 1960s started the practice of taking vaginal smears from women attending Social Security and Health Ministry health facilities. This activity clearly contributed to early detection of cervical cancer and saved many lives through timely treatment. The fact that the family planning programs started around the time that uterine cancer mortality began its decline suggests a more than coincidental connection.

Incidence

Although the National Register of Tumors provides information about cancer incidence since 1977, its data are only considered reliable beginning in 1979 and 1980. Hence, the apparently increasing rates of breast cancer, cervical cancer in situ, and invasive cervical cancer in 1977–1980 (see Table 2) probably reflect improvements in the register's coverage during its first few years of operation rather than actual increases in the diseases studied.

Between 1979 and 1985, according to the register, roughly 38 women per 100,000 over age 20 developed breast cancer, the annual incidence ranging from 36 to 42 with no clear upward or downward trend. In contrast, the incidences of both cervical cancer in situ and invasive cervical cancer exhibited marked declines in this period (see Table

TABLE 2. The incidences of breast cancer, cervical cancer in situ, and invasive cervical cancer per 100,000 among women over 19 years of age in Costa Rica during 1977-1985, by year.

Year	Breast cancer (cases per 100,000)	Cervical cancer		Ratio of invasive to in situ cases
		in situ (cases per 100,000)	invasive (cases per 100,000)	
1977	26.5	42.1	39.1	0.93
1978	27.5	37.3	37.9	1.02
1979	37.9	66.5	44.6	0.67
1980	42.2	68.9	51.5	0.75
1981	37.1	73.2	50.1	0.68
1982	38.1	63.1	38.9	0.62
1983	38.7	47.6	36.2	0.76
1984	36.8	36.5	36.0	0.99
1985	36.4	37.2	36.0	0.97

Source: Ministry of Health of Costa Rica, National Register of Tumors.

2). These data are generally consistent with a worldwide trend downward in the incidence of this cancer (4). However, this gradual worldwide trend does not match the sharp drop in a relatively short time that is seen in the Costa Rican data. It is probable that the number of cases recorded during the first few years was artificially inflated by cases actually pertaining to previous years. It is also likely that early case-detection activities directed at cervical cancer slackened off later in the period, a circumstance that could account for the very large drop in the number of in situ cases recorded during 1983-1985.

The ratio of invasive to in situ cases showed a considerable decline in 1979, probably as a result of more complete records being obtained. This was to have been expected, especially with regard to the larger numbers of less severe (in situ) cases being detected.

When progress is made in the early detection of cervical cancer, the incidence of in situ cases tends to increase

and the ratio of invasive to in situ cases tends to diminish. Hence, the apparent reduction in the incidence of in situ cases and the increase in the ratio of invasive to in situ cases in 1983-1985 suggests deterioration of the early detection programs.

Incidence by age and cumulative risk. With regard to incidence, breast cancer and invasive cervical cancer both show an almost linear increase with age (see Table 3 and Figure 2). About one out of every thousand Costa Rican women 60-64 years of age was found to develop each of these carcinomas in a year. These risks are roughly twice those found among women 40-44 years old. Also, even though the specific rates of these two types of cancer in the 44-74 age groups are quite similar (see Table 3), the rates of breast cancer are lower among the younger age groups, rise more rapidly with age, and tend to be higher in the oldest age groups than the rates of invasive cervical cancer.

As may also be seen in Figure 2 and Table 3, the incidence by age of in situ cervical cancer follows quite a different pattern. That is, it rises progressively

TABLE 3. Incidences of breast cancer, in situ cervical cancer, and invasive cervical cancer (annual cases per 100,000) among Costa Rican and U.S. women, by age group, in 1980–1983 in Costa Rica and 1973–1977 in the United States.

Age group (in years)	Costa Rica			United States[a]		
	Breast cancer	Cervical cancer		Breast cancer	Cervical cancer	
		in situ	invasive		in situ	invasive
20–24	—	24	2	1	56	3
25–29	3	80	13	9	129	9
30–34	9	109	28	28	131	17
35–39	25	112	37	62	95	21
40–44	45	106	59	114	63	22
45–49	77	51	79	180	38	22
50–54	89	45	83	209	25	24
55–59	96	27	96	240	19	28
60–64	103	30	103	262	16	28
65–69	123	39	123	294	18	29
70–74	132	16	132	313	13	29
75–79	163	12	140	349	9	28
≥ 80	199	17	133	372	5	33
Total (≥ 20 years)	39	63	44			
Cumulative risk (%)	5.3%	3.3%	5.1%	12.2%	3.1%	1.5%

Sources: Ministry of Health of Costa Rica. National Register of Tumors; and U.S. National Cancer Institute; *Surveillance, Epidemiology, and End Result (SEER);* NIH Publication No. 81-2330, Bethesda, 1981.
[a] White women only.

among younger women, reaching a maximum between the ages of 30 and 45. In this group the incidence exceeds one case per thousand women. Then, during the early 40s, the risk of developing in situ cervical cancer declines sharply. However, since in situ cancer tends to develop over time into invasive cancer, it is logical that in situ cancer should predominate in younger women and then become less significant with age as the rate of invasive cancer increases.

Comparison of these data with U.S. data for 1973–1977 shows that the incidence of breast cancer was clearly lower in Costa Rica, while that of cervical cancer was higher. Specifically, the risk of developing breast cancer was less than half the U.S. figure for Costa Rican women of all ages. On the other hand, the relative risk of developing invasive cervical cancer rose progressively with age

among Costa Rican women, reaching four to five times the risks found for older U.S. women of comparable ages.

Especially because of this latter finding, it is noteworthy that the rates of in situ cervical cancer found in the two countries were quite similar. This similarity suggests that Costa Rica's early detection programs were efficient and that the overall quality of data in the National Register of Tumors was good. However, the fact that the rates of in situ cervical cancer were higher in the United States than in Costa Rica up to around 35 years of age indicates that there is room for improvement in the Costa Rican programs. In addition, the observed patterns make

FIGURE 2. Relationships observed between patient age and cancers of the breast and cervix in Costa Rica (1980-1983) and the United States (1973-1977).

BREAST CANCER
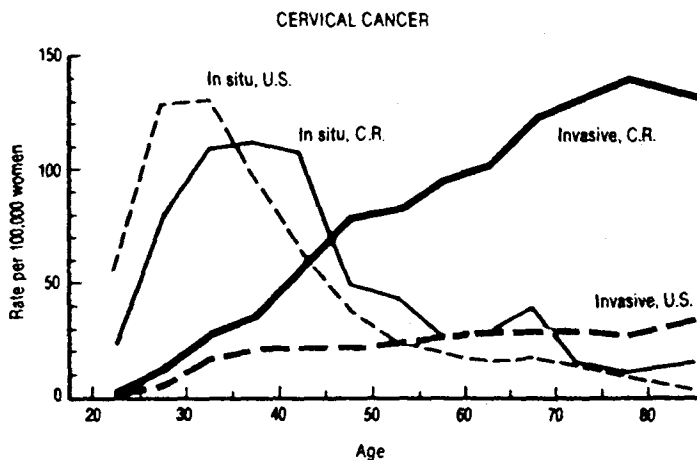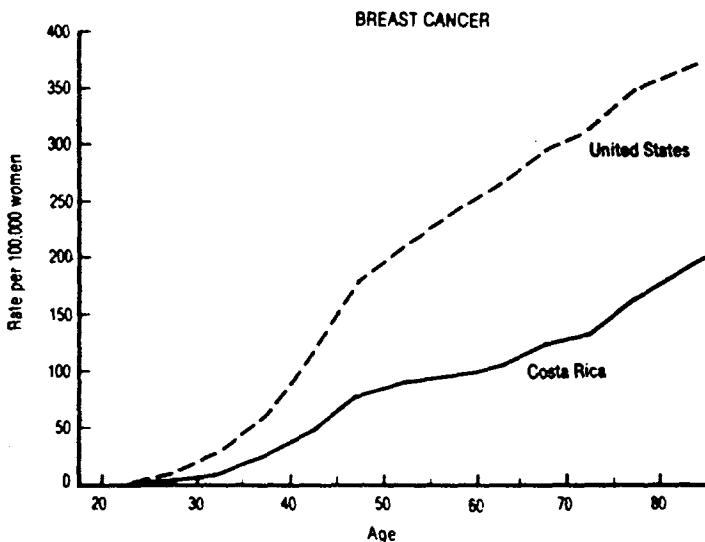
CERVICAL CANCER

it reasonable to hope for substantial future reductions in invasive cervical cancer rates in Costa Rica, as the women among whom in situ cancers are being detected and treated grow older.

Combining the observed age-specific incidences for all age groups together creates a summary index not af-

fected by the age structure of the population. This is commonly referred to as the "cumulative risk" or "whole-life risk" index (4, 5). It can be interpreted as an estimate of the risk of developing the disease at any time during one's life (it may also be defined for a particular age group), assuming for theoretical purposes that there are no competitive risks of dying from other causes.

The last line of Table 3 shows that the cumulative risk of developing breast cancer in Costa Rica in 1980–1983 was a little over 5%, or less than half the risk in the United States in 1973–1977 (12%). Also, the cumulative risk of developing invasive cervical cancer in Costa Rica was a little over 5%, or over three times greater than the risk in the United States (1.5%), while the risk of developing in situ cervical cancer in Costa Rica was 3.3%, a risk similar to that found in the United States. Despite the fact that the cumulative risk of contracting this latter cancer in Costa Rica is less than that of contracting the other two, the total incidence (the line above cumulative risk in Table 3) is higher because in situ cervical cancer is found most commonly among younger women—those in the most numerous population groups.

Figure 3 compares the cumulative risk of invasive cervical cancer in Costa Rica to that found in other populations. Of these populations, only those in Brazil and Colombia were found to experience risks exceeding 5%. The others (North American, European, Israeli, Asian, and African) experienced rates on the order of 1–2%. Hence, Costa Rica provides no exception to the rule that cervical cancer tends to be much more common in Latin America than elsewhere. At the same time, this relatively high rate provides some assurance regarding the completeness of data in the National Register of Tumors.

Geographic distribution. As Table 4 shows, the observed breast cancer incidence and mortality were higher in Costa Rica's four central provinces (San José, Alajuela, Cartago, and Heredia) and

FIGURE 3. The cumulative risk of developing cervical cancer experienced by female populations in Costa Rica and other areas.
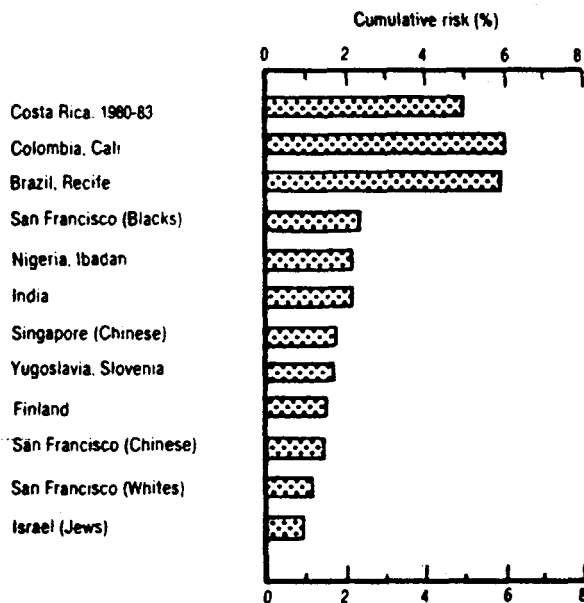
Sources: Costa Rican National Register of Tumors, and Cramer (3).

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TABLE 4. Geographic distribution of breast and cervical cancer incidence (1982–1983) and breast and uterine cancer mortality (1980–1983) in Costa Rica, by province. The rates shown are per 100,000 women over 19 years of age.

| Province | Incidence, 1982–83 | | | Mortality, 1980–83 | |
| | Breast cancer | Cervical cancer | | Breast cancer | Uterine cancer |
		in situ	invasive		
San José	51	58	39	15	17
Alajuela	36	52	27	11	19
Cartago	34	44	28	12	18
Heredia	44	53	30	12	14
Guanacaste	27	76	51	11	10
Puntarenas	14	64	46	7	22
Limón	25	38	39	12	20
Total	39	56	38	12.5	17

Source: Costa Rica. Ministry of Health. National Register of Tumors; and General Census and Statistics Directorate, Vital Statistics (1). Provincial populations were estimated by the authors on the basis of population censuses of 1973 and 1984.

lower in the three coastal provinces (Guanacaste, Puntarenas, and Limón). Also, San José had the highest rates and Puntarenas the lowest. Indeed, the observed incidence of breast cancer in San José was nearly four times that prevailing in Puntarenas, and breast cancer mortality in San José was over twice as high. In general, the geographic differences observed for breast cancer are similar to those observed by Moya de Madrigal et al. (6) in a study of deaths and hospital discharges from 1956 to 1969.

The causes underlying the high San José figures are uncertain. There could of course be artificially high numbers of cases and deaths recorded at health care centers in and around the capital; but the fact that this same pattern is not repeated for San José in the case of uterine and other cancers suggests that the observed geographic differential is genuine.

For proper interpretation of these and other findings, it should be noted that the four central provinces enjoy a higher level of well-being than the coastal provinces. They also exhibit lower birth rates, greater family stability, and a much lower propensity for illegitimate births and consensual unions.

Regarding cervical-uterine cancer, no clear provincial patterns emerged. That is, the highest incidence of both in situ and invasive cervical cancer was found in Guanacaste Province; but, paradoxically, this province is the one where recorded uterine cancer mortality was lowest. Puntarenas, on the other hand, yielded more consistent data showing it to have had the second-highest incidence of invasive cervical cancer and the second-highest uterine cancer mortality. Limón stood out by reason of its low incidence of in situ cervical cancer and because it was the sole province with more invasive than in situ cases.

It had been expected that these three coastal provinces (Guanacaste, Puntarenas, and Limón) would show the highest cervical and uterine

cancer incidence and mortality, since they contain the country's poorest population groups—wherein women tend to become sexually active at a relatively early age and commonly have a number of conjugal unions. Hence, Guanacaste's low mortality and Limón's low incidence are noteworthy. In the case of the latter province, the low incidence could be explained by shortcomings of the early cervical cancer detection program and by failure to provide full notification about cases of this type of cancer to the National Register of Tumors.

It should also be mentioned that the previously cited study by Moya de Madrigal and colleagues (6) was likewise unable to arrive at clear conclusions regarding the distribution of uterine cancer morbidity and mortality by province. In that study Guanacaste Province showed the lowest mortality throughout the 1956–1969 study period. Limón Province, on the other hand, showed the highest rates of hospital discharges for uterine cancer, a finding that contrasts sharply with the low incidence found by the present study. This is one more piece of evidence suggesting that the National Register of Tumors data for this province are incomplete.

Early detection. Public health authorities have sought to achieve secondary prevention of breast and cervical cancer by means of early detection programs. These programs are directed at diagnosing the disease in the earliest stages of development, even before the appearance of symptoms. For these two types of cancer it is possible to set up efficient, large-scale early detection programs; and, since the lesions detected in this way are generally small, the probability of being able to cure them by means of local treatment is relatively good.

In Costa Rica, programs for early detection of cancer have concentrated primarily on cancers of the uterine cervix. Detection of initial and precancerous lesions is done by means of exfoliative cytology (Pap smears). The smears are taken at Ministry of Health and Social Security outpatient facilities.

The family planning services offered by these two institutions since 1968 and 1970, respectively, have greatly facilitated development of the program. More than 200,000 smears are taken yearly. As shown in Table 5, the available data indicate that the number taken grew fairly steadily from 1977 through 1986, but that the increase was slower than the rate of population growth, and so population coverage declined from 39% in 1977 to 32% in 1986. This downward trend is a cause for concern, although it does not in any way detract

TABLE 5. Number of Papanicolaou smears taken in Costa Rica and the percent coverage of the female population over 19 years old, from 1977 through 1986.

Year	No. of Pap smears taken	% coverage of female population over 19 years old
1977	193,515	39
1978	194,378	38
1979	206,931	38
1980	215,899	38
1981	214,906	37
1982	221,742	36
1983	211,194	33
1984	237,921	36
1985	222,887	33
1986	224,903	32

Sources: Costa Rica, Social Security, Dirección Técnica Actuarial y de Planificación Institucional; and personal communication, Dr. Emilia León, Chief of the Department of Chronic Diseases, Costa Rican Ministry of Health.

from the past value of the early cervical cancer detection program.

Coverage provided by this program has been especially noteworthy among women 25 to 44 years old, being substantially higher than for other groups (Table 6). In particular, coverage has been much lower among women beyond the fertile ages, even though these latter have shown the highest rates of invasive cervical cancer.

The overall percentage of women over 19 from whom Pap smears have been taken is not known, nor do we know the overall priority assigned to this examination. (The percentage of women covered cannot be obtained by combining the numbers covered in successive years, because these numbers include women who had smears taken in more than one of those years.) Preliminary findings of a study on contraception and cancer risk carried out by the Costa Rican

Demographic Association (Asociación Demográfica Costarricense) show that as of 1984–1985 some 26% of all Costa Rican women between 25 and 59 years old had never had a Pap smear taken.

Regarding breast cancer, the early detection programs for this problem are basically educational and informative in nature, seeking mainly to encourage self-examination. Their scope is more difficult to measure. However, preliminary findings of the aforementioned study indicate that no more than 16% of Costa Rican women make a practice of frequently examining their breasts, and that 58% have never done so. Recent establishment of the Society of Mastectomized Women and the National Cancer Council in Costa Rica gives grounds for hoping that major programs for early detection of breast cancer will be implemented in the future.

CONCLUDING REMARKS

In closing, it is appropriate to underscore the epidemiologic importance of the National Register of Tumors. Despite the fact that this register was not set up until relatively recently, it has proven to be a reasonably reliable source of very valuable data.

Overall, trends observed in other countries, including the United States, lead to an expectation that breast cancer incidence and mortality will increase in Costa Rica. It is also probable that the incidence of in situ cervical cancer among young women will rise as a result of further improvements in early detection programs. On the other hand, it is to be expected that the role of invasive cervical cancer will decline, particularly with the aging of the cohorts of women who have participated in early detection programs in recent years.

TABLE 6. Papanicolaou smears taken from Costa Rican women belonging to different age groups in 1983, showing the number of smears taken and the percent coverage provided in each group.

Age group (in years)	No. of smears taken	Coverage provided (%)
15–24	54,845	21
25–34	79,539	42
35–44	41,748	36
45–54	21,556	26
55–64	8,867	16
≥65	4,639	9

Source: The figures shown are estimates based on the data in Table 5 and data provided by the National Morbidity Survey (External Consultation of 1983, personal communication by Dr. Herman Vargas).

ACKNOWLEDGMENT

SUMMARY

This article seeks to describe patterns of breast and uterine cancer morbidity and mortality in Costa Rica by examining and analyzing available data from several sources.

Regarding mortality, these data suggest a slight rise in breast cancer mortality between 1960 and 1984, mostly in women over 60, and also document a sharp drop in uterine cancer mortality. The latter decline (from 35 cases per 100,000 to 18) paralleled similar declines in certain other countries and was sharpest in younger women. The factors most likely responsible for this downward trend were improvement of socioeconomic conditions and implementation of a national family planning program that routinely took Pap smears in order to detect the disease early.

Regarding morbidity, data from 1979 through 1985 showed no clear upward or downward trend for breast cancer but did show a marked drop in the rates of both in situ and invasive cervical cancer. These changes could be accounted for by variations in the pace of case-detection and case-recording activities.

Regarding the ages of affected subjects, morbidity data for 1980–1983 show an almost linear increase with increasing age for both breast and cervical cancer, together with high rates of in situ cervical cancer among women of childbearing age. (Since in situ cervical cancer tends to develop into invasive cancer over time, it is logical that the former should predominate in younger women and then become less significant with age as the rate of invasive cervical cancer increases.)

Comparison of these 1980–1983 data with U.S. data for 1973–1977 shows the rate of breast cancer to be lower in Costa Rica and that of cervical cancer to be higher. It also suggests that Costa Rica's early cervical cancer detection program was reasonably efficient in these years but could be improved, and that further declines in the rate of invasive cervical cancer can be expected.

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