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Cancer Incidence in Postwar Lebanon: Findings from the First National Population-based Registry, 1998

ALI SHAMSEDDINE, MD, ABLA-MEHIO SIBAI, PHD, NAGEEB GEHCHAN, MD, BOUSHRA RAHAL, MPH, NAGI EL-SAGHIR, MD, MARWAN GHOSN, MD, GEORGES AFTIMOS, MD, NABIL CHAMSUDDINE, MD, AND MUHIEDDINE SEOUD, MD, FACOG, FOR THE LEBANESE CANCER EPIDEMIOLOGY GROUP*

PURPOSE: Cancer incidence rates in Lebanon have been lacking for over three decades. National data based on a total of 4388 cases diagnosed during the year 1998 were reviewed and analyzed.
METHODS: Crude and age-standardized rates (ASRs) per 100,000 population were calculated and results were contrasted with estimates from developed and selected developing countries in the region.
RESULTS: Among males, bladder (18.5%), prostate (14.2%), and lung cancer (14.1%) were the most frequently reported malignancies. Among females, breast cancer alone accounted for over a third of all cancers, followed by colon cancer (5.8%), and cancer of the corpus uteri (4.8%). Sex-differentials in incidence rates were highest for tobacco-related cancers (lung, larynx, and bladder). Compared with current estimates worldwide, ASRs for bladder cancer in Lebanon showed strikingly high rates. Whereas ASRs for breast and prostate cancer remained lower than those observed in developed countries, they were greater than those estimated from neighboring countries with a similar epidemiological transition as Lebanon.
CONCLUSIONS: Findings of the comparative assessments most likely reflect differentials in prevalence of risk factors and lifestyle variables (e.g., lung and breast cancers) and can be partly explained by improvement in cancer detection rate in recent years (for prostate cancer). The implications of the results in light of primary prevention activities, screening practices, and research initiatives in Lebanon are discussed.
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KEY WORDS: Cancer, Incidence, Registry, Lebanon, Middle-East.

INTRODUCTION

Population-based cancer registries are a valuable source of information and a public health surveillance tool for continuous monitoring of cancer patterns and trends and for framing health policy in cancer prevention and control (1–3). Initial attempts at establishing a national cancer registry in Lebanon, a small (population around 3.3 million) middle-income country located on the Eastern shore of the Mediterranean Sea, were made in the early 1970s. However these efforts failed due to a lack of financial and technical resources caused by the civil war that ravaged the country from 1975 until 1991. More recent efforts at establishing a cancer registry have also proved fruitless. Consequently, cancer incidence data have been lacking for over three decades. The only study published, which examined incidence rates, was undertaken in 1966 and was based on pathology reports from the eight institutions where histopathological diagnoses were made (4). Later on, several attempts were made at examining major sites of cancer in Lebanon and their epidemiological characteristics. Studies have relied primarily on hospital-based tumor registries with inconsistent results (5–8). Factors such as referral and selection biases due to availability or introduction of specialized diagnostic and therapeutic services within certain health-centers resulted in unreliable ranking estimates and have hindered extrapolation of findings to the total population.

From the Division of Medical Oncology, Department of Internal Medicine, American University of Beirut Medical Center (AUB-MC) Beirut, Lebanon (A.S., N.E.-S.); Department of Epidemiology and Population Health, Faculty of Health Sciences, American University of Beirut (A.-M.S.); Department of Surgical Oncology, Lebanese University Medical School and St. Georges Hospital, Beirut, Lebanon (N.G.); Department of Epidemiology and Population Health, Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon (B.R.); Division of Medical Oncology, Hotel Dieu de France University Medical Center, Beirut, Lebanon (M.G.); Department of Pathology, St. Georges Hospital Beirut, Lebanon (G.A.); Department of Medical Oncology, St. Georges Hospital, Beirut, Lebanon (N.C.); and Division of Gynecological Oncology, Department of Obstetrics and Gynecology, AUB-MC, Beirut, Lebanon (M.S.).

Address correspondence to: Abla-Mehio Sibai, Ph.D., Department of Epidemiology and Population Health, Faculty of Health Sciences, American University of Beirut, P.O. Box 11-0236, Riad El Solh, Beirut 11072020, Lebanon. Tel.: +961-1-350000; Fax: +961-1-744470. E-mail: ansibai@aub.edu.lb

*A list of the Group Members appears at the end of the article.

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Selected Abbreviations and Acronyms

ASR = age standardized rate
AUB-MC = American University of Beirut Medical Center
ICD-O = International Classification of Disease for Oncology
LCEG = Lebanese Cancer Epidemiology Group
PHS = Population and Housing Survey

With a commitment to examine cancer incidence rates at the national level, the Lebanese Cancer Epidemiology Group (LCEG), a network of all hospitals with oncology specialists and all pathology laboratories, was established. In this study, we present findings based on 4388 incident cases that were reported and registered in the year 1998. A comparison is made with data from developed countries and other selected developing countries in the region. The analysis provides leads to researchers involved in etiologic studies and to policy makers for evidence-based health planning.

METHODS

The LCEG operates in close collaboration with the American University of Beirut Medical Center (AUB-MC) Tumor Registry and the Lebanese Cancer Society. Registry personnel at AUB-MC collected pathology reports for the year 1998 from all collaborating centers (the 12 hospitals with oncology specialist(s) and the 6 diagnostic centers and pathology laboratories) in various districts of the country. The information entered in the registry included the patient's name, sex, date and age at diagnosis, address, anatomical site, and histological type. Carcinoma in situ, except for breast cancer, was excluded because these were not logged as cancers in many laboratories' register books. Furthermore, as most facilities exclude patients with basal and squamous cell carcinoma, only skin melanomas were included. The method of classification of lymphoma was done by disease not by site. All other cancers were coded according to the *International Classification of Disease for Oncology* (ICD-O) (9). Patients who resided outside Lebanon were excluded. Proportion of cases with unknown primary site was around 1%. Data were computerized using Access Software with modules for detecting duplicate registrations of the same cancer case.

For estimation of population data, the age- and sex-distribution for the year 1998 were projected from the Population and Housing Survey (PHS) conducted by the Lebanese Government in 1995 (10). The PHS was a large-scale survey of approximately one-tenth of all households in the country, thus, making available the first reliable source of demographic data for a country emerging from 16 years of wars and conflict. Age-specific mortality rates were based on the West Model, and the Pap Child Survey was used to estimate fertility and sex-specific death rates (11). The annual growth rate (2.1%) was obtained from the study conducted by the Council of Development and Reconstruction in 1995 (12). The projected population estimates for 1998 indicated a total of 1,623,230 males and 1,649,620 females.

Frequencies of various types of cancer were computed. Crude and age-specific incident rates per 100,000 population and median age at diagnosis were calculated for males and females separately. For comparability with published literature, age standardized rates (ASRs) per 100,000 were estimated by the direct method using the world standard population (13), and these were compared with ASRs from selected neighboring and developed countries worldwide.

RESULTS

During the year 1998, a total of 4388 new cancer cases were diagnosed of which 52.3% were males. Among males, the most frequently reported cancer was bladder (18.5%), followed by prostate (14.2%), and lung cancer (14.1%) (Table 1). Among females, breast cancer alone constituted around one third of the total cancer caseload in the country. This was followed by colon cancer (5.8%), and cancer of the corpus uteri (4.8%) (Table 2). Crude incidence rates for all cancers combined were overall larger for males than females (141.4 and 126.8 per 100,000, respectively). When examined by site, sex differentials were notably substantial for cancers of the larynx, lung, and bladder.

Table 3 shows ASRs per 100,000 for the 10 leading cancer sites among males and females, separately, and contrasts them with estimates from selected countries worldwide (14). ASRs for bladder cancer in Lebanon showed strikingly high rates, especially among males (28.7), exceeding those observed in most developed countries. While ASRs for breast and prostate cancer in Lebanon remained lower than those observed in developed countries, the rates were greater than those estimated from neighboring countries with a similar epidemiological transition as Lebanon.

DISCUSSION

This report is based on the first national dataset on cancer incidence to become available for the whole of Lebanon in the postwar period. The study results show an overall crude incidence rate for all cancers combined of 141.4 per 100,000 among males and 126.8 among females. This is in sharp contrast to earlier estimates made in 1966, of 102.8 and

TABLE 1. Percent distribution of cancer cases by site, age-specific incidence rates per 100,000, crude and age standardized rates (ASR) adjusted to the World Standard Population (W) and median age at diagnosis among males, Lebanon, 1998

			Age-specific rates										
Site (ICDO-code)	n	%	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75+	Crude rate	ASR (W)	Median age
Oro-pharyngeal[a]	60	2.6	0.0	0.0	1.4	3.4	7.4	16.3	17.3	26.5	3.7	4.1	63.0
Esophagus (150)	17	0.7	0.0	0.4	0.0	1.3	1.8	5.4	4.7	3.8	1.0	1.2	60.0
Stomach (151)	116	5.1	0.0	0.7	1.4	1.4	14.9	26.3	45.9	68.6	7.1	7.9	64.5
Colon (153)	111	4.8	0.0	1.5	0.9	6.0	11.9	16.1	35.6	96.9	6.8	7.4	66.5
Rectum (154)	72	3.1	0.0	0.4	1.8	2.7	9.1	11.7	37.0	22.2	4.4	4.9	64.5
Liver (155)	49	2.1	0.0	0.0	0.5	2.3	8.2	15.7	17.5	4.2	3.0	3.5	60.0
Gall bladder (156)	22	1.0	0.0	0.0	0.0	0.6	1.8	4.1	5.9	28.6	1.4	1.5	72.0
Pancreas (157)	27	1.2	0.0	0.0	0.4	0.0	1.6	7.7	11.1	20.0	1.7	1.8	67.0
Larynx (161)	110	4.8	0.0	0.0	0.0	2.7	17.2	32.9	44.5	33.3	6.8	7.7	62.0
Lung (162)	324	14.1	0.2	0.4	2.3	9.9	32.3	96.9	140.1	113.7	20.0	22.2	64.0
Bone (170)	56	2.4	0.9	3.8	0.9	4.4	5.2	7.1	10.3	17.7	3.4	3.6	46.0
Connective tissue (171)	57	2.5	1.0	2.3	1.9	4.2	3.8	6.7	16.3	19.6	3.5	3.6	53.0
Melanoma of skin[a]	19	0.8	0.0	0.3	0.0	1.2	0.9	8.0	4.3	7.0	1.1	1.3	67.0
Breast (174–175)	14	0.6	0.0	0.0	0.0	0.6	4.1	3.8	4.1	0.0	0.9	1.0	55.0
Prostate (185)	327	14.2	0.2	0.3	0.0	0.6	8.7	66.2	175.2	312.0	20.1	21.5	70.0
Testis & male genitalia (186–187)	39	1.7	0.5	1.8	6.5	2.7	0.0	3.2	3.1	7.5	2.4	2.3	32.0
Bladder (188)	425	18.5	0.2	0.4	0.9	11.5	36.0	93.2	192.7	298.1	26.2	28.7	67.0
Kidney & urinary tract (189)	62	2.7	0.5	0.3	0.9	2.5	5.1	19.0	24.6	13.9	3.8	4.2	61.0
Brain & nervous system (191–192)	90	3.9	2.0	2.0	5.0	6.1	16.6	12.7	14.1	6.8	5.5	6.1	46.0
Thyroid (193)	32	1.4	0.2	1.7	1.8	1.9	2.6	5.1	8.8	3.5	2.0	2.0	49.0
Hodgkins disease[a]	32	1.4	0.5	3.3	1.4	2.7	2.8	1.1	6.3	0.0	2.0	2.0	35.4
Non-Hodgkins[a]	61	2.7	1.0	1.2	0.0	5.0	6.9	15.0	18.3	8.0	3.8	4.2	51.5
All other sites[a]	174	7.6	3.2	1.2	6.1	5.8	17.9	39.7	42.2	81.3	10.8	11.6	53.5
All sites	2296	100.0	10.4	22.1	34.0	79.3	216.1	513.3	882.4	1197.9	141.4	154.2	60.2

[a]Oro-pharyngeal (ICDO-codes 140–149); Skin melanoma (ICDO-code 172–179); Hodgkins lymphoma (ICDO-code 196, histology 96503–96673); Non-Hodgkins lymphoma (ICDO-code 196, histology: 96703–96673, 95900–96333, 96403–96423, 96903–96983, 97003–97093, 97103–97233, 97503); All other sites (ICDO-codes 152, 158–159, 160, 163–165, 190, 194–195, 199).

104.1, respectively (4), and more recent assumptions suggesting that incidence rates in the country have not changed for the past 30 years (15). On the one hand, the increase in incidence rates may be attributed to improvement in detection rate of various types of cancer due to the marked rise in the number of diagnostic facilities in the country in recent years as well as the inclusion of more comprehensive data sources in the present study compared with the earlier one. On the other, the increase can be real, reflecting long-term changes in lifestyle and in the prevalence of risk factors coupled with an increase in life expectancy approaching 69 years among males and 72 years among females (16).

Whereas males showed overall higher incidence rates than females, sex-differentials were notably large for cancers of the larynx, lung, and bladder. These cancers have been closely linked to tobacco smoking. National trends in lung cancer incidence and mortality reflect maturity of the smoking epidemic (17). While Lebanon may have reached this maturity in men, the trend in women may still be increasing. Smoking prevalence rates among men have long been in the range of 50 to 60 percent (18–19). In women, these have increased from 28% in the 1960s (18) to 35% in 1992 (19), with prevalence rates among those aged 30 to 39 years (54%), for example, being more than triple those among older cohorts (16% for those over 60 years) (19). In spite of the egregious use of tobacco in Lebanon, there is very little public health action concerning the benefits of tobacco control measures.

In accordance with the majority of results from the developed world (20), breast cancer followed by colon cancer, were the two most frequently reported malignancies among females. In contrast, while lung cancer remains the most common type among males worldwide, it was preceded, in our study population, by bladder cancer. When examination of our findings was further extended to age-standardized rates adjusted to the world standard population, data from Lebanon for the ten leading sites showed some singularities in comparison to other developed and developing countries.

First, and in sharp contrast to countries of the region and worldwide, bladder cancer incidence rates in Lebanon are

TABLE 2. Percent distribution of cancer cases by site, age-specific incidence rates per 100,000, crude and age standardized rates (ASR) adjusted to the World Standard Population (W) and median age at diagnosis among females, Lebanon, 1998

			Age-specific rates										
Site (ICDO-code)	n	%	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75+	Crude rate	ASR (W)	Median age
Oro-pharyngeal[a]	32	1.5	0.3	0.8	1.3	0.6	5.5	5.4	9.9	3.5	1.9	2.0	56.0
Esophagus (150)	12	0.6	0.0	0.0	0.0	1.2	0.0	2.0	6.2	6.6	0.7	0.7	68.5
Stomach (151)	76	3.6	0.0	0.0	1.3	1.2	9.0	17.9	28.9	37.5	4.6	4.9	64.0
Colon (153)	122	5.8	0.0	0.0	2.0	5.1	14.4	16.9	51.4	70.6	7.4	7.8	65.0
Rectum (154)	59	2.8	0.2	0.0	1.1	2.1	3.9	14.5	23.5	26.4	3.6	3.7	64.0
Liver (155)	35	1.7	0.3	0.0	0.0	1.4	2.0	10.7	12.6	15.3	2.1	2.2	63.0
Gall bladder (156)	22	1.1	0.0	0.0	0.0	0.0	3.5	5.2	9.5	10.0	1.3	1.5	64.5
Pancreas (157)	25	1.2	0.0	0.0	0.0	0.6	3.6	5.3	14.5	3.4	1.5	1.7	64.0
Larynx (161)	14	0.7	0.0	0.0	0.4	0.0	3.1	4.6	2.8	2.9	0.8	1.0	58.0
Lung (162)	89	4.3	0.0	0.4	0.8	4.4	8.1	21.0	39.2	27.7	5.4	5.8	63.0
Bone (170)	40	1.9	0.5	1.9	2.8	3.4	3.4	6.0	6.1	0.0	2.4	2.3	41.5
Connective tissue (171)	54	2.6	0.3	4.4	2.2	1.8	7.2	5.3	9.7	13.7	3.3	3.3	47.0
Melanoma of skin[a]	10	0.5	0.0	0.5	0.0	0.7	0.0	5.1	0.0	4.1	0.5	0.7	62.0
Breast (174–175)	698	33.4	0.0	0.0	12.8	78.7	153.1	120.8	137.6	101.7	42.3	46.7	52.0
Cervix uteri (180)	87	4.2	0.0	0.0	3.5	14.3	13.8	10.8	16.5	7.0	5.3	5.6	46.0
Corpus uteri (181–182)	100	4.8	0.0	0.0	1.5	3.7	11.6	22.8	41.6	35.3	6.1	6.5	63.0
Ovary (183)	90	4.3	0.2	1.1	2.7	5.5	15.4	21.9	18.9	12.3	5.5	5.9	54.5
Bladder (188)	91	4.3	0.6	0.0	0.9	2.6	8.8	20.7	28.0	59.5	5.5	5.7	64.0
Kidney & urinary tract (189)	30	1.4	0.5	0.0	0.4	1.6	4.0	8.5	7.2	6.1	1.8	1.9	59.0
Brain & nervous system (191–192)	84	4.0	2.4	1.4	6.6	3.3	9.0	14.4	13.2	6.2	5.1	4.8	44.5
Thyroid (193)	69	3.3	0.5	1.6	3.5	6.7	10.9	9.6	11.3	6.9	4.2	4.3	46.0
Hodgkins disease[a]	31	1.5	0.6	2.4	4.0	1.9	1.9	1.1	0.0	3.5	1.9	1.6	31.5
Non-Hodgkins[a]	50	2.4	0.0	0.8	1.3	5.0	3.7	6.5	24.8	3.5	3.0	3.2	54.0
All other sites[a]	172	8.2	1.9	2.4	1.8	4.4	23.1	32.6	57.8	70.1	10.5	10.9	57.2
All sites	2092	100.0	8.3	17.1	51.0	149.9	319.6	390.6	572.8	530.5	126.8	134.8	54.4

[a]Oro-pharyngeal (ICDO-codes 140–149); Skin melanoma (ICDO-code 172–179); Hodgkins lymphoma (ICDO-code 196, histology: 96503–96673); Non-Hodgkins lymphoma (ICDO-code 196, histology: 96703–96673, 95900–96333, 96403–96423, 96903–96983, 97003–97093, 97103–97233, 97503); All other sites (ICDO-codes 152, 158–159, 160, 163–165, 190, 194–195, 199).

notably high, in particular among males, paralleling those observed in developed countries such as France, UK, and USA. While this observation may be an artifact caused by repeat biopsy over time, earlier small-scale studies in the country have similarly noted high rates for bladder in comparison to other cancer sites (4, 6, 7, 21); and yet the reasons remain not entirely clear. An early epidemiological study in Lebanon has identified tobacco smoking as a risk factor for bladder cancer (18), and a small proportion of bladder cancer can be attributed to caffeine consumption especially in non-smokers (22). Coffee drinking in Lebanon is socially tagged to cigarette smoking; however, there are no data to document its magnitude. In neighboring countries such as Egypt and Iraq, infestation with Bilharsia explains the high incidence of bladder cancer, and in certain populations, occupational exposures to paint components, polycyclic aromatic hydrocarbons, diesel exhausts, and aromatic amines may be related to a higher incidence of bladder cancer (23). However, none of these factors can explain the high bladder cancer incidence rates in Lebanon, which would have been even higher if in situ bladder cases were included. An online search revealed no etiological studies for bladder cancer in Lebanon for over two decades. Epidemiological studies examining individual and societal factors associated with the striking high incidence of bladder cancer should open areas for future intriguing research opportunities.

Whereas ASR for breast cancer in Lebanon (46.7 per 100,000) remains lower than those observed for France (83.4) or the UK (74.4), the rate is much higher than other developing countries of the region such as Algeria (21.3), Kuwait (32.8), or the non-Jews in Israel (27.7). This may, in part, be attributed to the wide adoption of screening programs and to better awareness of breast cancer and its early signs. Furthermore, and in contrast to neighboring countries, significant changes in certain reproductive factors have been occurring over the past few decades. Mean age at marriage of women has increased from 23.2 years in 1970 to 27.5 in 1996 while total fertility rate has steadily declined from 4.4 to 2.5 during the same period (24). On the other hand, the current age pattern at diagnosis of breast cancer in Lebanon is typical of that in low-risk countries (25) with increase in the rate up to the 5th decade, around menopause, and a decrease thereafter. With around 43% of cases presenting before age 50, median age at diagnosis was 52

TABLE 3. Age-standardized incidence rates directly adjusted to the World Standard Population per 100,000 for top ten cancer sites in Lebanon among males and females compared to those in selected neighboring and developed countries[a]

	Males							Females							
Rank in Lebanon	Site	Lebanon	Algeria	Kuwait	Non-Jews in Israel	France	UK	USA, SEER	Site	Lebanon	Algeria	Kuwait	Non-Jews in Israel	France	UK	USA, SEER
1	Bladder	28.7	10.8	4.6	15.5	31.0	22.3	23.3	Breast	46.7	21.3	32.8	27.7	83.4	74.4	92.1
2	Lung	22.2	17.2	21.5	35.1	62.7	51.2	54.4	Colon	7.8	2.8	5.4	8.2	16.9	15.0	19.4
3	Prostate	21.5	5.4	11.4	14.8	63.4	39.6	107.8	Corpus uteri	6.5	2.2	3.8	5.7	13.4	8.9	18.4
4	Stomach	7.9	5.6	5.6	6.7	13.0	13.1	6.6	Ovary	5.9	4.2	5.6	4.0	11.0	12.4	13.2
5	Larynx	7.7	4.3	3.5	5.4	8.7	4.1	5.3	Lung	5.8	1.9	5.6	4.3	8.8	22.0	34.6
6	Colon	7.4	3.3	6.3	9.6	31.3	20.6	25.5	Bladder	5.7	2.3	1.9	2.2	5.4	6.1	6.2
7	Brain & nervous system	6.1	2.7	5.2	4.5	6.0	6.5	7.0	Cervix uteri	5.6	12.5	4.2	2.5	8.6	8.2	6.8
8	Rectum	4.9	3.8	3.8	3.5	20.2	14.3	12.2	Stomach	4.9	3.7	2.2	3.7	4.4	4.9	2.6
9	Kidney & urinary tract	4.2	1.5	3.4	2.5	15.6	6.7	9.6	Brain & nervous system	4.8	1.4	3.3	2.5	3.3	4.5	4.8
10	Non-Hodgkins	4.2	3.6	8.6	9.7	13.0	10.0	16.8	Rectum	3.7	3.3	3.0	2.7	8.7	7.1	7.3
	All sites	154.2	85.9	121.6	158.7	405.7	266.6	364.5	All sites	134.8	85.9	111.1	109.9	233.9	226.0	284.6

[a]Parkin et al. (14): Algeria, 1993–1997 (p. 95); Kuwait, 1994–1997 (p. 280); Non-Jews in Israel, 1993–1997 (p. 256); France, 1993–1997 (p. 331); UK, 1993–1997 (p. 465), and USA, SEER, 1993–1997 (p. 209).

years compared with 63 years for developed countries such as the US (26). Such findings bear on currently adopted guidelines for age at initial screening for breast cancer in the country.

The relatively high ASR for prostate cancer is in contrast to earlier findings based on the tumor registry in one of the larger hospitals in the Lebanon (7). In this study, prostate cancer ranked seventh in frequency. The higher frequency of prostate cancer in our study data may be attributed to detection and surveillance bias as a result of extensive national public awareness campaigns promoting screening for prostate cancer in recent years. While survival is better in the developed as compared with developing countries (80% vs. 40%) (20), it is still uncertain whether early detection will be reflected in improvement in survival or in the quality of life (27). In countries with limited financial resources such as Lebanon, the welfare of the patient and the society (28) should be considered in economic analysis of screening decisions.

The findings of this study should be considered in light of the following limitations. The last and only census ever undertaken in the Lebanon was in 1932, and our population estimates and projections may have been subject to minor inaccuracies. Nevertheless, indirect estimates derived thereafter from a number of other surveys (29) point to a similar enumeration as the one estimated for the present study. Furthermore, as in most research based on cancer registry, incomplete case-reporting and under-registration of clinically advanced cases of certain types of cancer may have underestimated our rate estimates. While it is difficult to evaluate completeness of coverage, Lebanon is a small highly urbanized country (10,400 km^2, 81% urban); and we included *all* facilities that diagnose and treat cancer in the country. The dire need to generate and monitor cancer incidence at the national level made it possible for all oncologists and centers to collaborate in the present study and to willingly provide their data. Finally, there was no attempt in this study to match our database with death certificates from vital statistics since the vital registration system in the country is neither complete nor reliable or valid. Recent evidence suggests that a considerable proportion (43%) of death certificates do not report an underlying cause of death (30).

In spite of the above, the data at hand present the *first* attempt at providing policy makers, healthcare and public health providers in Lebanon with national estimates of various types of cancers to define priorities for prevention and control. The predominance of smoking-related cancers highlights the importance of primary prevention programs in a country where health policies and practices continue to favor curative and high-tech medical services. There is an urgent need to examine the reasons behind the notably high incidence of bladder cancer, and in the interest of evidence-based decision making, continual monitoring is essential for a more realistic appraisal of patterns in cancer caseload and incidence. Field preparations and fund raising for a similar activity that pools cancer cases from all collaborating centers for the year 2003, and for each 5-year interval thereafter, are underway.

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