



## Review Article

# The evolution of cancer registration in Egypt: From proportions to population-based incidence rates

Amal S. Ibrahim<sup>1</sup>, Nabil N.H. Mikhail<sup>2</sup>

<sup>1</sup> Department of Biostatistics and Cancer Epidemiology, National Cancer Institute, Cairo University

<sup>2</sup> Department of Biostatistics and Cancer Epidemiology, South Egypt Cancer Institute, Assiut University

Correspondence should be addressed to Amal Samy Ibrahim at Biostatistics and Cancer Epidemiology Department, National Cancer Institute, Cairo University, Egypt, [ibrahimamalsamy@gmail.com](mailto:ibrahimamalsamy@gmail.com)

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### Abstract

The idea of recording information on all cancer cases in defined community dates from the first half of the twentieth century, and there has been a steady growth in the number of such cancer registries since. Through a series of milestones; population-based cancer registration reached its current status where 290 registries in 68 countries are included in the version X of Cancer Incidence in 5 Continents. Egypt started to be indulged in cancer registration on 1936 and reached the stage of National Population-based Cancer Registry program in 2007. This review describes the evolution of cancer registration from cancer surveys, hospital-based registration and finally population-based registries and how Egypt made advantage of this worldwide evolution of cancer registration, with its pitfalls, difficulties and solutions, to establish its national population-based cancer registry program (NCRPE). The paper also describes most relevant cancer statistics in Egypt and, for the first time, the most recent incidence rates obtained through Egypt NCRPE in 3 regions representing Upper, Middle and Lower Egypt with provisional estimate of cancer incidence rates stratified by gender for entire Egypt.

### Introduction

Cancer registries collect, store and process data on cancer patients. They represent the cornerstone of cancer control activities; helping decision makers, researchers and clinicians. Registries either covers all new cancer cases in a population of defined geographical area (population-based registries) or relates to available data in a hospital or groups of hospitals (hospital-based registries). [1]. The data collected, incidence statistics produced and knowledge gained from population-based registries help better understanding of the occurrence of cancer in the community. Hospital-based registries mainly focus on clinical care and hospital administration. In areas with no population based cancer registries; hospital-based registries produce proportions of different sites of cancer that help in assessing the public health requirements, and impact of control measures. [2]

To be useful, a population based cancer registry must fulfill some prerequisites that include a) collect information on all the cancers cases; b) should be able to distinguish the residents of the defined geographic area from persons residing outside; c) should have access to all the sources diagnosing and/or treating cancer in that area; d) should have enough identification parameters to detect multiple registration in different

hospitals; e) should have population figures by sex and age groups; and f) should be large enough to provide meaningful figures. Most registries cover populations between one to five million populations. [3]

Although the data on cancer occurrence can be collected through one-time community surveys, the availability of data on a continuous basis helps in understanding the trends in cancer occurrence. Furthermore, their variation according to demographic or life style characteristics of the population, and in relation to diagnostic facilities available in the specific region help in generation of hypothesis in etiology and prevention of various cancers. Continuous registration always helps in study of time trends and for evaluation of screening programs and other preventive measures. [4]

### Evolution of Cancer registration worldwide

Cancer registration has developed through time as a slow process with many failures and successes. This process passed through 3 successive, sometimes overlapping phases, namely cancer mortality and morbidity surveys, hospital-based registries and finally population-based registries. The literature has excellent reviews on the subject. [5-8] The current review focuses on the lessons gained from those failures and successes

and how they were reflected on cancer registration in Egypt.

### Ancient Historical events

**2500 B.C.** The earliest known descriptions of cancer appear in seven papyri, discovered and deciphered late in the 19<sup>th</sup> century and contain descriptions of cancer written around 1600 B.C. and are believed to date from sources as early as 2500 B.C. They provided the first direct knowledge of Egyptian medical practice. Two of them, known as the “Edwin Smith” and “George Ebers” papyri described “cancer” without mention of its name. Breast tumors were mechanically attacked by a “fire drill”. In general, doctors were advised “not to pretend this disease”, reflecting the “cancer taboo” that still exists till current days. These papyri were written in the era of Imhotep who was a physician and architect and became a god. He designed the Zoser step pyramid and there are claims that Imhotep himself was the Egyptian scribe who shared in writing these early medical papyri considered the earliest cancer records and basis of current registration. These papyri give the oldest known description and surgical treatment of cancer. They describe 8 cases of ulcers of the breast that were treated by cauterization, with a tool called "the fire drill." The writing says about the disease, "There is no treatment." [1,5,8]

Fig. 1: Edwin Smith Papyrus



**400 B.C. – 370 B.C. Etymology:** Hippocrates gave cancer its name as a disease. He described several kinds of cancer, referring to them with the Greek word *carcinus* (crab or crayfish). [1] This name comes from the appearance of the cut surface of a surgically removed malignant tumor of the breast with "veins stretched on all sides as the crab has its feet". Since it was against Greek tradition to open the body, Hippocrates only described and made drawings of outwardly visible tumors on the skin, nose, and breasts. Celsus (ca. 25 BC - 50 AD) translated *carcinus* into the Latin cancer, also meaning crab. Galen (2<sup>nd</sup> century AD) called benign tumors *oncos*, Greek for swelling, reserving Hippocrates' *carcinus* for malignant tumors. He later added the suffix -oma, Greek for swelling, giving the name carcinoma. [1]

**1629 A.D.** In the 16<sup>th</sup> and 17<sup>th</sup> centuries, it became more acceptable for doctors to dissect bodies to discover the cause of death. The British surgeon Percivall Pott identified in 1775 the first cause of cancer, describing that cancer of the scrotum is a common disease among chimney sweeps. The “Bills of Mortality” in England mentioned Cancer as a cause of death for the first time and paved the way to national cancer mortality and morbidity surveys that started 100 years later. [5,8]

### Early Attempts at National Cancer Registration:

**1728** “General Census of Cancer” was conducted in London and is the first known systematic collection of information on cancer. It was followed by other attempts in England and European countries to obtain nationwide cancer statistics. None of them is considered a success. They added very little knowledge about mortality and morbidity of the disease in different populations. [9] Nonetheless, similar attempts were repeated for almost 200 years.

**1900** Germany conducted a general survey on cancer in Hamburg followed by an attempt to register all cancer patients in Germany to know the point prevalence of cancer using questionnaires sent to every physician in the country.[10,11] Results were discouraging and reasons behind these failures include: unsatisfactory participation of reporting physicians,[12] absence of obligatory notification of cancer and difficulty to obtain country-wide coverage.[13]

**1937** Three national cancer surveys were conducted in 10 metropolitan areas in the United States of America to record all cancer cases in 3 calendar years: 1937-38, 1947-48 and 1969-71. As in Europe, The purpose of these cancer surveys was to get data about morbidity, mortality, and prevalence of different forms of cancer.[14,15] The third national cancer survey put an end to this approach. The fate of registered cancer patients could not be detected by one-time surveys and time trends were difficult to evaluate. Relation of cancer occurrence to demographic or life style characteristics of the population and generation of hypotheses related to etiology and risk factors could not be achieved. Long-term collection of standardized data also helps to evaluate the effect of screening and other prevention measures of various cancers.[2] Continuous registration was thus considered superior for studies of end results.[16]. Despite reports that advised against these cancer census and surveys that “ had left cancer problems much where they were”.[9,11]; similar surveys were attempted in the early 1940s in many countries in Europe to obtain country-wide cancer statistics.

### Early Attempts at Continuous Cancer Registration on regional level

**1926** The oldest example of a modern cancer registry started in Hamburg and got its official status in 1929. It started on private basis by 3 nurses who actively collected data of incident cancer cases through regular visits to hospitals and medical practitioners in

Hamburg. Duplicates were eliminated using patients' names. A card index was compared once a week with official death certificates.[17] This activity laid the foundation of important principles in population-based cancer registration: a) Importance of community collaboration, b) need for official coverage and collaboration of health authorities, c) active data collection with standardized methodology allows adequate rate of coverage, d) use of death certificates supplements collected morbidity statistics. The registry was the basis of the Hamburg Cancer Registry. [17]

**1927** Cancer registration was tried on pilot basis in Massachusetts. This attempt failed due to unsatisfactory participation and coverage.[18] It was then suggested that compulsory registration of all cancer cases should be introduced in USA. [19]

**1935** At almost the same time of the national cancer surveys, a registry was developed in Connecticut. The registry still exists as the first population-based cancer registry in the United States. [21]

**1937** At the same time of these cancer surveys; continuous recording of individuals with cancer began in Germany (Mecklenburg in 1937) to produce standardized cancer morbidity statistics.[20] This activity represented a remarkable milestone in methodology of cancer registration namely reporting by name and establishing a special statistical office ensured a remarkable rate of coverage and reasonable quality of data.[8] This successful experience was soon followed by similar registries in other areas of Germany. Unfortunately these activities were discontinued due to unfavorable political developments and not for improper methodology.[8]

These early attempts at cancer registration emphasize important issues in population based registration. a) The need for adequate patient identification. In this case the name was used for elimination of multiple registrations; a serious pitfall in population-based cancer registration. b) The importance of having a satisfactory rate of coverage. Passive data collection should be supplemented by active checks in the central statistical office. c) Sustainability should be carefully considered. Failures could be due to factors other than inadequate methodology.

#### **Development of population-based registries in Europe, USA and worldwide**

During the first half of the last century, many population-based registries were developed in Europe and USA. They all had variable degrees of epidemiological and ecological objectives; focusing not only on calculation of standardized morbidity and mortality statistics but also on helping in development of etiological hypotheses and evaluation of impact of screening and other cancer control measures aiming at eventual reduction in cancer mortality.[8]

**1941** The Connecticut Tumor Registry began operation on a statewide basis in 1941, registering cases

retrospectively back to 1935.[21,22] It was based on the establishment of a division of cancer research in the Connecticut State Department of Health "to make investigations concerning cancer, the prevention and treatment thereof and the mortality there from, and to take such action as it may deem will assist in bringing about a reduction in the mortality due thereto", thus emphasizing the importance for official interest and support of cancer registration. Further cancer registries were established in the early 1940s in the USA and Canada.[23,24]

**1942** The Danish Cancer Registry was founded under the auspices of the Danish Cancer Society and is the oldest functioning registry covering a national population. The task of the registry was the collection of data serving as a basis for: a) individual follow-up of patients, b) reliable morbidity statistics with a view to an accurate estimate of therapeutic results; and c) an accurate evaluation of variations in incidence of malignant neoplasm; secular as well as geographical, occupational etc.[7] factors that contributed to success of the registry included the support by the Danish Medical Association for reporting of cases by physicians on a voluntary basis, and the support of The National Board of Health that assisted giving full access to death certificates and all mortality data. [8]

**Mid-1940s**, cancer registries were started up in a number of countries. In many European countries and some states in USA, notification of cancer cases is compulsory for every hospital. Such legislation facilitated the collection of data for population based cancer registries. However, in most developing countries including Egypt, the provision of information was on voluntary basis or endorsed by ministerial decrees that in most cases are not enforced.

Almost 50 years ago, about 200 population-based cancer registries existed in various parts of the world, mostly in cancers with compulsory notification of cancer.[25] At the same time, many registries have been developed that cover registration of specific age groups or certain cancer sites (e.g., childhood tumors in Germany, UK, and Australia; and gastrointestinal cancers in France).[25] In addition to a progressively increasing numbers of hospital based cancer registration, there is a remarkable increase in number of population-based cancer registries that could be judged by the numbers of registries with results published in successive editions of Cancer Incidence in 5 Continents (CI5). Volume 1 of CI5 (1960 - 1962) published results from 32 registries in 29 countries. These numbers increased steadily to 255 registries in 60 countries in Volume 9 of CI5 (1998 - 2002) as shown in Table 1. [26] The numbers increased to 290 cancer registries in 68 countries (cancers diagnosed from 2003 to 2007) in Volume X of CI5. [27]

Table (1): Coverage in successive volumes of Cancer Incidence in 5 Continents, 1966 – 2007 [26,27]

Volume	Year of Publication	Registries	Populations	Countries	Period (approx.)
I	1966	32	35	29	1960-1962
II	1970	47	58	24	1963-1967
III	1976	61	79	29	1968-1972
IV	1982	79	103	32	1973-1977
V	1987	105	137	36	1978-1982
VI	1992	138	166	49	1983-1987
VII	1997	150	183	50	1988-1992
VIII	2002	186	214	57	1993-1997
IX	2007	255	300	60	1998-2002
X	2013	290	-	68	2003-2007

## Evolution of Cancer Registration in Egypt

### Early cancer statistics in Egypt:

Cancer statistics in Egypt were completely lacking till 1924 when Dolbey and Mooro from the Royal School of Medicine in Cairo, published an article in the *Lancet* on cancer morbidity in Egypt.[28] Statistics are given as relative frequencies based upon data of Kasr El-Aini hospital that was, by that time, a 400 surgical-bed hospital with a yearly inpatient population of 13,000 draining patients from all the country. The study covers 671 malignant cases collected in four years representing less than 2% of hospitalized patients. It is a model of an “Analytical Epidemiological” study that tries to formulate etiological hypotheses based on hospital registry results. The methodology used and the resources available by that time do not allow valid interpretation of etiological hypotheses. Nonetheless, conclusions of the authors regarding etiology are interesting reflecting how cancer was viewed almost a century ago and how statistics could be used to formulate etiological hypotheses. Interestingly some of these hypotheses are still being challenged,

The proportions of cancer sites classified according to authors’ views are shown in table (2). The diagnoses given reflect how hospital based registration is affected by available diagnostic facilities in the hospital by the time of data collection. Cancer of bones, skin and skin appendages are relatively common... “ and may be attributed, as far as the skin is concerned, to the actinic rays of the sun in Egypt”. The authors also discussed the relation between schistosomiasis and bladder cancer. They stated that “there is no causal relation between cancer and parasitic diseases. .... the incidence of cancer in relation to Bilharzia of the bladder suggests that, only in an alkaline-infected medium, such as the stagnant urine of cystitis in Bilharzial bladder does the irritation of ova produce cancerous changes.”. Recent studies emphasized the relation of urinary schistosomiasis and urinary bladder cancer.[29] Dolbey and Mooro suggested a protective effect of Egyptian diet against cancer, a hypothesis currently believed to be valid for many populations around the Mediterranean Basin.[30] Relation between cancer and development was hypothesized in Dolbey and Mooro article. The authors stated that “the industrial revolution of the

nineteenth century has passed by Egypt” and that “rural Egypt has hardly changed in 3,000 years”. Recently, the Human Development Index had been investigated as a predictor of cancer incidence in different populations and a model have been developed based upon results of Mediterranean populations.[31]

Table (2): Topographical Diagnosis of Cancer Reported by Dolbey and Mooro in Cairo, 1924 [28]

	Cases	Percent
<b>Skin and Bone:</b>		
Epithelioma of the Scalp	30	4.5
Sarcoma of Skull Bones	10	1.5
Sarcoma of Long Bones	19	2.8
Sarcoma of Upper Jaw	23	3.4
Sarcoma of Lower Jaw	16	2.4
Rodent Ulcer	11	1.6
<b>Mouth and Upper Aero-Digestive:</b>		
Lip	31	4.6
Tongue	25	3.7
Esophagus	6	0.9
Larynx	29	4.3
<b>Female Malignancy:</b>		
Breast	75	11.2
Cervix	19	2.8
Body of Uterus	6	0.9
<b>Digestive Organs:</b>		
Stomach	8	1.2
Liver (second arise)	4	0.6
Gall Bladder	10	1.5
Rectum	7	1.0
<b>Urinary Organs:</b>		
Urinary Bladder	51	7.6
<b>Miscellaneous:</b>		
Cerebral	11	1.6
Thyroid	15	2.2
Prostate (the report mentioned that it was a very common tumor without mention of frequency)		

### Evolution of hospital-based registration:

Hospital-based registration, mainly in Kasr El Aini hospital, remained to be for some time, the main, if not the sole source of cancer data. Registration continued as routine activity of the hospital medical records room and became more cancer oriented with the establishment of a center for radiotherapy and nuclear medicine (NEMROCK) in the Faculty of Medicine, Cairo University. Several NEMROCK publications covered characteristics of individual sites of cancer and results of clinical trials and survival studies.[32-34]

In 1959, almost 30 years after the first cancer statistics were published by Dolbey and Mooro[28] , a symposium on cancer was organized in Cairo. As a result, two cancer registries were established; one in Cairo and the other in Alexandria.

**The Alexandria Cancer Registry**

Alexandria registry (ACR) is still operational as the first cancer registry in Egypt. It is a central hospital-based cancer registry affiliated to the Medical Research Institute of Alexandria University. This affiliation with registration built in the administrative hierarchy of the institute is the most important reason behind sustainability of the registry. The registry passively collects data about cancer patients diagnosed and treated in Alexandria in hospitals of Alexandria University, health insurances, health care organization and ministry of health. Passive data collection from this multitude of institutions, in absence of compulsory notification carries a serious risk of inadequate coverage of all incident cancer cases.[1]

Latest available statistics of proportions of different sites of cancer (1972–2004) are shown in table (3).[35] The method of site classification does not allow adequate interpretation according to standard international classification of cancer. However, data emphasize the high frequency of bladder cancer in males (16.9%) and breast cancer in females (40.9%).

Grouping of other sites do not allow adequate interpretation of individual sites of cancer especially liver cancer which is of serious importance in recent years[36] and for which historical data, even hospital-based, are important for understanding size of the problem.

**The Cairo Cancer Registry:**

The Cairo registry was initiated with partial support by the WHO. It focused on major Cairo hospitals and was mainly concerned by record keeping of cancer cases. A report was presented in the First International Symposium on Bilharziasis in 1962. This report deals with 734 cancer patients giving statistics of what was called “Organ Incidence of some Solid Tumors in Males and in Females”. The report emphasizes the highest relative frequency of urinary bladder cancer in males (11.0%) and breast cancer in females (35.1%) (Table 4).[37] The registry failed prematurely due to administrative and financial difficulties and was revived later as the Cancer Registry for the Metropolitan Cairo Area (CRMCA).[38]

Table (3): Frequency distribution by sex and age, of malignant cases registered by Alexandria Cancer registry from 1972 to 2004 [35]

Site	Total		Gender *				M:F Ratio
	Frequency		Male		Female		
	Absolute	Relative	N	%	N	%	
Oral Cavity and Pharynx	2928	3.9	1889	5.0	1029	2.7	1.8
Digestive Organs and Peritoneum	10630	14.0	6694	17.7	3936	10.3	1.7
Respiratory system	6725	8.8	5453	14.4	1272	3.3	4.3
Bone	1594	2.0	950	2.5	644	1.7	1.4
Soft tissue	1295	1.7	702	1.9	593	1.6	1.2
Skin	1219	1.6	763	2.0	456	1.1	1.6
Breast	16199	21.5	592	1.6	15607	40.9	0.04
Genital organs	5081	6.6	1283	3.4	3798	9.9	0.3
Urinary organs	8118	10.6	6407	16.9	1711	4.5	3.7
Lymphatic and hematopoietic	11838	15.6	7312	19.3	4526	11.9	1.6
Others and unspecified	10401	13.7	5796	15.3	4605	12.1	1.3
Total	76028	100	37841	100	38177	100	1.0

\*Sex not mentioned in 10 cases

Table (4): Incidence of some solid tumors Reported by Aboul Nasr, 1962 [37]

	Percent
Frequency among males	
- Bladder	11.0%
- Anal canal	8.3%
- Skin	7.9%
- Lung and Brain	4.0%
Frequency among females	
- Breast	35.1%
- Uterus	19.0%
- Ovary	5.4%
- Bladder	3.9%
- Skin	3.9%

**The Cancer Registry for the Metropolitan Cairo Area (CRMCA)**

The Cancer Registry for the Metropolitan Cairo Area was initiated as a PL-480 project in 1972; 2 years after inauguration of the National Cancer Institute, Cairo University as a regional hospital-based cancer registry for the Metropolitan Cairo Area. [39] Major university hospitals in Metropolitan Cairo area reported their incident cancer cases. Some private hospitals and clinics shared in supply of their data on voluntary basis. It covered all patients and was not limited to residents of the Metropolitan Cairo area. The long-term objective of the project was not achieved in absence of compulsory notification of cancer, a major handicap for cancer registration. The project ended in 1988 due to

lack of funds and absence of official administrative and financial support by health authorities. Lack of a strategy for sustainability is another serious handicap of continuous cancer registration, worldwide and not only in developing countries especially if the registry is not built in the hierarchy of the hosting institution. At the end of the project, a publication was issued including statistics of incident cancer cases as proportions (Table 5) [38] Reporting was based on body systems involved and not individual sites according to ICD system; an issue that complicates historical comparisons and interpretations. Rates could not be calculated due to absence of adequate numerator and lack of corresponding population denominators. Nonetheless, the relative frequencies given indicate that breast cancer is the commonest site of cancer in females (35.1) and urinary organs in males (11.0); a finding common to all hospital-based statistics of that time.

**Registry of the National Cancer Institute, Cairo University**

The Registry of the National Cancer Institute, Cairo University started with the establishment of the institute in 1970 as an activity of the medical records room that was manually operated till 1989 when a United Nations Development Project (UNDP) supported the development of a computerized hospital information system after the end of the CRMCA project. Statistics of cases accessed to the registry during 2002-2003 are shown in Table (6).[39] Results indicate the high frequency of cancer of the urinary bladder (16.2%) followed by cancer of the liver and intrahepatic ducts

(11.3%) and lymphomas (10.8%); findings that support the general impressions of clinicians with respect to increase in liver cancer, decrease in bladder cancer and a special importance of lymphomas. Results support the high frequency of breast cancer (37.5%) that by far exceeds all other cancers. A study is currently underway to describe the changing pattern of cancer proportions in NCI. As with all hospital-based registries, statistics are limited to relative frequencies. Despite the big size of NCI series; incidence rates that express the number of new cancer cases per 100,000 populations could not be calculated [39] Reports of more recent statistics are unavailable in the literature.

Another report was published by El Attar based upon data of the National Cancer Institute registry. Results are shown in figures 1-4 for years 2002–2004.[40] For all sites of cancer, all ages and 2 genders together, the 5 most common cancers are those of the breast, urinary bladder, liver, and lymphatic and hematopoietic malignancies (Fig. 2). Among males, the 5 most common cancers are those of the urinary bladder, liver, lymphatic and hematopoietic and lung (Fig. 3). For females, these cancers are those of the breast, lymphatic and hematopoietic, urinary bladder, colo-rectum and liver (Fig. 4). The report also describes the proportions of different sites of cancer among patients less than age of 20 years (Fig. 5). The report does not provide data that allow separation of the 2 age groups; pediatrics and adolescents, thus hindering standard evaluation of cancer below the age of 15 years.

**Table (5): Site distribution of cancer cases registered by the Cancer Registry for Metropolitan Cairo area, 1973-1982 [38]**

Site	Males		Females	
	Number	%	Number	%
Oral Cavity and Pharynx	1588	8.6	621	5.0
Digestive Organs and Peritoneum	2129	11.5	1015	8.2
Respiratory System	1967	10.6	272	2.2
Bones	715	3.9	422	3.4
Soft Tissues	552	3.0	330	2.7
Skin	1059	5.7	556	4.5
Breast	246	1.3	3577	29.0
Genital Organs	274	1.5	1705	13.8
Urinary Organs	5286	28.5	1201	9.7
Lymphatic and Hematopoietic	2655	14.3	1472	11.9
Other and Unspecified Sites	2078	11.2	1341	10.9
All sites	18549	100.0	12329	100.0

Table (6): Proportions of most common cancers registered in the National Cancer Institute registry, Cairo University for the years 2002- 2003 [39]

Males		Females	
Urinary Bladder	16.2%	Breast	37.5%
Liver & intrahepatic bile ducts	11.3%	Lymphoma	6.4%
Lymphoma	10.8%	Leukemia	5.9%
Leukemia	8.1%	Urinary Bladder	4.4%
Lung	6.1%	Ovary	4.0%
Colorectal	4.2%	Colorectal	3.8%
Soft tissue	3.7%	Liver & intrahepatic bile ducts	3.7%
Skin	3.3%	Cervix	2.7%
Larynx	3.0%	Soft tissue	2.7%
Bone & joints	2.8%	Thyroid	2.2%
Prostate	2.6%	Skin	2.0%
Pancreas	2.4%	Bone & joints	1.8%

Fig. (2): Most Common Sites of cancer for all ages, both Genders together, NCI Registry, 2002-2004 [40]

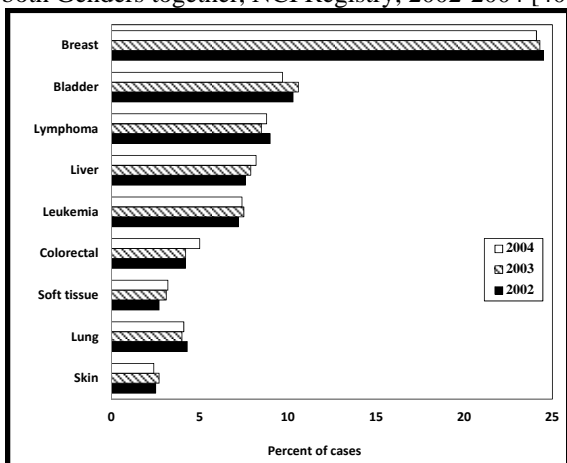


Fig. (4): Most Common Sites of cancer among females, all ages, NCI Registry, 2002-2004 [40]

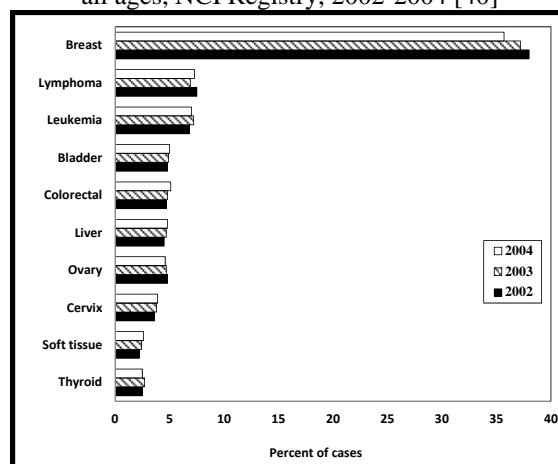


Fig. (3): Most Common Sites of cancer among males, all ages, NCI Registry, 2002-2004 [40]

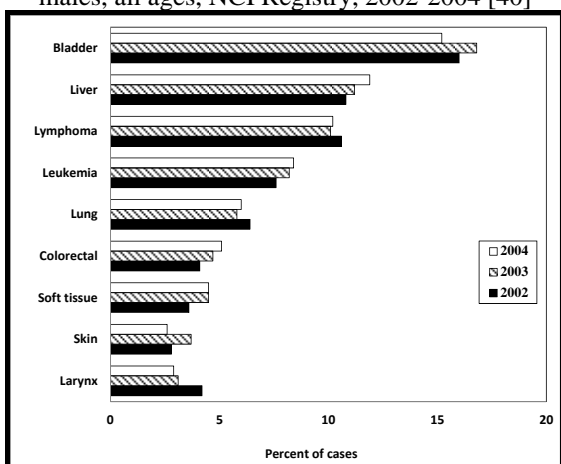
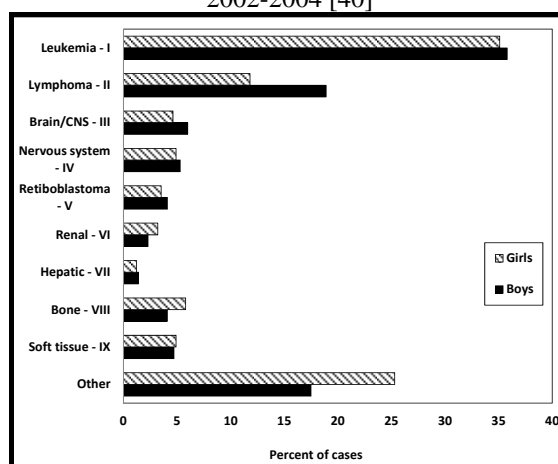


Fig. (5): Most Common sites of cancer among patients less than age 20 years. (n=862), NCI Registry, 2002-2004 [40]



### Attempts at developing Population-Based Cancer Registries

Two attempts were made to initiate population-based cancer registration, one in Fayoum governorate, a sort of oasis south to Cairo, and the other in Fakous, Sharkia in east Delta.

#### *The Fayoum Cancer Registry:*

Establishing the Fayoum Population-based Cancer Registry was attempted in the early sixties as a Ministry of Health activity in collaboration with the World Health Organization. Fayoum was selected being a sort of oasis, close to Cairo with an assumed relatively stable population that could be well defined. It was also assumed that patients' mobility between different healthcare delivery centers could be put under control thus ensuring adequate coverage of the population. Unfortunately this idea was not realized except after twenty years as the Fayoum satellite of the Cancer Registry for the Metropolitan Cairo Area. It was planned as a trial for population-based cancer registration. This pilot registry proved the feasibility of establishing a population-based cancer registry in Egypt.[41] However, methodology was still premature and calculation of incidence rates was not attempted. Results are presented as proportions of cancers affecting body systems and some individual sites without definition of a coding system (Table 7).

Table (7): Site distribution of malignant cases reported from Fayoum governorate during 1984 [41]

	Cases	Percent
Oral Cavity and Pharynx:	11	3.4
Tongue	1	0.3
Mouth	1	0.3
Hypopharynx	9	2.7
Digestive organs and Peritoneum:	14	4.2
Esophagus	9	2.7
Stomach	2	0.6
Colon	1	0.3
Rectum	2	0.6
Respiratory System:	7	2.1
Nose	1	0.3
Larynx	6	1.8
Bone and Soft Tissue:	6	1.8
Skin:	22	6.7
Breast:	17	5.2
Female Genital Organs:	11	3.3
Cervix	3	0.9
Ovary	8	2.4
Male Genital Organs:	2	0.6
Prostate	1	0.3
Testis	1	0.3
Urinary Bladder:	185	56.1
Lymphatic and Hematopoietic:	41	15.4
Hodgkin Disease	15	4.5
Other Lymphomas	16	4.8
Leukemias	20	6.1

### *The East Delta (Sharkeya governorate) Population-based Cancer Registry.*

The main centers that diagnose and treat cancer patients in Sharkeya governorate in East Delta were involved in a study in 1994 conducted by Fakkous Cancer Center; a rural NGO center for treatment of cancer with WHO/UICC support. Crude incidence of 60/ 100,000 population is recorded. Table (8) depicts the distribution of cases by site of tumor.[42] This relatively low incidence suggests incomplete case ascertainment, but is a nice example of the role that could be played by non-governmental institutions in cancer registration on voluntary basis. Sustainability of the registry was beyond center capability. This pioneer activity was discontinued with end of funding, a common reason behind failure of most registries.

Table (8): Site distribution of malignant cases reported from Sharkeya governorate during 1994 [42]

	Cases	Percent
GIT	319	18.19
Urinary	281	16.02
Hematopoietic – lymphatic	305	17.39
Bone	67	3.82
CNS	60	3.42
Breast	245	13.97
Female genital	42	2.39
Soft tissue	91	5.19
Respiratory	192	10.95
Skin	63	3.59
Endocrine	38	2.17
Others	51	2.91

### *The Gharbiah Population-based Cancer Registry:*

This is the first population-based cancer registry covering the Gharbiah Governorate in the middle of the delta. The registry was established in 1998 within the context of the Joint Cancer Registration Project of the Middle East Cancer Consortium (MECC).[43] Headquarters of the registry are in Tanta Cancer Center of the Ministry of Health; Tanta being the capital city of the Gharbiah Governorate about 100 kilometers north of Cairo. Registration began in 1999. The registry records all incident cancer cases among the approximately 3.4 million residents of Gharbiah diagnosed or managed within or outside the Gharbiah Governorate.[43] The registry was jointly sponsored by MECC and Egypt Ministry of Health. MECC funding stopped in 2007. The registry was then included as one of the peripheral registries of the National Cancer Registry Program of Egypt. The findings of the registry up to 2007 were published as project reports [44] and in *Cancer Incidence in 5 continents, Volume IX* [26] and *Volume X* [27]. Registry activities stopped in 2007 and Egypt returned to square 1 without any source of data that could be used to calculate incidence rates.



## The National Cancer Registry Program of Egypt (NCRPE)

The gap was soon filled by the National Cancer Registry Program of Egypt (NCRPE) established in 2007 through a protocol of cooperation between 3 ministries of Communication and Information Technology (MCIT), Health (MOH), and Higher Education and Scientific Research (MHE). The protocol aimed to develop a national population-based cancer registry for calculation of incidence rates as a first phase that ended 2014, to be followed by inclusion of hospital-based cancer registries to achieve a public domain cancer database that could help researchers and policy makers [45].

The results of this program was published in 2014 [46] and will be covered in the remaining part of this review article.

### Material and Methods:

For registration purposes, Egypt was stratified into 3 geographical strata (regions) namely Lower Egypt (north of Cairo), Middle Egypt (south of Cairo) and Upper Egypt (further south, reaching the southern frontier of the country). The current report covered three districts (governorate), each representing one of the 3 regions namely Damietta (Nile delta), Minia (Middle Egypt) and Aswan (Upper Egypt). A population-based registry was established the Ministry of Health Cancer Center in each of the 3 governorates. The methodology used by the registry is detailed in another publication. [46]

The main features are active data collection by trained MD abstractors using standard data set; data collection that covered cancer patients who are residents of the governorate selected and diagnosed/treated in major cancer care facilities within and outside the governorates to maximize ascertainment of cancer patients used as numerator for calculation of incidence rates. Death registers in local health directorates are regularly checked for cancer deaths from the 3 governorates. A special feature of the registry is online data entry using a software that allows for validity checks, duplicate elimination and data analysis. The database is centralized in the Ministry of Communication and Information Technology server with back-ups in the Ministry of Health and the National Cancer Institute. Registration cover all invasive cancers (behavior code /3), in situ breast cancer (topography code C50.\_ and behavior code /2), in situ urinary bladder cancer (topography code C67.\_ and behavior code /2) and borderline tumors of the brain (topography code C71.\_ and behavior code /1) [47].

The latest registry report analyzes data from Aswan (2008), Minia (2009) and Damietta (2009-2011) that represent the 3 geographical strata of Egypt. Crude, age-specific and world population age-standardized incidence rates are calculated and expressed /100,000 population for each of the 3 strata. [27, 47, 48].

A computer model was developed and used to calculate national rates based on the regional incidence rates. These rates when applied to the total population of Egypt lead to number of incident cancers and crude

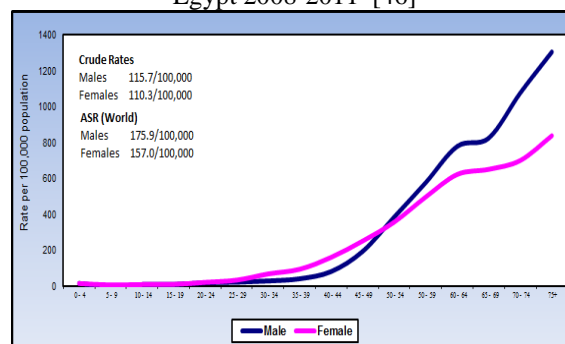
rate and ASR (world) at the national level and used for projections up to 2050. [49, 50] Steps of calculations are detailed in another publication. [46]

## Results

### National Incidence Rates and proportions:

The crude incidence rates on the national level for all sites excluding non-melanoma skin cancer (C44) were 113.1/100,000 (both sexes), 115.7/100,000 (males) and 110.3/100,000 (females). The age-standardized rates (world) were 166.6/100,000 (both sexes), 175.9/100,000 (males) and 157.0/100,000 (females) as shown in table 9. Proportions, crude, age standardized incidence rates and detailed age-specific rates of cancer sites according to ICD-10 format are shown in tables 10 and 11 for individual sites of cancer and for all sites together by gender. The age-specific rates are represented graphically in figure 6 for all cancers and figures 7-9 for breast, liver and bladder cancer as examples of some of the more frequent cancer sites.

Fig. (6): Calculated age specific incidence rates for Egypt 2008-2011 [46]



# Incidence rates do not include non-melanoma skin cancer

Fig. (7): Calculated age specific incidence rates for liver cancer in Egypt 2008-2011 [46]

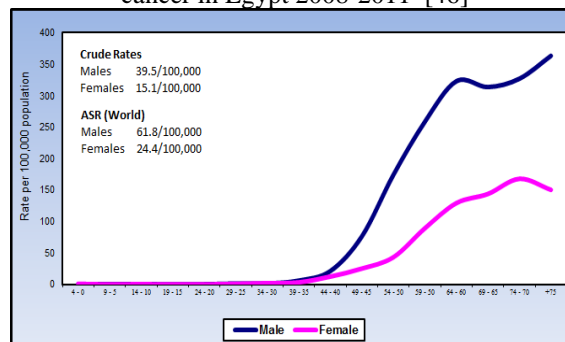


Fig. (8): Calculated age specific incidence rates for breast cancer in Egypt 2008-2011 [46]

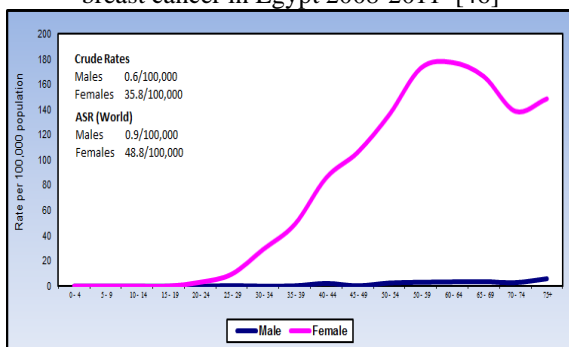


Fig. (10): Estimated number of cases in Egypt (2013-2050) [46]

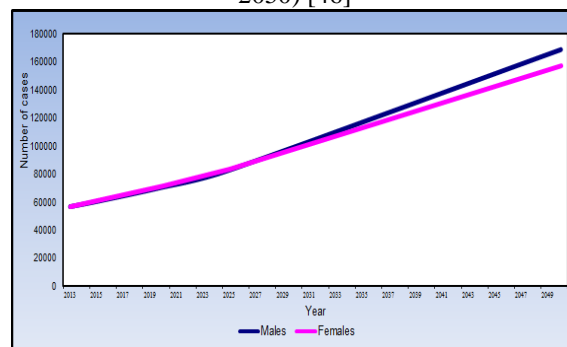


Fig. (9): Calculated age specific incidence rates for urinary bladder cancer in Egypt 2008-2011 [46]

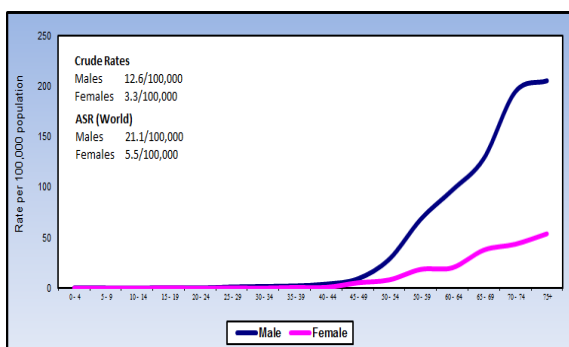


Fig. (11): Estimated number of cases in Egypt (2013-2050) and causes of the increase in cases [46]

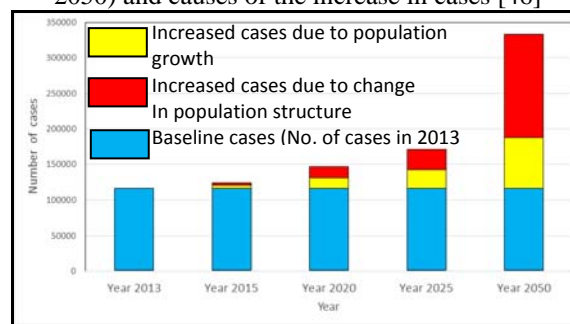


Table 12 depicts the proportions and rates of the most frequent cancer sites by gender. There was predominance of liver, breast and bladder cancer that represented approximately 46% of all cancers. Liver and bladder cancers represented approximately 44% of cancer in males. In females, breast and liver cancer occupied the top ranks accounting for around 45% of all cancers.

Estimated number of incident cancer cases 2013-2050:

During the period 2013–2050, population of Egypt is expected to increase to approximately 160% the 2013 population size. Applying the current age-specific incidence rates to successive populations would lead to a progressive increase in number of incident cases from 114,985 in 2013 to 331,169 in 2050; approximately 290% of 2013 incidence (table 13 and figure 10). This increase reflected both population growth and demographic change mainly due to ageing of population. Population growth alone would increase the number of incident cases by 55.2% in 2015. This fraction progressively decreased to become 32.8% in 2050. The fraction due to ageing gradually increased to reach 67.2% in 2050 (table 14 and figure 11).

Frequencies and Incidence Rates / geographical strata:

The frequencies of individual sites of cancer and their incidence rates by geographical stratum and sex are detailed in tables 15 and 16. Table 17 depicts the most common sites of cancer that accounted for approximately 3/4 of cases. For the 2 sexes together, the top 2 ranks in the 3 regions were liver and breast cancer. The proportions and ASR of liver cancer were highest in Lower Egypt (29.6% and 56.8/100,000), less in Middle and least in Upper Egypt (8.2% and 13.1/100,000).

Among males in the 3 regions, liver and bladder cancer occupied the top 2 ranks. The proportion and ASR of liver cancer were highest in Lower Egypt (41.7% and 81.0/100,000) and lowest in Upper Egypt (11.8% and 17.5/100,000). Cancer of the lung occupied the third or fourth ranks representing 5–7% of cancers and Non-Hodgkin lymphoma was among the 5 most common cancers in Lower Egypt only having a proportion of 6.0% and ASR 10.3/100,000.

Among females, the pattern in the 3 regions was dominated by the high frequency of breast cancer and liver cancer. Proportion of liver cancer was highest in Lower Egypt (16.4%), less in Middle Egypt and lowest in Upper Egypt (8.9% and 5.1% respectively).

Table (9): Incidence rates of Cancer in Egypt (/100,000 populations) classified by region and sex for all cancer sites with and without non-melanoma skin cancer (C44) [46]

	Females				All		Male : Female Ratio	
	Crude Rate (95% CI)	ASR (95% CI)	Crude Rate (95% CI)	ASR (95% CI)	Crude Rate (95% CI)	ASR (95% CI)	Crude Rate	ASR
<b>All sites</b>								
• Upper Egypt	97.1 (89.1-105.8)	142.8 (133.1-153.2)	116.9 (108.1-126.5)	167.1 (156.5-178.4)	107.0 (101.0-113.3)	155.0 (147.7-162.6)	0.8:1	0.9:1
• Middle Egypt	109.7 (105.4-114.1)	170.0 (164.7-175.5)	95.9 (91.1-100.2)	132.1 (127.4-137.0)	102.9 (100.0-106.0)	151.1 (147.5-154.8)	1.1:1	1.3:1
• Lower Egypt	138.5 (133.2-144.0)	191.8 (185.6-198.2)	131.7 (126.5-137.2)	173.3 (167.3-179.6)	135.2 (131.4-139.1)	182.6 (178.2-187.1)	1.1:1	1.1:1
• Calculated rates of Egypt	117.3 (116.0-118.6)	178.5 (176.9-180.2)	111.7 (110.4-113.0)	159.1 (157.6-160.7)	114.5 (113.6-115.5)	169.0 (167.9-170.2)	1.1:1	1.1:1
<b>All sites (excluding non-melanoma skin cancer C44)</b>								
• Upper Egypt	96.0 (88.1-1104.6)	141.0 (131.4-151.4)	115.1 (106.3-124.5)	163.9 (153.4-175.1)	105.5 (99.5-111.8)	152.5 (145.5-160.1)	0.8:1	0.9:1
• Middle Egypt	108.0 (103.8-112.3)	167.2 (162.0-172.6)	94.9 (90.9-99.1)	130.7 (126.0-135.6)	101.6 (98.7-104.6)	149.0 (145.5-152.6)	1.1:1	1.3:1
• Lower Egypt	136.7 (131.5-142.2)	189.1 (182.9-195.5)	130.1 (124.8-135.5)	170.9 (164.9-177.1)	133.5 (129.7-137.3)	180.0 (175.7-184.4)	1.1:1	1.1:1
• Calculated rates of Egypt	115.7 (114.4-117.0)	175.9 (174.3-177.5)	110.3 (109.0-111.6)	157.0 (155.4-158.5)	113.1 (112.2-114.0)	166.6 (165.5-167.8)	1:1	1.1:1

Table (10): Calculated age Specific Incidence Rates, Crude Rates and ASR (World), Males, Egypt 2008-2011 [46]

Site	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	Crude Rate	ASR	%
Lip	-	-	-	-	-	-	0.5	-	0.3	-	0.8	1.4	0.6	1.8	8.7	1.5	0.3	0.4	0.23%
Tongue	-	-	-	-	-	-	-	-	0.3	1.4	1.3	3.1	1.9	1.8	-	2.2	0.3	0.5	0.27%
Mouth	-	-	-	0.1	-	-	0.2	0.5	0.8	1.5	2.5	4.6	0.6	2.6	1.4	-	0.5	0.6	0.41%
Salivary glands	-	-	0.1	-	0.1	-	-	0.2	-	-	0.7	1.4	2.0	2.6	4.5	5.2	0.3	0.5	0.25%
Tonsil	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	0.01%
Other oropharynx	-	-	-	-	0.1	-	-	-	-	-	0.4	0.6	-	0.8	2.8	-	0.1	0.1	0.07%
Nasopharynx	-	-	-	-	0.3	-	-	0.2	-	-	3.4	0.4	-	3.6	-	5.2	0.3	0.4	0.26%
Hypopharynx	-	-	-	0.1	-	-	-	-	0.3	-	0.9	1.4	0.6	-	1.4	1.5	0.2	0.2	0.13%
Pharynx unspec.	-	-	-	-	-	-	0.2	-	-	1.0	-	-	-	-	1.5	0.1	0.1	0.1	0.07%
Esophagus	-	-	-	-	0.3	0.2	0.3	-	1.4	1.8	6.1	4.1	11.2	10.8	24.4	14.7	1.4	2.3	1.20%
Stomach	-	0.1	0.1	-	0.3	0.2	0.7	0.5	2.0	2.6	5.0	6.0	11.9	6.4	21.5	14.1	1.5	2.3	1.26%
Small intestine	0.1	-	-	-	-	-	0.5	0.5	0.6	0.3	0.4	1.4	-	0.8	-	1.5	0.2	0.3	0.17%
Colon	-	-	-	0.1	0.3	0.7	2.1	2.5	1.9	6.5	14.2	11.0	19.8	18.9	31.5	32.6	3.1	4.7	2.63%
Rectum	-	-	-	0.1	0.7	1.2	0.7	1.2	2.2	2.0	3.4	4.1	3.4	2.6	8.7	1.5	1.0	1.3	0.84%
Anus	-	-	-	-	0.3	-	0.5	0.5	0.6	0.6	-	2.1	2.0	1.0	-	-	0.3	0.3	0.24%
Liver	0.3	0.4	0.4	0.2	0.3	1.3	1.4	6.1	21.2	76.3	174.2	258.7	323.1	313.8	327.1	363.5	39.5	61.8	33.63%
Gallbladder etc.	-	-	-	-	-	0.4	-	0.5	0.6	0.6	1.0	1.0	5.9	1.0	4.7	7.4	0.5	0.7	0.40%
Pancreas	-	-	-	-	-	-	1.3	0.2	2.5	7.7	9.0	14.9	25.3	26.4	12.7	19.3	2.7	4.2	2.31%
Nose, sinuses etc.	-	0.1	-	-	-	-	-	0.5	0.3	-	1.2	-	-	-	1.4	8.2	0.2	0.3	0.17%
Larynx	-	-	-	-	-	-	0.2	-	2.1	2.6	6.6	6.8	18.2	11.0	23.2	32.5	1.9	3.1	1.58%
Trachea, Bronchus, Lung	0.1	-	0.1	0.4	0.8	1.2	1.2	3.0	3.8	12.5	19.3	39.1	49.0	49.3	73.9	76.1	6.7	10.4	5.69%
Other Thoracic organs	0.3	-	-	0.1	0.2	0.2	-	-	0.6	1.2	2.8	3.5	3.2	7.1	9.8	8.9	0.8	1.2	0.65%
Bone	0.1	1.2	1.4	0.7	1.8	0.8	1.0	1.0	1.4	2.0	4.2	3.7	13.9	8.6	8.4	15.6	1.9	2.5	1.62%
Melanoma of skin	-	-	-	-	0.1	0.2	-	-	0.6	-	-	0.4	-	1.8	2.8	-	0.1	0.2	0.11%
Other skin	0.6	-	0.1	-	0.3	0.4	0.5	0.5	1.1	0.6	3.2	4.5	14.0	14.2	18.5	30.4	1.6	2.6	1.35%
Mesothelioma	-	-	-	-	-	-	-	-	-	0.8	0.5	1.4	-	0.8	-	-	0.1	0.2	0.10%
Kaposi sarcoma	-	-	-	-	-	-	0.2	-	-	-	1.1	-	1.3	0.8	1.4	-	0.1	0.2	0.10%
Connective, Soft tissue	0.3	0.1	0.1	0.6	1.1	2.0	1.3	1.3	3.1	3.5	3.6	8.3	4.6	6.1	18.8	2.2	1.7	2.2	1.47%
Breast	-	-	-	-	-	0.4	-	0.3	2.2	0.3	2.5	3.1	3.4	3.6	2.8	5.9	0.6	0.9	0.51%
Penis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Prostate	-	-	-	-	-	0.2	0.3	-	0.3	1.3	4.1	11.2	24.6	47.5	90.3	216.5	5.0	9.3	4.27%
Testis	-	0.1	-	-	1.1	1.2	0.7	1.5	0.6	0.6	0.4	0.4	0.6	-	1.4	2.2	0.5	0.5	0.43%
Other male genital	-	-	-	-	-	-	-	-	-	-	0.4	-	-	0.8	1.4	-	-	0.1	0.04%
Kidney	1.2	0.1	-	-	-	0.2	0.2	0.5	0.5	3.4	6.9	9.8	7.9	16.9	14.1	22.3	1.8	2.7	1.53%
Renal pelvis	-	-	-	-	0.1	-	-	0.2	0.6	0.3	0.4	1.9	2.0	1.8	2.8	4.4	0.3	0.4	0.25%
Ureter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	3.0	-	0.1	0.04%
Bladder	0.1	0.1	-	0.3	0.1	1.2	1.7	2.2	4.0	9.2	28.7	68.4	97.2	128.6	194.8	205.6	12.6	21.1	10.71%
Other urinary organs	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-	0.01%
Eye	0.5	0.3	-	-	-	-	-	-	-	0.4	0.4	1.8	0.6	-	-	-	0.2	0.2	0.16%
Brain, Nervous tissue	2.9	3.0	1.8	1.7	1.5	3.3	4.2	6.8	7.3	7.3	15.5	14.5	27.2	30.4	46.7	91.4	6.4	9.0	5.48%
Thyroid	-	-	-	-	0.2	0.8	1.2	1.9	1.1	3.2	4.5	4.3	6.6	8.7	3.0	-	1.1	1.5	0.95%
Adrenal gland	0.3	0.1	-	-	-	-	-	-	-	-	-	0.6	-	0.8	1.4	-	0.1	0.1	0.08%
Other endocrine	0.5	-	0.1	-	0.3	-	-	0.5	0.3	1.0	0.4	1.3	0.6	-	2.8	-	0.3	0.4	0.25%
Hodgkin disease	0.5	1.7	1.7	1.5	1.5	1.4	-	0.2	1.7	2.5	2.0	1.4	5.3	6.1	2.8	1.5	1.5	1.7	1.29%
Non-Hodgkin lymphoma	1.1	1.2	1.5	1.0	2.2	2.5	2.1	3.6	5.8	16.6	24.4	36.0	33.8	29.5	38.1	28.8	6.4	8.8	5.48%
Immunoproliferative dis.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Multiple myeloma	-	-	-	-	-	0.5	0.5	1.1	0.4	3.1	3.9	8.0	0.8	2.8	2.9	0.6	0.9	0.9	0.53%
Lymphoid leukemia	3.9	2.2	0.7	0.2	1.4	-	0.7	1.5	1.1	1.8	1.5	5.0	6.0	8.9	5.6	-	1.8	2.1	1.50%
Myeloid Leukemia	0.8	0.4	0.3	0.8	1.0	0.4	1.1	0.7	1.4	1.8	4.2	3.3	3.4	2.6	4.5	1.5	1.1	1.3	0.96%
Leukemia unspec.	1.0	1.2	1.1	0.6	2.1	2.2	1.7	0.5	2.1	4.7	1.8	6.0	8.0	3.5	7.3	20.8	2.1	2.6	1.80%
Other & unspecified	2.4	2.8	0.9	1.7	1.3	1.8	3.3	3.1	6.1	15.0	22.9	25.2	44.9	54.7	64.7	83.6	7.6	11.2	6.52%
All sites Total	17.1	15.4	10.5	10.5	20.1	23.9	30.6	42.8	83.8	195.4	389.6	582.4	793.5	840.2	1096.1	1335.6	117.3	178.5	100.00%
All sites but C44#	16.6	15.4	10.4	10.5	19.8	23.5	30.0	42.4	82.7	194.9	386.4	577.9	779.5	826.0	1077.5	1305.3	115.7	175.9	98.65%

# Incidence rates do not include non-melanoma skin cancer

Table (11): Calculated age Specific Incidence Rates, Crude Rates and ASR (World), Females, Egypt 2008-2011 [46]

Site	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	Crude rate	ASR	%
Lip	-	-	-	-	-	-	-	-	0.3	1.4	0.8	0.5	1.6	0.8	1.3	4.7	0.2	0.4	0.21%
Tongue	-	-	-	-	-	0.5	-	-	-	0.4	0.4	1.2	0.7	-	-	15.4	0.3	0.5	0.26%
Mouth	-	0.1	0.1	-	-	-	-	-	0.3	1.0	0.8	0.5	1.4	2.9	6.1	2.7	0.3	0.5	0.28%
Salivary glands	-	-	0.3	-	-	-	-	-	-	0.7	-	2.9	0.7	2.9	-	-	0.2	0.3	0.18%
Tonsil	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	1.4	-	0.1	0.04%
Other oropharynx	-	-	-	-	-	-	-	-	-	0.3	-	0.7	-	0.8	-	-	-	0.1	0.04%
Nasopharynx	0.1	-	0.1	-	-	-	-	-	-	-	-	-	1.6	-	-	-	0.1	0.1	0.06%
Hypopharynx	-	-	-	-	-	0.2	-	0.4	0.3	1.0	0.9	0.5	-	1.1	-	-	0.2	0.2	0.16%
Pharynx unspec.	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	0.01%
Esophagus	-	-	-	-	-	0.2	-	-	2.0	1.3	0.8	3.7	11.1	10.6	9.2	5.4	0.9	1.5	0.79%
Stomach	-	0.1	-	-	-	-	2.0	1.4	3.1	5.1	5.7	5.1	9.7	16.3	18.7	14.8	1.8	2.7	1.65%
Small intestine	-	-	-	-	-	-	-	0.4	-	1.9	1.7	-	1.4	5.2	4.8	-	0.4	0.5	0.32%
Colon	-	-	-	-	0.5	0.5	1.0	2.4	2.9	7.9	9.4	7.9	10.4	25.2	16.2	29.4	2.5	3.8	2.28%
Rectum	-	-	-	-	0.1	1.1	1.2	0.7	1.9	1.7	1.9	2.9	3.0	3.9	4.4	5.4	0.8	1.1	0.72%
Anus	-	-	-	-	-	0.2	-	-	0.3	-	0.5	-	1.6	-	1.3	-	0.1	0.1	0.09%
Liver	1.0	-	0.5	-	-	0.9	2.0	3.3	12.5	25.2	43.2	89.3	129.3	143.9	167.9	150.4	15.1	24.4	13.54%
Gallbladder etc.	-	-	-	-	0.3	-	0.5	0.5	0.3	1.3	2.5	3.3	2.2	3.7	6.9	6.0	0.6	0.9	0.55%
Pancreas	-	-	-	-	-	0.4	-	0.5	0.6	3.0	3.4	8.6	9.0	18.7	24.4	19.5	1.6	2.6	1.41%
Nose, sinuses etc.	0.1	-	-	-	-	-	-	-	0.3	0.7	1.2	1.2	5.4	-	-	-	0.3	0.4	0.23%
Larynx	-	-	-	-	-	-	-	-	0.3	1.0	2.0	-	3.0	-	3.0	2.1	0.3	0.4	0.23%
Trachea, Bronchus, Lung	0.7	-	0.1	0.1	0.5	2.0	1.0	1.5	1.7	6.9	12.3	11.7	15.1	11.3	35.9	38.0	3.0	4.5	2.70%
Other Thoracic organs	-	-	-	-	-	-	-	-	0.8	1.7	1.6	2.6	1.6	3.0	1.3	10.7	0.5	0.7	0.42%
Bone	0.7	0.1	1.1	2.0	1.4	0.7	0.7	2.2	0.9	2.3	6.5	6.7	12.0	4.5	2.6	16.9	2.0	2.5	1.80%
Melanoma of skin	-	-	-	-	-	-	-	-	0.6	-	-	-	-	2.2	4.4	-	0.1	0.2	0.10%
Other skin	0.3	-	-	0.2	-	0.4	0.5	-	2.0	2.7	1.2	8.6	10.4	14.0	14.9	11.8	1.4	2.2	1.24%
Mesothelioma	-	-	-	-	-	-	-	-	-	-	1.2	0.5	3.0	1.1	4.8	-	0.2	0.3	0.17%
Kaposi sarcoma	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	-	-	-	-	0.01%
Connective, Soft tissue	1.2	0.3	0.7	0.4	1.5	2.1	1.7	1.2	2.0	2.0	2.9	2.4	6.2	3.9	3.1	13.4	1.6	1.9	1.42%
Breast	-	-	-	-	3.1	9.5	29.2	49.0	86.0	106.2	136.0	172.9	177.4	166.3	138.7	148.6	35.8	48.8	32.04%
Vulva	0.1	-	0.1	-	-	-	-	-	-	0.3	-	1.0	-	0.8	-	1.4	0.1	0.1	0.09%
Vagina	-	-	-	-	-	-	-	-	-	-	-	1.0	3.0	3.3	-	1.4	0.2	0.3	0.14%
Cervix Uteri	-	-	-	-	-	0.2	0.2	-	0.6	3.6	6.5	9.1	8.3	10.5	1-	9.4	1.3	2.0	1.17%
Corpus Uteri	-	-	-	-	-	-	0.5	0.2	0.6	1.3	0.7	8.1	4.3	3.0	3.0	12.1	0.7	1.1	0.62%
Uterus unspec.	-	-	-	0.5	1.2	0.4	0.7	0.5	1.8	1.6	11.1	9.5	21.5	20.4	31.4	21.2	2.5	3.9	2.27%
Ovary	-	-	0.5	0.4	0.8	1.5	1.5	3.3	8.7	17.2	20.3	24.0	19.6	17.2	2-	26.3	4.6	6.3	4.12%
Other female genital	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	1.3	2.1	0.1	0.1	0.05%
Placenta	-	-	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	0.03%
Kidney	1.5	0.1	-	-	-	0.5	0.8	0.5	0.6	2.9	2.3	1.0	10.4	10.7	1.3	7.3	1.1	1.6	0.97%
Renal pelvis	-	0.3	-	-	-	0.6	-	0.2	-	0.7	0.4	0.5	1.6	0.8	-	-	0.2	0.3	0.19%
Ureter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Bladder	0.1	-	-	0.2	-	0.2	-	0.7	0.8	5.3	8.2	18.6	20.2	37.8	43.6	53.9	3.3	5.5	2.96%
Other urinary organs	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	0.1	0.03%
Eye	0.1	0.3	-	-	-	-	0.5	-	-	-	-	1.2	0.7	0.8	-	1.4	0.2	0.2	0.14%
Brain, Nervous tissue	3.3	2.1	1.9	0.8	2.9	0.7	4.5	6.5	6.6	9.5	11.3	12.1	31.4	26.3	33.1	72.2	5.8	8.0	5.18%
Thyroid	-	-	-	-	2.7	2.8	10.2	7.2	6.4	9.7	10.2	11.0	9.0	2.6	10.4	14.2	3.7	4.3	3.28%
Adrenal gland	1.5	0.1	-	-	-	-	-	-	-	-	-	1.2	-	-	-	1.4	0.2	0.3	0.20%
Other endocrine	-	0.1	-	0.1	0.1	0.3	-	0.5	0.3	0.3	0.4	1.0	0.7	0.8	-	-	0.2	0.2	0.19%
Hodgkin disease	-	0.6	0.4	1.9	1.3	0.4	1.2	0.7	0.6	0.4	-	1.2	3.8	-	-	-	0.8	0.8	0.70%
Non-Hodgkin lymphoma	0.9	0.7	-	1.1	0.8	1.2	1.7	3.3	3.8	8.6	16.0	23.4	24.1	16.8	31.3	36.7	4.2	6.1	3.80%
Immunoproliferative dis.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Multiple myeloma	-	-	-	-	-	-	-	-	0.6	1.4	0.8	1.2	2.3	4.4	6.1	2.7	0.4	0.6	0.34%
Lymphoid leukemia	2.0	0.7	0.9	0.4	0.5	-	0.7	0.7	1.4	1.0	2.7	1.7	2.8	3.9	4.4	-	1.0	1.2	0.93%
Myeloid Leukemia	0.5	0.3	0.7	0.2	1.5	1.5	1.4	1.0	0.9	0.7	4.0	3.1	6.8	7.5	-	4.9	1.3	1.6	1.14%
Leukemia unspec.	0.4	0.7	0.7	1.3	0.9	1.7	1.5	0.7	1.4	2.7	3.3	5.5	6.1	8.3	7.4	14.8	1.7	2.2	1.55%
Other & unspecified	1.4	0.9	1.9	1.7	2.4	3.9	4.6	5.5	9.6	12.5	23.8	37.3	39.9	42.1	42.6	70.5	7.7	10.8	6.93%
All sites Total	16.1	7.8	10.1	11.4	22.4	34.9	69.7	95.2	163.7	255.3	359.1	506.5	633.7	665.8	715.9	850.5	111.7	159.1	100.00%
All sites but C44#	15.8	7.8	10.1	11.2	22.4	34.6	69.3	95.2	161.6	252.5	357.9	497.8	623.3	651.8	701.0	838.7	110.3	157.0	98.76%

# Incidence rates do not include non-melanoma skin cancer

Table (12): The most frequent cancers in Egypt estimated using the results of the National Population-based Registry Program of Egypt 2008-2011 [46]

	Site	%	Crude Rate	ASR
Males	Liver	33.63	39.5	61.8
	Bladder	10.71	12.6	21.1
	Lung <sup>#</sup>	5.69	6.7	10.4
	Non-Hodgkin lymphoma	5.48	6.4	8.8
	Brain <sup>##</sup>	5.48	6.4	8.8
	Prostate	4.27	5.0	9.3
Females	Breast	32.04	35.8	48.8
	Liver	13.54	15.1	24.4
	Brain <sup>##</sup>	5.18	5.8	8.0
	Ovary	4.12	4.6	6.3
	Non-Hodgkin lymphoma	3.80	4.2	6.1
	Thyroid	3.28	3.7	4.3
Both Sexes	Liver	23.81	27.5	43.6
	Breast	15.41	17.8	24.3
	Bladder	6.94	8.0	13.5
	Brain <sup>##</sup>	5.29	6.1	8.5
	Non-Hodgkin lymphoma	4.64	5.4	7.5
	Lung <sup>#</sup>	4.22	4.9	7.5

<sup>#</sup>Includes trachea, bronchus and lung tumors  
<sup>##</sup> Includes brain and nervous system tumors

Table (13): Estimated Number of Cancer Cases, Egypt 2013 – 2050 [46]

	2013			2015			2020			2025			2050		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
Lip	135	126	262	146	135	281	178	164	342	206	202	408	438	427	866
Tongue	155	175	330	164	185	349	186	231	417	219	296	515	417	763	1180
Mouth	228	163	391	243	178	420	275	216	491	314	261	575	544	528	1071
Salivary glands	147	108	255	158	117	275	189	130	319	222	153	375	495	265	760
Tonsil	6	31	37	6	33	40	9	41	50	11	54	65	13	129	142
Other oropharynx	42	25	67	45	28	73	54	30	85	63	37	100	132	65	198
Nasopharynx	145	32	178	154	34	188	171	40	211	207	42	249	428	68	496
Hypopharynx	72	80	152	76	85	161	88	96	184	102	111	213	200	173	372
Pharynx unspec.	35	7	42	36	7	43	42	7	48	55	7	62	94	8	102
Oesophagus	699	485	1184	746	525	1271	897	644	1542	1065	762	1827	2249	1504	3752
Stomach	726	969	1695	772	1045	1816	922	1249	2171	1080	1484	2565	2185	2877	5062
Small intestine	98	179	277	106	194	300	120	229	349	134	274	408	223	507	730
Colon	1522	1339	2862	1618	1437	3055	1893	1715	3608	2225	2063	4287	4465	4120	8585
Rectum	464	406	871	490	432	922	568	502	1070	645	584	1230	1097	1052	2149
Anus	133	50	183	142	53	195	162	65	227	178	71	249	291	127	418
Liver	19646	8345	27991	20932	9043	29975	24420	10900	35320	28580	12933	41513	59047	26425	85471
Gallbladder etc.	235	324	559	248	350	598	297	413	710	348	488	835	715	967	1682
Pancreas	1350	876	2226	1440	957	2397	1676	1160	2836	1961	1405	3366	3912	2971	6883
Nose, sinuses etc.	98	136	234	104	144	247	124	170	294	154	186	340	340	322	661
Larynx	933	134	1067	993	142	1136	1194	173	1367	1428	201	1629	3094	395	3489
Trachea, Bronchus, Lung	3304	1586	4890	3530	1703	5233	4168	2031	6198	4889	2404	7293	10176	4895	15071
Other Thoracic organs	368	260	628	393	277	670	464	335	798	551	415	966	1149	897	2046
Bone	889	957	1846	935	1011	1946	1068	1174	2242	1216	1330	2546	2212	2401	4613
Melanoma of skin	60	59	119	66	66	132	82	84	166	95	105	200	181	207	388
Other skin	797	749	1547	853	813	1666	1018	973	1990	1205	1160	2365	2641	2306	4947
Mesothelioma	55	106	161	58	116	174	65	143	207	76	161	238	135	321	456
Kaposi sarcoma	60	8	68	63	9	72	72	10	82	81	13	95	159	28	187
Connective, Soft tissue	801	751	1552	846	787	1633	981	901	1882	1113	1026	2139	1924	1796	3720
Breast	287	17905	18192	306	19105	19411	362	22320	22682	422	25793	26215	807	45243	46050
Vulva	0	52	52	0	56	56	0	63	63	0	76	76	0	146	146
Vagina	0	95	95	0	103	103	0	126	126	0	147	147	0	305	305
Cervix Uteri	0	701	701	0	752	752	0	882	882	0	1039	1039	0	2039	2039
Corpus Uteri	0	392	392	0	426	426	0	502	502	0	600	600	0	1256	1256
Uterus unspec.	0	1353	1353	0	1456	1456	0	1758	1758	0	2055	2055	0	4143	4143
Ovary	0	2288	2288	0	2434	2434	0	2830	2830	0	3311	3311	0	5957	5957
Other female genital	0	30	30	0	34	34	0	44	44	0	55	55	0	134	134
Placenta	0	14	14	0	14	14	0	14	14	0	15	15	0	18	18
Penis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prostate	2544	0	2544	2747	0	2747	3398	0	3398	4295	0	4295	10785	0	10785
Testis	229	0	229	240	0	240	266	0	266	291	0	291	425	0	425
Other male genital	21	0	21	22	0	22	28	0	28	33	0	33	73	0	73
Kidney	877	561	1438	934	594	1528	1080	693	1774	1274	801	2076	2628	1487	4115
Renal pelvis	141	99	240	152	103	255	183	115	297	214	126	341	446	196	642
Ureter	22	0	22	24	0	24	31	0	31	41	0	41	111	0	111
Bladder	6362	1872	8234	6852	2038	8891	8228	2481	10709	9746	3016	12762	21783	6554	28337
Other urinary organs	8	21	29	8	23	31	10	27	37	11	35	46	22	72	94
Eye	89	82	171	92	87	180	98	96	194	104	108	212	160	195	355
Brain, Nervous tissue	3072	2933	6004	3256	3133	6389	3779	3721	7500	4390	4351	8740	8439	8450	16888
Thyroid	547	1759	2306	582	1867	2448	661	2106	2767	748	2363	3111	1298	3814	5113
Adrenal gland	43	105	149	46	109	155	52	113	166	57	121	178	102	180	282
Other endocrine	129	95	224	136	100	236	156	114	269	174	125	300	273	188	462
Hodgkin disease	647	321	968	673	336	1008	751	371	1123	837	397	1234	1245	527	1772
Non-Hodgkin lymphoma	3053	2188	5241	3223	2345	5568	3689	2755	6444	4240	3202	7442	7749	6135	13884
Immunoproliferative dis.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Multiple myeloma	316	200	516	334	218	552	386	264	650	432	321	753	819	644	1463
Lymphoid leukaemia	801	471	1272	841	493	1335	926	551	1477	1000	603	1604	1535	896	2431
Myeloid Leukaemia	511	614	1125	534	642	1176	595	727	1323	666	810	1476	1054	1358	2412
Leukemia unspec.	965	842	1807	1005	891	1896	1131	1027	2157	1295	1188	2483	2226	2169	4395
Other & unspecified	3692	3965	7657	3921	4232	8153	4573	4971	9543	5358	5793	11151	10582	11026	21607
All sites Total	57558	57426	114985	61288	61495	122783	71759	72496	144255	84045	84679	168723	171494	159675	331169
All sites but C44 <sup>#</sup>	56761	56677	113438	60435	60683	121117	70742	71523	142265	82840	83519	166358	168854	157369	326223

# Numbers do not include non-melanoma skin cancer

Table (14): Estimated Cancer incidence in the period 2013-2050 and causes of increase [46]

	2013	2015	2020	2025	2050
Estimated population	85294388 (100%)	88487396 (103.7%)	96260017 (112.9%)	103742157 (121.6%)	137872522 (161.6%)
Number of cases <sup>#1</sup>	114985	122783 (106.8%)	144255 (125.5%)	168723 (146.7%)	331169 (288.0%)
Increased cases from 2013 <sup>#2</sup>		7798 (6.8%)	29270 (25.5%)	53738 (46.7%)	216184 (188.0%)
Increased cases due to population growth <sup>#3</sup>		4303	14783	24869	70880
Increased cases due to population structure change <sup>#4</sup>		3494	14487	28869	145304
% Increase due to population growth <sup>#5</sup>		55.20%	50.50%	46.28%	32.79%

**N.B.**

#1 Number of expected cases depending on 2013 rates of incidence

#2 Number of increased cases from 2013 number of cases

#3 Number of increased cases (from 2013) that is attributed to increase in population number (population growth)

#4 Number of increased cases (from 2013) that is attributed to change in population structure (aging of population) and not to population growth

#5 Percent of increased number of cases (from 2013) that can be attributed to population growth only (not due to change in population structure)



Table (15): Incidence rates / 100,000 population of individual cancer sites in Lower, Middle and Upper Egypt: Males [46]

Primary site	Lower Egypt 2009-2011			Middle Egypt 2009			Upper Egypt 2008		
	Crude	ASR	%	Crude	ASR	%	Crude	ASR	%
Lip	0.4	0.4	0.28%	0.3	0.5	0.24%	0.4	0.6	0.38%
Tongue	0.3	0.3	0.20%	0.2	0.4	0.20%	1.1	1.5	1.15%
Mouth	0.2	0.3	0.16%	0.8	1.1	0.73%	1.3	1.9	1.34%
Salivary glands	0.3	0.4	0.20%	0.4	0.5	0.36%	0.6	0.9	0.57%
Tonsil	0.0	0.0	0.00%	0.0	0.1	0.04%	0.0	0.0	0.00%
Other oropharynx	0.0	0.0	0.00%	0.2	0.3	0.20%	0.2	0.3	0.19%
Nasopharynx	0.5	0.5	0.35%	0.1	0.1	0.12%	0.6	1.0	0.57%
Hypopharynx	0.0	0.0	0.00%	0.3	0.5	0.28%	0.6	0.9	0.57%
Pharynx unspec.	0.1	0.1	0.04%	0.1	0.1	0.08%	0.2	0.3	0.19%
Esophagus	1.0	1.3	0.71%	1.8	3.0	1.61%	3.9	5.5	4.01%
Stomach	1.4	2.0	0.98%	1.7	2.5	1.53%	2.4	3.8	2.48%
Small intestine	0.1	0.1	0.04%	0.5	0.6	0.44%	0.2	0.2	0.19%
Colon	4.0	5.4	2.91%	2.3	3.7	2.10%	2.4	3.7	2.48%
Rectum	0.9	1.1	0.67%	1.2	1.6	1.13%	0.7	1.1	0.76%
Anus	0.4	0.4	0.28%	0.2	0.2	0.16%	0.4	0.5	0.38%
Liver	57.8	81	41.71%	22.4	37.6	20.42%	11.5	17.5	11.83%
Gallbladder etc.	0.5	0.5	0.39%	0.4	0.7	0.32%	1.3	2.2	1.34%
Pancreas	3.2	4.4	2.28%	2.1	3.5	1.94%	3.5	5.4	3.63%
Nose, sinuses etc.	0.1	0.1	0.04%	0.4	0.6	0.32%	0.6	0.9	0.57%
Larynx	0.8	1.3	0.59%	3.3	5.7	3.03%	3.9	6.0	4.01%
Trachea, Bronchus, Lung	7.6	10.1	5.47%	6.3	10.8	5.77%	7.4	11.5	7.63%
Other Thoracic organs	1.0	1.3	0.71%	0.8	1.2	0.69%	0.6	0.8	0.57%
Bone	1.9	2.4	1.34%	2.3	3.4	2.10%	1.5	1.9	1.53%
Melanoma of skin	0.2	0.2	0.12%	0.1	0.1	0.12%	0.0	0.0	0.00%
Other skin	1.8	2.7	1.30%	1.7	2.8	1.53%	1.1	1.8	1.15%
Mesothelioma	0.0	0.0	0.00%	0.3	0.4	0.24%	0.4	0.6	0.38%
Kaposi sarcoma	0.1	0.1	0.08%	0.2	0.3	0.16%	0.0	0.0	0.00%
Connective, Soft tissue	2.5	2.6	1.77%	0.5	0.8	0.48%	3.0	3.8	3.05%
Breast	0.7	0.8	0.47%	0.4	0.6	0.32%	1.1	1.8	1.15%
Penis	0.0	0.0	0.00%	0.0	0.0	0.00%	0.0	0.0	0.00%
Prostate	6.7	11.7	4.84%	2.9	5.2	2.66%	5.7	9.2	5.92%
Testis	0.5	0.4	0.35%	0.5	0.7	0.48%	0.4	0.5	0.38%
Other male genital	0.0	0.0	0.00%	0.1	0.2	0.12%	0.0	0.0	0.00%
Kidney	2.2	3.2	1.61%	1.7	2.5	1.53%	0.9	1.3	0.95%
Renal pelvis	0.2	0.3	0.12%	0.5	0.8	0.48%	0.4	0.5	0.38%
Ureter	0.1	0.1	0.04%	0.0	0.1	0.04%	0.0	0.0	0.00%
Bladder	12.2	19	8.82%	15.6	26.4	14.25%	12.2	19.3	12.60%
Other urinary organs	0.0	0.0	0.00%	0.0	0.0	0.00%	0.2	0.3	0.19%
Eye	0.1	0.2	0.08%	0.3	0.4	0.24%	0.7	0.6	0.76%
Brain, Nervous tissue	6.2	8.1	4.49%	8.0	12.5	7.26%	5.2	6.7	5.34%
Thyroid	1.3	1.5	0.91%	1.2	1.7	1.05%	0.7	1.1	0.76%
Adrenal gland	0.0	0.0	0.00%	0.1	0.2	0.12%	0.6	0.8	0.57%
Other endocrine	0.1	0.1	0.08%	0.6	0.8	0.56%	0.4	0.4	0.38%
Hodgkin disease	1.6	1.8	1.18%	1.7	2.0	1.53%	1.5	1.5	1.53%
Non-Hodgkin lymphoma	8.3	10.3	6.03%	5.2	7.6	4.76%	2.8	4.2	2.86%
Immunoproliferative dis.	0.0	0.0	0.00%	0.0	0.0	0.00%	0.0	0.0	0.00%
Multiple myeloma	0.7	0.9	0.51%	0.7	1.1	0.61%	0.2	0.3	0.19%
Lymphoid leukemia	1.7	2.2	1.22%	1.8	2.3	1.61%	3.0	3.1	3.05%
Myeloid Leukemia	0.9	1.0	0.63%	1.6	1.8	1.45%	1.9	2.5	1.91%
Leukemia unspec.	2.4	3.1	1.73%	2.0	2.6	1.86%	1.1	1.1	1.15%
Other & unspecified	5.9	8.3	4.25%	13.9	17.6	12.67%	8.7	13	8.97%
All sites Total	138.5	191.8	100.00%	109.7	170	100.00%	97.1	142.8	100.00%
All sites but C44#	136.7	189.1	98.70%	108	167.2	98.47%	96	141	98.85%

# Incidence rates do not include non-melanoma skin cancer

Table (16): Incidence rates /100,000 population of individual cancer sites in Lower, Middle and Upper Egypt: females [46]

Primary site	Lower Egypt 2009-2011			Middle Egypt 2009			Upper Egypt 2008		
	Crude	ASR	%	Crude	ASR	%	Crude	ASR	%
Lip	0.3	0.4	0.26%	0.2	0.4	0.24%	0.0	0.0	0.00%
Tongue	0.3	0.5	0.26%	0.3	0.5	0.34%	0.2	0.2	0.16%
Mouth	0.1	0.2	0.09%	0.5	0.8	0.53%	0.9	1.5	0.80%
Salivary glands	0.2	0.2	0.13%	0.3	0.4	0.29%	0.2	0.4	0.16%
Tonsil	0.1	0.1	0.04%	0.0	0.1	0.05%	0.0	0.0	0.00%
Other oropharynx	0.0	0.0	0.00%	0.1	0.1	0.10%	0.2	0.3	0.16%
Nasopharynx	0.1	0.1	0.04%	0.0	0	0.05%	0.2	0.2	0.16%
Hypopharynx	0.0	0.0	0.00%	0.4	0.4	0.38%	0.6	0.9	0.48%
Pharynx unspec.	0.0	0.0	0.00%	0.0	0.0	0.05%	0.0	0.0	0.00%
Esophagus	0.9	1.2	0.65%	1.2	1.9	1.25%	1.1	1.6	0.96%
Stomach	2.3	3.2	1.73%	1.2	1.8	1.25%	1.9	3.1	1.60%
Small intestine	0.3	0.5	0.22%	0.4	0.6	0.43%	0.6	0.9	0.48%
Colon	3.0	4.2	2.30%	2.2	3.2	2.31%	2.4	3.5	2.08%
Rectum	0.9	1.0	0.65%	1.0	1.2	1.01%	0.7	1.3	0.64%
Anus	0.1	0.1	0.04%	0.1	0.2	0.14%	0.2	0.3	0.16%
Liver	21.6	32.6	16.37%	8.6	13.7	8.95%	6.0	8.7	5.12%
Gallbladder etc.	0.5	0.5	0.35%	0.6	0.9	0.58%	1.9	3.1	1.60%
Pancreas	2.1	3.2	1.60%	0.9	1.4	0.91%	1.7	2.3	1.44%
Nose, sinuses etc.	0.3	0.5	0.26%	0.1	0.2	0.14%	0.2	0.2	0.16%
Larynx	0.2	0.3	0.17%	0.3	0.4	0.29%	0.4	0.7	0.32%
Trachea, Bronchus, Lung	3.7	5.3	2.82%	2.2	3.1	2.26%	2.4	3.8	2.08%
Other Thoracic organs	0.6	0.8	0.43%	0.5	0.7	0.48%	0.0	0.0	0.00%
Bone	2.0	2.3	1.52%	1.8	2.4	1.92%	3.4	4.4	2.88%
Melanoma of skin	0.2	0.3	0.17%	0.0	0.1	0.05%	0.0	0.0	0.00%
Other skin	1.7	2.4	1.26%	1.0	1.5	1.06%	1.9	3.1	1.60%
Mesothelioma	0.3	0.3	0.22%	0.2	0.3	0.24%	0.4	0.7	0.32%
Kaposi sarcoma	0.0	0.0	0.00%	0.0	0.1	0.05%	0.0	0.0	0.00%
Connective, Soft tissue	2.3	2.6	1.78%	0.4	0.6	0.38%	1.9	2.2	1.60%
Breast	43.8	53	33.22%	25.8	35.6	26.84%	45.3	64.5	38.72%
Vulva	0.0	0.0	0.00%	0.3	0.4	0.34%	0.0	0.0	0.00%
Vagina	0.1	0.2	0.09%	0.1	0.2	0.14%	0.6	1.0	0.48%
Cervix Uteri	1.7	2.4	1.26%	1.0	1.5	1.06%	0.6	0.9	0.48%
Corpus Uteri	0.6	0.9	0.43%	0.6	0.9	0.67%	1.7	2.9	1.44%
Uterus unspec.	3.7	5.3	2.77%	1.0	1.3	1.06%	2.4	3.8	2.08%
Ovary	5.1	6.4	3.90%	3.6	5.0	3.75%	7.1	10.2	6.08%
Other female genital	0.0	0.0	0.00%	0.0	0.1	0.05%	0.4	0.6	0.32%
Placenta	0.0	0.0	0.00%	0.0	0.0	0.05%	0.2	0.2	0.16%
Kidney	1.1	1.6	0.87%	1.2	1.8	1.25%	0.7	1.1	0.64%
Renal pelvis	0.2	0.3	0.17%	0.2	0.3	0.19%	0.2	0.2	0.16%
Ureter	0.0	0.0	0.00%	0.0	0.0	0.00%	0.0	0.0	0.00%
Bladder	3.7	5.9	2.77%	3.1	4.9	3.27%	3.6	5.7	3.04%
Other urinary organs	0.1	0.1	0.04%	0.0	0.0	0.00%	0.0	0.0	0.00%
Eye	0.1	0.1	0.04%	0.3	0.5	0.34%	0.2	0.2	0.16%
Brain, Nervous tissue	5.8	7.4	4.42%	7.4	11.1	7.70%	2.4	2.9	2.08%
Thyroid	5.1	5.4	3.90%	1.6	2.1	1.64%	3.6	4.2	3.04%
Adrenal gland	0.2	0.3	0.17%	0.2	0.3	0.24%	0.2	0.2	0.16%
Other endocrine	0.1	0.0	0.04%	0.5	0.7	0.53%	0.2	0.2	0.16%
Hodgkin disease	1.0	0.7	0.74%	1.0	1.0	1.01%	0.9	0.9	0.80%
Non-Hodgkin lymphoma	5.4	6.7	4.11%	4.2	5.8	4.43%	2.6	3.8	2.24%
Immunoproliferative dis.	0.0	0.0	0.00%	0.0	0.0	0.00%	0.0	0.0	0.00%
Multiple myeloma	0.7	0.9	0.52%	0.1	0.3	0.14%	0.2	0.0	0.16%
Lymphoid leukemia	1.0	1.1	0.74%	1.2	1.6	1.25%	1.5	1.6	1.28%
Myeloid Leukemia	0.9	1.1	0.65%	1.7	2.0	1.78%	2.2	3.3	1.92%
Leukemia unspec.	1.8	2.4	1.34%	1.6	2.0	1.68%	1.9	2.3	1.60%
Other & unspecified	5.9	8.2	4.46%	14.3	15.5	14.86%	9.2	12.9	7.84%
All sites Total	131.7	173.3	100.00%	95.9	132.1	100.00%	116.9	167.1	100.00%
All sites but C44#	130.1	170.9	98.74%	94.9	130.7	98.94%	115.1	163.9	98.40%

# Incidence rates do not include non-melanoma skin cancer

Table (17): Proportions and incidence rates of the most frequently observed cancers in the 3 regions of Egypt [46]

	Lower Egypt 2009-2011				Middle Egypt 2009				Upper Egypt 2008			
	Site	%	Crude Rate	ASR	Site	%	Crude Rate	ASR	Site	%	Crude Rate	ASR
Males	Liver	41.7	57.8	81.0	Liver	20.4	22.4	37.6	Bladder	12.6	12.2	19.3
	Bladder	8.8	12.2	19.0	Bladder	14.2	15.6	26.4	Liver	11.8	11.5	17.5
	NHL	6.0	8.3	10.3	Brain <sup>#</sup>	7.3	8.0	12.5	Lung <sup>##</sup>	7.6	7.4	11.5
	Lung <sup>##</sup>	5.5	7.6	10.1	Lung <sup>##</sup>	5.8	6.3	10.8	Leukemia	6.1	6.0	6.7
	Prostate	4.8	6.7	11.7	Leukemia	4.9	5.4	6.7	Prostate	5.9	5.7	9.2
Females	Breast	33.2	43.8	53.0	Breast	26.8	25.8	35.6	Breast	38.7	45.3	64.5
	Liver	16.4	21.6	32.6	Liver	8.9	8.6	13.7	Ovary	6.1	7.1	10.2
	Brain <sup>#</sup>	4.4	5.8	7.4	Brain <sup>#</sup>	7.7	7.4	11.1	Liver	5.1	6.0	8.7
	NHL	4.1	5.4	6.7	Leukemia	4.7	4.5	5.6	Leukemia	4.8	5.6	7.2
	Thyroid	3.9	5.1	5.4	NHL	4.4	4.2	5.8	Uterus	3.5	4.1	6.7
Both Sexes	Liver	29.6	40.1	56.8	Liver	15.2	15.6	25.7	Breast	21.6	23.1	33.2
	Breast	16.1	21.7	26.9	Breast	12.4	12.8	18.1	Liver	8.2	8.8	13.1
	Bladder	5.9	8.0	12.5	Bladder	9.2	9.5	15.7	Bladder	7.4	7.9	12.5
	NHL	5.1	6.9	8.5	Brain <sup>#</sup>	7.5	7.7	11.8	Leukemia	5.4	5.7	7.0
	Brain <sup>#</sup>	4.5	6.0	7.8	Leukemia	4.8	4.9	6.2	Lung <sup>##</sup>	4.6	4.9	7.7

# Includes brain and nervous system tumors

## Includes trachea, bronchus and lung tumors

### Discussion and Conclusion:

The establishment of the National Cancer Registry Program in 2007 filled the gap between Egypt and most developed countries in cancer registration. The program was planned in phases ending 2017. During the current phase, efforts are focused on quality assurance and case ascertainment. The latter would be achieved by including more sources of data focusing on Health Insurance and Government-subsidized Treatment programs that would eventually cover the majorities of private cases due the expensive cost of cancer management that progressively escalates upwards. [51] Nonetheless, most of patients covered by these programs seek care in major tertiary-care cancer centers and would be registered as duplicates and deleted using the National ID number. Linkage with death records adds to case ascertainment. Percent of death certificate only cases is a measure of quality of registration systems. [52]

To ensure high-quality data, and based upon lessons gained from historical successes of other registries, the registry planned a set of strategies. These included training and certifying of registrars and abstractors (certified tumor registrar program), local manual and computer validation at the peripheral registries before central submission of data and improving of medical records in the cancer centers. The latter is an ambitious

project of ministry of health cancer centers, coupled with a project for automation of the centers and their linkage to the national cancer institute in Cairo.

An essential element of success of registries is a sustained funding. The registry is cover by a ministerial protocol of collaboration till 2017. Sustainability strategy had been based upon integrating cancer registration within the routine hospital activity with the necessary infrastructure designed as part of the general hospital infrastructure. Information technology development is currently adapted in most cancer centers. [2] This helps automation of data flow within the centers and simplifies data collection and data transfer to the central registry.

Registry success could not be complete without use of its results in research and policy making. Publishing the results on the net in the registry website allowed their wide dissemination and promoted their use in research. [53] A series of workshops were planned. The latest was about health economics (The use of health economics on strategic planning of cancer control activities in Egypt, 7<sup>th</sup> February 2015). The recently published article on cancer incidence in Egypt [46] is currently in PubMed and started to be cited in medical publications. A very encouraging action is the use of registry national results in establishing a cancer control strategy by the high council of cancer [54].

### List of Abbreviations:

ACR	Alexandria Cancer Registry
ASIR	Age Specific Incidence Rate
ASR	Age Standardized Rate
CAPMAS	Central Agency for Public Mobilization and Statistics
CI5	Cancer Incidence in Five Continents
CRMCA	Cancer Registry for the Metropolitan Cairo Area
IARC	International Agency for Research on Cancer
ICD	International Classification of Diseases
MCIT	Ministry of Communication and Information Technology
MECC	Middle East Cancer Consortium
MHE	Ministry of Higher Education
MOH	Ministry of Health
NCI	National Cancer Institute
NCRPE	National Cancer Registry Program of Egypt
NEMROCK	Nuclear Medicine and Radiation Oncology Center of Kasr El-Aini
NGO	Non-Governmental Organization
SEER	Surveillance, Epidemiology, and End Results Program
UICC	Union for International Cancer Control
UNDP	United Nations Development Project
WHO	World Health Organization

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