# Cancer in Adolescents and Young Adults, Kingston and St Andrew, Jamaica, 1988–2007

TN Gibson, B Hanchard, N Waugh, D McNaughton

***ABSTRACT***

***Objective:*** *To determine the distribution of malignancies in adolescents and young adults (AYA; 15 to 29 years) in Jamaica.*

***Methods:*** *All cases of malignancies diagnosed in AYA in the period 1988–2007, were extracted from the files of the Jamaica Cancer Registry. For each case, age, gender and diagnosis were recorded and the diagnoses categorized according to the recently proposed diagnostic groups for cancers in AYA. The data were used to calculate incidence rates and relative frequencies.*

***Results:*** *Among males, the age-specific incidence rate for the oldest age group (25–29 years) was higher than that recorded for each of the younger groups. In females, there was a progressive increase in incidence with increasing age. The age-standardized rates (ASRs) per million were 131.4 (males) and 226.1 (females). In males, the highest ASRs (per million) were those for lymphoma (34.7), carcinoma (29.3) and soft tissue sarcoma (17.2), and in females, carcinoma (121.6), lymphoma (31.4) and germ cell and trophoblastic neoplasms (14.6). Lymphoma was the commonest diagnosis in younger males, and ranked second to carcinoma in the oldest. Carcinoma and lymphoma were the commonest and second commonest diagnoses, respectively, among all three age groups in females, with carcinomas accounting for progressively greater proportions of tumours with increasing age.*

***Conclusion:*** *The incidence of malignancy in AYA in Jamaica is higher in females than in males. In both genders, increasing age is accompanied by increasing incidence and a shift from non-epithelial to epithelial malignancies. This shift occurs at an earlier age in females.*

**Keywords:** Adolescents, cancer, Jamaica, young adults

# Cáncer en los Adolescentes y Adultos Jóvenes, Kingston y Saint Andrew, Jamaica, 1988–2007

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***RESUMEN***

***Objetivo:*** *Determinar la distribución de enfermedades malignas en los adolescentes y los adultos jóvenes (abreviado AJA; 15 a 29 años) en Jamaica.*

***Métodos:*** *Todos los casos de enfermedades malignas diagnosticadas en AJA en el periodo 1988–2007, fueron extraídos de los archivos del Registro de Cáncer en Jamaica. Para cada caso, se registraron la edad, el sexo, y el diagnóstico. Los diagnósticos fueron clasificados de acuerdo con los grupos de diagnóstico recientemente propuestos para los cánceres en AJA. Los datos fueron usados para calcular las tasas de incidencia y las frecuencias relativas.*

***Resultados:*** *Entre los varones, la tasa de incidencia específica por edad para el grupo etario de más edad (25–29 años) fue más alta que la obtenida en cada uno de los grupos más jóvenes. Entre las hembras, se produjo un aumento progresivo de la incidencia paralelo con el aumento de la edad. Las tasas estandarizadas por edad (TEE) por millón fueron 131.4 (varones) y 226.1 (hembras). En los varones, las TEE más altas (por millón) fueron las correspondientes al linfoma (34.7), el carcinoma (29.3) y el sarcoma de tejido blando (17.2), en tanto que en las hembras correspondieron al carcinoma (121.6), el linfoma (31.4) y las neoplasias trofoblásticas y los tumores de células germinales (14.6). El linfoma fue el diagnóstico más común en los varones más jóvenes, y ocupó el segundo lugar con respecto al carcinoma*

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*en los de más edad. El carcinoma y el linfoma fueron el primero y el segundo diagnósticos más comunes respectivamente, entre los tres grupos etarios de las hembras, representando los carcinomas cada vez más la mayor proporción de tumores a medida que era mayor la edad.*
***Conclusión:*** *La incidencia de enfermedades malignas en los AJA en Jamaica es más alta en las hembras que en los varones. En ambos géneros, a mayor edad existe una mayor incidencia, así como un desplazamiento de tumores no epiteliales malignos a tumores epiteliales malignos. Este cambio ocurre a una edad más temprana en las hembras.*

**Palabras claves:** Adolescentes, cáncer, Jamaica, adultos jóvenes

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## INTRODUCTION

The adolescent and young adult (AYA) period has been defined as that period of life between the ages of 15 and 29 years (1–4), and represents a bridge between childhood and older adulthood, when individuals experience physical and hormonal changes (2). Cancers that arise in this age group reportedly represent a transition from those seen in childhood (0–14 years) which are usually categorized according to morphology, to the pattern exhibited in older adults, represented primarily by carcinomas, and categorized according to topography (3).

The Jamaica Cancer Registry (JCR) has a 50-year history of reporting cancer incidence and trends in Jamaica, in the population at large [using the International Classification of Diseases – ICD] (5–10) and in children [using the International Classification for Childhood Cancer – ICCC] (11). However, the distribution of malignancies in the Jamaican AYA population has not been previously analysed.

As an accurate knowledge of the cancer burden within a given population is crucial for the appropriate planning of adequate health services, we decided to investigate the distribution of malignancies in AYA in Jamaica. This paper presents the epidemiologic profile of cancers in AYA in Kingston and St Andrew, Jamaica, using the unique cancer classification scheme proposed for this age group by Birch *et al* (12).

## MATERIALS AND METHODS

The Jamaica Cancer Registry (JCR) is a population-based registry, established in 1958. Its population base is that of the Kingston and St Andrew region of Jamaica and this comprises approximately 26% of the total population of the country. The methodology of the Registry has been previously described in detail (5, 13). Briefly, cases are registered from the medical records of public and private hospitals, general and specialist practitioners' offices, pathology laboratories, radiotherapy facilities and death certificates in Kingston and St Andrew, and verified by pathologists at the Cancer Registry, in accordance with standard techniques of registration (14). Facilities in Kingston and St Andrew function as referral centres for much of the island outside of the Kingston and St Andrew region, but only cases from patients who reside in Kingston and St Andrew are used in the calculation of rates. The population denominators for the Kingston and St Andrew region, required for these calculations, are supplied by the Statistical Institute of Jamaica.

We reviewed the files of the JCR for the 20-year period 1988–2007 and extracted all cases of malignancies diagnosed in patients between the ages of 15 and 29 years. For each case, we abstracted age, gender and diagnosis, and categorized the diagnoses according to the diagnostic groups proposed by Birch *et al* (12) for cancers in adolescents and young adults. The data were used to calculate age-specific incidence rates, age-standardized rates (ASRs; standardized to the World Standard population) and relative frequencies for each diagnosis.

## RESULTS

Over the 20-year period, there were 18 033 cancers diagnosed in Kingston and St Andrew, of which 646 (3.6%) occurred in individuals between the ages of 15 and 29 years. Of the 646 patients (220 males and 426 females), 54.2% were older than 24 years. The overall male to female ratio (M:F) was 1:1.9, but this varied with age, ranging from 1:1.06 in the youngest age group to 1:2.5 in the oldest (Fig. 1). Five hundred and eighty-

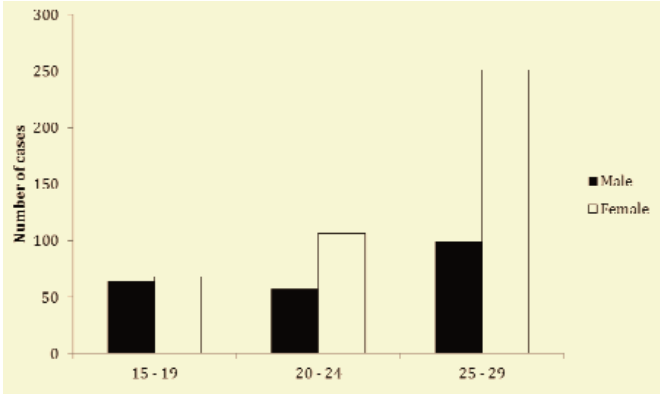



Fig. 1: Age and sex distribution of adolescents and young adults with malignancies, Kingston and St Andrew, Jamaica, 1988–2007.

four of the cases (90.4%) were ascertained by histology, 28 (4.3%) by post-mortem examination, with or without histology, 15 (2.3%) by clinical examination, nine (1.4%) by radiologic imaging, five (0.8%) by cytology and five (0.8%) by either blood film evaluation or flow cytometry.

Among males, the age-specific incidence rate for the oldest age group was higher than that recorded for each of the

younger groups. In females, there was a progressive increase in age-specific incidence rate with increasing age (Table). The ASR per million for males was 131.4 and that for females was 226.1. In males, the highest ASR was that for lymphoma (34.7 per million), followed by carcinoma (29.3 per million), soft tissue sarcoma (17.2 per million), leukaemia (16.7 per million) and central nervous system (CNS) tumours (11.9 per million), while in females, carcinoma exhibited the highest ASR (121.6 per million), followed by lymphoma (31.4 per million), germ cell and trophoblastic neoplasms (14.6 per million), and soft tissue sarcomas and CNS tumours (13.0 per million each) [Table]. The ASRs calculated for individuals between the ages of 15 and 24 years was 105.2 per million in males and 140.8 per million in females (Table).

Analysis of diagnostic groups by age group and gender showed that, among males, lymphoma was the commonest diagnosis among 15–19 and 20–24-year age groups (26.6 and 24.6%, respectively), but was surpassed by carcinoma in the

Table: Average annual incidence (per million) and relative frequencies of malignancies in adolescents and young adults aged 15 to 29 years, Kingston and St.Andrew, Jamaica, 1988–2007

| | Diagnostic group (Birch et al 2002) | Number of cases | | | | | | Age-specific incidence rates | | | | | | ASR | | | | Relative frequencies | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15–19 yr | | 20–24 yr | | 25–29 yr | | 15–19 yr | | 20–24 yr | | 25–29 yr | | 15–24 yr | | 15–29 yr | | Male | | Female | | Total | |
| | | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | N | % | N | % | N | % |
| **1** | **LEUKAEMIAS** | **11** | **5** | **8** | **7** | **9** | **7** | **18.8** | **8.3** | **14.1** | **11.3** | **17.0** | **11.4** | **16.6** | **9.7** | **16.7** | **10.2** | **28** | **12.7** | **19** | **4.5** | **47** | **7.3** |
| 1.1 | Acute lymphoid leukaemia | 7 | 3 | 1 | 0 | 1 | 0 | 12.0 | 5.0 | 1.8 | 0.0 | 1.9 | 0.0 | 7.2 | 2.6 | 5.5 | 1.8 | | | | | | |
| 1.2 | Acute myeloid leukaemia | 2 | 2 | 3 | 5 | 3 | 5 | 3.4 | 3.3 | 5.3 | 8.0 | 5.7 | 8.1 | 4.3 | 5.5 | 4.7 | 6.4 | | | | | | |
| 1.3 | Chronic myeloid leukaemia | 1 | 0 | 3 | 2 | 3 | 1 | 1.7 | 0.0 | 5.3 | 3.2 | 5.7 | 1.6 | 3.4 | 1.5 | 4.1 | 1.5 | | | | | | |
| 1.4 | Other and unspecified leukaemias | 1 | 0 | 1 | 0 | 2 | 1 | 1.7 | 0.0 | 1.8 | 0.0 | 3.8 | 1.6 | 1.7 | 0.0 | 2.4 | 0.5 | | | | | | |
| **2** | **LYMPHOMAS** | **17** | **10** | **14** | **10** | **27** | **39** | **29.1** | **16.6** | **24.6** | **16.1** | **51.0** | **63.3** | **27.0** | **16.4** | **34.7** | **31.4** | **58** | **26.4** | **59** | **13.8** | **117** | **18.1** |
| 2.1 | Non-Hodgkin lymphoma | 12 | 7 | 10 | 5 | 22 | 31 | 20.6 | 11.6 | 17.6 | 8.0 | 41.6 | 50.3 | 19.2 | 9.9 | 26.3 | 22.9 | | | | | | |
| 2.2 | Hodgkin's disease | 5 | 3 | 4 | 5 | 5 | 8 | 8.6 | 5.0 | 7.0 | 8.0 | 9.4 | 13.0 | 7.8 | 6.4 | 8.4 | 8.5 | | | | | | |
| **3** | **CNS AND OTHER INTRACRANIAL AND INTRASPINAL NEOPLASMS** | **5** | **7** | **7** | **9** | **8** | **8** | **8.6** | **11.6** | **12.3** | **14.5** | **15.1** | **13.0** | **10.3** | **13.0** | **11.9** | **13.0** | **20** | **9.1** | **24** | **5.6** | **44** | **6.8** |
| 3.1 | Astrocytoma | 3 | 4 | 4 | 5 | 3 | 2 | 5.1 | 6.7 | 7.0 | 8.0 | 5.7 | 3.2 | 6.0 | 7.3 | 5.9 | 6.0 | | | | | | |
| 3.2 | Other glioma | 0 | 0 | 1 | 2 | 3 | 1 | 0.0 | 0.0 | 1.8 | 3.2 | 5.7 | 1.6 | 0.8 | 1.5 | 2.4 | 1.5 | | | | | | |
| 3.3 | Ependymoma | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| 3.4 | Medulloblastoma and other PNET | 2 | 1 | 1 | 2 | 2 | 1 | 3.4 | 1.7 | 1.8 | 3.2 | 3.8 | 1.6 | 2.6 | 2.4 | 3.0 | 2.1 | | | | | | |
| 3.5 | Other specified intracranial and intraspinal neoplasms | 0 | 1 | 0 | 0 | 0 | 0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.6 | | | | | | |
| 3.6 | Unspecified intracranial and intraspinal neoplasms | 0 | 1 | 1 | 0 | 0 | 4 | 0.0 | 1.7 | 1.8 | 0.0 | 0.0 | 6.5 | 0.8 | 0.9 | 0.6 | 2.7 | | | | | | |
| **4** | **OSSEOUS AND CHONDROMATOUS NEOPLASMS, EWING TUMOUR AND OTHER NEOPLASMS OF BONE** | **12** | **9** | **3** | **5** | **3** | **2** | **20.6** | **15.0** | **5.3** | **8.0** | **5.7** | **3.2** | **13.4** | **11.7** | **10.9** | **9.0** | **18** | **8.2** | **16** | **3.8** | **34** | **5.3** |
| 4.1 | Osteosarcoma | 10 | 9 | 3 | 5 | 2 | 1 | 17.1 | 15.0 | 5.3 | 8.0 | 3.8 | 1.6 | 11.6 | 11.7 | 9.1 | 8.5 | | | | | | |
| 4.2 | Chondrosarcoma | 1 | 0 | 0 | 0 | 0 | 1 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.9 | 0.0 | 0.6 | 0.5 | | | | | | |
| 4.3 | Ewing tumour | 0 | 0 | 0 | 0 | 1 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | | | | | | |
| 4.4 | Other specified and unspecified bone tumours | 1 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.6 | 0.0 | | | | | | |
| **5** | **SOFT TISSUE SARCOMAS** | **5** | **7** | **10** | **9** | **14** | **8** | **8.6** | **11.6** | **17.6** | **14.5** | **26.4** | **13.0** | **12.8** | **13.0** | **17.2** | **13.0** | **29** | **13.2** | **24** | **5.6** | **53** | **8.2** |
| 5.1 | Fibromatous neoplasms | 2 | 4 | 3 | 4 | 8 | 4 | 3.4 | 6.7 | 5.3 | 6.4 | 15.1 | 6.5 | 4.3 | 6.5 | 7.8 | 6.5 | | | | | | |
| 5.2 | Rhabdomyosarcoma | 1 | 0 | 3 | 0 | 0 | 0 | 1.7 | 0.0 | 5.3 | 0.0 | 0.0 | 0.0 | 3.4 | 0.0 | 2.3 | 0.0 | | | | | | |
| 5.3.1 | Other specified soft tissue sarcoma | 2 | 2 | 1 | 3 | 3 | 3 | 3.4 | 3.3 | 1.8 | 4.8 | 5.7 | 4.9 | 2.6 | 4.0 | 3.6 | 4.3 | | | | | | |
| 5.3.2 | Other unspecified soft tissue sarcoma | 0 | 1 | 3 | 2 | 3 | 1 | 0.0 | 1.7 | 5.3 | 3.2 | 5.7 | 1.6 | 2.5 | 2.4 | 3.5 | 2.1 | | | | | | |
| **6** | **GERM CELL AND TROPHOBLASTIC NEOPLASMS** | **0** | **8** | **2** | **7** | **0** | **12** | **0.0** | **13.3** | **3.5** | **11.3** | **0.0** | **19.5** | **1.7** | **12.3** | **1.1** | **14.6** | **2** | **0.9** | **27** | **6.3** | **29** | **4.5** |
| 6.1 | Germ cell and trophoblastic neoplasms of gonads | 0 | 7 | 2 | 4 | 0 | 5 | 0.0 | 11.6 | 3.5 | 6.4 | 0.0 | 8.1 | 1.7 | 9.2 | 1.1 | 8.8 | | | | | | |
| 6.2.1 | Germ cell and trophoblastic neoplasms of nongonodal sites, intracranial | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| 6.2.2 | Germ cell and trophoblastic neoplasms of nongonodal sites, other nongonodal sites | 0 | 1 | 0 | 3 | 0 | 7 | 0.0 | 1.7 | 0.0 | 4.8 | 0.0 | 11.4 | 0.0 | 3.2 | 0.0 | 5.8 | | | | | | |
| **7** | **MELANOMA AND SKIN CARCINOMAS** | **2** | **1** | **1** | **2** | **4** | **4** | **3.4** | **1.7** | **1.8** | **3.2** | **7.6** | **6.5** | **2.6** | **2.4** | **4.2** | **3.7** | **7** | **3.2** | **7** | **1.6** | **14** | **2.2** |
| 7.1 | Melanoma | 0 | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 1.6 | 0.0 | 0.8 | 0.0 | 1.0 | | | | | | |
| 7.2 | Skin carcinomas | 2 | 1 | 1 | 1 | 4 | 3 | 3.4 | 1.7 | 1.8 | 1.6 | 7.6 | 4.9 | 2.6 | 1.6 | 4.2 | 2.7 | | | | | | |
| **8** | **CARCINOMAS** | **10** | **18** | **10** | **54** | **29** | **160** | **17.1** | **29.9** | **17.6** | **86.8** | **54.8** | **259.6** | **17.3** | **56.7** | **29.3** | **121.6** | **49** | **22.3** | **232** | **54.5** | **281** | **43.5** |
| 8.1 | Thyroid | 0 | 4 | 1 | 11 | 3 | 24 | 0.0 | 6.7 | 1.8 | 17.7 | 5.7 | 38.9 | 0.8 | 11.8 | 2.4 | 20.5 | | | | | | |
| 8.2.1 | Other head and neck, nasopharyngeal carcinoma | 6 | 2 | 0 | 1 | 1 | 2 | 10.3 | 3.3 | 0.0 | 1.6 | 1.9 | 3.2 | 5.4 | 2.5 | 4.3 | 2.8 | | | | | | |
| 8.2.2 | Other head and neck, lip, oral cavity, pharynx | 0 | 2 | 2 | 4 | 3 | 1 | 0.0 | 3.3 | 3.5 | 6.4 | 5.7 | 1.6 | 1.7 | 4.8 | 2.9 | 3.8 | | | | | | |
| 8.2.3 | Other head and neck, nasal cavity, middle ear, sinuses, larynx and other ill-defined head and neck | 1 | 0 | 1 | 1 | 0 | 0 | 1.7 | 0.0 | 1.8 | 1.6 | 0.0 | 0.0 | 1.7 | 0.8 | 1.2 | 0.5 | | | | | | |
| 8.3 | Trachea, bronchus and lung | 0 | 1 | 1 | 2 | 5 | 0 | 0.0 | 1.7 | 1.8 | 3.2 | 9.4 | 0.0 | 0.8 | 2.4 | 3.6 | 1.6 | | | | | | |
| 8.4 | Breast | 0 | 0 | 0 | 6 | 0 | 46 | 0.0 | 0.0 | 0.0 | 9.6 | 0.0 | 74.6 | 0.0 | 4.5 | 0.0 | 27.0 | | | | | | |
| 8.5.1 | Genitourinary tract, kidney | 1 | 2 | 0 | 0 | 1 | 2 | 1.7 | 3.3 | 0.0 | 0.0 | 1.9 | 3.2 | 0.9 | 1.8 | 1.2 | 2.2 | | | | | | |
| 8.5.2 | Genitourinary tract, bladder | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| 8.5.3 | Genitourinary tract, gonads | 0 | 3 | 0 | 7 | 0 | 5 | 0.0 | 5.0 | 0.0 | 11.3 | 0.0 | 8.1 | 0.0 | 7.9 | 0.0 | 8.0 | | | | | | |
| 8.5.4 | Genitourinary tract, cervix and uterus | 0 | 1 | 0 | 19 | 0 | 61 | 0.0 | 1.7 | 0.0 | 30.5 | 0.0 | 99.0 | 0.0 | 15.3 | 0.0 | 42.0 | | | | | | |
| 8.5.5 | Genitourinary tract, other and ill-defined sites in genitourinary tract | 1 | 0 | 0 | 1 | 0 | 3 | 1.7 | 0.0 | 0.0 | 1.6 | 0.0 | 4.9 | 0.9 | 0.8 | 0.6 | 2.1 | | | | | | |
| 8.6.1 | Gastrointestinal tract, colon and rectum | 0 | 2 | 1 | 1 | 7 | 8 | 0.0 | 3.3 | 1.8 | 1.6 | 13.2 | 13.0 | 0.8 | 2.5 | 4.8 | 5.9 | | | | | | |
| 8.6.2 | Gastrointestinal tract, stomach | 0 | 0 | 1 | 0 | 2 | 2 | 0.0 | 0.0 | 1.8 | 0.0 | 3.8 | 3.2 | 0.8 | 0.0 | 1.8 | 1.0 | | | | | | |
| 8.6.3 | Gastrointestinal tract, liver and intrahepatic bile ducts | 1 | 1 | 1 | 0 | 1 | 0 | 1.7 | 1.7 | 1.8 | 0.0 | 1.9 | 0.0 | 1.7 | 0.9 | 1.8 | 0.6 | | | | | | |
| 8.6.4 | Gastrointestinal tract, pancreas | 0 | 0 | 0 | 0 | 1 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | | | | | | |
| 8.6.5 | Gastrointestinal tract, other and ill-defined sites in gastrointestinal tract | 0 | 0 | 0 | 1 | 2 | 1 | 0.0 | 0.0 | 0.0 | 1.6 | 3.8 | 1.6 | 0.0 | 0.8 | 1.2 | 1.0 | | | | | | |
| 8.7.1 | Adrenocortical carcinoma | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| 8.7.2 | Ill-defined sites, NEC | 0 | 0 | 2 | 0 | 3 | 5 | 0.0 | 0.0 | 3.5 | 0.0 | 5.7 | 8.1 | 1.7 | 0.0 | 2.9 | 2.6 | | | | | | |
| **9** | **MISCELLANEOUS SPECIFIED NEOPLASMS, NEC** | **2** | **3** | **2** | **4** | **0** | **7** | **3.4** | **5.0** | **3.5** | **6.4** | **0.0** | **11.4** | **3.5** | **5.7** | **2.4** | **7.5** | **4** | **1.8** | **14** | **3.3** | **18** | **2.8** |
| 9.1.1 | Wilms tumour | 0 | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 1.6 | 0.0 | 0.8 | 0.0 | 1.0 | | | | | | |
| 9.1.2 | Neuroblastoma | 0 | 1 | 0 | 0 | 0 | 0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.6 | | | | | | |
| 9.1.3 | Other paediatric and embryonal tumours, NEC | 2 | 0 | 0 | 0 | 0 | 0 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 1.2 | 0.0 | | | | | | |
| 9.2.1 | Paraganglioma and glomus tumours | 0 | 1 | 0 | 0 | 0 | 0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.6 | | | | | | |
| 9.2.2 | Other specified gonadal tumours | 0 | 0 | 0 | 1 | 0 | 3 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 4.9 | 0.0 | 0.8 | 0.0 | 2.1 | | | | | | |
| 9.2.3 | Myeloma, mast cell tumours and miscellaneous lymphoreticular neoplasms, NEC | | | | | | | | | | | | | | | | | | | | | | |
| 9.2.4 | Other specified neoplasms, NEC | 0 | 1 | 1 | 1 | 0 | 2 | 0.0 | 1.7 | 1.8 | 1.6 | 0.0 | 3.2 | 0.8 | 1.6 | 0.6 | 2.2 | | | | | | |
| **10** | **UNSPECIFED MALIGNANT NEOPLASMS, NEC** | **0** | **0** | **0** | **0** | **5** | **4** | **0.0** | **0.0** | **0.0** | **0.0** | **9.4** | **6.5** | **0.0** | **0.0** | **3.0** | **2.1** | **5** | **2.3** | **4** | **0.9** | **9** | **1.4** |
| | **ALL CANCERS** | **64** | **68** | **57** | **107** | **99** | **251** | **109.6** | **113.1** | **100.3** | **172** | **187** | **407.2** | **105.2** | **140.8** | **131.4** | **226.1** | **220** | **100** | **426** | **100** | **646** | **100** |

ASR: age-standardized rate, PNET: primitive neuroectodermal tumour, CNS: central nervous system, NEC: not elsewhere classified

oldest group, where it ranked second (Fig. 2). Carcinoma and soft tissue sarcoma shared the second place ranking in males between the ages of 20 and 24 years, each accounting for 17.5% of tumours in that age group. In the youngest males, carcinoma ranked fourth, accounting for 15.6% of tumours, being surpassed by lymphoma (26.6%), bone tumours (18.8%) and leukaemias (17.2%). Leukaemia ranked fourth in the 20–24 (14%) and 25–29 (9.1%)-year age groups, and CNS tumours placed fifth in all three age groups (Fig. 2).

Carcinoma and lymphoma were the commonest and second commonest diagnoses, respectively, among all three age groups in females, with carcinomas accounting for progressively greater proportions of tumours with increasing age (26.5% in the youngest age group, 50.5% in the middle and 63.7% in the oldest) [Fig. 2]. Soft tissue, germ cell and CNS tumours were also among the commonest diagnoses in all three age groups, in addition to bone tumours in 15–19-year old pa-

Fig. 2: Leading malignancies in adolescents and young adults, Kingston and St Andrew, 1988–2007, by gender and age group. Each malignancy is represented as a percentage of total new cases in that age group. Actual numbers appear to the right of the bars.

All cancers (incidence by age group (years) and gender):

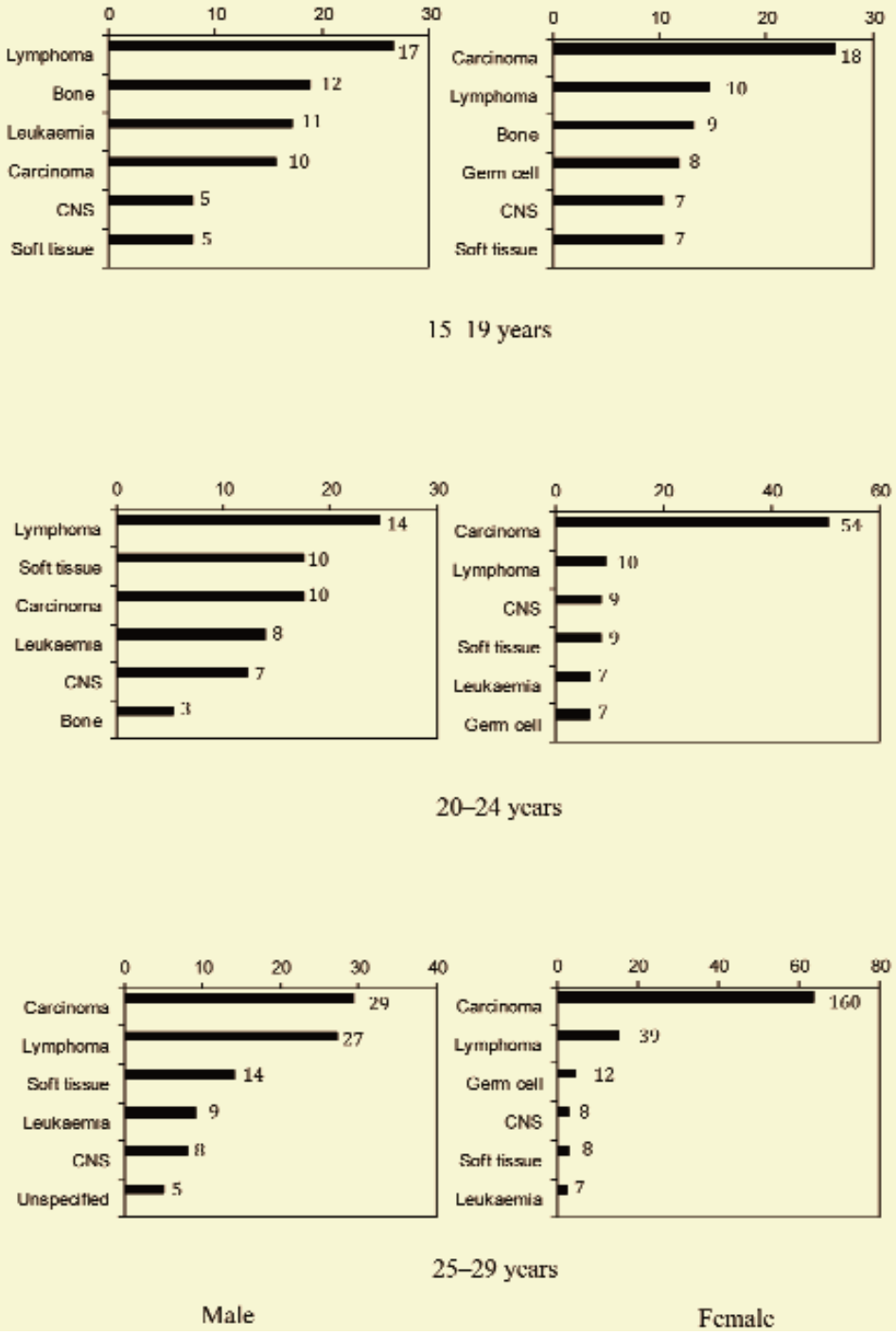
**Male**

15–19 64
20–24 57
25 29 99

**Female**

15 19 68
20–24 107
25 29 251

Soft tissue: soft tissue sarcomas, CNS: central nervous system and other intracranial and intraspinal neoplasms, Germ cell: germ cell and trophoblastic neoplasms, Unspecified: unspecified malignant neoplasms, not elsewhere classified.



tients and leukaemia in the 20–24 and 25–29-year age groups (Fig. 2).

Further analysis of carcinomas showed that, among males, colorectal carcinoma was the commonest overall (16.3%), followed by nasopharyngeal (14.3%), lung (12.2%), "lip, oral cavity and pharynx" (10.2%) and "ill-defined sites, not elsewhere classified" (10.2%) [Fig. 3]. Analysis by five-year age groups showed that colorectal carcinoma was the commonest (24.1%) in those patients between the ages of 25 and 29 years, but ranked thirteenth among 15–19 year olds, in whom nasopharyngeal carcinoma (60%) was the commonest, and sixth in 20–24 year olds, in whom carcinomas of "lip, oral cavity and pharynx" and "ill-defined sites, not elsewhere classified" were commonest (20% each) [Fig. 3].

Among females, "cervix and uterus" was the commonest site (34.9%) for carcinoma. This included 81 carcinomas, of which 80 (34.5% of all carcinomas in females) were cervical carcinomas and one was endometrial. Breast carcinomas were the second commonest (22.4%), followed by thyroid (16.8%) and ovarian (6.5%) [Fig. 3]. On analysis by age

Fig. 3: Commonest carcinomas in adolescents and young adults, Kingston and St Andrew, 1988–2007, by gender and age group. Each site is represented as a percentage of total carcinomas in that age group. Actual numbers appear to the right of the bars.

All carcinomas (n = 281; incidence by age group (years) and gender):

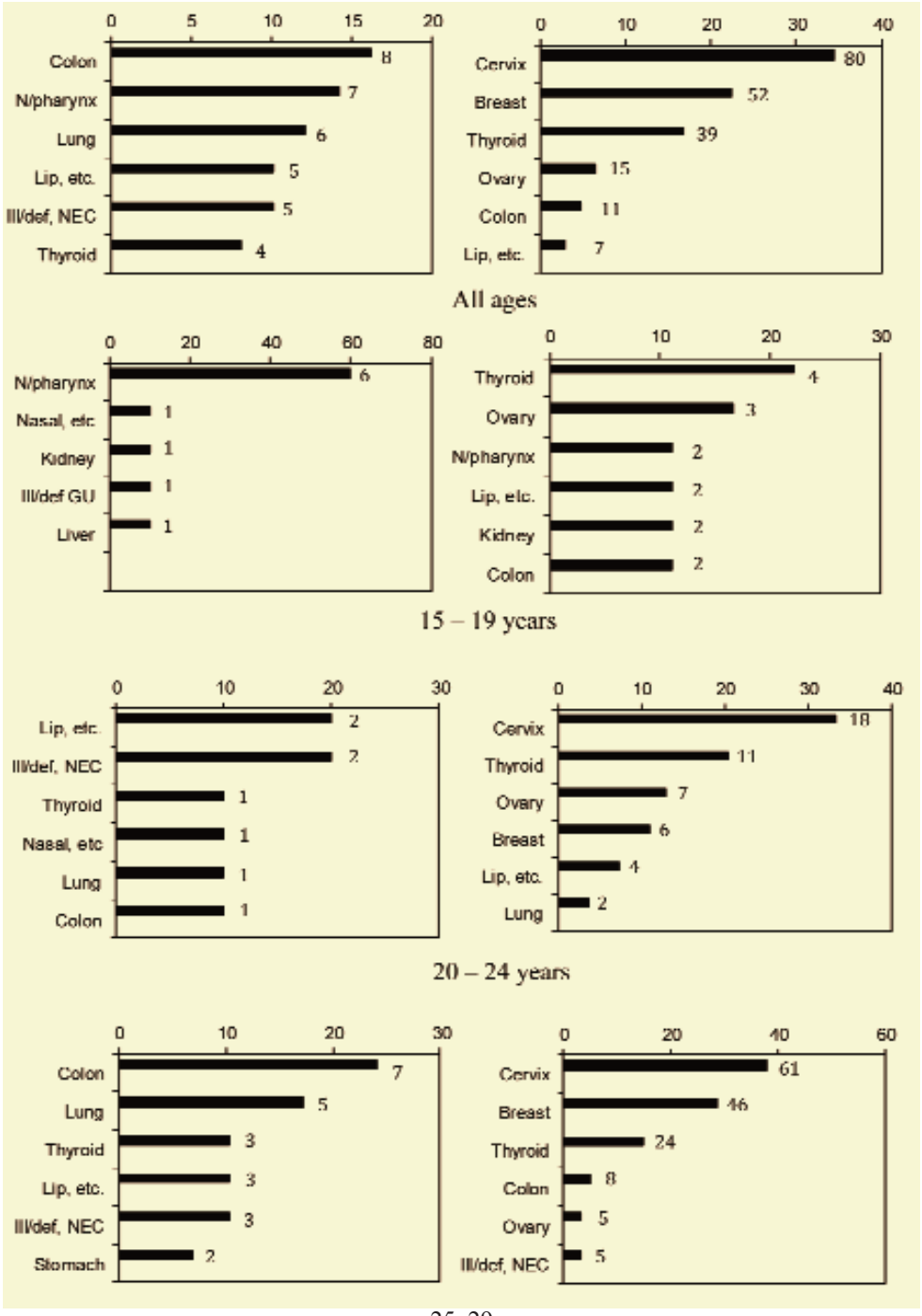
**Male**

| | |
|---|---|
| 15–19 | 10 |
| 20–24 | 10 |
| 25–29 | 29 |
| Total | 49 |

**Female**

| | |
|---|---|
| 15–19 | 18 |
| 20–24 | 54 |
| 25–29 | 160 |
| Total | 232 |

Colon includes rectum, Lip, etc: lip, oral cavity and pharynx, Nasal, etc: nasal cavity, middle ear, sinuses, larynx, other ill-defined head and neck, N/pharynx: nasopharynx, Ill/def: ill-defined, NEC: not elsewhere classified, GU: genitourinary



groups, cervix uteri remained the commonest site in the two older groups, but ranked eighth in the youngest, where carcinomas of the thyroid (22.2%) and ovaries (16.7%) were the commonest (Fig. 3). Thyroid carcinomas were ranked second (20.4%) among 20–24-year old females and third (15%) among those females between the ages of 25 and 29 years (Fig. 3).

## DISCUSSION

It has been previously reported (4) that 2% of all invasive cancers occur in individuals between the ages of 15 and 29 years. Our data also show a low contribution to invasive cancer total by this age group, which accounts for 3.6% of all cancers. Additionally, it has been reported that approximately 50% of cancers occurring in individuals between the ages of 15 and 29 years are found in those older than 24 years (4). Our data show a similar distribution, with 54.2% of cancers in the 15–29-year age group occurring within the 25–29-year age range.

Previously published data on cancers in adolescents and young adults are sparse and vary with respect to the age group included in analysis (15–19; 13/15–24; or 15–29), the cancer classification scheme used (ICD, ICCC or Birch *et al*) and the methods of reporting (both sexes combined or sexes reported separately) and representing (per 100 000 *versus* per million) the ASR. As a result, direct comparisons between our data and that previously published were not always possible.

The incidence rates for cancer in adolescents aged 15–19 years reportedly show worldwide variation, from 90–300 per million in males and 88–270 per million in females (15). Our age-specific incidence rates for cancer in the 15–19-year age group (109.6 per million in males and 113.1 in females) fall within these ranges. However, while the range reported in the literature is higher for males than for females, our data show a higher incidence rate for females. Although this is the less common scenario, a higher incidence rate in females had been previously reported in some populations (15). In our data, the higher overall incidence rate in adolescent females appears to be the result of higher rates in females than in males for carcinomas, germ cell and trophoblastic neoplasms and CNS tumours.

Review of cancer ASRs (15–24 years) in the literature show that those in our study (105.2 per million in males and 140.8 per million in females) are somewhat lower than those reported elsewhere (182–193.8 per million in both sexes combined (12, 16) and 129.7 per million in males and 147.2 per million in females in a study which excluded haematological malignancies (17)). Our ASRs for the 15–29-year age group (131.4 in males and 226.1 in females) also fall below those reported elsewhere, where age-specific incidence rates of 319.5 per million in males and 359.6 per million in females were documented (3). The reasons for lower incidence rates in our data are uncertain.

A previously published series that reported combined cancer frequencies for all three age groups presented their data by topography rather than morphology, and so our calculated proportions for carcinomas in these series are estimates only. In addition, we were unable to tell the proportion of genital tract malignancies that were carcinoma rather than germ cell tumours in some instances. Nonetheless, the commonest malignancies seen in males in the 15–29-year age group in other series (3, 4) were lymphoma (21–24%), germ cell tumours of the testis (24%), carcinoma (15–16%), malignant melanoma (7–17%), CNS tumours (8% in each series) and leukaemia [8% in each series] (3). In the current study, lymphoma (26.4%), carcinoma (22.3%), leukaemia (12.7%) and CNS tumours (9.1%), were also among the top six malignancies. However, germ cell tumours of the testis (0.9%) and malignant melanoma (no cases) were not main contributors to malignancy total in males in our data.

Among females, carcinomas were the commonest malignancies in the 15–29-year age group in other series [approximately 35–43%] (3, 4), as they are in our study (54.5%). The other top-ranked malignancies in females in other series (3, 4) – lymphoma (17–18%), malignant melanoma (11–17%), leukaemia (5–6%) and CNS tumours (5–6%) – were also among the commonest in our data, with the exception of malignant melanoma.

The similarities in the distribution of most malignancies among the different series suggest that similar aetiologic factors common to the age group involved are present across populations. The relatively low incidence of malignant melanoma in our data is in keeping with the overall low incidence of this malignancy in the Jamaican population (5–10), the latter, presumably the consequence of the population, being composed predominantly of individuals of African descent (18), in whom the incidence of malignant melanoma is generally low (19). We are uncertain of the reasons for the differences in frequency of the proportionate contributions from germ cell tumours of the testis.

Analysis of the commonest malignancies in our study by five-year age group showed a general shift from non-epithelial to epithelial malignancies with increasing age, in both genders, as has been reported elsewhere (4, 20). It has been suggested that this shift may be explained by differences in aetiology between the two groups of tumours. That is, non-epithelial malignancies seen commonly in childhood and adolescence are often related to viral infections, environmental carcinogens (radiation, chemicals) and genetic mutations, whereas epithelial malignancies are more likely to be the result of lifestyle and dietary influences that have accumulated over several years, and are therefore more commonly seen in older adults (20).

The shift from non-epithelial to epithelial malignancies was more marked in females than in males in this study, with carcinomas being common even in the youngest females, and becoming progressively more common with increasing age. An earlier non-epithelial to epithelial tumour shift in females compared to males has been previously documented (20) and it has been proposed that the earlier shift seen in females may be the result of certain physiological changes and risk factor exposures in that gender (20). For example, it has been sug-

gested that hormonal changes associated with puberty and menstruation in females may cause increased thyroid follicular cell turnover and consequent increased predisposition to development of thyroid carcinoma (20). The profile of carcinomas seen in females in this study is similar to that reported elsewhere (3, 4, 16, 20), where carcinomas of the breast, cervix uteri, thyroid and ovary feature prominently.

The incidence of malignancy in adolescents and young adults in Jamaica is higher in females than in males. In both genders, increasing age is accompanied by increased incidence and a general shift from non-epithelial to epithelial malignancies. This shift occurs at an earlier age in females, in whom carcinomas of the breast, thyroid, cervix uteri and ovary are the commonest epithelial malignancies.

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