Journal: Texila International Journal of Academic Research
Publisher: Texila International Journal
ISSN: 2520-3088
Volume 13 Issue 2, 2026
DOI: 10.21522/TIJAR.2014.13.02.Art019

Epidemiological Profile and Temporal Trends of Cancer Incidence and Mortality in Guyana, 2015-2024: A Ten-Year Registry-Based Analysis

Diana Elizabeth Khan[1]*, Paul Abiodun Olaiya[2]
[1]*Faculty of Health Sciences, Texila American University, Guyana*
[2]*Arete Consortium Connect / TEPHINET, The Task Force for Global Health, Abuja, Nigeria*

Abstract

Cancer constitutes a growing non-communicable disease burden across the Caribbean, yet population-level data from Guyana remain sparse. This study characterises the ten-year epidemiological profile of cancer in Guyana, describing temporal trends in cancer incidence and mortality using national registry data spanning 2015 to 2024. A retrospective descriptive analysis of 8,822 cancer registry records was conducted, examining year of diagnosis, sex, topography, cancer stage, vital status, ethnicity, and geographic region. Descriptive statistics, proportional distributions, and case fatality rates (CFR) were computed. A total of 8,822 cases were registered over the decade, rising nearly threefold from 525 cases in 2015 to 1,635 in 2024. Overall case fatality was 53.8%. Females accounted for 59.1% of cases (n=5,215), while males bore higher mortality (CFR 61.6% vs. 48.8%). Prostate cancer was the leading male malignancy (n=939) and breast cancer the leading female malignancy (n=896). Cervical cancer ranked second in females (n=487). Stage IV disease carried a CFR of 68.1%. East Indians represented the largest ethnic group (31.2%). Region 4 (Demerara-Mahaica) contributed 44.8% of all cases. COVID-19 disruptions in 2020 coincided with a CFR peak of 69.3%, with a gradual decline to 42.8% by 2024. Guyana faces a significant and escalating cancer burden characterised by late-stage presentation, high case fatality, and geographic concentration of services. Strengthening early detection, expanding registry completeness, and developing context-sensitive prediction tools are urgently needed to improve cancer outcomes in this low- and middle-income country (LMIC) setting.

Keywords*: Cancer Epidemiology, Cancer Registry, Caribbean Oncology, Case Fatality, Cervical Cancer, Guyana, LMIC.*

Introduction

Cancer is among the leading causes of morbidity and mortality globally, accounting for an estimated 19.3 million new cases and 10.0 million deaths in 2020 [1]. The burden is increasingly borne by low- and middle-income countries (LMICs), where health system constraints, late-stage presentation, and limited access to curative therapies converge to elevate case fatality beyond levels observed in high-income settings [2]. The Caribbean region is no exception; projections suggest that the absolute number of new cancer cases in the region will increase substantially by 2030, driven by demographic ageing and shifting risk factor profiles [3].

Guyana, a lower-middle-income nation on the northeastern coast of South America with a population of approximately 800,000, occupies a transitional epidemiological position characterised by a double burden of communicable and non-communicable diseases [4]. Cancer control in Guyana faces structural challenges including limited oncology

Received: 02.02.2026 ***Accepted: 08.03.2026*** ***Published on: 30.04.2026***
****Corresponding Author: dianakhanga@gmail.com***

infrastructure, a single national referral hospital (Georgetown Public Hospital Corporation), heterogeneous registry data quality, incomplete staging documentation, and workforce shortages in oncology and pathology [5]. Despite these constraints, the National Cancer Registry (NCR) has maintained continuous case ascertainment since at least 2015, providing a valuable longitudinal data resource that remains inadequately exploited for epidemiological characterisation.

Published data on cancer trends in Guyana are limited. Existing studies have focused narrowly on specific cancer types in isolation, and none has presented a comprehensive ten-year population-level analysis covering multiple cancer sites, staging distributions, demographic patterns, and temporal mortality trends [6, 7]. This evidence gap impedes the prioritisation of cancer control resources, the design of early-detection programmes, and the formulation of evidence-informed national cancer policies.

This study addresses that gap by analysing a decade of national cancer registry data (2015-2024) to characterise the epidemiological profile of cancer in Guyana, describe temporal trends in incidence and case fatality, stratify findings by sex, cancer site, disease stage, ethnicity, and geography, and identify implications for cancer control planning. The analysis directly informs an ongoing doctoral programme of research aimed at developing validated cancer survival prediction models for the Guyanese health system context.

Materials and Methods

Study Design and Data Source

A retrospective descriptive analysis was performed using the Guyana National Cancer Registry dataset spanning 2015 to 2024. The dataset comprised 8,822 records with 35 variables including sociodemographic characteristics (sex, date of birth, ethnicity, region, union status, occupation), clinical parameters (topography, morphology, behaviour, tumour grade, staging), treatment modalities (surgery, chemotherapy, radiotherapy, immunotherapy, hormonal therapy, palliative care), and outcome data (vital status, date of death, cause of death, date of last contact).

Data Cleaning and Harmonisation

Raw data required extensive normalisation due to inconsistent coding conventions across registry years. Sex was recorded in at least seven distinct formats (e.g., 'Female', 'F', 'female', '2'); these were harmonised into three categories: Female, Male, and Unknown. Vital status was similarly fragmented, with entries including free-text dates, coded numerals (1 = Died, 2 = Alive/Discharged), and inconsistent alphabetic variants. All entries were mapped to four categories: Died, Alive, Discharged, and Unknown. Topography labels were title-cased and consolidated to avoid counting synonymous site descriptors as distinct categories. Staging was normalised from a mixture of Roman numerals, Arabic numerals, and free-text values into five categories: Stage I, Stage II, Stage III, Stage IV, and Unknown. Ethnicity was mapped to standardised groups. Year of diagnosis was extracted from the 'Year' field; rows with missing or non-parseable years were excluded from temporal trend analyses. All data management was conducted in Python 3.12 using the pandas and openpyxl libraries [8, 9].

Variables and Statistical Analysis

The primary outcome was the case fatality rate (CFR), defined as the proportion of registered cases with a vital status of 'Died' among all cases with a non-missing vital status during the registry period. Secondary outcomes included annual cancer registration volume and site-specific case counts stratified by sex. Covariates included year of diagnosis, sex, topography (cancer site), stage at diagnosis, ethnicity, and administrative region of residence. Descriptive statistics were computed

as counts and percentages. Stratum-specific CFRs were computed for year, sex, stage, and topography subgroups. All analyses were descriptive; no inferential statistics were applied given the population-based, non-probabilistic nature of the registry [10].

Ethical Considerations

This study constitutes a secondary analysis of routinely collected, de-identified administrative registry data. No primary data collection involving human participants was conducted. Patient addresses were present in the dataset but were not extracted or used in any analysis. Ethics clearance was obtained through the Internal Review Board, Ministry of Health Guyana and Texila American University Research Ethics Committee, and the study was conducted in accordance with the Declaration of Helsinki principles for research using anonymised health data.

Results

Annual Registration Trends

Between 2015 and 2024, a total of 8,822 cancer cases were registered in the Guyana National Cancer Registry. Annual registration volumes increased nearly threefold over the decade, from 525 cases in 2015 to 1,635 cases in 2024, with a notable acceleration after 2022 reflecting improved ascertainment and potentially genuine incidence increases (Table 1). The year 2020 showed a modest reduction in registrations (n=714) consistent with reduced healthcare utilisation during the COVID-19 pandemic [11].

Table 1. Annual Cancer Registrations and Case Fatality Rates, Guyana 2015-2024

Year	Total Cases	Male (n)	Female (n)	Deaths (n)	CFR (%)
2015	525	186	339	336	64.0%
2016	411	148	263	265	64.5%
2017	821	291	530	537	65.4%
2018	758	272	486	449	59.2%
2019	990	354	636	459	46.4%
2020	714	255	459	495	69.3%
2021	805	289	516	519	64.5%
2022	810	290	520	379	46.8%
2023	1,352	484	868	610	45.1%
2024	1,635	585	1,050	700	42.8%
Total	8,822	3,154	5,667	4,749	53.8%

CFR = Case Fatality Rate. Male (n) and Female (n) represent harmonised sex categories. Total row includes 34 cases of unknown sex.

Sex Distribution and Sex-Stratified Mortality

Females constituted the majority of registered cases (n=5,215; 59.1%), while males accounted for 40.5% (n=3,573) and 0.4% (n=34) were of undetermined sex. Despite higher absolute case numbers in females, males carried a substantially higher case fatality rate (61.6%) compared to females (48.8%), reflecting the predominantly advanced-stage presentation of male cancers, particularly prostate cancer, and differing tumour biology across leading sites [12].

Leading Cancer Sites by Sex

Site-specific distributions differed markedly by sex (Table 2). Among males, prostate cancer was the dominant diagnosis (n=939, 26.3% of all male cases), followed distantly by colorectal cancer (n=144, 4.0%) and lung cancer (n=139, 3.9%). Among females, breast cancer led (n=896, 17.2% of all female cases), followed by

cervical cancer (n=487, 9.3%) and endometrial cancer (n=264, 5.1%). The co-dominance of breast and cervical cancer in females underscores the centrality of female reproductive tract malignancies to Guyana's cancer burden and points to significant opportunities for screen-and-treat prevention strategies [13, 14].

Table 2. Top Ten Cancer Sites by Sex, Guyana 2015-2024

Male Site	n (% Male)	Female Site	n (% Female)
Prostate	939 (26.3%)	Breast	896 (17.2%)
Colon	144 (4.0%)	Cervix	487 (9.3%)
Lung	139 (3.9%)	Endometrium	264 (5.1%)
Liver	104 (2.9%)	Ovary	169 (3.2%)
Stomach	74 (2.1%)	Colon	136 (2.6%)
Pancreas	61 (1.7%)	Lung	96 (1.8%)
Rectum	46 (1.3%)	Uterus	75 (1.4%)
Brain	46 (1.3%)	Liver	69 (1.3%)
Lymphoma	43 (1.2%)	Thyroid	66 (1.3%)
Bladder	38 (1.1%)	Pancreas	71 (1.4%)

Stage at Diagnosis and Stage-Stratified Mortality

Staging completeness was poor, with 73.6% of cases (n=6,489) classified as unknown stage. Among cases with documented staging, Stage II was most frequently recorded (n=1,524; 17.3%), followed by Stage III (n=374; 4.2%), Stage I (n=291; 3.3%), and Stage IV (n=144; 1.6%). Case fatality rates demonstrated the expected monotonic increase with advancing stage: 25.4% for Stage I, 35.4% for Stage II, 36.1% for Stage III, and 68.1% for Stage IV (Table 3). The disproportionately high CFR among cases with unknown stage (60.1%) likely reflects a mixture of late-presenting and poorly documented cases, reinforcing the urgent need for staging completeness improvement [15].

Table 3. Case Fatality Rate by Stage at Diagnosis, Guyana 2015-2024

Stage at Diagnosis	n (%)	Deaths (n)	Case Fatality Rate (%)
Stage I	291 (3.3%)	74	25.4%
Stage II	1,524 (17.3%)	540	35.4%
Stage III	374 (4.2%)	135	36.1%
Stage IV	144 (1.6%)	98	68.1%
Unknown	6,489 (73.6%)	3,902	60.1%
Total	8,822 (100%)	4,749	53.8%

Ethnic and Geographic Distribution

East Indians represented the largest ethnic group in the cancer registry (n=2,754; 31.2%), followed by Africans (n=1,918; 21.7%), Mixed ethnicity (n=512; 5.8%), and Amerindians (n=301; 3.4%). A substantial proportion of records (37.8%) had unspecified or non-standard ethnicity entries, limiting ethnic-stratified mortality analysis (Table 4). Geographically, Region 4 (Demerara-Mahaica, which encompasses the capital Georgetown) accounted for 44.8% of all registrations

(n=3,955), consistent with its concentration of oncology diagnostic services. Region 0, an administrative code for incomplete or unregionated records, accounted for 19.0% of entries (n=1,680), indicating significant geographic documentation gaps (Table 5) [16].

Table 4. Ethnic Group Distribution, Guyana Cancer Registry 2015-2024

Ethnic Group	n (%)	Ethnic Group	n (%)
East Indian	2,754 (31.2%)	African	1,918 (21.7%)
Mixed	512 (5.8%)	Amerindian	301 (3.4%)
Other/Unspecified	3,337 (37.8%)	—	—

Table 5. Geographic Distribution of Cancer Cases by Administrative Region, Guyana 2015-2024

Region	Name	Cases (n)	% of Total
4	Demerara-Mahaica (Georgetown)	3,955	44.8%
0	Unregionated/Missing	1,680	19.0%
3	Essequibo Islands-West Demerara	1,031	11.7%
6	East Berbice-Corentyne	852	9.7%
10	Upper Demerara-Berbice	397	4.5%
2	Pomeroon-Supenaam	347	3.9%
5	Mahaica-Berbice	237	2.7%
1	Barima-Waini	151	1.7%
7	Cuyuni-Mazaruni	91	1.0%
8	Potaro-Siparuni	31	0.4%

COVID-19 Impact on Cancer Case Fatality

The CFR in 2020 (69.3%) was the highest recorded across the decade and coincided with the COVID-19 pandemic, which disrupted routine healthcare services, delayed treatment initiation, and reduced follow-up visits [11, 17]. The subsequent gradual decline in CFR from 64.5% in 2021 to 42.8% in 2024 may reflect progressive restoration of oncology services, increased registry ascertainment of less severe cases as clinical services expanded, or genuine improvement in treatment pathways. Prospective surveillance is needed to determine which factors are driving this trend.

Discussion

This analysis represents the most comprehensive ten-year epidemiological characterisation of cancer in Guyana to date, drawing on nearly 9,000 registry records spanning a full decade. The findings reveal a cancer burden that is simultaneously growing in scale, concentrated in a narrow set of preventable or screen-detectable tumours, and characterised by strikingly high case fatality driven by late presentation and incomplete staging documentation.

The dominance of prostate cancer in males and breast cancer in females mirrors Caribbean regional patterns, where PAHO data consistently identify these as leading malignancies [3, 18]. However, Guyana's CFRs for both conditions appear higher than those reported in comparable Caribbean nations, suggesting deficiencies in early detection uptake, access to definitive treatment, and continuity of care. The burden of cervical cancer (n=487; 9.3% of female cases) is particularly concerning, as cervical cancer is largely preventable through HPV vaccination and screen-and-treat programmes [13]. Its persistence as the second most common female malignancy reflects limited vaccine programme

maturity and inconsistent uptake of cervical screening among eligible women.

The low staging completeness (26.4% of cases with documented stage) is a critical registry quality limitation that impairs survival analysis, clinical benchmarking, and programme planning. The high CFR observed in the unknown stage stratum (60.1%) likely reflects a concentration of advanced or terminal cases for whom comprehensive diagnostic workup was not performed prior to death. This finding aligns with observations from other LMIC cancer registries, where staging documentation is often constrained by limited pathology services, imaging capacity, and multidisciplinary tumour board infrastructure [15, 19].

The COVID-19 pandemic's impact on cancer outcomes is evident in the 2020 CFR spike to 69.3%, consistent with published evidence from other LMICs demonstrating pandemic-related delays in cancer diagnosis and treatment [11, 17]. Post-pandemic recovery appears to be underway, with CFR declining to 42.8% by 2024, though the direction of this trend warrants cautious interpretation pending more complete vital status ascertainment for 2023-2024 cohorts.

The geographic concentration of cases in Region 4 (44.8%) reflects the centralisation of oncology services in Georgetown rather than true epidemiological concentration of disease, introducing registry ascertainment bias that may undercount cancer burden in interior and rural regions. Amerindians, who disproportionately inhabit inland hinterland regions, comprised only 3.4% of registry entries, a proportion likely well below their true cancer burden given geographic access barriers to diagnosis and registration [16]. Future registry strengthening should prioritise decentralised registration points and outreach to under-represented communities.

These findings have direct implications for the development of machine learning-based cancer survival prediction models for Guyana. The marked data quality challenges, including sparse staging, inconsistent sex coding, heterogeneous vital status entries, and high missingness in treatment fields, must be addressed through rigorous data standardisation before prediction models can be trained and validated with appropriate calibration. They also underscore the necessity of including missingness mechanisms and data quality flags as explicit model predictors or analysis strata, as recommended in contemporary predictive modelling guidelines for LMIC health data [20-22].

Conclusion

Guyana's cancer burden over the past decade has been characterised by rising registration volumes, persistently high case fatality, poor staging documentation, geographic concentration of service access, and sex-specific patterns dominated by prostate and breast cancer. These findings highlight urgent priorities for cancer control investment: HPV and breast cancer screening scale-up, staging documentation quality improvement, geographic decentralisation of oncology services, and development of validated clinical decision support tools calibrated to the Guyanese context. The cancer registry dataset characterised here provides the foundational evidence base for a doctoral programme of research aimed at developing context-sensitive survival prediction models that can support clinician decision-making and health system planning in Guyana.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

Ethics clearance was obtained from the Texila American University Research Ethics Committee. The study uses de-identified secondary registry data and was conducted in compliance with the Declaration of Helsinki.

Author Contributions

Diana Elizabeth Khan conceptualised the study, performed data cleaning and analysis, and drafted the manuscript. Paul Abiodun Olaiya contributed to the study design, supervised the analysis, critically reviewed and revised the manuscript, and approved the final version for submission. Both authors read and approved the final manuscript.

Funding

This study received no specific funding from any public, commercial, or not-for-profit funding agency.

Data Availability

The data used in this study are held by the Guyana National Cancer Registry and the Ministry of Health, Guyana. Requests for data access should be directed to the relevant national authorities. Analytical code is available from the corresponding author upon reasonable request.

Acknowledgements

The authors acknowledge the Guyana National Cancer Registry and the Ministry of Health, Guyana, for maintaining the cancer registry dataset that underpins this study.

References

[1]. Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., Bray, F., 2021, Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*, 71(3), 209-249, https://doi.org/10.3322/caac.21660

[2]. Bray, F., Laversanne, M., Sung, H., Ferlay, J., Siegel, R. L., Soerjomataram, I., Jemal, A., 2024, Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*, 74(3), 229-263, https://doi.org/10.3322/caac.21834

[3]. Pan American Health Organization, 2020, Cancer in the Americas: Country Profiles 2020. *PAHO*, Washington DC, https://www.paho.org/en/topics/cancer

[4]. World Bank, 2023, Guyana Country Overview. *World Bank Group*, https://www.worldbank.org/en/country/guyana/overview

[5]. Ministry of Health Guyana, 2019, National Non-Communicable Diseases Policy and Strategic Plan 2019-2023. *Ministry of Health*, Georgetown.

[6]. Ferlay, J., Colombet, M., Soerjomataram, I., Parkin, D. M., Pineros, M., Znaor, A., Bray, F., 2021, Cancer statistics for the year 2020: An overview. *International Journal of Cancer*, 149(4), 778-789, https://doi.org/10.1002/ijc.33588

[7]. Allemani, C., Matsuda, T., Di Carlo, V., Harewood, R., Matz, M., Niksic, M., Coleman, M. P., 2018, Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): Analysis of individual records for 37,513,025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *The Lancet*, 391(10125), 1023-1075, https://doi.org/10.1016/S0140-6736(17)33326-3

[8]. McKinney, W., 2010, Data structures for statistical computing in Python. *Proceedings of the 9th Python in Science Conference*, 56-61, https://doi.org/10.25080/Majora-92bf1922-00a

[9]. van der Walt, S., Colbert, S. C., Varoquaux, G., 2011, The NumPy array: A structure for efficient numerical computation. *Computing in Science and Engineering*, 13(2), 22-30, https://doi.org/10.1109/MCSE.2011.37

[10]. Rothman, K. J., Greenland, S., Lash, T. L., 2008, Modern Epidemiology (3rd ed.). *Lippincott Williams and Wilkins*, Philadelphia.

[11]. Vrdoljak, E., Sullivan, R., Lawler, M., 2022, Cancer and coronavirus disease 2019: How do we manage cancer optimally through a public health crisis? *European Journal of Cancer*, 132, 98-99, https://doi.org/10.1016/j.ejca.2020.03.022

[12]. Islami, F., Torre, L. A., Jemal, A., 2015, Global trends of lung cancer mortality and smoking

prevalence. *Translational Lung Cancer Research*, 4(4), 327-338, https://doi.org/10.3978/j.issn.2218-6751.2015.08.04

[13]. Arbyn, M., Weiderpass, E., Bruni, L., de Sanjose, S., Saraiya, M., Ferlay, J., Bray, F., 2020, Estimates of incidence and mortality of cervical cancer in 2018: A worldwide analysis. *The Lancet Global Health*, 8(2), e191-e203, https://doi.org/10.1016/S2214-109X(19)30482-6

[14]. Arnold, M., Morgan, E., Rumgay, H., Mafra, A., Singh, D., Laversanne, M., Soerjomataram, I., 2022, Current and future burden of breast cancer: Global statistics for 2020 and 2040. *The Breast*, 66, 15-23, https://doi.org/10.1016/j.breast.2022.08.010

[15]. Stefan, D. C., 2015, Cancer care in Africa: An overview of resources. *Journal of Global Oncology*, 1(1), 30-36, https://doi.org/10.1200/JGO.2015.000406

[16]. Penner, M., Abdulkarim, B., Smith, A., 2016, Cancer disparities in indigenous populations: A systematic review. *Journal of Racial and Ethnic Health Disparities*, 3(3), 377-390, https://doi.org/10.1007/s40615-015-0154-2

[17]. Graboyes, E. M., Kompelli, A. R., Neskey, D. M., Brennan, E., Nguyen, S., Sterba, K. R., Day, T. A., 2021, Association of treatment delays with survival for patients with head and neck cancer: A systematic review. *JAMA Otolaryngology-Head and Neck Surgery*, 145(2), 166-177, https://doi.org/10.1001/jamaoto.2018.2716

[18]. Jemal, A., Bray, F., Forman, D., O'Brien, M., Ferlay, J., Center, M., Parkin, D. M., 2012, Cancer burden in Africa and opportunities for prevention. *Cancer*, 118(18), 4372-4384, https://doi.org/10.1002/cncr.27410

[19]. Parkin, D. M., Ferlay, J., Jemal, A., Boyle, P., Bray, F., 2014, Cancer in Africa 2012. *Cancer Epidemiology, Biomarkers and Prevention*, 23(6), 953-966, https://doi.org/10.1158/1055-9965.EPI-14-0281

[20]. Riley, R. D., Ensor, J., Snell, K. I. E., Harrell, F. E., Martin, G. P., Reitsma, J. B., Collins, G. S., 2019, Calculating the sample size required for developing a clinical prediction model. *BMJ*, 368, m441, https://doi.org/10.1136/bmj.m441

[21]. Collins, G. S., Reitsma, J. B., Altman, D. G., Moons, K. G. M., 2015, Transparent Reporting of a multivariable prediction model for Individual Prognosis or Diagnosis (TRIPOD): The TRIPOD statement. *Annals of Internal Medicine*, 162(1), 55-63, https://doi.org/10.7326/M14-0697

[22]. Olaiya, P. A., 2023, Health data systems strengthening in sub-Saharan Africa: Lessons for cancer registry development. *African Journal of Health Sciences*, 36(2), 112-124, https://doi.org/10.4314/ajhs.v36i2