Original Article

Colorectal Cancer in Cape Verde: What Do We Know?

Cancro Colorectal em Cabo Verde: O que Sabemos?

Danielson Veiga[1], Víctor Costa[2], Hirondina Borges Spencer[3], Carla Barbosa[4], Stefani Furtado[5], Aderlinda Fonseca[5], Cátia Mendonça[4], Viviane Lopes[6], Pedro Leite Silva[7], Teresa Garcia[7], Lúcio Lara Santos[8], Pamela Borges[5]

1. Surgical Service, Hospital Universitário Agostinho Neto (HUAN), Praia, Cape Verde
2. Surgical Service, Hospital Batista de Sousa (HBS), Mindelo, Cape Verde
3. Medical Oncology Service, HUAN, Praia, Cape Verde
4. Pathology Service, HUAN, and Cape Verde Population-Based Cancer Registry, Praia, Cape Verde
5. Translational Research and Molecular Biology Laboratory, HUAN, Praia, Cape Verde
6. Cape Verde Population-Based Cancer Registry, Mindelo, Cape Verde
7. Grupo de Epidemiologia, Resultados, Economia e Gestão em Oncologia, CI-IPOP / RISE@CI-IPOP / Porto Comprehensive Cancer Center (Porto.CCC), Porto, Portugal
8. Experimental Pathology and Therapeutics Group and Department of Surgical Oncology, CI-IPOP / RISE@CI-IPOP / Porto Comprehensive Cancer Center (Porto.CCC), Porto, Portugal

Corresponding Author/Autor Correspondente:
Pamela Borges [palu15.18@gmail.com]
Translational Research and Molecular Biology Laboratory, Hospital Universitário Agostinho Neto, Praia, Cabo Verde

https://doi.org/10.34635/rpc.1205

ABSTRACT

Introduction: In 2022, Cape Verde established its population-based cancer registry (Registo Oncológico de Cabo Verde, ROCV). Until then, information on colorectal cancer (CRC) in the country relied largely on hospital-based series and modelled international estimates. Three consecutive years of population-based registration (2022–2024) are now available. We aimed to describe the incidence of colon and rectal cancer in Cape Verde using the ROCV case-level database for 2022–2024, and to characterize the demographic, clinicopathological, staging, treatment, and vital-status profile of an institutional cohort of patients with CRC managed at the Hospital Universitário Agostinho Neto (HUAN).

Methods: Descriptive study with two components. The population-based component analysed the ROCV case-level database, restricted to malignant tumours diagnosed between 2022 and 2024 at colon and rectal sites (ICD-10 C18–C20); anal tumours (C21)

Received/Recebido: 01/07/2026 **Accepted/Aceite:** 03/07/2026 **Published online/Publicado online:** 31/07/2026 **Published/Publicado:** 31/07/2026

© Portuguese Society of Surgery 2026. Re-use permitted under CC BY-NC. No commercial re-use.
© Sociedade Portuguesa de Cirurgia 2026. Reutilização permitida de acordo com CC BY-NC. Nenhuma reutilização comercial.

were excluded. The institutional component comprised 255 patients diagnosed with CRC and registered at HUAN between 2017 and 2026; for each variable, only patients with available information were analysed, the number of missing values is reported, and no imputation was performed.
Results: Between 2022 and 2024, 1424 malignant tumours were registered (excluding non-melanoma skin cancer). Colon and rectal cancer accounted for 113 cases (7.9%), the fourth most frequent site nationally and the third in each sex, with 58 cases in men and 55 in women. The age-standardized incidence rate (world population) was 8.9 per 100 000 in men and 6.7 in women, and the cumulative risk between birth and 74 years was 1.23% and 0.75%, respectively. The colon accounted for 59.3% of cases and the rectum and rectosigmoid junction for 40.7%. Median age at diagnosis was 62 years (range 24–90) and 21.2% of patients were younger than 50 years. Adenocarcinoma not otherwise specified accounted for 76.1% of cases, morphological verification reached 98.2%, and no case was registered from a death certificate only.
Conclusion: Colon and rectal cancer is the fourth most frequent malignancy in Cape Verde, affects men and women in similar proportions, although the age-standardized incidence rate is higher in men than in women (8.9 *vs* 6.7 per 100 000, with a cumulative risk to age 74 of 1.23% *vs* 0.75%), shows a high proportion of morphologically verified cases, and occurs before the age of 50 in about one fifth of patients. This high proportion of patients under 50 years mandates a dedicated early-diagnosis programme for symptomatic patients in this age group. In the institutional cohort, diagnosis at an advanced stage predominated, with limited use of radiotherapy and substantial gaps in vital-status ascertainment. Consolidation of the ROCV and its linkage to civil and mortality registries are essential to characterize the incidence, staging, and survival of CRC in the country.

Keywords: Cabo Verde; Colorectal Neoplasms/epidemiology; Cabo Verde; Registries; Africa South of the Sahara

RESUMO

Introdução: Em 2022, Cabo Verde criou o seu Registo Oncológico de Base Populacional (ROCV). Até então, a informação sobre o cancro colorretal (CCR) no país assentava sobretudo em séries hospitalares e em estimativas internacionais modeladas. Estão agora disponíveis três anos consecutivos de registo populacional (2022–2024). O nosso objetivo foi descrever a incidência do cancro do cólon e do reto em Cabo Verde, com base na base de dados do ROCV (2022–2024), e caracterizar o perfil demográfico, clinicopatológico, de estadiamento, de tratamento e de estado vital de uma coorte institucional de doentes com CCR seguidos no Hospital Universitário Agostinho Neto (HUAN).
Métodos: Estudo descritivo com duas componentes. A componente populacional analisou a base de dados de casos individuais do ROCV, restringida aos tumores malignos com data de diagnóstico entre 2022 e 2024 e às localizações do cólon e reto (CID-10 C18–C20); os tumores do ânus (C21) foram excluídos. A componente institucional incluiu 255 doentes com diagnóstico de CCR registados no HUAN entre 2017 e 2026; para cada variável foram considerados apenas os doentes com informação disponível, sendo indicado o número de valores omissos, sem imputação.
Resultados: Entre 2022 e 2024 foram registados 1424 tumores malignos (excluindo pele não melanoma). O cancro do cólon e do reto representou 113 casos (7,9%), a quarta localização mais frequente do país e a terceira em cada sexo, com 58 casos em homens e 55 em mulheres. A taxa de incidência padronizada para a idade (população mundial) foi de 8,9/100 000 nos homens e 6,7/100 000 nas mulheres, com risco cumulativo aos 74 anos de 1,23% e 0,75%, respetivamente. O cólon correspondeu a 59,3% dos casos e o reto e junção rectossigmoideia a 40,7%. A idade mediana ao diagnóstico foi de 62 anos (24–90) e 21,2% dos doentes tinham menos de 50 anos. O adenocarcinoma sem outra especificação representou 76,1% dos casos, a verificação morfológica foi de 98,2% e nenhum caso foi registado apenas por certificado de óbito. Na coorte institucional (255 doentes), a informação esteve frequentemente ausente para várias variáveis; todos os resultados institucionais referem-se apenas aos doentes com dados disponíveis. Entre estes, 54,8% dos doentes com estádio conhecido apresentavam doença em estádio IV e 45 dos 145 doentes com estado vital determinado (31,0%) tinham falecido.
Conclusão: O cancro do cólon e do recto é a quarta neoplasia mais frequente em Cabo Verde, afeta homens e mulheres em proporções semelhantes, embora a taxa de incidência padronizada para a idade seja mais elevada nos homens do que nas mulheres (8,9 *vs* 6,7 por 100 000, com risco cumulativo aos 74 anos de 1,23% *vs* 0,75%), apresenta uma elevada proporção de confirmação morfológica e surge antes dos 50 anos em cerca de um quinto dos doentes. A elevada proporção de doentes com menos de 50 anos obriga à criação de um programa dedicado ao diagnóstico precoce para os doentes sintomáticos desta faixa etária. A elevada proporção de valores omissos na coorte institucional é assumida de forma explícita e reflete sobretudo lacunas de registo, pelo que os resultados devem ser interpretados como referentes aos doentes com dados disponíveis. Na coorte institucional predomina o

diagnóstico em estádio avançado, com utilização limitada de radioterapia e lacunas relevantes na determinação do estado vital. A consolidação do ROCV e a sua articulação com os registos civis e de mortalidade são essenciais para caracterizar a incidência, o estadiamento e a sobrevivência do CCR no país.

Palavras-chave: Cabo Verde; Neoplasias Colorretais/epidemiologia; Sistema de Registos

INTRODUCTION

Colorectal cancer (CRC) is increasingly recognized as an emerging global public-health problem. Its incidence is rising in regions historically considered low-risk, and marked disparities persist between high- and low-resource settings in the stage at diagnosis and in access to treatment.[1] In high-income countries with organized screening programmes, earlier-stage diagnosis and standardized multidisciplinary care have translated into improved survival for both colon and rectal cancer.[2]

Cape Verde is an island nation of approximately 509 000 inhabitants distributed across nine inhabited islands, according to the national demographic projections of the Instituto Nacional de Estatística (INE). Until recently, information on the true incidence, stage distribution, and outcomes of CRC in the country was limited and was inferred mainly from hospital-based series and regional comparators.[3,4] This changed in 2022 with the launch of the Cape Verde Population-Based Cancer Registry (Registo Oncológico de Cabo Verde, ROCV), established under the National Programme for Cancer Prevention and Control with technical support from the Instituto Português de Oncologia do Porto (IPO-Porto) and the Instituto de Higiene e Medicina Tropical (IHMT), and validated by the African Cancer Registry Network (AFCRN). The registry uses CanReg5 software and follows the coding and quality-control procedures of the International Agency for Research on Cancer (IARC). Three consecutive years of registration (2022–2024) are now consolidated, allowing national incidence to be described from observed rather than modelled data.

This development is part of a broader pattern described for Sub-Saharan Africa, where CRC incidence is rising in most studied registry populations, presentation tends to be both younger and more advanced than in high-income settings, and overall survival is low, shaped by limited diagnostic and treatment capacity.[5–7] The regional evidence base is improving but remains heterogeneous, with sparse registry coverage and country-level data gaps that probably underestimate the true disease burden.[8,9]

The present study has two objectives: to describe the incidence of colon and rectal cancer in Cape Verde using ROCV data for 2022–2024, and to characterize the demographic, clinicopathological, staging, treatment, and vital-status profile of an institutional cohort of patients with CRC managed at HUAN, the country's main oncology referral centre.

PATIENTS AND METHODS

1. STUDY DESIGN

This was a descriptive study with two independent and complementary components, designed to view colorectal cancer in Cape Verde at two levels that answer different questions. The population-based component, based on the ROCV, provides the national panorama: the incidence, demographic profile, and data-quality indicators of the disease across the resident population. The institutional component, based on the HUAN cohort, anchors that panorama to clinical reality: the stage at presentation, treatment received, and vital status of patients actually managed at the country's main referral centre. The two components are independent by construction — they draw on different data sources, cover different periods, and are analysed separately, without being combined or compared statistically — and their overlap (patients registered through HUAN in 2022–2024) does not constitute double counting, because each component addresses a distinct question. The population-based analysis estimates how common the disease is; the institutional analysis describes how it presents and is treated.

The relationship between the two components, and the way the extent of missing information conditions the institutional findings, is summarized in Fig. 1. Beyond describing the data, the pattern of missing information is used here as a roadmap for improving clinical protocols: each category of missing data points to a specific corrective measure (standardized minimum data set, synoptic pathology reporting, retrospective audit, prospective staging, and linkage to civil and mortality registries), developed in the Limitations. Institutional results are therefore reported among the patients with available data, and the missing-data profile is treated as an actionable finding rather than only as a constraint.

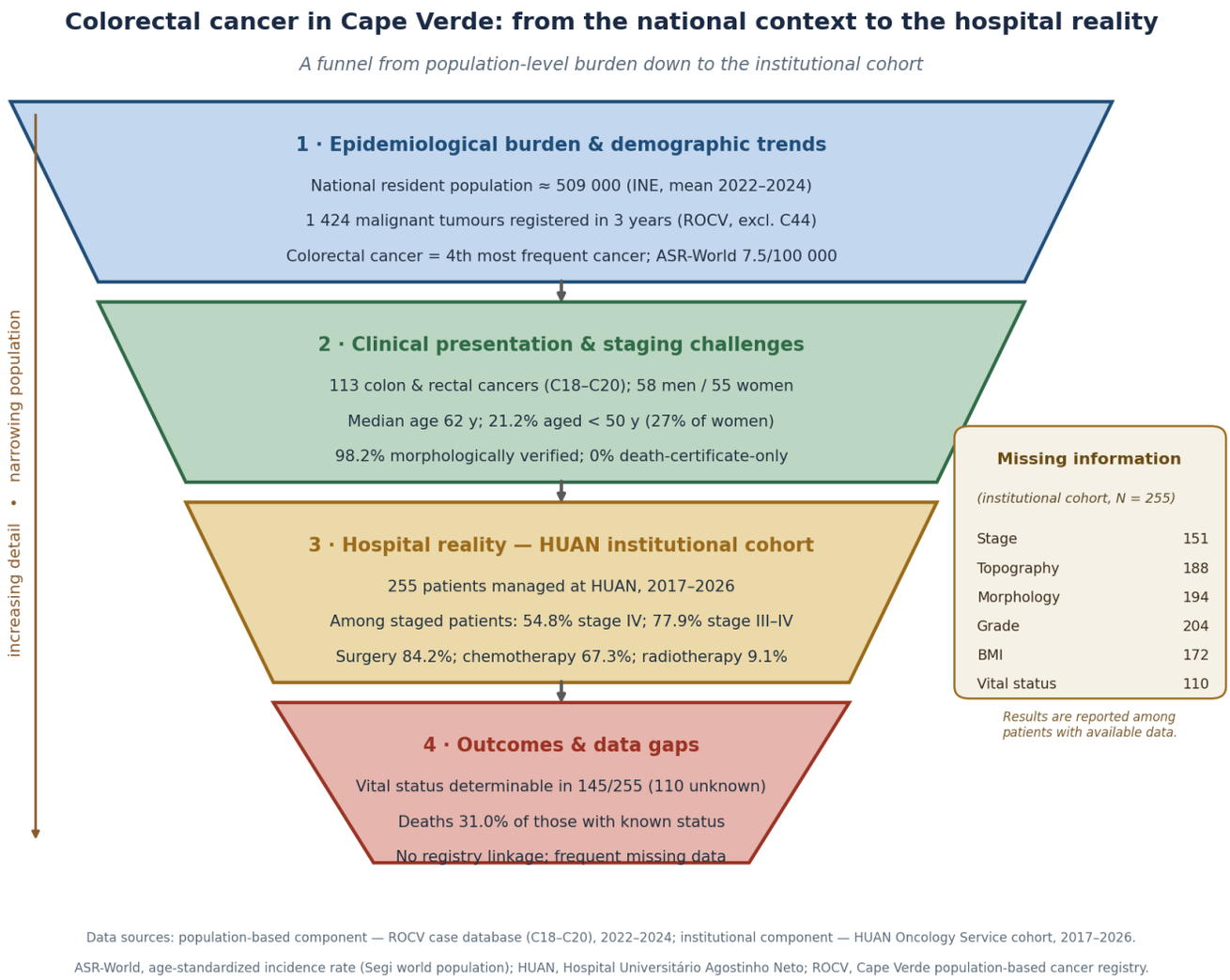

Figure 1. Funnel framework linking the national epidemiological context (ROCV, population-based) to the institutional (hospital) reality of colorectal cancer in Cape Verde. The two components are independent and complementary: the population-based tier gives the national panorama, and the institutional tier anchors it to clinical presentation, staging, treatment, and outcomes. Institutional results refer only to patients with available data; the side panel summarizes the extent of missing information, which is used as a roadmap for protocol improvement.

2. POPULATION-BASED COMPONENT (ROCV, 2022–2024)

National incidence data were obtained directly from the ROCV as a case-level database export covering registrations from 2022 to 2024; these data are held on file by the registry and were made available to the authors.[10] The registry covers the resident population of Cape Verde and collects data from the oncology, surgery, and pathology services of the national hospital network, including HUAN and the Hospital Batista de Sousa (HBS), together with records of patients evacuated abroad for treatment. Cases are coded according to the International Classification of Diseases for Oncology, 3rd edition(ICD-O-3) and the information is registered in CanReg5 platform.

The analysis was restricted to tumours with malignant behaviour (behaviour code 3) and a date of diagnosis between 1 January 2022 and 31 December 2024. Registrations dated 2021 and 2025 were excluded because those years were incomplete at the boundaries of the database export. Colorectal cancer was defined as tumours of the colon (C18), the rectosigmoid junction (C19), and the rectum (C20). The 11 tumours of the anus and anal canal (C21) were excluded, since anal cancer differs from colorectal cancer in histogenesis, aetiology, and management. Non-melanoma skin cancer (C44) was also excluded, following standard cancer-registry practice.

The following variables were analysed for each case: sex, age at diagnosis, year of diagnosis, topography, morphology, basis

of diagnosis, and registering hospital. Cases were classified as morphologically verified when the basis of diagnosis was cytology or histology of the primary tumour or of a metastasis.

In order to calculate incidence rates, person-years at risk were derived from the official demographic projections of the INE for Cape Verde, by sex and five-year age group, for 2022, 2023, and 2024. Age-specific rates were computed for eighteen age groups (0–4 to 85 years and over) and standardized to the Segi world standard population to obtain the age-standardized incidence rate (ASR-World), expressed per 100 000 person-years. The cumulative risk of developing the disease between birth and 74 years was derived from the age-specific rates using the standard exponential formula. Crude annual rates were also reported. The method was verified by reproducing the rates previously derived by the registry for the broader colon, rectum, and anus grouping: the difference observed was proportional to the difference in the number of registered cases between the earlier analysis and the present database export, confirming that the standardization procedure was equivalent.

3. INSTITUTIONAL COMPONENT (HUAN COHORT)

The institutional dataset comprised 255 consecutive patients with a diagnosis of CRC registered at the Oncology Service of HUAN, Praia, between 2017 and 2026. These are unpublished institutional data, presented in 2026 and made available to the authors. The institutional dataset was retrospective, with a data cut-off of 01.05.2026; records from 2024 onwards were therefore partial at the cut-off and should be read as such, rather than as a complete calendar-year series.[11] Demographic, anatomical, histopathological, staging, treatment, and outcome variables were collected retrospectively from clinical records.

Handling of missing data. For each variable, only patients with recorded (non-missing) information were included in the corresponding analysis, and missing cases were not imputed. For every variable, the number of patients with available information and the number of missing values are reported in the text and tables. Because information availability varied by variable, denominators differ between analyses and are stated explicitly throughout.

The two components of the study are not independent: of the 113 colorectal cancers registered by the ROCV in 2022–2024, 81 (71.7%) were registered through HUAN and therefore also belong, in principle, to the institutional cohort, which spans a longer period. The components are therefore presented separately and are not combined or compared statistically. The two analyses also answer different questions and are not redundant: the population-based component estimates national incidence, whereas the institutional component describes the clinical profile, treatment, and outcomes of managed patients. The overlap between them therefore does not constitute double counting of results.

4. ANALYSIS AND ETHICS

Given the descriptive nature of the study, results are presented as counts, proportions, rates, and medians with ranges, and no formal statistical inference was performed on the descriptive findings. The potential impact of missing data was specifically examined as a possible source of selection bias: patients in the institutional cohort with and without a documented stage at diagnosis were compared across the available baseline variables (age, sex, island of residence, and surgery) using the Mann–Whitney U test for continuous variables and the chi-squared test for categorical variables, to assess whether the patients with missing information differed systematically from those with complete data (Supplementary Table S1). This study was conducted in accordance with Good Clinical Practice standards and was approved by the Cape Verde National Committee for Data Protection (Resolution #2/2021), the Cape Verde Ethics Committee (Resolution #54/2022, Document #61/2022), and the Clinical Direction of HUAN.

RESULTS

1. NATIONAL INCIDENCE OF COLON AND RECTAL CANCER (ROCV, 2022–2024)

Between 2022 and 2024, the ROCV registered 1424 malignant tumours, excluding non-melanoma skin cancer, corresponding to 418 registrations in 2022, 502 in 2023, and 504 in 2024.

Colon and rectal cancer accounted for 113 cases, or 7.9% of all registered malignancies, making it the fourth most frequent cancer nationally, after prostate (259 cases), breast (250), and cervical cancer (136). It was the third most frequent malignancy in each sex, affecting 58 men and 55 women. The numbers may be similar, but the rates indicate that the risk is higher in men. Annual counts were 27 in 2022, 45 in 2023, and 41 in 2024 (Table 1).

The colon was the most frequent subsite, accounting for 67 cases (59.3%), while the rectum and the rectosigmoid junction together accounted for 46 cases (40.7%). Median age at diagnosis was 62 years (range 24–90), and was slightly higher in men (63.5 years) than in women (61.0 years). Notably, 24

Table 1. Colon and rectal cancer (ICD-10 C18–C20) registered by the ROCV, 2022–2024 (N = 113).

Characteristic	Category	n	%
Sex	Men	58	51.3
	Women	55	48.7
Subsite	Colon (C18)	67	59.3
	Rectum (C20)	25	22.1
	Rectosigmoid junction (C19)	21	18.6
Age at diagnosis (years)	<40	11	9.7
	40–49	13	11.5
	50–59	26	23.0
	60–69	31	27.4
	70–79	23	20.4
	≥80	9	8.0
Morphology	Adenocarcinoma NOS	86	76.1
	Other adenocarcinoma variants	6	5.3
	Mucinous adenocarcinoma	5	4.4
	Squamous cell carcinoma	7	6.2
	Neuroendocrine carcinoma	3	2.7
	Malignant neoplasm NOS	4	3.5
	Other	2	1.8
Basis of diagnosis	Histology of primary tumour	110	97.3
	Histology of metastasis	1	0.9
	Clinical investigation	2	1.8
Registering hospital	HUAN, Praia	81	71.7
	HBS, Mindelo	32	28.3
Year of diagnosis	2022	27	23.9
	2023	45	39.8
	2024	41	36.3

patients (21.2%) were diagnosed before the age of 50, and 11 (9.7%) before the age of 40.

Adenocarcinoma not otherwise specified was the predominant morphology (86 cases; 76.1%); when mucinous, signet-ring cell, and other adenocarcinoma variants are included, adenocarcinomas accounted for 98 cases (86.7%). Data quality indicators were favourable: 111 cases (98.2%) were morphologically verified, almost all through histology of the primary tumour, 2 cases (1.8%) were registered based on clinical investigation, and no case was registered from a death certificate alone. Most cases were registered at HUAN in Praia (81; 71.7%), with the remainder registered at HBS in Mindelo (32; 28.3%).

Table 2. Incidence rates for colon and rectal cancer (C18–C20), Cape Verde, 2022–2024.

Indicator	Men	Women	Both sexes
Cases (2022–2024)	58	55	113
Mean annual population	256 228	252 840	509 069
Crude annual rate per 100 000	7.5	7.3	7.4
ASR-World per 100 000	8.9	6.7	7.5
Cumulative risk, 0–74 years	1.23%	0.75%	0.94%

ASR-World, incidence rate standardized to the Segi world standard population.

Over the three years, the mean annual resident population was 509 069 (256 228 men and 252 840 women). The annual crude incidence rate of colon and rectal cancer was 7.4 per 100,000 (7.5 in men and 7.3 in women), the ASR-World was 8.9 per 100 000 in men and 6.7 per 100 000 in women, giving an overall rate of 7.5 per 100 000. The cumulative risk of developing colon or rectal cancer between birth and 74 years was 1.23% in men and 0.75% in women (Table 2).

2. DEMOGRAPHIC AND CLINICOPATHOLOGICAL CHARACTERISTICS OF THE INSTITUTIONAL COHORT

The institutional cohort comprised 255 patients with cancer, 131 men (51.4%) and 124 women (48.6%), Table 3. Median age at diagnosis was 62 years (range 18–98; n=200; 55 patients without recorded age), with most cases concentrated between 51 and 70 years. Body mass index was recorded for only 83 patients (median 22.6 kg/m^2; 172 missing). Among the 176 patients with a recorded island of residence, most lived in Santiago (104; 59.1%), followed by São Vicente (29; 16.5%) and the remaining islands (43; 24.4%).

Colorectal cancer was registered for 67 patients: the rectum accounted for 34.3% (23/67) and the sigmoid colon for 20.9% (14/67), with the remaining 44.8% (30/67) distributed across other or unspecified colonic segments. Morphology was coded for 61 patients, of whom 91.8% (56/61) had adenocarcinoma not otherwise specified (NOS). Histological grade was available for 51 patients, of whom 54.9% (28/51) were moderately differentiated. Stage at diagnosis (as recorded at the time of analysis) was available

Table 3. Sociodemographic, clinical and pathological characteristics of colorectal cancer cases (N = 255).

Characteristic	Category	n	% *
Sex	Male	131	51.4
	Female	124	48.6
Island of residence	Santiago	104	59.1
	São Vicente	29	16.5
	Other islands	43	24.4
	Missing	79	—
Topography	Rectum	23	34.3
	Sigmoid colon	14	20.9
	Other/unspecified colon	30	44.8
	Missing	188	—
Morphology	Adenocarcinoma NOS	56	91.8
	Other	5	8.2
	Missing	194	—
Histological grade	Moderately differentiated	28	54.9
	Other grade	23	45.1
	Missing	204	—
Stage at diagnosis	I	9	8.7
	II	14	13.5
	III	24	23.1
	IV	57	54.8
	Missing	151	—

* Percentages calculated among valid cases, excluding missing or unspecified values. Topography categories in the institutional cohort (rectum, sigmoid colon, other/unspecified colon) follow the original clinical records and therefore differ from the ICD-10 subsite grouping used for the population-based data in Table 1 (colon C18, rectosigmoid junction C19, rectum C20); the two classifications are not directly interchangeable.

for 104 patients and was advanced in most: 54.8% (57/104) had stage IV and 77.9% (81/104) stage III or IV disease. The registry data also included seven squamous cell carcinomas (6.2%) coded to colorectal sites.

Treatment information was recorded independently for each modality, so denominators differ slightly between modalities. Surgery was performed in 84.2% of patients with surgical information (160/190) and was most often combined with chemotherapy (92/192; 47.9%). Chemotherapy was administered to 67.3% (132/196) and radiotherapy to only 9.1% (18/197) of patients.

Table 4. Treatment and outcomes in the institutional cohort (N = 255).

Variable	n / with information	%	Missing (n)
Surgery only	160 / 190	84.2	65
Chemotherapy only	132 / 196	67.3	59
Surgery + chemotherapy	92 / 192	47.9	63
Radiotherapy	18 / 197	9.1	58

Percentages are calculated among patients with available information for the respective variable.

Metastatic status was documented for 21 patients, among whom distant metastases were confirmed in 5. Vital status could be determined for 145 patients; of these, 45 (31.0%) had died and 100 (69.0%) were alive at the time of data collection. Vital status was undetermined for the remaining 110 patients (Table 4).

3. DISCUSSION

3.1 MAIN FINDINGS: A FUNNEL FROM THE COUNTRY TO THE HOSPITAL

This study provides the first description of colorectal cancer in Cape Verde combining three consecutive years of a population-based cancer registry, analysed at case level, with a clinicopathological characterization of an institutional cohort. Three findings stand out. At the population level, colon and rectal cancer is already the fourth most frequent malignancy in the country and the third in each sex, with an almost equal distribution between men and women. More than one fifth of registered patients were diagnosed before the age of 50. At the institutional level, the disease is diagnosed predominantly at an advanced stage, with 54.8% of staged patients presenting with stage IV disease, and is treated with surgery and chemotherapy but with very limited use of radiotherapy relative to the observed rectal burden.

The predominance of adenocarcinoma in the institutional cohort (91.8% of coded cases) is consistent with the predominance of adenocarcinoma observed nationally in the registry data (86.7% of cases when all adenocarcinoma variants are combined), and provides mutual corroboration between the two data sources. The registry data also included seven squamous cell carcinomas (6.2%) coded to colorectal sites. Squamous histology is unexpected at these locations and characteristically arises at the anorectal junction or anal canal. For these cases, however, the source documents recorded the site as rectal, and no additional information was

available that would allow the topography to be reviewed retrospectively; they were therefore retained as registered. Prospective confirmation of the site of origin whenever squamous histology is reported at a rectal site would allow this small group to be classified with greater confidence in future analyses. More specifically, every squamous cell carcinoma assigned to a rectal site must undergo a clear, systematic, and mandatory review, combining re-examination of the source documents with immunohistochemistry where needed, to determine whether the tumour is genuinely rectal or is in fact a primary carcinoma of the anal canal (ICD-10 C21). This review is not optional and is not merely a coding refinement: the therapeutic protocols for the two entities are completely distinct — a genuinely rectal adenocarcinoma is managed primarily by surgery, whereas an anal squamous carcinoma is treated with definitive chemoradiotherapy — so that a misclassified case would receive the wrong treatment. Instituting this mandatory review for every such case would protect both individual treatment decisions and the accuracy of the registry.

The proportion of patients diagnosed before the age of 50 deserves particular attention. In the registry data, 21.2% of colorectal cancers occurred before that age and 9.7% before the age of 40, with a median age at diagnosis of 62 years. In the Cape Verde registry data, the mean age at diagnosis was 60.7 years (standard deviation 14.7) and the median 62 years. This proportion is lower than the figure of 38% reported in a recent descriptive synthesis of age at colorectal cancer diagnosis across Africa, where the mean age was 53.5 years,[6] but it remains substantially higher than that observed in high-income countries with organized screening programmes. It is relevant for service planning, since early-onset disease is unlikely to be detected by age-based screening strategies designed for older populations and is frequently diagnosed at an advanced stage.

This early-onset pattern was more pronounced in women (15 of 55; 27.3%) than in men (9 of 58; 15.5%). A high proportion of young patients is a recognized feature of colorectal cancer across West Africa, in contrast to high-income countries, where the rising incidence below the age of 50 starts from a much lower baseline and has prompted several national programmes to lower the screening start age to 45 years. Whether Cape Verde should introduce opportunistic screening at a younger age than is conventional in European guidelines is a legitimate policy question raised by the finding that roughly one in five patients, and more than one in four women, present before the age of 50. Any such decision would need to be weighed against the country's endoscopic and pathology capacity, since a screening policy that cannot be resourced would divert scarce diagnostic services from symptomatic patients. Because organized population screening is not currently feasible in Cape Verde, the high proportion of patients under 50 years nonetheless demands a concrete and mandatory response focused on symptomatic patients. Every symptomatic patient, regardless of age, should have a structured colorectal cancer family history taken and a faecal immunochemical test (FIT) performed, with colonoscopy mandated for all FIT-positive cases. This symptom-triggered pathway does not require the resources of a mass screening programme, targets the patients already presenting to the health system, and would shorten the interval to diagnosis in precisely the young, advanced-stage group that age-based screening would miss. The drivers of this early-onset pattern also warrant dedicated investigation, including dietary transition, obesity, and possible hereditary or germline predisposition, none of which could be examined with the present data.

3.2 EPIDEMIOLOGICAL BURDEN AND DEMOGRAPHIC TRENDS (NATIONAL CONTEXT)

Incidence in Cape Verde is intermediate to high among African registries with comparable data. Using the same case definition as the comparators, the ASR-World in Cape Verde was 9.5 per 100,000 in men and 7.5 in women. Among men, this was lower than in Zimbabwe (12.7) but higher than in Uganda (approximately 7.7) and far higher than in South Africa (2.6); among women, it was lower than in Zimbabwe (11.5), essentially identical to Uganda (7.5), and again far higher than in South Africa (1.6) (Table 5, Fig. 2). The comparison should nonetheless be read as indicative of order of magnitude rather than as a formal contrast, since the comparators refer to 2008–2012 and to registries covering defined subnational areas, whereas the Cape Verdean data are national and more recent.

Table 5. Age-standardized incidence rates (ASR-World, per 100 000) for colon and rectum (C18–C21) in Cape Verde and selected African registries.

Registry (period)	Men	Women
Zimbabwe (2008–2012)	12.7	11.5
Cape Verde, ROCV (2022–2024)	9.5	7.5
Uganda (2008–2012)	7.7	7.5
South Africa (2008–2012)	2.6	1.6

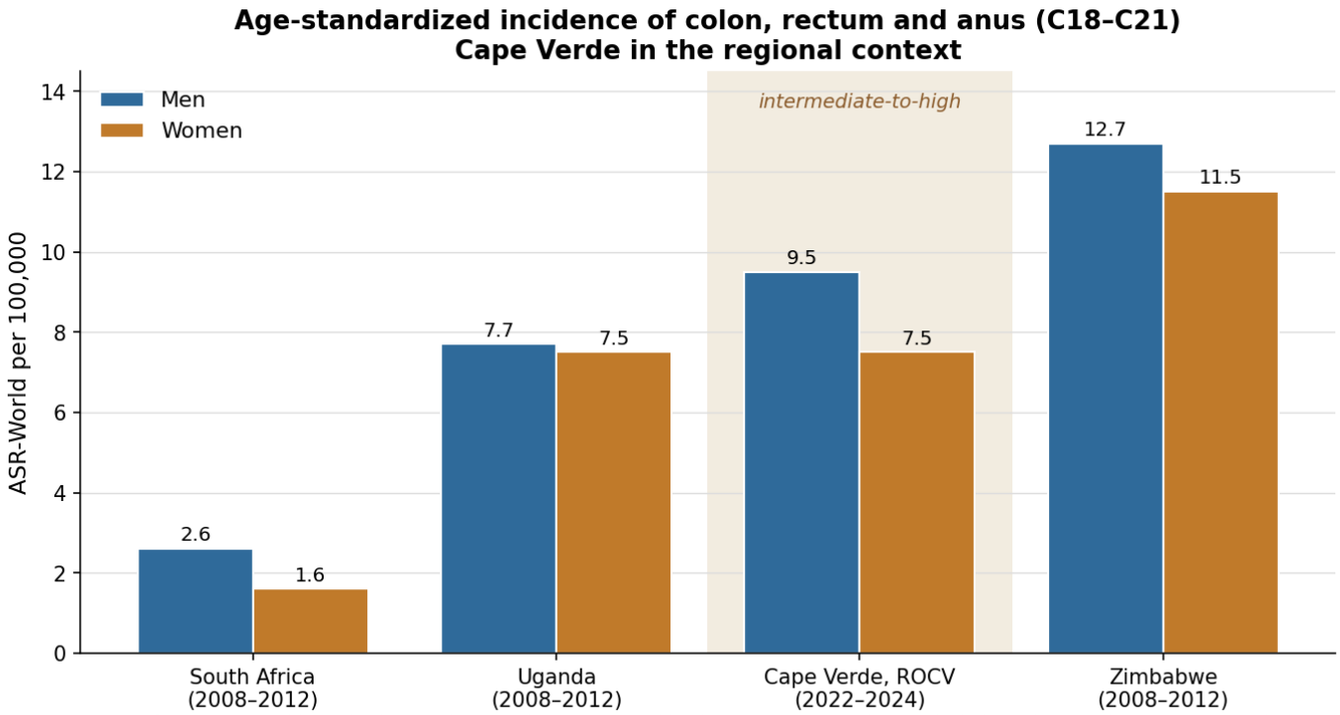

Figure 2. Age-standardized incidence rate (ASR-World, per 100,000) of colon, rectum, and anus (C18–C21) in Cape Verde compared with selected African registries, by sex. Cape Verde occupies an intermediate-to-high position, below Zimbabwe and at or above Uganda and South Africa. Comparator rates refer to 2008–2012 (Cancer Incidence in Five Continents, Volume X); the comparison is indicative rather than a formal contrast.

These figures also allow the earlier modelled estimates for the country to be placed in perspective. The most recent country-specific GLOBOCAN estimates available for Cape Verde remain those for 2022, which were not superseded by a country-level update in the 2024 global release; GLOBOCAN estimated 28 new colorectal cancer cases for Cape Verde in 2022, corresponding to 6.4% of all cancers, the fourth most frequent site, with a cumulative risk to age 75 of 0.65%.[12] The registry recorded an average of approximately 38 colon and rectal cancers per year, with an ASR-World of 7.5 per 100 000 for both sexes combined — appreciably more than the modelled estimate. Two factors contribute to this gap. The first, and most significant, is the improvement in case ascertainment that typically accompanies the establishment of a new registry; a modelled estimate produced before national registration was fully consolidated would be expected to underestimate the true burden. The second is the population denominator: GLOBOCAN used a resident population of 567 676 for 2022, whereas the INE national projection for the same year is 506,595, so that rates derived from the larger denominator are correspondingly lower. Neither factor implies a change in underlying risk over so short an interval. The annual counts of colorectal cancer were 27 in 2022, 45 in 2023, and 41 in 2024, following the same pattern as total registrations, which rose from 418 in the first year to around 500 in each of the two subsequent years. With only three years of data, counts of this magnitude, and a registry still consolidating its sources, no incidence trend can be inferred; whether incidence is genuinely rising in Cape Verde will only become assessable once several further years of registration have accumulated. Such an assessment would be of considerable interest, since incidence has been reported to be rising in most African registry populations studied.[5,13]

The quality indicators for this site are reassuring: morphological verification of 98.2%, almost entirely based on histology of the primary tumour, is high by regional standards and indicates that registered cases are well supported by morphological diagnosis. The complete absence of cases registered from death certificates alone should nevertheless be interpreted with caution. Rather than indicating completeness, it suggests that death certification is not yet functioning as an independent source of case-finding for the registry, so that patients who die without reaching the hospital network may

not be captured. The concentration of registrations in the two hospitals with oncology services, HUAN and HBS, points in the same direction. Registered incidence should therefore be regarded as a lower bound on the true national incidence. This qualification applies directly to the rates reported here: the ASR-World of 8.9 per 100 000 in men and 6.7 in women should be read as a lower bound, and the true incidence is likely to be somewhat higher once patients who die at home without reaching the hospital network are captured.

4. CHALLENGES IN CLINICAL PRESENTATION AND STAGING, AND THE HOSPITAL REALITY

The most clinically relevant finding of the institutional component is the predominance of advanced-stage disease at diagnosis, which is consistent with the regional picture and lies at its more advanced end. Emergency presentation of CRC across African series ranges from 8.3% to 64.9%,[14] and 60.4% of cases presented at stage III–IV in Cotonou;[15] delayed diagnosis of rectal cancer has been reported to compromise treatment in Brazzaville.[16] Regional survival is correspondingly low: a pooled 5-year survival of 48.2% has been reported across 13 registries from 11 African countries,[7] and a meta-analysis estimated 5-year survival at 28% (74% at 1 year and 36% at 3 years).[17] Treatment access is a major determinant of outcome: only 3.1% of non-metastatic patients received guideline-concordant treatment and 35.1% received none, with a 3.49-fold higher risk of death in the absence of cancer-directed therapy.[18] In Nigeria, median survival was 25 months among patients who received the recommended treatment, compared with 7 months among those who did not[19]; in Rwanda, 66.2% of patients underwent surgery, typically after a delayed presentation.[20]

The limited availability of endoscopy is widely recognized as the main barrier to CRC screening across the region.[21,22] Delays in seeking, reaching, and accessing quality cancer care are concentrated in a few countries and reflect costs, poor coordination, and workforce shortages.[23] Proposed policy solutions — stronger registries, health-insurance coverage, workforce development, and context-adapted screening — recur across multiple reviews,[24–26] and the consolidation of the ROCV over three years is a concrete example of the first of these priorities. The regional evidence base nonetheless remains incomplete, with data available from only about 18% of the African population.[8,9] The treatment pattern observed here — frequent surgery but low use of radiotherapy relative to the rectal burden — echoes the capacity constraints described across the region[25] and is consistent with clinicopathological series from other low- and middle-income countries.[27]

5. LIMITATIONS

This study has several limitations. First, the two components are not independent and are not directly comparable: the registry data covered the national population in 2022–2024, whereas the institutional cohort covered patients managed at a single referral centre between 2017 and 2026, and patients registered through HUAN during 2022–2024 belong to both. The institutional data are hospital-based, subject to referral bias, and cannot be used to estimate national incidence or survival. Second the number of cases in each age group is small, so the rates — and particularly the age-specific and cumulative estimates — carry appreciable statistical uncertainty; the rates reported here also exceed those derived in earlier registry analyses, in proportion to the larger number of cases available in the present database. Third, the registry database did not include stage at diagnosis, treatment, or follow-up, so the population-based component described incidence and demographic characteristics only, and no population-based estimate of stage distribution or survival is possible; incorporating stage and a follow-up mechanism into the registry, as set out in the protocol below, would remove this limitation in future analyses. Fourth, missing data in the institutional cohort were frequent and varied markedly between variables — for example, body mass index was available for 83 of 255 patients, topography for 67 cases indicated colorectal exclusively, without differentiating colon from rectum, and metastatic status was registered for only 21 — which may introduce information bias in the corresponding analyses. These gaps arose from two distinct mechanisms that should be addressed differently. The first is a registration deficit — information that existed in the clinical record but was not transcribed into the dataset, which accounts for much of the missingness in island of residence, topography, and stage. The second is a data-generation deficit — information that was never produced, such as histological grade or molecular characterization not performed, or staging investigations not completed before treatment. Accordingly, the following corrective protocol is proposed: (i) adoption of a standardized minimum data set with mandatory fields for topography, stage, and treatment, so that a case cannot be closed while these remain blank; (ii) structured synoptic pathology reporting to capture subsite, grade, and morphology consistently; (iii) periodic retrospective audit and back-filling of records against clinical, pathology, and imaging sources; (iv) prospective staging protocols aligned with the available diagnostic capacity; and (v) linkage of the institutional dataset to the ROCV and to civil and mortality registries to recover vital-status information. Until such measures are consolidated, the institutional results should be read as applying to the subset of patients with available data rather than to the cohort as a whole. This caveat

was examined directly. Patients with a documented stage (n=103) were compared with those without one (n=152) across the variables available for both groups. The two groups were similar in median age at diagnosis (61.5 *vs* 62.0 years; p=0.86, Mann–Whitney), in the proportion aged under 50 years (26% *vs* 25%), in sex distribution (50% *vs* 52% men; p=0.91), in residence in Santiago (56% *vs* 59%; p=0.81), and in the proportion undergoing surgery (81% *vs* 88%; p=0.32). They differed markedly in only one respect: vital status could be determined for 71% of staged patients but for just 47% of unstaged patients (p<0.001), indicating that incomplete staging and loss to follow-up tend to co-occur in the same patients rather than that staged patients form a clinically distinct subgroup (Supplementary Table S1). This pattern is reassuring for the internal validity of the stage distribution, since the staged and unstaged groups were comparable on the measured baseline characteristics, but it reinforces the caution that the reported proportion of advanced disease applies to patients who reached and completed specialist assessment. It must be stressed, however, that the absence of significant differences between the staged and unstaged groups in Supplementary Table S1 reassures only about the internal validity of the present analysis; it does not make the missing data acceptable. The extent of missing information remains a serious deficiency of the current system, and its underlying causes — the registration and data-generation deficits described above — must be overcome as a matter of urgency. Without this, the completeness and reliability of any future analysis will remain compromised, and the corrective protocol set out below should be regarded not as an optional improvement but as an immediate priority. Fifth, vital status could be determined for only 145 patients, with no linkage to civil or mortality registries and therefore no follow-up-adjusted survival analysis; the observed proportion of deaths should not be interpreted as a survival estimate. A further consideration is that the topography recorded in the registry could not be re-examined against the source documents, which is relevant for the small group of tumours with squamous histology coded to rectal sites. Finally, molecular characterization (KRAS, NRAS, BRAF, and microsatellite instability) was not available, and comparisons with the African literature are necessarily indirect, drawing on multi-country series and on registry data from earlier periods.

Assessing the incidence trend as further years accumulate, to ensure more exhaustive recording of variables, including recording stage at diagnosis within the registry, confirming the site of origin of tumours with squamous histology reported at rectal sites, strengthening the link between the synoptic pathology report and the clinical registry at HUAN so that colon and rectal subsites can be distinguished reliably, examining variation between islands, linking treatment to outcomes, and characterizing molecular profiles therefore remain the principal objectives for future work as the ROCV matures.

CONCLUSION

Colon and rectal cancer is the fourth most frequent malignancy registered in Cape Verde and the third in each sex, affecting men and women in almost equal numbers, although the age-standardized incidence rate was higher in men than in women (8.9 *vs* 6.7 per 100 000, with a cumulative risk to age 74 of 1.23% *vs* 0.75%), with a high proportion of morphologically verified cases and with more than one fifth of registry patients diagnosed before the age of 50. This high proportion of patients under 50 years mandates a dedicated early-diagnosis programme for symptomatic patients in this age group. In the institutional cohort managed at HUAN, colorectal cancer was diagnosed predominantly at an advanced stage among the patients with a documented stage, was treated mainly with surgery and chemotherapy with limited use of radiotherapy, and was accompanied by substantial gaps in vital-status ascertainment — a profile consistent with that described for Sub-Saharan Africa. Registrations increased between the first and subsequent years of the registry, but this is best understood as consolidation of registration rather than as a demonstrated change in risk, and any trend in colorectal cancer incidence will require several further years of data. Recording stage at diagnosis within the registry, strengthening diagnostic and endoscopic capacity across the islands, linking the registry to civil and mortality records — ideally through the adoption of a unique health identifier that would allow the ROCV to track mortality automatically and thereby become a tool for measuring the impact of national cancer policies rather than a simple incidence counter — and expanding access to radiotherapy and molecular testing are critical priorities that would not only enable a more robust characterization of colorectal cancer incidence, staging, and outcomes in Cape Verde, but also drive meaningful improvements in early detection, treatment quality, and patient survival.

SUPPLEMENTARY MATERIAL

Supplementary Table S1. Comparison of baseline characteristics between institutional patients with and without a documented stage at diagnosis (selection-bias assessment; N = 255, staged 103 versus not staged 152).

Characteristic	Staged (n=103)	Not staged (n=152)	*p*
Median age at diagnosis (years)	61.5	62.0	0.86
Aged under 50 years	26%	25%	1.00
Male sex	50%	52%	0.91
Resident in Santiago	56%	59%	0.81
Underwent surgery	81%	88%	0.32
Vital status determinable	71%	47%	<0.001

p values: Mann–Whitney U test for age, chi-squared test for categorical variables. Percentages are calculated among patients with available information for each variable within each group. The groups were comparable on all measured baseline characteristics except the determinability of vital status, which was lower among unstaged patients.

ETHICAL DISCLOSURES

Conflicts of Interest: The authors have no conflicts of interest to declare.

Financing Support: This work has not received any contribution, grant or scholarship

Confidentiality of Data: The authors declare that they have followed the protocols of their work center on the publication of patient data.

Protection of Human and Animal Subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and those of the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in 2024).

Provenance and Peer Review: Not commissioned; externally peer-reviewed.

RESPONSABILIDADES ÉTICAS

Conflitos de Interesse: Os autores declaram a inexistência de conflitos de interesse na realização do presente trabalho.

Fontes de Financiamento: Não existiram fontes externas de financiamento para a realização deste artigo.

Confidencialidade dos Dados: Os autores declaram ter seguido os protocolos da sua instituição acerca da publicação dos dados de doentes.

Proteção de Pessoas e Animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pela Comissão de Ética responsável e de acordo com a Declaração de Helsínquia revista em 2024 e da Associação Médica Mundial.

Proveniência e Revisão por Pares: Não comissionado; revisão externa por pares.

CONTRIBUTORSHIP STATEMENT

All authors contributed to this work, approved the final version of the manuscript for publication, and agree to be accountable for all aspects of the work, ensuring the accuracy and integrity of the data presented.

DECLARAÇÃO DE CONTRIBUIÇÃO

Todos os autores contribuíram para este trabalho, aprovaram a versão final do manuscrito para publicação e concordam em assumir a responsabilidade por todos os aspetos do trabalho, garantindo a exatidão e a integridade dos dados apresentados.

REFERENCES

1. Pinheiro M, Moreira D, Ghidini M. Colon and rectal cancer: an emergent public health problem. World J Gastroenterol. 2024;30:644-51.
2. Araghi M, Arnold M, Rutherford M, Guren M, Cabasag C, Bardot A, et al. Colon and rectal cancer survival in seven high-income countries 2010-2014. Gut. 2020;70:114-26.
3. Silva ET, Spencer HB, Costa V, Gonçalves AF, Castro C, Bento M, et al. Cancer in Santiago Island, Cape Verde. ecancermedicalscience. 2019;13:995.
4. Santos LL, Spencer HB, Miguel F, Tulsidás S, Rodrigues B, Lopes L. Fight against cancer in Portuguese-speaking African countries. Infect Agent Cancer. 2019;14.
5. Moen L, Liu B, Bukirwa P, Chingonzoh T, Chokunonga E, Finesse A, et al. Trends in the incidence of82.
6. Matovu N, Coleman HG, Mesa-Eguiagaray I, Theodoratou E, McShane CM. The descriptive epidemiology of age at colorectal cancer diagnosis in Africa. eClinicalMedicine. 2025;88:103445.
7. Gullickson C, Goodman M, Joko-Fru Y, Gnangnon F, N'da G, Woldegeorgis MA, et al. Colorectal cancer survival in sub-Saharan Africa by age, stage and HDI. Int J Cancer. 2021;149:1553-63.
8. Arhin ND, Ssentongo P, Taylor M, Olecki EJ, Pameijer C, Shen C, et al. Age-standardised incidence rate and epidemiology of colorectal cancer in Africa. BMJ Open. 2022;12.
9. Graham A, Adeloye D, Grant L, Theodoratou E, Campbell H. Estimating the incidence of colorectal cancer in Sub-Saharan Africa. J Glob Health. 2012;2:020204.
10. Registo Oncológico de Cabo Verde (ROCV). Cancer incidence in Cape Verde, 2022–2024 [unpublished registry data]. Praia: Programa Nacional de Prevenção e Controlo das Doenças Oncológicas, Direção Nacional de Saúde, Ministério da Saúde de Cabo Verde; 2026. Data on file, provided by the registry to the authors.
11. Serviço de Oncologia, Hospital Universitário Agostinho Neto (HUAN). Clinicopathological dataset of patients with colorectal cancer (N = 255), 2017–2026 [unpublished data]. Praia, Cape Verde; 2026.
12. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, et al. Global Cancer Observatory: Cancer Today — Cape Verde. GLOBOCAN 2022. Lyon: IARC; 2024.
13. Katsidzira L, Gangaidzo I, Thomson S, Rusakaniko S, Matenga J, Ramesar R. The shifting epidemiology of colorectal cancer in sub-Saharan Africa. Lancet Gastroenterol Hepatol. 2017;2:377-83.
14. Chinyowa S, Murewanhema G, Katsidzira L, Moodley J, Chirenje M, Muguti G. Emergency presentation of colorectal cancer in Africa. BMJ Open. 2026;16.
15. Kpossou A, Vignon R, Hadjete J, Sokpon C, Gnangnon F, Séidou F, et al. Colorectal cancers in Cotonou from 2013 to 2023. West Afr J Med. 2024;41:S3-S4.
16. Pierlesky E, Didace M, Julie N-M, Médi B, Bienvenu T, Pertinie A, et al. Surgical treatment of rectal cancer in Brazzaville. SAS J Surg. 2025.
17. Hassen HY, Hussien FM, Hassen AM, Dewau R, Amsalu E, Limenih M, et al. Survival pattern of colorectal cancer in Sub-Saharan Africa. Cancer Epidemiol. 2022;81:102276.
18. Hämmerl L, Mezger N, Seraphin T, Joko-Fru WY, Griesel M, Feuchtner J, et al. Treatment and Survival Among Patients With Colorectal Cancer in Sub-Saharan Africa. J Natl Compr Canc Netw. 2023;21:924-33.
19. Sharma A, Alatise O, Adisa A, Arowolo O, Olasehinde O, Famurewa O, et al. Treatment of colorectal cancer in Sub-Saharan Africa. J Surg Oncol. 2019;121:342-9.
20. Baldwin M, Niyibizi BA, Rangira D, Rangira B, Kazindu MK, Seifu D, et al. Colorectal cancer disease profile and treatment patterns in Rwanda. ecancermedicalscience. 2024;18.
21. Kwakye G, Dally C. Colorectal cancer screening in sub-Saharan Africa. Lancet Glob Health. 2022;10:e938-9.
22. Lee RR, Holmes D. Barriers and recommendations for colorectal cancer screening in Africa. Glob Health Action. 2023;16.
23. Lombe D, Mwamba M, Msadabwe S, Bond V, Simwinga M, Ssemata A, et al. Delays in seeking, reaching and access to quality cancer care in sub-Saharan Africa. BMJ Open. 2023;13.
24. Omotoso OE, Teibo J, Atiba F, Oladimeji T, Paimo OK, Ataya FS, et al. Addressing cancer care inequities in sub-Saharan Africa. Int J Equity Health. 2023;22.
25. Umobong EO, Ugwu IV, Gbaa ZL, Ojo BA, Uko AF, Onyewuchi AJ, Gbaa AF. An overview of the current state of cancer diagnosis and treatment in sub-Saharan Africa. J Am Med Sci Res. 2025;4.
26. Zhao J, Miao D, Yang T, Chen J, Lai X. Trend analysis and epidemiological forecasting of colorectal cancer mortality among reproductive-age women in sub-Saharan Africa. Prev Med Rep. 2025;56:103167.
27. Andero ET, Fasanmade PO, Sowunmi PA, Habeebu M, Aje E. Clinicopathological Presentation and Treatment Modalities of Colorectal Cancer in a Low-Middle-Income Country. Int J Res Sci Innov. 2025;12/15: 2640-7.