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# BMJ Open

## Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).

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**TITLE PAGE****Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).****Authors' names and affiliations**

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**Keywords:** cancer registry, incidence, Caribbean, mortality. Digestive cancers

### Strengths and limitations of this study

- The purpose of this project is to present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2007-2014 period.
- This study will contribute to expanding knowledge on the epidemiology of world cancers with data from the Caribbean zone.
- Potential limitations include the fact that comorbidities and risk factors are not recorded and thus cannot be taken into account in statistical analyses.

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3 **Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-**  
4 **based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).**  
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7

8 **Abstract**

9 Background

10 Data from population-based cancer registries contribute to improving our knowledge of Digestive  
11 cancer trends worldwide.  
12

13 Objectives

14 In this study we present cancer incidence and mortality in Guadeloupe, French Guiana and Martinique  
15 for the periods 2008-2014, 2010-2014 and 2007-2014 respectively.  
16  
17

18 Design and Methods

19 Data were extracted from cancer registries. World-standardized incidence and mortality rates were  
20 calculated. Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver  
21 and pancreas cancers.  
22  
23

24 Results

25 We observed a global lower-incidence compared to mainland France, except for stomach cancer for  
26 which the incidence is high, with significant standardized incidence ratios (SIRs) in men and women  
27 at 1.90 vs 2.29 for Guadeloupe and French Guiana and 1.58 vs 2.31 for Martinique. We found a global  
28 lower-mortality, except for stomach cancer for which the mortality remains high, with significant  
29 mortality ratios (SMRs) in men and women at 2.10 vs 2.74 for Guadeloupe, 1.64 vs 1.79 for French  
30 Guiana and 2.05 vs 2.53 for Martinique. Overall, these 3 regions have similar world-standardized  
31 incidence (WSI) and mortality (WSM) rates which remain lower than those in mainland France. We  
32 noticed an overall over-incidence and over-mortality in men compared to women as in France.  
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35 Conclusions: there is a high incidence of stomach cancer in French overseas territories. Publication of  
36 these data contributed to expanding knowledge on the epidemiology of world cancers with data from  
37 the Caribbean zone.  
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40 **Keywords:** cancer registry, incidence, Caribbean, mortality. Digestive cancers  
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## Introduction

A total number of 111 933 new cancer cases were estimated in the Caribbean in 2018 according to GLOBOCAN 2018 Database. The most common cancer types were prostate, breast, lung and colorectum cancers; cervical and stomach cancers had higher incidence rates compared to mainland France. Digestive cancer represented 20.6% of these incident cases in both sexes[1].

Main identified risk factors of digestive cancers include socio-economic status, chronic tobacco smoking, and alcoholism. Conversely, a diet rich in fruit and vegetables has been shown to have a protective effect[2]. Other risk factors of oesophageal adenocarcinoma include gastro-oesophageal reflux and obesity [3]. For stomach cancer, *Helicobacter pylori* infection, high intake of salt, exposure to N-nitroso compounds (through diet, tobacco and endogenous synthesis) have been identified as major causes of cancer development[4].

The French West-Indies have a particular socio-demographic profile compared to the Caribbean, with high life expectancy and favourable health indicators. Nevertheless, certain digestive cancers appear in over-incidence such as stomach cancer [4]and underline the need for a study of the evolution of cancers over time from the cancer registries. The epidemiological transition has begun and continues for these regions. At the same time, the development of the care offer provides innovative technical platforms.

The cancer control strategy implemented with the various cancer plans [5] has enabled the deployment of significant resources to reduce disparities in the face of cancer. Through the development of health promotion policies, the general population is made aware of the impact of certain risk factors on the development of cancer. Studies are therefore necessary in order to explore the evolution of digestive cancers in our regions [6-9].

Data from population-based cancer registries contribute to improving our knowledge of cancer trends worldwide. The cancer indicators generated are useful for the general population, for researchers, clinicians and local and governmental organisations, and to decision-makers in public health. Pooling of data from the three registries of the French overseas departments will make it possible to identify clinical and epidemiological characteristics of digestive cancers. In this study we present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2007-2014 period.

## Methods

### *Data sources for incidence and mortality*

#### **Incidence data**

Data were extracted for Guadeloupe, French Guiana and Martinique for the periods 2008-2014, 2010-2014 and 2007-2014 respectively. They are coded according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3). For mainland France, incidence data (2007-2016 period) were estimated from healthcare and registry data, using a dedicated method described elsewhere [10].

#### **Mortality data**

Mortality data cover the period 2007 to 2014. All the data were extracted from the Centre for Epidemiology of the medical causes of death (CepiDC). Data for the year 2012 were not exploitable for Martinique.

#### **Statistical methods**

Standardized rates were calculated using the world standard population of the WHO as standard [12]. The standardized incidence ratio (SIR) or standardized mortality ratio (SMR) were calculated in this study, using incidence and mortality rates from mainland France as references. We present the average annual number of cases and deaths observed and the world-standardized incidence and mortality rates for these three regions, and at national level. The standardized incidence and mortality ratios for these three regions are also presented, with 95% confidence intervals.

#### **Patient and Public Involvement**

Our study did not involve direct patient contact. Patients were not involved in the design of this study. Regarding patient involvement, cancer cases are identified through multidisciplinary team meetings, through medical records and the registry, according to the Registry procedures (French National authority for the protection of privacy and personal data). Additional approval from ethical committees was not required.

## Results

Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver and pancreas cancers. In our study, we observed a global lower-incidence in digestive cancer, except for stomach cancer.

### **Oesophagus**

In Martinique, Guadeloupe and French Guiana, oesophageal cancer affects on average 34 men and 6 women per year (Table 1-2), i.e. 1.6% of incident cancer cases in men and 0.4% in women. It was



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3 responsible for 26 deaths per year in men between 2007 and 2014 (Table 1), representing 3.0% of  
4 cancer deaths, and 4 deaths per year in women (0.6%).  
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### 8 **Stomach**

9 In the French West-Indies, 80 individuals were diagnosed with stomach cancer each year respectively  
10 in Guadeloupe and Martinique, and 20 in French Guiana. Stomach cancer is more common in these  
11 Departments than in mainland France, and represents 4.5% of cancers in men in Martinique, 5.3% in  
12 Guadeloupe and 5.7% in French Guiana.  
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15 In men, it is the 3rd most common malignancy in Martinique and Guadeloupe, and 4<sup>th</sup> most common  
16 in French Guiana. In women, it is the 3<sup>rd</sup> most common malignancy in Martinique and 4<sup>th</sup> most  
17 common in Guadeloupe, whereas it is less common in French Guiana.  
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20 Observed incidence is comparable in men in Guadeloupe and French Guiana (respectively 14.3 and  
21 14.6 per 100,000 person-years), and lower in Martinique (12.1). In women, world-standardized  
22 incidence rates are 6.9 in Martinique, 7.2 in French Guiana and 7.3 in Guadeloupe. This higher  
23 incidence of stomach cancer, with significant standardized incidence ratios (SIRs) at 1.90 for  
24 Guadeloupe and French Guiana and 1.58 for Martinique, place these 3 Departments at the top of the  
25 list of French regional incidence for this cancer.  
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30 In line with incidence data, mortality is also higher than in mainland France. In men, the world-  
31 standardized mortality rate, which reached 9.3 per 100,000 person-years in Guadeloupe, 8.9 in  
32 Martinique and 7.3 in French Guiana, is between 1.6 and 2.1 times higher than the corresponding rate  
33 in mainland France (4.5) and in most French regions with the exception of Corsica. These differences  
34 are also evident for stomach cancer mortality in women, where the world-standard mortality rate of  
35 4.4 per 100,000 person-years in Guadeloupe is more than 2.7 times higher than that of mainland  
36 France (1.7). Among the French West-Indies, Guadeloupe has the highest world-standard mortality  
37 rates, in both men and women.  
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### 44 **Colon-Rectum**

45 In the regions of Guadeloupe, Martinique and French Guiana, on average, 194 men and 173 women  
46 per year are diagnosed with CRC (Table 1-2), i.e. 9.0% of incident cancer cases in men and 12.2% in  
47 women. CRC was responsible for 78 deaths per year in men from 2007 to 2014, representing 9.1% of  
48 all cancer-related deaths, and 74 deaths per year in women (11.2%).  
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51 Overall, these 3 regions have similar world-standardized incidence rates, which remain lower than  
52 incidence in France as a whole; CRC mortality is also lower.  
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### 57 **Liver**

58 In Guadeloupe, Martinique and French Guiana, liver cancer is diagnosed in an average of 30 men and  
59 14 women per year, accounting for 1.4% of incident cancer cases in men, and 1.0% in women. It was  
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3 responsible for 38 deaths per year in men from 2007 to 2014, representing 4.4% of cancer-related  
4 deaths, and 23 deaths per year in women (3.5% of cancer-related deaths).  
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## 8 **Pancreas**

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10 In Martinique, Guadeloupe and French Guiana, pancreatic cancer is diagnosed in an average of 44  
11 men and 39 women per year, accounting for 2.0% of incident cancers in men and 2.7% in women. It  
12 was responsible for 53 deaths per year between 2007 and 2014, corresponding to 6.2% of cancer  
13 deaths in men and 49 deaths per year (7.4% of cancer-related deaths) in women.  
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## 17 **Discussion**

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19 Overall, Martinique, Guadeloupe and French Guiana present world-standardized incidence rates that  
20 vary somewhat between the three regions, but that are in general lower than overall rates for the whole  
21 of France; there is also lower mortality related to oesophageal cancer.  
22  
23

24 For the period 2007 to 2016, incidence of oesophageal cancer was 7.2 per 100,000 person-years in  
25 men, and 1.5 in women in mainland France, corresponding to a sex ratio of 4.85, and accounting for  
26 an average of 3,998 incident cases in men and 1,072 in women per year, i.e. 2.0% of incident cancer  
27 cases in men and 0.7% in women. Oesophageal cancer was responsible for 3,825 deaths per year in  
28 mainland France between 2007 and 2015, accounting for 3.4% of cancer-related deaths in men, and  
29 1.3% in women.  
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34 Rates in France are around the average for Western European countries. The incidence of oesophageal  
35 cancer has been declining for several years in men, whereas it is increasing in women. Net survival at  
36 5 years for the period 2005-2010 was 14% in men and 18% in women[11].  
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39 The majority of oesophageal cancers can be classed into two histological groups. Epidermoid cancers  
40 are the most frequent in France in both men and women [12]. Furthermore, the World Health  
41 Organization (WHO) has established that X-rays and gamma radiation can contribute to oesophageal  
42 cancer. The second histological type is adenocarcinoma, whose frequency looks set to exceed that of  
43 epidermoid oesophageal cancers in France beyond the year 2017 according to some projections[13].  
44 The majority of adenocarcinomas of the oesophagus develop in the context of endobrachyoesophagus  
45 (Barrett's oesophagus), following the metaplasia-dysplasia-carcinoma sequence. The data used for this  
46 report do not make it possible to distinguish between these two histological types.  
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51 On average, 4,707 men and 2,587 women were diagnosed with stomach cancer each year over the  
52 period 2007-2016, accounting for 2.4% of incident cancer cases in men and 1.6% in women. Stomach  
53 cancer caused almost 4,600 deaths per year in mainland France over the period 2007-2014, i.e. 3.3%  
54 of cancer-related deaths in men, and 2.6% in women.  
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57 The estimated incidence of stomach cancer in France is amongst the lowest of all the estimates  
58 provided by the WHO [14]. Incidence of stomach cancer is on the decline over the long term, and this  
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3 is confirmed by the observations between 2005 and 2012 [15]. Mortality has also been declining  
4 persistently since the 1990s[15].

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6 Net survival at 5 years of patients diagnosed between 2005 and 2010 was estimated at 23% for men  
7 and 28% for women [11]. The risk of stomach cancer is increased in first-degree relatives of a patient  
8 with stomach cancer, in individuals who have undergone partial gastrectomy for cancer, or in those  
9 who have undergone endoscopic treatment for gastric cancer, as well as in case of precancerous  
10 lesions of the stomach and in persons originating from regions with high stomach cancer incidence.  
11 Obesity and gastro-oesophageal reflux are risk factors for cardia cancer [16-18]. In Guadeloupe,  
12 prevalence of *Helicobacter pylori* infection, the main risk factor for this type of cancer, was estimated  
13 to be 55% in blood donors. Further studies are required to estimate the prevalence in the general  
14 population, and among patients with cancer. Environmental risk factors, as well as high intake of salt,  
15 and smoked meat and fish in the French West Indies, as in certain Asian countries, could also  
16 contribute to the high incidence of stomach cancer. Consumption of fruit and vegetables has a  
17 protective effect against stomach cancer.

18  
19 Colorectal cancer is also a cancer among those requiring a policy of care, from the stage of organized  
20 or individual cancer screening to follow-up as part of the various treatments delivered. Several studies  
21 have been carried out in Martinique by the Martinique Cancer Registry, on the evolution of this cancer  
22 but also on the factors conditioning survival by age at diagnosis [6 8 9]. Additional studies are  
23 underway to analyze regional survival within the French West-Indies and should allow a better  
24 understanding of the profile of cancer patients in our region. In France, this cancer benefits from a  
25 prevention program which involves health actors from the general practitioner to integration within the  
26 framework of the hospital care pathway. Over the period 2007 to 2016, on average, 22,828 men and  
27 19,174 women were diagnosed each year in mainland France, accounting for 12% of incident cancer  
28 cases in men and women.

29  
30 On average, over the period 2007-2016, 6,989 men were diagnosed with liver cancer each year,  
31 corresponding to 3.5% of incident cancer cases in men. The number of deaths from liver cancer  
32 annually was on average 5,739 for the period 2007-2014 in mainland France in men (i.e. 6.4% of all  
33 cancer-related deaths in men) and 2,118 in women (3.3% of all cancer-related deaths in women).

34  
35 Liver cancer includes primary carcinoma of the liver or hepatocellular carcinoma (HCC, which  
36 represents more than 80% of all liver cancers), as well as cancer of the intra-hepatic bile ducts. It is  
37 more frequent in France than in Europe as whole or in developed countries [14].

38  
39 In men, mortality has been declining since 1995, but the opposite trend has been observed in women  
40 [15]. For recently diagnosed cases (2005-2010), net survival at 5 years was 15% [19].

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42 There is also under-mortality from liver cancer in men. Conversely, in women, world-standardized  
43 mortality rates show no significant excess- or under-mortality compared to the rates observed in  
44 mainland France.

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3 There are numerous established risk factors for primary liver cancer [20] namely: alcohol  
4 consumption, hepatitis B and C viruses, obesity [20], diabetes and tobacco smoking. Bile duct cancer  
5 risk factors include liver fluke, biliary tract diseases (primary sclerosing cholangitis and Caroli  
6 disease), and exposure to certain chemical compounds such as dichloropropane or  
7 dichloromethane[21].

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11 Geographic variations in incidence observed over the study period could be explained by  
12 heterogeneity in the prevalence of chronic diseases linked to alcohol use, hepatitis B and C, or  
13 steatosis [22]. Progress in the management of patients with cirrhosis enables carcinogenesis to  
14 continue, and also contributes to the increased number of liver cancer cases[22], notably cancer of the  
15 intrahepatic bile ducts, whereas other histological types, such as HCC, are on the decline[23]. The  
16 distinct geographic distribution of the main risk factors for liver cancer, particularly alcohol  
17 consumption, likely explains to a large extent the disparities between Departments in terms of  
18 incidence and mortality.

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23 On average, 5,581 men and 5,278 women were diagnosed with cancer of the pancreas each year in  
24 mainland France over the period 2007-2016, corresponding to 2.8% of incident cancers in men and  
25 3.3% in women. Pancreatic cancer caused 9,409 deaths per year in mainland France from 2007 to  
26 2014, i.e. 5.4% of cancer-related deaths in men, and 7.3% in women.

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30 The incidence of pancreatic cancer is the highest in Eastern Europe, France and Japan[24]. In France,  
31 the incidence rate for pancreatic cancer is higher than the average of the 28 EU countries [15].  
32 Pancreatic cancer is one of the 10 most frequent types of cancer, and its incidence increased in both  
33 sexes between 2005 and 2012, whereas mortality has remained practically unchanged since the  
34 1980s[15]

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38 During the period 2005-2010, net survival at 5 years was 8% in men and 7% in women[11]. Overall,  
39 the 3 regions have world-standardized incidence rates that remain lower than those of France as a  
40 whole; mortality from pancreatic cancer is also lower.

41  
42 Tobacco smoking and obesity are established environmental risk factors for pancreatic cancer. Low-  
43 calorie diets, high alcohol consumption and increased abdominal fat have also been reported to be  
44 precipitating factors, while a diet rich in fruit, vegetables and folates, and regular physical exercise are  
45 reported to have a protective effect [22].

## 46 47 48 49 50 **Conclusion**

51  
52 Collaborative projects to promulgate this expertise will help to improve knowledge of the clinical,  
53 demographic, socio-economic or organizational factors that contribute to the heterogeneity of cancer  
54 pathologies in the region.

55  
56 The next projects of analysis will allow the carrying out of cancer mapping studies as well as the  
57 implementation of studies on the risk factors of stomach cancer and the prevalence of Helicobacter  
58 Pylori infection in the Antilles.  
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3 The study of environmental and behavioral factors is therefore an important issue for a better  
4 understanding of the determinants of health and cancer survival.  
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## DECLARATIONS

### Authors' contributions

LID, SB, CJ, JVB, JD were major contributors in writing the manuscript, made substantial contributions to conception and design, JP, BBM, JPe, EC, JM, MB revising it critically for important intellectual content. EC and FRANCIM Network made substantial contributions to conception and design; and revising it critically for important intellectual content. All authors read and approved the final manuscript.

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### Conflict interest statement

The authors declare that there are no conflicts of interest.

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### Data Sharing

Requests to access the data are welcome and will be considered by the Scientific Committee. For more information, please contact Clarisse Joachim, at [Clarisse.joachim@chu-martinique.fr](mailto:Clarisse.joachim@chu-martinique.fr)

Table 1. Annual number of new cases and deaths for digestive cancers in men, standardized incidence and mortality rates, standardized incidence and mortality ratios, with 95% confidence intervals.

	Incidence				Mortality				
	New cases <sup>1</sup>	WSR <sup>2</sup>	SIR <sup>3</sup>	Deaths	WSR <sup>2</sup>	SMR <sup>3</sup>			
<b>Oesophagus</b>									
Guadeloupe	18 [15 ; 21]	6.1 [5.1 ; 7.4]	0.78 [0.65 ; 0.93]	14 [12 ; 17]	4.8 [4.0 ; 5.9]	0.89 [0.73 ; 1.07]			
Martinique	12 [10 ; 15]	3.8 [3.1 ; 4.8]	0.52 [0.42 ; 0.63]	10 [7 ; 12]	2.8 [2.2 ; 3.8]	0.56 [0.43 ; 0.71]			
French Guiana	4 [2 ; 6]	4.5 [2.7 ; 7.2]	0.56 [0.34 ; 0.88]	2 [1 ; 4]	2.8 [1.6 ; 4.6]	0.52 [0.31 ; 0.82]			
Mainland France	3998 [3851 ; 4153]	7.23 [6.95 ; 7.51]		3031 [2993 ; 3070]	5.18 [5.11 ; 5.25]				
<b>Stomach</b>									
Guadeloupe	50 [44 ; 55]	14.3 [12.8 ; 16.1]	1.90 [1.70 ; 2.11]	32 [29 ; 37]	9.3 [8.2 ; 10.7]	2.10 [1.85 ; 2.37]			
Martinique	43 [39 ; 48]	12.1 [10.8 ; 13.7]	1.58 [1.42 ; 1.76]	33 [29 ; 38]	8.9 [7.7 ; 10.3]	2.05 [1.79 ; 2.33]			
French Guiana	14 [11 ; 17]	14.6 [11.2 ; 18.7]	1.90 [1.48 ; 2.41]	6 [5 ; 8]	7.3 [5.3 ; 9.8]	1.64 [1.21 ; 2.17]			
Mainland France	4707 [4561 ; 4859]	7.88 [7.62 ; 8.14]		2952 [2914 ; 2990]	4.54 [4.48 ; 4.61]				
<b>Colon-Rectum</b>									
Guadeloupe	81 [74 ; 88]	26.2 [24.0 ; 28.6]	0.66 [0.61 ; 0.72]	34 [30 ; 39]	10.1 [8.9 ; 11.5]	0.74 [0.66 ; 0.84]			
Martinique	90 [83 ; 97]	26.9 [24.8 ; 29.2]	0.70 [0.65 ; 0.76]	39 [35 ; 44]	10.8 [9.5 ; 12.4]	0.80 [0.71 ; 0.90]			
French Guiana	23 [19 ; 27]	25.0 [20.4 ; 30.3]	0.70 [0.57 ; 0.84]	5 [3 ; 6]	6.3 [4.4 ; 8.7]	0.46 [0.33 ; 0.64]			
Mainland France	22828 [22442 ; 23222]	37.8 [37.2 ; 38.5]		8976 [8910 ; 9041]	12.7 [12.6 ; 12.8]				
<b>Liver</b>									
Guadeloupe	10 [8 ; 13]	3.6 [2.8 ; 4.7]	0.27 [0.21 ; 0.33]	15 [12 ; 18]	4.8 [3.9 ; 5.8]	0.50 [0.41 ; 0.59]			
Martinique	11 [9 ; 13]	3.3 [2.6 ; 4.3]	0.27 [0.22 ; 0.33]	18 [15 ; 22]	5.4 [4.5 ; 6.7]	0.57 [0.48 ; 0.68]			
French Guiana	9 [7 ; 12]	10.5 [7.6 ; 14.3]	0.85 [0.62 ; 1.13]	5 [3 ; 7]	5.9 [4.2 ; 8.2]	0.66 [0.47 ; 0.91]			
Mainland France	6989 [6730 ; 7261]	12.38 [11.91 ; 12.87]		5739 [5686 ; 5791]	9.25 [9.16 ; 9.34]				
<b>Pancreas</b>									
Guadeloupe	15 [13 ; 19]	4.8 [3.9 ; 6.0]	0.51 [0.42 ; 0.62]	24 [20 ; 27]	7.0 [6.0 ; 8.2]	0.94 [0.81 ; 1.08]			
Martinique	24 [20 ; 27]	7.0 [6.0 ; 8.2]	0.75 [0.65 ; 0.87]	25 [22 ; 29]	6.9 [5.8 ; 8.2]	0.94 [0.80 ; 1.09]			
French Guiana	5 [3 ; 7]	5.5 [3.4 ; 8.3]	0.58 [0.37 ; 0.86]	4 [3 ; 6]	5.8 [4.0 ; 8.3]	0.69 [0.48 ; 0.96]			
Mainland France	5581 [5460 ; 5705]	9.52 [9.30 ; 9.74]		4808 [4760 ; 4857]	7.70 [7.62 ; 7.79]				

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.

Table 2. Annual number of new cases and deaths for digestive cancers in women, standardized incidence and mortality rates, standardized incidence and mortality ratios, with 95% confidence intervals.

	New cases <sup>1</sup>		Incidence				Deaths		Mortality			
			WSR <sup>2</sup>			SIR <sup>3</sup>			WSR <sup>2</sup>		SMR <sup>3</sup>	
<b>Oesophagus</b>												
Guadeloupe	3	[2.0 ; 5.0]	0.9	[0.5 ; 1.5]	0.52	[0.33 ; 0.79]	2	[1 ; 3]	0.4	[0.2 ; 0.9]	0.45	[0.25 ; 0.75]
Martinique	2	[2.0 ; 4.0]	0.6	[0.3 ; 1.1]	0.40	[0.24 ; 0.61]	2	[1 ; 4]	0.6	[0.3 ; 1.2]	0.55	[0.32 ; 0.88]
French Guiana	1	[0.0 ; 3.0]	1.2	[0.4 ; 2.8]	0.82	[0.30 ; 1.79]	0	[0 ; 1]	0.4	[0.1 ; 1.4]	0.43	[0.09 ; 1.27]
Mainland France	1072	[1018 ; 1130]	1.49	[1.41 ; 1.58]			794	[774 ; 813]	0.96	[0.93 ; 0.98]		
<b>Stomach</b>												
Guadeloupe	32	[28 ; 37]	7.3	[6.3 ; 8.6]	2.29	[2.00 ; 2.61]	23	[19 ; 26]	4.4	[3.7 ; 5.3]	2.74	[2.35 ; 3.16]
Martinique	34	[30 ; 39]	6.9	[6.0 ; 8.0]	2.31	[2.04 ; 2.60]	22	[19 ; 26]	3.7	[3.1 ; 4.7]	2.53	[2.15 ; 2.94]
French Guiana	8	[5 ; 10]	7.2	[5.0 ; 10.1]	2.29	[1.62 ; 3.15]	3	[2 ; 4]	3.3	[2.1 ; 5.1]	1.79	[1.15 ; 2.66]
Mainland France	2587	[2508 ; 2670]	3.22	[3.11 ; 3.34]			1665	[1637 ; 1694]	1.71	[1.68 ; 1.75]		
<b>Colon-Rectum</b>												
Guadeloupe	70	[64 ; 76]	17.3	[15.7 ; 19.2]	0.68	[0.62 ; 0.75]	29	[26 ; 33]	6.2	[5.4 ; 7.3]	0.76	[0.66 ; 0.86]
Martinique	85	[79 ; 92]	20.4	[18.8 ; 22.3]	0.80	[0.74 ; 0.86]	41	[36 ; 46]	7.8	[6.8 ; 9.0]	0.98	[0.87 ; 1.10]
French Guiana	18	[14 ; 22]	17.4	[13.8 ; 21.7]	0.75	[0.60 ; 0.92]	4	[3 ; 6]	3.8	[2.5 ; 5.5]	0.54	[0.37 ; 0.77]
Mainland France	19174	[18895 ; 19458]	24.4	[24.0 ; 24.8]			7938	[7877 ; 8000]	7.5	[7.4 ; 7.6]		
<b>Liver</b>												
Guadeloupe	4	[3 ; 6]	1.1	[0.7 ; 1.8]	0.44	[0.30 ; 0.63]	9	[7 ; 11]	2.0	[1.5 ; 2.7]	0.84	[0.65 ; 1.06]
Martinique	7	[5 ; 9]	1.8	[1.3 ; 2.7]	0.64	[0.48 ; 0.84]	12	[9 ; 15]	2.5	[1.9 ; 3.4]	1.04	[0.83 ; 1.29]
French Guiana	3	[2 ; 5]	2.7	[1.5 ; 4.8]	1.21	[0.66 ; 2.02]	2	[1 ; 3]	1.8	[1.0 ; 3.2]	0.86	[0.47 ; 1.43]
Mainland France		Not Available					2118	[2087 ; 2151]	2.24	[2.20 ; 2.29]		
<b>Pancreas</b>												
Guadeloupe	12	[9 ; 15]	3.0	[2.3 ; 3.9]	0.43	[0.34 ; 0.53]	22	[19 ; 26]	4.8	[4.0 ; 5.7]	0.98	[0.84 ; 1.13]
Martinique	22	[19 ; 25]	4.4	[3.7 ; 5.4]	0.75	[0.64 ; 0.87]	24	[21 ; 28]	4.4	[3.6 ; 5.3]	0.97	[0.83 ; 1.13]
French Guiana	5	[3 ; 7]	4.8	[3.0 ; 7.4]	0.76	[0.48 ; 1.13]	3	[2 ; 5]	3.2	[2.0 ; 5.0]	0.72	[0.47 ; 1.06]
Mainland France	5278	[5152 ; 5407]	6.46	[6.29 ; 6.63]			4601	[4554 ; 4648]	4.83	[4.77 ; 4.89]		

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.



## References:

1. Cancer IAfRo. Population fact sheets. Secondary Population fact sheets 2019.  
<https://gco.iarc.fr/today/data/factsheets/populations/915-caribbean-fact-sheets.pdf>.
2. Abnet CC, Arnold M, Wei WQ. Epidemiology of Esophageal Squamous Cell Carcinoma. *Gastroenterology* 2018;**154**(2):360-73 doi: 10.1053/j.gastro.2017.08.023[published Online First: Epub Date]].
3. Thrift AP. The epidemic of oesophageal carcinoma: Where are we now? *Cancer Epidemiol* 2016;**41**:88-95 doi: 10.1016/j.canep.2016.01.013[published Online First: Epub Date]].
4. Curado MP, de Oliveira MM, de Araujo Fagundes M. Prevalence of Helicobacter pylori infection in Latin America and the Caribbean populations: A systematic review and meta-analysis. *Cancer Epidemiol* 2019;**60**:141-48 doi: 10.1016/j.canep.2019.04.003[published Online First: Epub Date]].
5. INCa. Plan Cancer 2014-2019. Secondary Plan Cancer 2014-2019 2014. <http://www.e-cancer.fr/Expertises-et-publications/Catalogue-des-publications/Plan-cancer-2014-2019>.
6. Joachim C, Godaert L, Drame M, et al. Overall survival in elderly patients with colorectal cancer: A population-based study in the Caribbean. *Cancer Epidemiology* 2017;**48**:85-91 doi: 10.1016/j.canep.2017.03.005[published Online First: Epub Date]].
7. Joachim C, Veronique-Baudin J, Ulric-Gervaise S, et al. Cancer burden in the Caribbean: an overview of the Martinique Cancer Registry profile. *BMC cancer* 2019;**19**(1):239 doi: 10.1186/s12885-019-5434-6[published Online First: Epub Date]].
8. Joachim C, Véronique-Baudin J, Razanakaivo M, et al. Trends in colorectal cancer in the Caribbean: A population-based study in Martinique, 1982-2011. *Revue d'épidémiologie et de sante publique* 2017;**65**:181-88 doi: 10.1016/j.respe.2016.11.002[published Online First: Epub Date]].
9. Joachim C, Macni J, Drame M, et al. Overall survival of colorectal cancer by stage at diagnosis: Data from the Martinique Cancer Registry. *Medicine (Baltimore)* 2019;**98**(35):e16941 doi: 10.1097/md.000000000016941[published Online First: Epub Date]].
10. Chatignoux E, Remontet L, Iwaz J, et al. For a sound use of health care data in epidemiology: evaluation of a calibration model for count data with application to prediction of cancer incidence in areas without cancer registry. *Biostatistics (Oxford, England)* 2019;**20**(3):452-67 doi: 10.1093/biostatistics/kxy012[published Online First: Epub Date]].
11. Cowppli-Bony A, Uhry, Z., Remontet, L., Guizard, A.-V., Voirin, N. et al. . *Survie des personnes atteintes de cancer en France métropolitaine, 1989-2013. Partie 1 - Tumeurs solides.* . Saint-Maurice : Institut de veille sanitaire, , 2016, :274 p.
12. Arnold M, Soerjomataram I, Ferlay J, et al. Global incidence of oesophageal cancer by histological subtype in 2012. *Gut* 2015;**64**(3):381-7 doi: 10.1136/gutjnl-2014-308124[published Online First: Epub Date]].
13. Arnold M, Laversanne M, Brown LM, et al. Predicting the Future Burden of Esophageal Cancer by Histological Subtype: International Trends in Incidence up to 2030. *The American journal of gastroenterology* 2017;**112**(8):1247-55 doi: 10.1038/ajg.2017.155[published Online First: Epub Date]].
14. Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *International journal of cancer* 2015;**136**(5):E359-86 doi: 10.1002/ijc.29210[published Online First: Epub Date]].
15. Binder-Foucard F, Bossard N, Delafosse P, et al. Cancer incidence and mortality in France over the 1980-2012 period: solid tumors. *Revue d'épidémiologie et de sante publique* 2014;**62**(2):95-108 doi: 10.1016/j.respe.2013.11.073[published Online First: Epub Date]].
16. Sitarz R, Skierucha M, Mielko J, et al. Gastric cancer: epidemiology, prevention, classification, and treatment. *Cancer management and research* 2018;**10**:239-48 doi: 10.2147/cmar.s149619[published Online First: Epub Date]].

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17. Fock KM. Review article: the epidemiology and prevention of gastric cancer. *Alimentary pharmacology & therapeutics* 2014;**40**(3):250-60 doi: 10.1111/apt.12814[published Online First: Epub Date]].
18. Karimi P, Islami F, Anandasabapathy S, et al. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology* 2014;**23**(5):700-13 doi: 10.1158/1055-9965.epi-13-1057[published Online First: Epub Date]].
19. Anne Cowppli-Bony ZU, Laurent Remontet, Anne-Valérie Guizard, Nicolas Voirin, Alain Monnereau, Anne-Marie Bouvier, Marc Colonnas, Nadine Boosard, Anne-Sophie Woronoff, Pascale Grosclaude. *Survie des personnes atteintes de cancer en France métropolitaine 1989-2013. Etude à partir des registres des cancers du réseau Francim*, 2016.
20. El-Serag HB. Hepatocellular carcinoma. *The New England journal of medicine* 2011;**365**(12):1118-27 doi: 10.1056/NEJMra1001683[published Online First: Epub Date]].
21. Lauby-Secretan B, Scoccianti C, Loomis D, et al. Body Fatness and Cancer--Viewpoint of the IARC Working Group. *The New England journal of medicine* 2016;**375**(8):794-8 doi: 10.1056/NEJMsr1606602[published Online First: Epub Date]].
22. IARC. List of classifications by cancer sites with sufficient or limited evidence in humans Vt. Secondary. <https://monographs.iarc.fr/wp-content/uploads/2018/07/Table4.pdf>.
23. Petrick JL, Braunlin M, Laversanne M, et al. International trends in liver cancer incidence, overall and by histologic subtype, 1978-2007. *International journal of cancer* 2016;**139**(7):1534-45 doi: 10.1002/ijc.30211[published Online First: Epub Date]].
24. Ferlay J EM DR, et al. GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC CancerBase Secondary GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC CancerBase 2012. [http://globocan.iarc.fr/Pages/fact\\_sheets\\_cancer.aspx](http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx).

## STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	3
		(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
Participants	6	<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	3
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
Variables	7	(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	3
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Data sources/measurement	8*	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
		For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3
		(a) Describe all statistical methods, including those used to control for confounding	
Statistical methods	12	(b) Describe any methods used to examine subgroups and interactions	3
		(c) Explain how missing data were addressed	3
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	3
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	Not

applicable

Section/Topic	Item No	Recommendation	Reported on Page No
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3-5
		(b) Give reasons for non-participation at each stage	3-5
		(c) Consider use of a flow diagram	3-5
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	3-5
		(b) Indicate number of participants with missing data for each variable of interest	3-5
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	3-5
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	3-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	3-5
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	3-5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	3-5
		(b) Report category boundaries when continuous variables were categorized	3-5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	3-5
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	5-7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5-7
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	5-7
Generalisability	21	Discuss the generalisability (external validity) of the study results	5-7
<b>Other Information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	8

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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# BMJ Open

## Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).

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<b>Primary Subject Heading</b>:	Epidemiology
Secondary Subject Heading:	Oncology
Keywords:	ONCOLOGY, Epidemiology < ONCOLOGY, GASTROENTEROLOGY

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**TITLE PAGE****Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).****Authors' names and affiliations**

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Or peer review only

## **Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).**

### **Abstract**

Objectives: Data from population-based cancer registries contribute to improving our knowledge of Digestive cancer trends worldwide. In this study we present cancer incidence and mortality in Guadeloupe, French Guiana and Martinique for the periods 2008-2014, 2010-2014 and 2007-2014 respectively.

Design: Data were extracted from population-based cancer registries. World-standardized incidence and mortality rates were calculated. Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver and pancreas cancers.

Setting: This study was performed based on data from French Territories in the Caribbean

Results:

We observed a lower-incidence compared to mainland France, except for stomach cancer for which the incidence is high, with significant standardized incidence ratios (SIRs) in men and women at 1.90 vs 2.29 for Guadeloupe and French Guiana and 1.58 vs 2.31 for Martinique. We found a lower-mortality, except for stomach cancer for which the mortality remains high, with significant mortality ratios (SMRs) in men and women at 2.10 vs 2.74 for Guadeloupe, 1.64 vs 1.79 for French Guiana and 2.05 vs 2.53 for Martinique. Overall, these 3 regions have similar world-standardized incidence (WSI) and mortality (WSM) rates which remain lower than those in mainland France. We noticed an overall high incidence and high mortality in men compared to women as in France.

Conclusions: There is a high incidence of stomach cancer in French overseas territories. Publication of these data contributed to expanding knowledge on the epidemiology of world cancers with data from the Caribbean zone.

**Keywords:** cancer registry, incidence, Caribbean, mortality. Digestive cancers

### **Strengths and limitations of this study**

- The purpose of this project is to present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2007-2014 period.
- This study will contribute to expanding knowledge on the epidemiology of world cancers with data from the Caribbean zone.
- Potential limitations include the fact that comorbidities and risk factors are not recorded and thus cannot be taken into account in statistical analyses.

## Introduction

A total number of 111 933 new cancer cases were estimated in the Caribbean in 2018 according to GLOBOCAN Database. The most common cancer types were prostate, breast, lung and colorectum cancers; cervical and stomach cancers had higher incidence rates compared to mainland France. Digestive cancer represented 20.6% of these incident cases in both sexes[1].

Main identified risk factors of digestive cancers include socio-economic status, chronic tobacco smoking, and alcoholism. Conversely, a diet rich in fruit and vegetables has been shown to have a protective effect[2]. Other risk factors of oesophageal adenocarcinoma include gastro-oesophageal reflux and obesity [3]. For stomach cancer, *Helicobacter pylori* infection, high intake of salt, exposure to N-nitroso compounds (through diet, tobacco and endogenous synthesis) have been identified as major causes of cancer development[4].

The French West-Indies have a particular socio-demographic profile compared to the Caribbean, with high life expectancy and favourable health indicators. Nevertheless, certain digestive cancers appear in over-incidence such as stomach cancer [4]and underline the need for a study of the evolution of cancers over time from the cancer registries.

The cancer control strategy implemented with the various cancer plans in France [5] has enabled the deployment of significant resources to reduce disparities in the face of cancer. Through the development of health promotion policies, the general population is made aware of the impact of certain risk factors on the development of cancer. Studies are therefore necessary in order to explore the evolution of digestive cancers in our regions [6-9].

Data from population-based cancer registries contribute to improving our knowledge of cancer trends worldwide. The cancer indicators generated are useful for the general population, for researchers, clinicians and local and governmental organisations, and to decision-makers in public health. Pooling of data from the three registries of the French overseas departments will make it possible to identify clinical and epidemiological characteristics of digestive cancers. In this study we present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2008-2014, 2010-2014 and 2007-2014 periods respectively.

## Methods

### *Data sources for incidence and mortality*

#### **Incidence data**

Data were extracted for Guadeloupe, French Guiana and Martinique for the periods 2008-2014, 2010-2014 and 2007-2014 respectively. They are coded according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3). For mainland France, incidence data (2007-2016 period) were estimated from healthcare and registry data, using a dedicated method described elsewhere [10].

#### **Mortality data**

Mortality data cover the period 2007 to 2014. All the data were extracted from the Centre for Epidemiology of the medical causes of death (CepiDC). Data for the year 2012 were not exploitable for Martinique.

#### **Statistical methods**

Standardized rates were calculated using the world standard population of the WHO as standard [11]. The standardized incidence ratio (SIR) or standardized mortality ratio (SMR) were calculated in this study, using incidence and mortality rates from mainland France as references. We present the average annual number of cases and deaths observed and the world-standardized incidence and mortality rates by regions, and at national level. The standardized incidence and mortality ratios for these three regions are also presented, with 95% confidence intervals.

#### **Patient and Public Involvement**

Our study did not involve direct patient contact. Patients were not involved in the design of this study. Regarding patient involvement, cancer cases are identified through multidisciplinary team meetings, through medical records and the registry, according to the Registry procedures (French National authority for the protection of privacy and personal data). Additional approval from ethical committees was not required.

## Results

Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver and pancreas cancers. In our study, we observed a lower-incidence in all digestive cancer, except for stomach cancer.

### **Oesophagus**

In Martinique, Guadeloupe and French Guiana, oesophageal cancer affects on average 34 men and 6 women per year (Table 1-2), i.e. 1.6% of incident cancer cases in men and 0.4% in women. It was

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3 responsible for 26 deaths per year in men between 2007 and 2014 (Table 1), representing 3.0% of cancer  
4 deaths, and 4 deaths per year in women (0.6%).  
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### 8 **Stomach**

9 In the French West-Indies, 80 individuals were diagnosed with stomach cancer each year respectively  
10 in Guadeloupe and Martinique, and 20 in French Guiana. Stomach cancer is more common in these  
11 Departments than in mainland France, and represents 4.5% of cancers in men in Martinique, 5.3% in  
12 Guadeloupe and 5.7% in French Guiana.  
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15 In men, it is the 3<sup>rd</sup> most common malignancy in Martinique and Guadeloupe, and 4<sup>th</sup> most common in  
16 French Guiana. In women, it is the 3<sup>rd</sup> most common malignancy in Martinique and 4<sup>th</sup> most common  
17 in Guadeloupe, whereas it is 8<sup>th</sup> in French Guiana.  
18

19 Observed incidence is comparable in men in Guadeloupe and French Guiana (respectively 14.3 and 14.6  
20 per 100,000 person-years), and lower in Martinique (12.1). In women, world-standardized incidence  
21 rates are 6.9 in Martinique, 7.2 in French Guiana and 7.3 in Guadeloupe. This higher incidence of  
22 stomach cancer, with significant standardized incidence ratios (SIRs) at 1.90 for Guadeloupe and French  
23 Guiana and 1.58 for Martinique, place these 3 Departments at the top 3 of French regional incidence for  
24 this cancer.  
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27 In line with incidence data, mortality is also higher than in mainland France. In men, the world-  
28 standardized mortality rate, which reached 9.3 per 100,000 person-years in Guadeloupe, 8.9 in  
29 Martinique and 7.3 in French Guiana, is between 1.6 and 2.1 times higher than the corresponding rate  
30 in mainland France (4.5) and in most French regions with the exception of Corsica. These differences  
31 are also evident for stomach cancer mortality in women, where the world-standard mortality rate of 4.4  
32 per 100,000 person-years in Guadeloupe is more than 2.7 times higher than that of mainland France  
33 (1.7). Among the French West-Indies, Guadeloupe has the highest world-standard mortality rates, in  
34 both men and women.  
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### 44 **Colon-Rectum**

45 In the regions of Guadeloupe, Martinique and French Guiana, on average, 194 men and 173 women per  
46 year are diagnosed with CRC (Table 1-2), i.e. 9.0% of incident cancer cases in men and 12.2% in  
47 women. CRC was responsible for 78 deaths per year in men from 2007 to 2014, representing 9.1% of  
48 all cancer-related deaths, and 74 deaths per year in women (11.2%).  
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50 Overall, these 3 regions have similar world-standardized incidence rates, which remain lower than  
51 incidence in France as a whole; CRC mortality is also lower.  
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### 57 **Liver**

58 In Guadeloupe, Martinique and French Guiana, liver cancer is diagnosed in an average of 30 men and  
59 14 women per year, accounting for 1.4% of incident cancer cases in men, and 1.0% in women. It was  
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3 responsible for 38 deaths per year in men from 2007 to 2014, representing 4.4% of cancer-related deaths,  
4 and 23 deaths per year in women (3.5% of cancer-related deaths).  
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## 8 **Pancreas**

9 In Martinique, Guadeloupe and French Guiana, pancreatic cancer is diagnosed in an average of 44 men  
10 and 39 women per year, accounting for 2.0% of incident cancers in men and 2.7% in women. It was  
11 responsible for 53 deaths per year between 2007 and 2014, corresponding to 6.2% of cancer deaths in  
12 men and 49 deaths per year (7.4% of cancer-related deaths) in women.  
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## 17 **Discussion**

18 Overall, Martinique, Guadeloupe and French Guiana present world-standardized incidence rates that  
19 vary somewhat between the three regions, but that are in general lower than overall rates for the whole  
20 of France; there is also lower mortality related to oesophageal cancer.  
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23 The incidence of oesophageal cancer has been declining for several years in men, whereas it is increasing  
24 in women.  
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27 The majority of oesophageal cancers can be classed into two histological groups. Epidermoid cancers  
28 are the most frequent in France in both men and women [12]. Furthermore, the World Health  
29 Organization (WHO) has established that X-rays and gamma radiation can contribute to oesophageal  
30 cancer. The second histological type is adenocarcinoma; the majority of adenocarcinomas of the  
31 oesophagus develop in the context of endobrachyoesophagus (Barrett's oesophagus), following the  
32 metaplasia-dysplasia-carcinoma sequence.  
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37 In the Caribbean, few data are available on oesophagus cancers incidence and mortality; data available  
38 from GLOBOCAN Observatory show that incidence cancer of oesophagus cancer was below 4.0 per  
39 100,000 person-years in men and below 1.0 in women. Latin America and the Caribbean (LAC) region  
40 had the lowest incidence rates for this cancer compared to Europe (1.3 per 100,000 in women and 5.8  
41 in men) or Asia (5.3 per 100,000 in women and 12.1 in men). Mortality data in the LAC was 0.91 per  
42 100,000 pers-years in women and 3.7 in men. In our study, our rates are similar to those observed in the  
43 LAC [13 14].  
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48 We observed incidence and mortality rates of 6.0 and 4.5 per 100,000 pers-years in women for stomach  
49 cancer. In men these rates were respectively 11.0 and 8.8 per 100,000 pers-years. In our study we  
50 observed higher incidence and mortality rate, especially in men [14]. The estimated incidence of  
51 stomach cancer in France is amongst the lowest of all the estimates provided by the WHO [15].  
52 Incidence of stomach cancer is on the decline over the long term, and this is confirmed by the  
53 observations between 2005 and 2012 [16]. Mortality has also been declining persistently since the  
54 1990s[16].  
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3 The risk of stomach cancer is increased in first-degree relatives of a patient with stomach cancer, in  
4 individuals who have undergone partial gastrectomy for cancer, or in those who have undergone  
5 endoscopic treatment for gastric cancer, as well as in case of precancerous lesions of the stomach and  
6 in persons originating from regions with high stomach cancer incidence. Obesity and gastro-oesophageal  
7 reflux are risk factors for cardia cancer [17-19]. In Guadeloupe, prevalence of *Helicobacter pylori*  
8 infection, the main risk factor for this type of cancer, was estimated to be 55% in blood donors. Further  
9 studies are required to estimate the prevalence in the general population, and among patients with cancer.  
10 Environmental risk factors, as well as high intake of salt, and smoked meat and fish in the French West  
11 Indies, as in certain Asian countries, could also contribute to the high incidence of stomach cancer.  
12 Consumption of fruit and vegetables has a protective effect against stomach cancer.

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14 In the LAC regions, colorectal cancer incidence rates in women was 15.1 per 100,000 pers-years in  
15 women and 18.5 in men. Mortality rates were respectively 7.3 per 100,000 pers-years in women and 9.4  
16 in men [14]. In our study, we observed that our incidence and mortality rates were higher compared to  
17 Caribbean rates. This could be explained by the development of organized colorectal cancer screening  
18 since 2008 in Martinique and Guadeloupe, and in 2009 in French Guiana, that could help to detect more  
19 cancer cases. Furthermore, we observed that western lifestyle impacts the incidence and mortality rates  
20 in our regions.

21  
22 Colorectal cancer is also a cancer among those requiring a policy of care, from the stage of organized  
23 or individual cancer screening to follow-up as part of the various treatments delivered. Several studies  
24 have been carried out in Martinique by the Martinique Cancer Registry, on the evolution of this cancer  
25 but also on the factors conditioning survival by age at diagnosis [6 8 9]. Additional studies are underway  
26 to analyze regional survival within the French West-Indies and should allow a better understanding of  
27 the profile of cancer patients in our region. In France, this cancer benefits from a prevention program  
28 which involves health actors from the general practitioner to integration within the framework of the  
29 hospital care pathway.

30  
31 Liver cancer includes primary carcinoma of the liver or hepatocellular carcinoma (HCC, which  
32 represents more than 80% of all liver cancers), as well as cancer of the intra-hepatic bile ducts. It is more  
33 frequent in France than in Europe as whole or in developed countries [15].

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35 In men, mortality has been declining since 1995, but the opposite trend has been observed in women  
36 [16].

37  
38 There is also a lower mortality from liver cancer in men. Conversely, in women, world-standardized  
39 mortality rates show no significant excess- or a lower mortality compared to the rates observed in  
40 mainland France.

41  
42 There are numerous established risk factors for primary liver cancer [20] namely: alcohol consumption,  
43 hepatitis B and C viruses, obesity [20], diabetes and tobacco smoking. Bile duct cancer risk factors  
44 include liver fluke, biliary tract diseases (primary sclerosing cholangitis and Caroli disease), and  
45 exposure to certain chemical compounds such as dichloropropane or dichloromethane[21].  
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3 Geographic variations in incidence observed over the study period could be explained by heterogeneity  
4 in the prevalence of chronic diseases linked to alcohol use, hepatitis B and C, or steatosis [22]. Progress  
5 in the management of patients with cirrhosis enables carcinogenesis to continue, and also contributes to  
6 the increased number of liver cancer cases[22], notably cancer of the intrahepatic bile ducts, whereas  
7 other histological types, such as HCC, are on the decline[23]. The distinct geographic distribution of the  
8 main risk factors for liver cancer, particularly alcohol consumption, likely explains to a large extent the  
9 disparities between Departments in terms of incidence and mortality.  
10

11 In women, liver cancer incidence and mortality were respectively 4.0 and 3.7 per 100,000 pers-years; in  
12 men these rates were respectively 5.9 and 5.6 per 100,000 pers-years in the LAC [14]. In our study our  
13 incidence and mortality rates were lower except for French Guiana with an incidence rate of 10.5 per  
14 100,000 pers-years in men.

15 We observed incidence and mortality rates of 4.0 and 3.8 per 100,000 pers-years in women in the LAC.  
16 In men these rates were respectively 5.0 and 4.9 per 100,000 pers-years [14]. In our study, our incidence  
17 and mortality rates were higher compared to the LAC.

18 The incidence of pancreatic cancer is the highest in Eastern Europe, France and Japan[24]. In France,  
19 the incidence rate for pancreatic cancer is higher than the average of the 28 EU countries [16]. Pancreatic  
20 cancer is one of the 10 most frequent types of cancer, and its incidence increased in both sexes between  
21 2005 and 2012, whereas mortality has remained practically unchanged since the 1980s [16]

22 Overall, the 3 regions have world-standardized incidence rates that remain lower than those of France  
23 as a whole; mortality from pancreatic cancer is also lower. According to Globocan data for LAC (5.0),  
24 in men, the incidence rates were similar than the incidence rates in our study except in Martinique (7.0)  
25 where it was higher. In women we observed the results between our study (Guadeloupe: 3.0, Martinique:  
26 4.4, French Guiana: 4.8) and LAC (4.0). However, the mortality rates were higher in our study compared  
27 to LAC (4.9) in men. In women the mortality rates were similar between LAC (3.8) and data from our  
28 study.

29 Tobacco smoking and obesity are established environmental risk factors for pancreatic cancer. Low-  
30 calorie diets, high alcohol consumption and increased abdominal fat have also been reported to be  
31 precipitating factors, while a diet rich in fruit, vegetables and folates, and regular physical exercise are  
32 reported to have a protective effect [22].

### 33 **Conclusion**

34 Collaborative projects to promulgate this expertise will help to improve knowledge of the clinical,  
35 demographic, socio-economic or organizational factors that contribute to the heterogeneity of cancer  
36 pathologies in the region. Our results are not sufficient to allow trend analysis, but our important to  
37 monitor these first results in the future. The next projects of analysis will allow the carrying out of cancer  
38 mapping studies as well as the implementation of studies on the risk factors of stomach cancer and the  
39 prevalence of Helicobacter Pylori infection in the Antilles. The study of environmental and behavioral  
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3 factors is therefore an important issue for a better understanding of the determinants of health and cancer  
4 survival.  
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## 7 8 **DECLARATIONS**

### 9 **Authors' contributions**

10 LID, SB, CJ, JVB, JD were major contributors in writing the manuscript, made substantial contributions  
11 to conception and design, JP, BBM, JPe, EC, JM, MB, MBR revising it critically for important  
12 intellectual content. EC and FRANCIM Network made substantial contributions to conception and  
13 design; and revising it critically for important intellectual content. All authors read and approved the  
14 final manuscript.  
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### 19 **Ethics approval statement**

20 Our study did not involve direct patient contact. Patients were not involved in the design of this study.  
21 Regarding patient involvement, cancer cases are identified through multidisciplinary team meetings,  
22 through medical records and the registry, according to the Registry procedures (French National  
23 authority for the protection of privacy and personal data). Additional approval from ethical committees  
24 was not required.  
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### 52 **Conflict interest statement**

53 The authors declare that there are no conflicts of interest.

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55 Santé publique France, Institut national du cancer. COP N°2019-071

### 56 **Data Sharing**

57 Not applicable.  
58  
59  
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Table 1. Annual number of new cases and deaths for digestive cancers in men, standardized incidence and mortality ratios, standardized incidence and mortality ratios, with 95% confidence intervals.

	New cases <sup>1</sup>		Incidence			Deaths		Mortality				
			WSR <sup>2</sup>		SIR <sup>3</sup>			WSR <sup>2</sup>		SMR <sup>3</sup>		
<b>Oesophagus</b>												
Guadeloupe	18	[15 ; 21]	6.1	[5.1 ; 7.4]	0.78	[0.65 ; 0.93]	14	[12 ; 17]	4.8	[4.0 ; 5.9]	0.89	[0.73 ; 1.07]
Martinique	12	[10 ; 15]	3.8	[3.1 ; 4.8]	0.52	[0.42 ; 0.63]	10	[7 ; 12]	2.8	[2.2 ; 3.8]	0.56	[0.43 ; 0.71]
French Guiana	4	[2 ; 6]	4.5	[2.7 ; 7.2]	0.56	[0.34 ; 0.88]	2	[1 ; 4]	2.8	[1.6 ; 4.6]	0.52	[0.31 ; 0.82]
Mainland France	3998	[3851 ; 4153]	7.23	[6.95 ; 7.51]			3031	[2993 ; 3070]	5.18	[5.11 ; 5.25]		
<b>Stomach</b>												
Guadeloupe	50	[44 ; 55]	14.3	[12.8 ; 16.1]	1.90	[1.70 ; 2.11]	32	[29 ; 37]	9.3	[8.2 ; 10.7]	2.10	[1.85 ; 2.37]
Martinique	43	[39 ; 48]	12.1	[10.8 ; 13.7]	1.58	[1.42 ; 1.76]	33	[29 ; 38]	8.9	[7.7 ; 10.3]	2.05	[1.79 ; 2.33]
French Guiana	14	[11 ; 17]	14.6	[11.2 ; 18.7]	1.90	[1.48 ; 2.41]	6	[5 ; 8]	7.3	[5.3 ; 9.8]	1.64	[1.21 ; 2.17]
Mainland France	4707	[4561 ; 4859]	7.88	[7.62 ; 8.14]			2952	[2914 ; 2990]	4.54	[4.48 ; 4.61]		
<b>Colon-Rectum</b>												
Guadeloupe	81	[74 ; 88]	26.2	[24.0 ; 28.6]	0.66	[0.61 ; 0.72]	34	[30 ; 39]	10.1	[8.9 ; 11.5]	0.74	[0.66 ; 0.84]
Martinique	90	[83 ; 97]	26.9	[24.8 ; 29.2]	0.70	[0.65 ; 0.76]	39	[35 ; 44]	10.8	[9.5 ; 12.4]	0.80	[0.71 ; 0.90]
French Guiana	23	[19 ; 27]	25.0	[20.4 ; 30.3]	0.70	[0.57 ; 0.84]	5	[3 ; 6]	6.3	[4.4 ; 8.7]	0.46	[0.33 ; 0.64]
Mainland France	22828	[22442 ; 23222]	37.8	[37.2 ; 38.5]			8976	[8910 ; 9041]	12.7	[12.6 ; 12.8]		
<b>Liver</b>												
Guadeloupe	10	[8 ; 13]	3.6	[2.8 ; 4.7]	0.27	[0.21 ; 0.33]	15	[12 ; 18]	4.8	[3.9 ; 5.8]	0.50	[0.41 ; 0.59]
Martinique	11	[9 ; 13]	3.3	[2.6 ; 4.3]	0.27	[0.22 ; 0.33]	18	[15 ; 22]	5.4	[4.5 ; 6.7]	0.57	[0.48 ; 0.68]
French Guiana	9	[7 ; 12]	10.5	[7.6 ; 14.3]	0.85	[0.62 ; 1.13]	5	[3 ; 7]	5.9	[4.2 ; 8.2]	0.66	[0.47 ; 0.91]
Mainland France	6989	[6730 ; 7261]	12.38	[11.91 ; 12.87]			5739	[5686 ; 5791]	9.25	[9.16 ; 9.34]		
<b>Pancreas</b>												
Guadeloupe	15	[13 ; 19]	4.8	[3.9 ; 6.0]	0.51	[0.42 ; 0.62]	24	[20 ; 27]	7.0	[6.0 ; 8.2]	0.94	[0.81 ; 1.08]
Martinique	24	[20 ; 27]	7.0	[6.0 ; 8.2]	0.75	[0.65 ; 0.87]	25	[22 ; 29]	6.9	[5.8 ; 8.2]	0.94	[0.80 ; 1.09]
French Guiana	5	[3 ; 7]	5.5	[3.4 ; 8.3]	0.58	[0.37 ; 0.86]	4	[3 ; 6]	5.8	[4.0 ; 8.3]	0.69	[0.48 ; 0.96]
Mainland France	5581	[5460 ; 5705]	9.52	[9.30 ; 9.74]			4808	[4760 ; 4857]	7.70	[7.62 ; 7.79]		

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.

Table 2. Annual number of new cases and deaths for digestive cancers in women, standardized incidence and mortality rates, standardized incidence and mortality ratios, with 95% confidence intervals.

	New cases <sup>1</sup>		Incidence			SIR <sup>3</sup>		Deaths		Mortality		
			WSR <sup>2</sup>							WSR <sup>2</sup>		SMR <sup>3</sup>
<b>Oesophagus</b>												
Guadeloupe	3	[2.0 ; 5.0]	0.9	[0.5 ; 1.5]	0.52	[0.33 ; 0.79]	2	[1 ; 3]	0.4	[0.2 ; 0.9]	0.45	[0.25 ; 0.75]
Martinique	2	[2.0 ; 4.0]	0.6	[0.3 ; 1.1]	0.40	[0.24 ; 0.61]	2	[1 ; 4]	0.6	[0.3 ; 1.2]	0.55	[0.32 ; 0.88]
French Guiana	1	[0.0 ; 3.0]	1.2	[0.4 ; 2.8]	0.82	[0.30 ; 1.79]	0	[0 ; 1]	0.4	[0.1 ; 1.4]	0.43	[0.09 ; 1.27]
Mainland France	1072	[1018 ; 1130]	1.49	[1.41 ; 1.58]			794	[774 ; 813]	0.96	[0.93 ; 0.98]		
<b>Stomach</b>												
Guadeloupe	32	[28 ; 37]	7.3	[6.3 ; 8.6]	2.29	[2.00 ; 2.61]	23	[19 ; 26]	4.4	[3.7 ; 5.3]	2.74	[2.35 ; 3.16]
Martinique	34	[30 ; 39]	6.9	[6.0 ; 8.0]	2.31	[2.04 ; 2.60]	22	[19 ; 26]	3.7	[3.1 ; 4.7]	2.53	[2.15 ; 2.94]
French Guiana	8	[5 ; 10]	7.2	[5.0 ; 10.1]	2.29	[1.62 ; 3.15]	3	[2 ; 4]	3.3	[2.1 ; 5.1]	1.79	[1.15 ; 2.66]
Mainland France	2587	[2508 ; 2670]	3.22	[3.11 ; 3.34]			1665	[1637 ; 1694]	1.71	[1.68 ; 1.75]		
<b>Colon-Rectum</b>												
Guadeloupe	70	[64 ; 76]	17.3	[15.7 ; 19.2]	0.68	[0.62 ; 0.75]	29	[26 ; 33]	6.2	[5.4 ; 7.3]	0.76	[0.66 ; 0.86]
Martinique	85	[79 ; 92]	20.4	[18.8 ; 22.3]	0.80	[0.74 ; 0.86]	41	[36 ; 46]	7.8	[6.8 ; 9.0]	0.98	[0.87 ; 1.10]
French Guiana	18	[14 ; 22]	17.4	[13.8 ; 21.7]	0.75	[0.60 ; 0.92]	4	[3 ; 6]	3.8	[2.5 ; 5.5]	0.54	[0.37 ; 0.77]
Mainland France	19174	[18895 ; 19458]	24.4	[24.0 ; 24.8]			7938	[7877 ; 8000]	7.5	[7.4 ; 7.6]		
<b>Liver</b>												
Guadeloupe	4	[3 ; 6]	1.1	[0.7 ; 1.8]	0.44	[0.30 ; 0.63]	9	[7 ; 11]	2.0	[1.5 ; 2.7]	0.84	[0.65 ; 1.06]
Martinique	7	[5 ; 9]	1.8	[1.3 ; 2.7]	0.64	[0.48 ; 0.84]	12	[9 ; 15]	2.5	[1.9 ; 3.4]	1.04	[0.83 ; 1.29]
French Guiana	3	[2 ; 5]	2.7	[1.5 ; 4.8]	1.21	[0.66 ; 2.02]	2	[1 ; 3]	1.8	[1.0 ; 3.2]	0.86	[0.47 ; 1.43]
Mainland France		Not Available					2118	[2087 ; 2151]	2.24	[2.20 ; 2.29]		
<b>Pancreas</b>												
Guadeloupe	12	[9 ; 15]	3.0	[2.3 ; 3.9]	0.43	[0.34 ; 0.53]	22	[19 ; 26]	4.8	[4.0 ; 5.7]	0.98	[0.84 ; 1.13]
Martinique	22	[19 ; 25]	4.4	[3.7 ; 5.4]	0.75	[0.64 ; 0.87]	24	[21 ; 28]	4.4	[3.6 ; 5.3]	0.97	[0.83 ; 1.13]
French Guiana	5	[3 ; 7]	4.8	[3.0 ; 7.4]	0.76	[0.48 ; 1.13]	3	[2 ; 5]	3.2	[2.0 ; 5.0]	0.72	[0.47 ; 1.06]
Mainland France	5278	[5152 ; 5407]	6.46	[6.29 ; 6.63]			4601	[4554 ; 4648]	4.83	[4.77 ; 4.89]		

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.

**References:**

1. Cancer IAfRo. Population fact sheets. Secondary Population fact sheets 2019. <https://gco.iarc.fr/today/data/factsheets/populations/915-caribbean-fact-sheets.pdf>.
2. Abnet CC, Arnold M, Wei WQ. Epidemiology of Esophageal Squamous Cell Carcinoma. *Gastroenterology* 2018;**154**(2):360-73 doi: 10.1053/j.gastro.2017.08.023[published Online First: Epub Date]].
3. Thrift AP. The epidemic of oesophageal carcinoma: Where are we now? *Cancer Epidemiol* 2016;**41**:88-95 doi: 10.1016/j.canep.2016.01.013[published Online First: Epub Date]].
4. Curado MP, de Oliveira MM, de Araujo Fagundes M. Prevalence of Helicobacter pylori infection in Latin America and the Caribbean populations: A systematic review and meta-analysis. *Cancer Epidemiol* 2019;**60**:141-48 doi: 10.1016/j.canep.2019.04.003[published Online First: Epub Date]].
5. INCa. Plan Cancer 2014-2019. Secondary Plan Cancer 2014-2019 2014. <http://www.e-cancer.fr/Expertises-et-publications/Catalogue-des-publications/Plan-cancer-2014-2019>.
6. Joachim C, Godaert L, Drame M, et al. Overall survival in elderly patients with colorectal cancer: A population-based study in the Caribbean. *Cancer Epidemiology* 2017;**48**:85-91 doi: 10.1016/j.canep.2017.03.005[published Online First: Epub Date]].
7. Joachim C, Veronique-Baudin J, Ulric-Gervaise S, et al. Cancer burden in the Caribbean: an overview of the Martinique Cancer Registry profile. *BMC cancer* 2019;**19**(1):239 doi: 10.1186/s12885-019-5434-6[published Online First: Epub Date]].
8. Joachim C, Véronique-Baudin J, Razanakaivo M, et al. Trends in colorectal cancer in the Caribbean: A population-based study in Martinique, 1982-2011. *Revue d'épidémiologie et de sante publique* 2017;**65**:181-88 doi: 10.1016/j.respe.2016.11.002[published Online First: Epub Date]].
9. Joachim C, Macni J, Drame M, et al. Overall survival of colorectal cancer by stage at diagnosis: Data from the Martinique Cancer Registry. *Medicine (Baltimore)* 2019;**98**(35):e16941 doi: 10.1097/md.000000000016941[published Online First: Epub Date]].
10. Chatignoux E, Remontet L, Iwaz J, et al. For a sound use of health care data in epidemiology: evaluation of a calibration model for count data with application to prediction of cancer incidence in areas without cancer registry. *Biostatistics (Oxford, England)* 2019;**20**(3):452-67 doi: 10.1093/biostatistics/kxy012[published Online First: Epub Date]].
11. Segi M. *Cancer mortality for selected sites in 24 countries (1950-57)*. Sendai: Department of Public Health, Tohoku University of Medicine, 1960.
12. Arnold M, Soerjomataram I, Ferlay J, et al. Global incidence of oesophageal cancer by histological subtype in 2012. *Gut* 2015;**64**(3):381-7 doi: 10.1136/gutjnl-2014-308124[published Online First: Epub Date]].
13. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians* 2018;**68**(6):394-424 doi: 10.3322/caac.21492[published Online First: Epub Date]].
14. Cancer IAfRo. GLOBOCAN CANCER OBSERVATORY 2020. Secondary GLOBOCAN CANCER OBSERVATORY 2020. <https://gco.iarc.fr/>.
15. Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *International journal of cancer* 2015;**136**(5):E359-86 doi: 10.1002/ijc.29210[published Online First: Epub Date]].
16. Binder-Foucard F, Bossard N, Delafosse P, et al. Cancer incidence and mortality in France over the 1980-2012 period: solid tumors. *Revue d'épidémiologie et de sante publique* 2014;**62**(2):95-108 doi: 10.1016/j.respe.2013.11.073[published Online First: Epub Date]].
17. Sitarz R, Skierucha M, Mielko J, et al. Gastric cancer: epidemiology, prevention, classification, and treatment. *Cancer management and research* 2018;**10**:239-48 doi: 10.2147/cmar.s149619[published Online First: Epub Date]].

18. Fock KM. Review article: the epidemiology and prevention of gastric cancer. *Alimentary pharmacology & therapeutics* 2014;**40**(3):250-60 doi: 10.1111/apt.12814[published Online First: Epub Date]].
19. Karimi P, Islami F, Anandasabapathy S, et al. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology* 2014;**23**(5):700-13 doi: 10.1158/1055-9965.epi-13-1057[published Online First: Epub Date]].
20. El-Serag HB. Hepatocellular carcinoma. *The New England journal of medicine* 2011;**365**(12):1118-27 doi: 10.1056/NEJMra1001683[published Online First: Epub Date]].
21. Lauby-Secretan B, Scocciati C, Loomis D, et al. Body Fatness and Cancer--Viewpoint of the IARC Working Group. *The New England journal of medicine* 2016;**375**(8):794-8 doi: 10.1056/NEJMs1606602[published Online First: Epub Date]].
22. IARC. List of classifications by cancer sites with sufficient or limited evidence in humans Vt. Secondary. <https://monographs.iarc.fr/wp-content/uploads/2018/07/Table4.pdf>.
23. Petrick JL, Braunlin M, Laversanne M, et al. International trends in liver cancer incidence, overall and by histologic subtype, 1978-2007. *International journal of cancer* 2016;**139**(7):1534-45 doi: 10.1002/ijc.30211[published Online First: Epub Date]].
24. Ferlay J EM DR, et al. GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC CancerBase Secondary GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC CancerBase 2012. [http://globocan.iarc.fr/Pages/fact\\_sheets\\_cancer.aspx](http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx).

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Named Corresponding Author:	Clara JoActin
Revision no:	Revision 1

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 We add that Murielle Beaubrun-rehard (NBR) revised critically for important intellectual content





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Murielle Beaubrun-renard participated to the revision of the manuscript and to the modifications of the paper.





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## STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	3
		(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
Participants	6	<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	3
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
Variables	7	(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	3
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Data sources/measurement	8*	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
		For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3
		(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	
Statistical methods	12	<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	3
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	

Section/Topic	Item No	Recommendation	Reported on Page No
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3-5
		(b) Give reasons for non-participation at each stage	3-5
		(c) Consider use of a flow diagram	3-5
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	3-5
		(b) Indicate number of participants with missing data for each variable of interest	3-5
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	3-5
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	3-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	3-5
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	3-5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	3-5
		(b) Report category boundaries when continuous variables were categorized	3-5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	3-5
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	5-7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5-7
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	5-7
Generalisability	21	Discuss the generalisability (external validity) of the study results	5-7
<b>Other Information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	8

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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# BMJ Open

## Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).

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**TITLE PAGE****Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).****Authors' names and affiliations**

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## **Burden of gastric and digestive cancers in the French Caribbean: perspectives from population-based cancer registries of Martinique, Guadeloupe and French Guiana (2007-2014).**

### **Abstract**

Objectives: Data from population-based cancer registries contribute to improving our knowledge of Digestive cancer trends worldwide. In this study we present cancer incidence and mortality in Guadeloupe, French Guiana and Martinique for the periods 2008-2014, 2010-2014 and 2007-2014 respectively.

Design: Data were extracted from population-based cancer registries. World-standardized incidence and mortality rates were calculated. Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver and pancreas cancers.

Setting: This study was performed based on data from French Territories in the Caribbean

Results:

We observed a lower-incidence compared to mainland France, except for stomach cancer for which the incidence is high, with significant standardized incidence ratios (SIRs) in men and women at 1.90 vs 2.29 for Guadeloupe and French Guiana and 1.58 vs 2.31 for Martinique. We found a lower-mortality, except for stomach cancer for which the mortality remains high, with significant mortality ratios (SMRs) in men and women at 2.10 vs 2.74 for Guadeloupe, 1.64 vs 1.79 for French Guiana and 2.05 vs 2.53 for Martinique. Overall, these 3 regions have similar world-standardized incidence (WSI) and mortality (WSM) rates which remain lower than those in mainland France. We noticed an overall high incidence and high mortality in men compared to women as in France.

Conclusions: There is a high incidence of stomach cancer in French overseas territories. Publication of these data contributed to expanding knowledge on the epidemiology of world cancers with data from the Caribbean zone.

**Keywords:** cancer registry, incidence, Caribbean, mortality. Digestive cancers

### **Strengths and limitations of this study**

- The purpose of this project is to present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2007-2014 period.
- This study will contribute to expanding knowledge on the epidemiology of world cancers with data from the Caribbean zone.
- Potential limitations include the fact that comorbidities and risk factors are not recorded and thus cannot be taken into account in statistical analyses.

## Introduction

A total number of 111 933 new cancer cases were estimated in the Caribbean in 2018 according to GLOBOCAN Database. The most common cancer types were prostate, breast, lung and colorectum cancers; cervical and stomach cancers had higher incidence rates compared to mainland France. Digestive cancer represented 20.6% of these incident cases in both sexes[1].

Main identified risk factors of digestive cancers include socio-economic status, chronic tobacco smoking, and alcoholism. Conversely, a diet rich in fruit and vegetables has been shown to have a protective effect[2]. Other risk factors of oesophageal adenocarcinoma include gastro-oesophageal reflux and obesity [3]. For stomach cancer, *Helicobacter pylori* infection, high intake of salt, exposure to N-nitroso compounds (through diet, tobacco and endogenous synthesis) have been identified as major causes of cancer development[4].

The French West-Indies have a particular socio-demographic profile compared to the Caribbean, with high life expectancy and favourable health indicators. Nevertheless, certain digestive cancers appear in over-incidence such as stomach cancer [4]and underline the need for a study of the evolution of cancers over time from the cancer registries.

The cancer control strategy implemented with the various cancer plans in France [5] has enabled the deployment of significant resources to reduce disparities in the face of cancer. Through the development of health promotion policies, the general population is made aware of the impact of certain risk factors on the development of cancer. Studies are therefore necessary in order to explore the evolution of digestive cancers in our regions [6-9].

Data from population-based cancer registries contribute to improving our knowledge of cancer trends worldwide. The cancer indicators generated are useful for the general population, for researchers, clinicians and local and governmental organisations, and to decision-makers in public health. Pooling of data from the three registries of the French overseas departments will make it possible to identify clinical and epidemiological characteristics of digestive cancers. In this study we present incidence and mortality for digestive cancer in Guadeloupe, French Guiana and Martinique for the 2008-2014, 2010-2014 and 2007-2014 periods respectively.

## Methods

### Data sources for incidence and mortality

The population-based cancer registries of Martinique, Guadeloupe and French Guiana use patient records which are reviewed actively. The Data quality control procedures are performed according to the French Network of cancer registries FRANCIM and the International Agency for Research cancer (IARC). The control of all available cancer data sources guarantees high quality cancer registration data for international comparisons.

### Incidence data

Data were extracted for Guadeloupe, French Guiana and Martinique for the periods 2008-2014, 2010-2014 and 2007-2014 respectively. They are coded according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3). For mainland France, incidence data (2007-2016 period) were estimated from healthcare and registry data, using a dedicated method described elsewhere [10].

### Mortality data

Mortality data cover the period 2007 to 2014. All the data were extracted from the Centre for Epidemiology of the medical causes of death (CepiDC). Data for the year 2012 were not exploitable for Martinique.

### Statistical methods

Standardized rates were calculated using the world standard population of the WHO as standard [11]. The standardized incidence ratio (SIR) or standardized mortality ratio (SMR) were calculated in this study, using incidence and mortality rates from mainland France as references. We present the average annual number of cases and deaths observed and the world-standardized incidence and mortality rates by regions, and at national level. The standardized incidence and mortality ratios for these three regions are also presented, with 95% confidence intervals.

### Patient and Public Involvement

Our study did not involve direct patient contact. Patients were not involved in the design of this study. Regarding patient involvement, cancer cases are identified through multidisciplinary team meetings, through medical records and the registry, according to the Registry procedures (French National authority for the protection of privacy and personal data). Additional approval from ethical committees was not required.

## Results

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3 Main digestive cancers were analysed, including oesophagus, stomach, colorectum, liver and pancreas  
4 cancers. In our study, we observed a lower-incidence in all digestive cancer, except for stomach cancer.  
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### 8 **Oesophagus**

9 In Martinique, Guadeloupe and French Guiana, oesophageal cancer affects on average 34 men and 6  
10 women per year (Table 1-2), i.e. 1.6% of incident cancer cases in men and 0.4% in women. It was  
11 responsible for 26 deaths per year in men between 2007 and 2014 (Table 1), representing 3.0% of cancer  
12 deaths, and 4 deaths per year in women (0.6%).  
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### 17 **Stomach**

18 In the French West-Indies, 80 individuals were diagnosed with stomach cancer each year respectively  
19 in Guadeloupe and Martinique, and 20 in French Guiana. Stomach cancer is more common in these  
20 Departments than in mainland France, and represents 4.5% of cancers in men in Martinique, 5.3% in  
21 Guadeloupe and 5.7% in French Guiana.  
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25 In men, it is the 3<sup>rd</sup> most common malignancy in Martinique and Guadeloupe, and 4<sup>th</sup> most common in  
26 French Guiana. In women, it is the 3<sup>rd</sup> most common malignancy in Martinique and 4<sup>th</sup> most common  
27 in Guadeloupe, whereas it is 8<sup>th</sup> in French Guiana.  
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30 Observed incidence is comparable in men in Guadeloupe and French Guiana (respectively 14.3 and 14.6  
31 per 100,000 person-years), and lower in Martinique (12.1). In women, world-standardized incidence  
32 rates are 6.9 in Martinique, 7.2 in French Guiana and 7.3 in Guadeloupe. This higher incidence of  
33 stomach cancer, with significant standardized incidence ratios (SIRs) at 1.90 for Guadeloupe and French  
34 Guiana and 1.58 for Martinique, place these 3 Departments at the top 3 of French regional incidence for  
35 this cancer.  
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39 In line with incidence data, mortality is also higher than in mainland France. In men, the world-  
40 standardized mortality rate, which reached 9.3 per 100,000 person-years in Guadeloupe, 8.9 in  
41 Martinique and 7.3 in French Guiana, is between 1.6 and 2.1 times higher than the corresponding rate  
42 in mainland France (4.5) and in most French regions with the exception of Corsica. These differences  
43 are also evident for stomach cancer mortality in women, where the world-standard mortality rate of 4.4  
44 per 100,000 person-years in Guadeloupe is more than 2.7 times higher than that of mainland France  
45 (1.7). Among the French West-Indies, Guadeloupe has the highest world-standard mortality rates, in  
46 both men and women.  
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### 54 **Colon-Rectum**

55 In the regions of Guadeloupe, Martinique and French Guiana, on average, 194 men and 173 women per  
56 year are diagnosed with CRC (Table 1-2), i.e. 9.0% of incident cancer cases in men and 12.2% in  
57 women. CRC was responsible for 78 deaths per year in men from 2007 to 2014, representing 9.1% of  
58 all cancer-related deaths, and 74 deaths per year in women (11.2%).  
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3 Overall, these 3 regions have similar world-standardized incidence rates, which remain lower than  
4 incidence in France as a whole; CRC mortality is also lower.  
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### 7 8 **Liver**

9 In Guadeloupe, Martinique and French Guiana, liver cancer is diagnosed in an average of 30 men and  
10 14 women per year, accounting for 1.4% of incident cancer cases in men, and 1.0% in women. It was  
11 responsible for 38 deaths per year in men from 2007 to 2014, representing 4.4% of cancer-related deaths,  
12 and 23 deaths per year in women (3.5% of cancer-related deaths).  
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### 16 17 **Pancreas**

18 In Martinique, Guadeloupe and French Guiana, pancreatic cancer is diagnosed in an average of 44 men  
19 and 39 women per year, accounting for 2.0% of incident cancers in men and 2.7% in women. It was  
20 responsible for 53 deaths per year between 2007 and 2014, corresponding to 6.2% of cancer deaths in  
21 men and 49 deaths per year (7.4% of cancer-related deaths) in women.  
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### 26 27 **Discussion**

28 Overall, Martinique, Guadeloupe and French Guiana present world-standardized incidence rates that  
29 vary somewhat between the three regions, but that are in general lower than overall rates for the whole  
30 of France; there is also lower mortality related to oesophageal cancer.  
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33 The incidence of oesophageal cancer has been declining for several years in men, whereas it is increasing  
34 in women.  
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37 The majority of oesophageal cancers can be classed into two histological groups. Epidermoid cancers  
38 are the most frequent in France in both men and women [12]. Furthermore, the World Health  
39 Organization (WHO) has established that X-rays and gamma radiation can contribute to oesophageal  
40 cancer. The second histological type is adenocarcinoma; the majority of adenocarcinomas of the  
41 oesophagus develop in the context of endobrachyoesophagus (Barrett's oesophagus), following the  
42 metaplasia-dysplasia-carcinoma sequence.  
43  
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45 In the Caribbean, few data are available on oesophagus cancers incidence and mortality; data available  
46 from GLOBOCAN Observatory show that incidence cancer of oesophagus cancer was below 4.0 per  
47 100,000 person-years in men and below 1.0 in women. Latin America and the Caribbean (LAC) region  
48 had the lowest incidence rates for this cancer compared to Europe (1.3 per 100,000 in women and 5.8  
49 in men) or Asia (5.3 per 100,000 in women and 12.1 in men). Mortality data in the LAC was 0.91 per  
50 100,000 pers-years in women and 3.7 in men. In our study, our rates are similar to those observed in the  
51 LAC [13 14].  
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54 We observed incidence and mortality rates of 6.0 and 4.5 per 100,000 pers-years in women for stomach  
55 cancer. In men these rates were respectively 11.0 and 8.8 per 100,000 pers-years. In our study we  
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3 observed higher incidence and mortality rate compared to mainland France, especially in men [14]. The  
4 estimated incidence of stomach cancer in France is amongst the lowest of all the estimates provided by  
5 the WHO [15]. Incidence of stomach cancer is on the decline over the long term, and this is confirmed  
6 by the observations between 2005 and 2012 in mainland France [16]. Mortality has also been declining  
7 persistently since the 1990s [16].

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11 The risk of stomach cancer is increased in first-degree relatives of a patient with stomach cancer, in  
12 individuals who have undergone partial gastrectomy for cancer, or in those who have undergone  
13 endoscopic treatment for gastric cancer, as well as in case of precancerous lesions of the stomach and  
14 in persons originating from regions with high stomach cancer incidence. Obesity and gastro-oesophageal  
15 reflux are risk factors for cardia cancer [17-19]. In Guadeloupe, prevalence of *Helicobacter pylori*  
16 infection, the main risk factor for this type of cancer, was estimated to be 55% in blood donors. Further  
17 studies are required to estimate the prevalence in the general population, and among patients with cancer.  
18 Environmental risk factors, as well as high intake of salt, and smoked meat and fish in the French West  
19 Indies, as in certain Asian countries, could also contribute to the high incidence of stomach cancer.  
20 Consumption of fruit and vegetables has a protective effect against stomach cancer.

21  
22 In the LAC regions, colorectal cancer incidence rates in women was 15.1 per 100,000 pers-years in  
23 women and 18.5 in men. Mortality rates were respectively 7.3 per 100,000 pers-years in women and 9.4  
24 in men [14]. In our study, we observed that our incidence and mortality rates were higher compared to  
25 Caribbean rates. This could be explained by the development of organized colorectal cancer screening  
26 since 2008 in Martinique and Guadeloupe, and in 2009 in French Guiana, that could help to detect more  
27 cancer cases. Furthermore, we observed that western lifestyle impacts the incidence and mortality rates  
28 in our regions.

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Colorectal cancer is also a cancer among those requiring a policy of care, from the stage of organized  
or individual cancer screening to follow-up as part of the various treatments delivered. Several studies  
have been carried out in Martinique by the Martinique Cancer Registry, on the evolution of this cancer  
but also on the factors conditioning survival by age at diagnosis [6 8 9]. Additional studies are underway  
to analyze regional survival within the French West-Indies and should allow a better understanding of  
the profile of cancer patients in our region. In France, this cancer benefits from a prevention program  
which involves health actors from the general practitioner to integration within the framework of the  
hospital care pathway.

Liver cancer includes primary carcinoma of the liver or hepatocellular carcinoma (HCC, which  
represents more than 80% of all liver cancers), as well as cancer of the intra-hepatic bile ducts. It is more  
frequent in France than in Europe as whole or in developed countries [15].

In men, mortality has been declining since 1995 in mainland France, but the opposite trend has been  
observed in women [16].

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3 There is also a lower mortality from liver cancer in men in our study for the three regions. Conversely,  
4 in women, world-standardized mortality rates show no significant excess- or a lower mortality compared  
5 to the rates observed in mainland France.  
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7  
8 There are numerous established risk factors for primary liver cancer [20] namely: alcohol consumption,  
9 hepatitis B and C viruses, obesity [20], diabetes and tobacco smoking. Bile duct cancer risk factors  
10 include liver fluke, biliary tract diseases (primary sclerosing cholangitis and Caroli disease), and  
11 exposure to certain chemical compounds such as dichloropropane or dichloromethane[21].  
12

13  
14 Geographic variations in incidence observed over the study period could be explained by heterogeneity  
15 in the prevalence of chronic diseases linked to alcohol use, hepatitis B and C, or steatosis [22]. Progress  
16 in the management of patients with cirrhosis enables carcinogenesis to continue, and also contributes to  
17 the increased number of liver cancer cases[22], notably cancer of the intrahepatic bile ducts, whereas  
18 other histological types, such as HCC, are on the decline[23]. The distinct geographic distribution of the  
19 main risk factors for liver cancer, particularly alcohol consumption, may explain the disparities between  
20 Departments in terms of incidence and mortality.  
21

22  
23 In women, liver cancer incidence and mortality were respectively 4.0 and 3.7 per 100,000 pers-years; in  
24 men these rates were respectively 5.9 and 5.6 per 100,000 pers-years in the LAC [14]. In our study our  
25 incidence and mortality rates were lower except for French Guiana with an incidence rate of 10.5 per  
26 100,000 pers-years in men.  
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29 We observed incidence and mortality rates of 4.0 and 3.8 per 100,000 pers-years in women in the LAC.  
30 In men these rates were respectively 5.0 and 4.9 per 100,000 pers-years [14]. In our study, our incidence  
31 and mortality rates were higher compared to the LAC.  
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33  
34 The incidence of pancreatic cancer is the highest in Eastern Europe, France and Japan[24]. In France,  
35 the incidence rate for pancreatic cancer is higher than the average of the 28 EU countries [16]. Pancreatic  
36 cancer is one of the 10 most frequent types of cancer, and its incidence increased in both sexes between  
37 2005 and 2012, whereas mortality has remained practically unchanged since the 1980s [16]  
38

39  
40 Overall, the 3 regions have world-standardized incidence rates that remain lower than those of France  
41 as a whole; mortality from pancreatic cancer is also lower. According to Globocan data for LAC (5.0),  
42 in men, the incidence rates were similar than the incidence rates in our study except in Martinique (7.0)  
43 where it was higher. In women we observed the results between our study (Guadeloupe: 3.0, Martinique:  
44 4.4, French Guiana: 4.8) and LAC (4.0). However, the mortality rates were higher in our study compared  
45 to LAC (4.9) in men. In women the mortality rates were similar between LAC (3.8) and data from our  
46 study.  
47

48  
49 Tobacco smoking and obesity are established environmental risk factors for pancreatic cancer. Low-  
50 calorie diets, high alcohol consumption and increased abdominal fat have also been reported to be  
51 precipitating factors, while a diet rich in fruit, vegetables and folates, and regular physical exercise are  
52 reported to have a protective effect [22].  
53

## 54 55 56 57 58 59 60 **Conclusion**

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3 Collaborative projects to promulgate this expertise will help to improve knowledge of the clinical,  
4 demographic, socio-economic or organizational factors that contribute to the heterogeneity of cancer  
5 burden in the region. Our results are not sufficient to allow trend analysis, but our important to monitor  
6 these first results in the future. The next projects of analysis will allow the carrying out of cancer  
7 mapping studies as well as the implementation of studies on the risk factors of stomach cancer and the  
8 prevalence of Helicobacter Pylori infection in the Antilles. The study of environmental and behavioral  
9 factors is therefore an important issue for a better understanding of the determinants of health and cancer  
10 survival.  
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## 17 **DECLARATIONS**

### 18 **Authors' contributions**

19 LID, SB, CJ, JVB, JD were major contributors in writing the manuscript, made substantial contributions  
20 to conception and design, JP, BBM, JPe, EC, JM, MB, MBR revising it critically for important  
21 intellectual content. EC and FRANCIM Network made substantial contributions to conception and  
22 design; and revising it critically for important intellectual content. All authors read and approved the  
23 final manuscript.  
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### 30 **Ethics approval statement**

31 Our study did not involve direct patient contact. Patients were not involved in the design of this study.  
32 Regarding patient involvement, cancer cases are identified through multidisciplinary team meetings,  
33 through medical records and the registry, according to the Registry procedures (French National  
34 authority for the protection of privacy and personal data). Additional approval from ethical committees  
35 was not required.  
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52 Besancon, France) for editorial assistance.  
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3 **Conflict interest statement**

4 The authors declare that there are no conflicts of interest.

5  
6 **Source of funding**

7 Santé publique France, Institut national du cancer. COP N°2019-071

8  
9 **Data Sharing**

10 Not applicable.  
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Table 1. Annual number of new cases and deaths for digestive cancers in men, standardized incidence and mortality ratios, standardized incidence and mortality ratios, with 95% confidence intervals.

	New cases <sup>1</sup>		Incidence			Deaths		Mortality				
			WSR <sup>2</sup>		SIR <sup>3</sup>			WSR <sup>2</sup>		SMR <sup>3</sup>		
<b>Oesophagus</b>												
Guadeloupe	18	[15 ; 21]	6.1	[5.1 ; 7.4]	0.78	[0.65 ; 0.93]	14	[12 ; 17]	4.8	[4.0 ; 5.9]	0.89	[0.73 ; 1.07]
Martinique	12	[10 ; 15]	3.8	[3.1 ; 4.8]	0.52	[0.42 ; 0.63]	10	[7 ; 12]	2.8	[2.2 ; 3.8]	0.56	[0.43 ; 0.71]
French Guiana	4	[2 ; 6]	4.5	[2.7 ; 7.2]	0.56	[0.34 ; 0.88]	2	[1 ; 4]	2.8	[1.6 ; 4.6]	0.52	[0.31 ; 0.82]
Mainland France	3998	[3851 ; 4153]	7.23	[6.95 ; 7.51]			3031	[2993 ; 3070]	5.18	[5.11 ; 5.25]		
<b>Stomach</b>												
Guadeloupe	50	[44 ; 55]	14.3	[12.8 ; 16.1]	1.90	[1.70 ; 2.11]	32	[29 ; 37]	9.3	[8.2 ; 10.7]	2.10	[1.85 ; 2.37]
Martinique	43	[39 ; 48]	12.1	[10.8 ; 13.7]	1.58	[1.42 ; 1.76]	33	[29 ; 38]	8.9	[7.7 ; 10.3]	2.05	[1.79 ; 2.33]
French Guiana	14	[11 ; 17]	14.6	[11.2 ; 18.7]	1.90	[1.48 ; 2.41]	6	[5 ; 8]	7.3	[5.3 ; 9.8]	1.64	[1.21 ; 2.17]
Mainland France	4707	[4561 ; 4859]	7.88	[7.62 ; 8.14]			2952	[2914 ; 2990]	4.54	[4.48 ; 4.61]		
<b>Colon-Rectum</b>												
Guadeloupe	81	[74 ; 88]	26.2	[24.0 ; 28.6]	0.66	[0.61 ; 0.72]	34	[30 ; 39]	10.1	[8.9 ; 11.5]	0.74	[0.66 ; 0.84]
Martinique	90	[83 ; 97]	26.9	[24.8 ; 29.2]	0.70	[0.65 ; 0.76]	39	[35 ; 44]	10.8	[9.5 ; 12.4]	0.80	[0.71 ; 0.90]
French Guiana	23	[19 ; 27]	25.0	[20.4 ; 30.3]	0.70	[0.57 ; 0.84]	5	[3 ; 6]	6.3	[4.4 ; 8.7]	0.46	[0.33 ; 0.64]
Mainland France	22828	[22442 ; 23222]	37.8	[37.2 ; 38.5]			8976	[8910 ; 9041]	12.7	[12.6 ; 12.8]		
<b>Liver</b>												
Guadeloupe	10	[8 ; 13]	3.6	[2.8 ; 4.7]	0.27	[0.21 ; 0.33]	15	[12 ; 18]	4.8	[3.9 ; 5.8]	0.50	[0.41 ; 0.59]
Martinique	11	[9 ; 13]	3.3	[2.6 ; 4.3]	0.27	[0.22 ; 0.33]	18	[15 ; 22]	5.4	[4.5 ; 6.7]	0.57	[0.48 ; 0.68]
French Guiana	9	[7 ; 12]	10.5	[7.6 ; 14.3]	0.85	[0.62 ; 1.13]	5	[3 ; 7]	5.9	[4.2 ; 8.2]	0.66	[0.47 ; 0.91]
Mainland France	6989	[6730 ; 7261]	12.38	[11.91 ; 12.87]			5739	[5686 ; 5791]	9.25	[9.16 ; 9.34]		
<b>Pancreas</b>												
Guadeloupe	15	[13 ; 19]	4.8	[3.9 ; 6.0]	0.51	[0.42 ; 0.62]	24	[20 ; 27]	7.0	[6.0 ; 8.2]	0.94	[0.81 ; 1.08]
Martinique	24	[20 ; 27]	7.0	[6.0 ; 8.2]	0.75	[0.65 ; 0.87]	25	[22 ; 29]	6.9	[5.8 ; 8.2]	0.94	[0.80 ; 1.09]
French Guiana	5	[3 ; 7]	5.5	[3.4 ; 8.3]	0.58	[0.37 ; 0.86]	4	[3 ; 6]	5.8	[4.0 ; 8.3]	0.69	[0.48 ; 0.96]
Mainland France	5581	[5460 ; 5705]	9.52	[9.30 ; 9.74]			4808	[4760 ; 4857]	7.70	[7.62 ; 7.79]		

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.

Table 2. Annual number of new cases and deaths for digestive cancers in women, standardized incidence and mortality rates, standardized incidence and mortality ratios, with 95% confidence intervals.

	New cases <sup>1</sup>		Incidence			SIR <sup>3</sup>		Deaths		Mortality		
			WSR <sup>2</sup>							WSR <sup>2</sup>		SMR <sup>3</sup>
<b>Oesophagus</b>												
Guadeloupe	3	[2.0 ; 5.0]	0.9	[0.5 ; 1.5]	0.52	[0.33 ; 0.79]	2	[1 ; 3]	0.4	[0.2 ; 0.9]	0.45	[0.25 ; 0.75]
Martinique	2	[2.0 ; 4.0]	0.6	[0.3 ; 1.1]	0.40	[0.24 ; 0.61]	2	[1 ; 4]	0.6	[0.3 ; 1.2]	0.55	[0.32 ; 0.88]
French Guiana	1	[0.0 ; 3.0]	1.2	[0.4 ; 2.8]	0.82	[0.30 ; 1.79]	0	[0 ; 1]	0.4	[0.1 ; 1.4]	0.43	[0.09 ; 1.27]
Mainland France	1072	[1018 ; 1130]	1.49	[1.41 ; 1.58]			794	[774 ; 813]	0.96	[0.93 ; 0.98]		
<b>Stomach</b>												
Guadeloupe	32	[28 ; 37]	7.3	[6.3 ; 8.6]	2.29	[2.00 ; 2.61]	23	[19 ; 26]	4.4	[3.7 ; 5.3]	2.74	[2.35 ; 3.16]
Martinique	34	[30 ; 39]	6.9	[6.0 ; 8.0]	2.31	[2.04 ; 2.60]	22	[19 ; 26]	3.7	[3.1 ; 4.7]	2.53	[2.15 ; 2.94]
French Guiana	8	[5 ; 10]	7.2	[5.0 ; 10.1]	2.29	[1.62 ; 3.15]	3	[2 ; 4]	3.3	[2.1 ; 5.1]	1.79	[1.15 ; 2.66]
Mainland France	2587	[2508 ; 2670]	3.22	[3.11 ; 3.34]			1665	[1637 ; 1694]	1.71	[1.68 ; 1.75]		
<b>Colon-Rectum</b>												
Guadeloupe	70	[64 ; 76]	17.3	[15.7 ; 19.2]	0.68	[0.62 ; 0.75]	29	[26 ; 33]	6.2	[5.4 ; 7.3]	0.76	[0.66 ; 0.86]
Martinique	85	[79 ; 92]	20.4	[18.8 ; 22.3]	0.80	[0.74 ; 0.86]	41	[36 ; 46]	7.8	[6.8 ; 9.0]	0.98	[0.87 ; 1.10]
French Guiana	18	[14 ; 22]	17.4	[13.8 ; 21.7]	0.75	[0.60 ; 0.92]	4	[3 ; 6]	3.8	[2.5 ; 5.5]	0.54	[0.37 ; 0.77]
Mainland France	19174	[18895 ; 19458]	24.4	[24.0 ; 24.8]			7938	[7877 ; 8000]	7.5	[7.4 ; 7.6]		
<b>Liver</b>												
Guadeloupe	4	[3 ; 6]	1.1	[0.7 ; 1.8]	0.44	[0.30 ; 0.63]	9	[7 ; 11]	2.0	[1.5 ; 2.7]	0.84	[0.65 ; 1.06]
Martinique	7	[5 ; 9]	1.8	[1.3 ; 2.7]	0.64	[0.48 ; 0.84]	12	[9 ; 15]	2.5	[1.9 ; 3.4]	1.04	[0.83 ; 1.29]
French Guiana	3	[2 ; 5]	2.7	[1.5 ; 4.8]	1.21	[0.66 ; 2.02]	2	[1 ; 3]	1.8	[1.0 ; 3.2]	0.86	[0.47 ; 1.43]
Mainland France		Not Available					2118	[2087 ; 2151]	2.24	[2.20 ; 2.29]		
<b>Pancreas</b>												
Guadeloupe	12	[9 ; 15]	3.0	[2.3 ; 3.9]	0.43	[0.34 ; 0.53]	22	[19 ; 26]	4.8	[4.0 ; 5.7]	0.98	[0.84 ; 1.13]
Martinique	22	[19 ; 25]	4.4	[3.7 ; 5.4]	0.75	[0.64 ; 0.87]	24	[21 ; 28]	4.4	[3.6 ; 5.3]	0.97	[0.83 ; 1.13]
French Guiana	5	[3 ; 7]	4.8	[3.0 ; 7.4]	0.76	[0.48 ; 1.13]	3	[2 ; 5]	3.2	[2.0 ; 5.0]	0.72	[0.47 ; 1.06]
Mainland France	5278	[5152 ; 5407]	6.46	[6.29 ; 6.63]			4601	[4554 ; 4648]	4.83	[4.77 ; 4.89]		

(1) Incidence mainland France: 2007-2016 ; Guadeloupe : 2008-2014 ; Martinique : 2007-2014 ; French Guiana: 2010-2014. (2) World-standardized rates: rates are standardized to the age structure of the world standard population and expressed per 100,000 person-years. (3) Ratios standardized to mainland France.

## References:

1. Cancer IAfRo. Population fact sheets. Secondary Population fact sheets 2019. <https://gco.iarc.fr/today/data/factsheets/populations/915-caribbean-fact-sheets.pdf>.
2. Abnet CC, Arnold M, Wei WQ. Epidemiology of Esophageal Squamous Cell Carcinoma. *Gastroenterology* 2018;**154**(2):360-73 doi: 10.1053/j.gastro.2017.08.023[published Online First: Epub Date]].
3. Thrift AP. The epidemic of oesophageal carcinoma: Where are we now? *Cancer Epidemiol* 2016;**41**:88-95 doi: 10.1016/j.canep.2016.01.013[published Online First: Epub Date]].
4. Curado MP, de Oliveira MM, de Araujo Fagundes M. Prevalence of Helicobacter pylori infection in Latin America and the Caribbean populations: A systematic review and meta-analysis. *Cancer Epidemiol* 2019;**60**:141-48 doi: 10.1016/j.canep.2019.04.003[published Online First: Epub Date]].
5. INCa. Plan Cancer 2014-2019. Secondary Plan Cancer 2014-2019 2014. <http://www.e-cancer.fr/Expertises-et-publications/Catalogue-des-publications/Plan-cancer-2014-2019>.
6. Joachim C, Godaert L, Drame M, et al. Overall survival in elderly patients with colorectal cancer: A population-based study in the Caribbean. *Cancer Epidemiology* 2017;**48**:85-91 doi: 10.1016/j.canep.2017.03.005[published Online First: Epub Date]].
7. Joachim C, Veronique-Baudin J, Ulric-Gervaise S, et al. Cancer burden in the Caribbean: an overview of the Martinique Cancer Registry profile. *BMC cancer* 2019;**19**(1):239 doi: 10.1186/s12885-019-5434-6[published Online First: Epub Date]].
8. Joachim C, Véronique-Baudin J, Razanakaivo M, et al. Trends in colorectal cancer in the Caribbean: A population-based study in Martinique, 1982-2011. *Revue d'épidémiologie et de sante publique* 2017;**65**:181-88 doi: 10.1016/j.respe.2016.11.002[published Online First: Epub Date]].
9. Joachim C, Macni J, Drame M, et al. Overall survival of colorectal cancer by stage at diagnosis: Data from the Martinique Cancer Registry. *Medicine (Baltimore)* 2019;**98**(35):e16941 doi: 10.1097/md.00000000000016941[published Online First: Epub Date]].
10. Chatignoux E, Remontet L, Iwaz J, et al. For a sound use of health care data in epidemiology: evaluation of a calibration model for count data with application to prediction of cancer incidence in areas without cancer registry. *Biostatistics (Oxford, England)* 2019;**20**(3):452-67 doi: 10.1093/biostatistics/kxy012[published Online First: Epub Date]].
11. Segi M. *Cancer mortality for selected sites in 24 countries (1950-57)*. Sendai: Department of Public Health, Tohoku University of Medicine, 1960.
12. Arnold M, Soerjomataram I, Ferlay J, et al. Global incidence of oesophageal cancer by histological subtype in 2012. *Gut* 2015;**64**(3):381-7 doi: 10.1136/gutjnl-2014-308124[published Online First: Epub Date]].
13. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians* 2018;**68**(6):394-424 doi: 10.3322/caac.21492[published Online First: Epub Date]].
14. Cancer IAfRo. GLOBOCAN CANCER OBSERVATORY 2020. Secondary GLOBOCAN CANCER OBSERVATORY 2020. <https://gco.iarc.fr/>.
15. Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *International journal of cancer* 2015;**136**(5):E359-86 doi: 10.1002/ijc.29210[published Online First: Epub Date]].
16. Binder-Foucard F, Bossard N, Delafosse P, et al. Cancer incidence and mortality in France over the 1980-2012 period: solid tumors. *Revue d'épidémiologie et de sante publique* 2014;**62**(2):95-108 doi: 10.1016/j.respe.2013.11.073[published Online First: Epub Date]].
17. Sitarz R, Skierucha M, Mielko J, et al. Gastric cancer: epidemiology, prevention, classification, and treatment. *Cancer management and research* 2018;**10**:239-48 doi: 10.2147/cmar.s149619[published Online First: Epub Date]].

- 1
- 2
- 3 18. Fock KM. Review article: the epidemiology and prevention of gastric cancer. *Alimentary*
- 4 *pharmacology & therapeutics* 2014;**40**(3):250-60 doi: 10.1111/apt.12814[published Online
- 5 First: Epub Date]].
- 6
- 7 19. Karimi P, Islami F, Anandasabapathy S, et al. Gastric cancer: descriptive epidemiology, risk factors,
- 8 screening, and prevention. *Cancer epidemiology, biomarkers & prevention* : a publication of
- 9 the American Association for Cancer Research, cosponsored by the American Society of
- 10 Preventive Oncology 2014;**23**(5):700-13 doi: 10.1158/1055-9965.epi-13-1057[published
- 11 Online First: Epub Date]].
- 12
- 13 20. El-Serag HB. Hepatocellular carcinoma. *The New England journal of medicine* 2011;**365**(12):1118-
- 14 27 doi: 10.1056/NEJMra1001683[published Online First: Epub Date]].
- 15
- 16 21. Lauby-Secretan B, Scocciati C, Loomis D, et al. Body Fatness and Cancer--Viewpoint of the IARC
- 17 Working Group. *The New England journal of medicine* 2016;**375**(8):794-8 doi:
- 18 10.1056/NEJMs1606602[published Online First: Epub Date]].
- 19
- 20 22. IARC. List of classifications by cancer sites with sufficient or limited evidence in humans Vt.
- 21 Secondary. <https://monographs.iarc.fr/wp-content/uploads/2018/07/Table4.pdf>.
- 22
- 23 23. Petrick JL, Braunlin M, Laversanne M, et al. International trends in liver cancer incidence, overall
- 24 and by histologic subtype, 1978-2007. *International journal of cancer* 2016;**139**(7):1534-45
- 25 doi: 10.1002/ijc.30211[published Online First: Epub Date]].
- 26
- 27 24. Ferlay J EM DR, et al. GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC
- 28 CancerBase Secondary GLOBOCAN 2012 - Cancer Incidence and Mortality Worldwide: IARC
- 29 CancerBase 2012. [http://globocan.iarc.fr/Pages/fact\\_sheets\\_cancer.aspx](http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx).
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## STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	3
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	3
		<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
Variables	7	(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	3
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Data sources/measurement	8*	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
Bias	9	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Study size	10	Describe any efforts to address potential sources of bias	3
Quantitative variables	11	Explain how the study size was arrived at	3
Statistical methods	12	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3
		(a) Describe all statistical methods, including those used to control for confounding	3
		(b) Describe any methods used to examine subgroups and interactions	3
		(c) Explain how missing data were addressed	3
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	3
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	Not

Section/Topic	Item No	Recommendation	Reported on Page No
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3-5
		(b) Give reasons for non-participation at each stage	3-5
		(c) Consider use of a flow diagram	3-5
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	3-5
		(b) Indicate number of participants with missing data for each variable of interest	3-5
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	3-5
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	3-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	3-5
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	3-5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	3-5
		(b) Report category boundaries when continuous variables were categorized	3-5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	3-5
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	5-7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5-7
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	5-7
Generalisability	21	Discuss the generalisability (external validity) of the study results	5-7
<b>Other Information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	8

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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