Trends in Incidence and Early Outcomes in a Black Afro-Caribbean Population From 1999 to 2012

Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux II Study

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Background and Purpose—Seldom studies are available on trends in stroke incidence in blacks. We aimed to evaluate whether stroke risk prevention policies modified first-ever stroke incidence and outcomes in the black Afro-Caribbean population of Martinique.

Methods—Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux (ERMANCIA) I and II are 2 sequential prospective population-based epidemiological studies. There have assessed temporal trends in first-ever stroke incidence, risk factors, pathological types, and early outcomes in the black Afro-Caribbean population of Martinique comparing two 12-month periods (1998–1999 and 2011–2012). Crude and age-standardized incidence and 30-day outcomes for stroke in the 2 study periods were compared using Poisson regression.

Results—We identified 580 and 544 first-ever strokes in the 2 studies. World age-standardized incidence rates decreased by 30.6% in overall (111 [95% confidence interval, 102–120] versus 77 [95% confidence interval, 70–84]). Rate decline was greater in women than in men (34% versus 26%) particularly in women aged 65 to 74 years (−69%) and 75 to 84 years (−43%). Frequencies of hypertension and diabetes mellitus were unchanged, whereas dyslipidemia, smoking, and atrial fibrillation significantly increased. Only ischemic stroke types showed significant rate reduction in overall and in women, incidence rate ratio (95% confidence intervals) of 0.69 (0.50–0.97) and 0.61 (0.42–0.88), respectively. The overall 30-day case-fatality ratio remained stable (19.3%/17.6%), whereas a better 30-day outcome was found (modified Rankin Score, ≤2 in 47%/37.6%; *P*=0.03).

Conclusions—Over 13 years, there has been a significant decrease (30.6%) in the age-specific first-ever stroke incidence in our Afro-Carribean population. Although prevention policies seem effective, we need to focus on new risk factors limitation and on male population adherence to prevention program. (*Stroke*. 2014;45:3367-3373.)

Key Words: blacks ■ epidemiology ■ incidence ■ outcomes assessment ■ stroke ■ trends

Stroke is the main cause of neurological disability in adults and the second leading cause of death worldwide.[1] The burden of stroke cases is predicted to increase over the years ahead because of growth in the aging population in both developed and developing countries.[2] Few epidemiological stroke population–based studies on trends in incidence have been conducted since the beginning of the 21st century.[3] Although variable in magnitude, significant age-adjusted incidence decreases have been found usually in high-income countries.[4–6] Limited data are available, in black subjects, on time trends in stroke incidence and most studies have been

conducted in multiracial population in the United Kingdom and United States.[7,8] Whereas stroke incidence decrease was noted in white group, stable rate was found in black group.[9,10] The higher prevalence of vascular risk factors[11] and the lower socioeconomic status level[12] in blacks compared with whites are supposed to account for these trends differences. Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux I (ERMANCIA I) was a 1-year population-based study conducted in 1998–1999.[13] It has shown a heavy prevalence of major vascular risk factors and a high stroke incidence rate in the Afro-Caribbean

population of Martinique. Therefore and on the basis of these results, preventive strategies have been applied on a community level. We present here, ERMANCIA II study performed 13 years later and using the same methods. We aimed to reassess risk factors prevalence, premorbid use of preventive treatments, first-ever stroke (FES) incidence and outcome in the same Afro-Caribbean population. Final objective was to evaluate whether implementation of prevention procedures and treatments was associated with any significant changes.

Subjects and Methods

Study Design and Population

ERMANCIA II was a prospective population-based epidemiological study performed from November 1, 2011 to October 31, 2012, to determine the incidence, pathogenesis, and outcomes of strokes in Martinique, French West Indies. One of the objectives was to compare ERMANCIA II data with ERMANCIA I[13] performed 13 years ago. The study was conducted according to the methodological criteria recommended in such epidemiological study.[14] Relevant ethics committees approved the protocol for each period.

Martinique is one of the most highly developed islands in the Caribbean, classified high (41st) in terms of global human development at the world level. The population remained stable in Martinique between 1999 (381 364) and 2012 (390 371). The great majority is Afro-Caribbean.

To reduce stroke burden, a primary prevention program has been implemented in 2000. Networks of an extensive number of specialists and general practitioners developed comprehensive primary prevention of major vascular risk factors such as hypertension and diabetes mellitus. The program was based on frequent information to decrease sugar and salt intake from alimentation, to increase fruits and vegetables consumption and to engage in physical activity. All general practitioners focused on effective treatment of hypertension and diabetes mellitus and taught patients how to self-assess blood pressure and blood glycemia. In 2003, the stroke unit was established in the University Hospital of Fort de France.

Case Ascertainment and Assessment

Stroke was defined according to the World Health Organization definition.[15] Patients with transient clinical symptoms and infarction on imaging were recorded for local analysis but excluded in the current study to be in agreement with the World Health Organization definition and to offer easy comparison with previous studies. In case of previous stroke history, patients were classified as recurrent stroke. In other cases, they were classified as FES.

We used identical ascertainment methods and definitions to those used in the ERMANCIA I study, which have been described previously.[13] An exhaustive pursuit was performed to identify incident and recurrent stroke events, using multiple overlapping hospital and community sources according to recommended core methods for stroke epidemiological studies.[14]

A standardized case report form has been elaborated and collected the demographic data, the medical and stroke history, the clinical symptoms including admission National Institutes of Health Stroke Scale, the investigation results, and the 30-day, 3-month, and 12-month disability level assessed by modified Rankin Scale (mRS). When patient could not be interviewed, a next of kin was contacted and information was collected. Patients were classified into 3 racial categories: Afro-Caribbean, white, and Other. The individual's response to the race question was based on self-identification. Known treated or not treated hypertension, diabetes mellitus, and hypercholesterolemia were retained as vascular risk factors. Atrial fibrillation (AF) was classified as known AF or paroxysmal AF. Smoking was classified as current smoking and as a cumulative consumption >10 pack-years. Alcohol abuse was diagnosed when the patient had a daily consumption >120 g. Peripheral arterial disease was recorded on the basis of a history of intermittent claudication or previous arterial intervention or Doppler ultrasonography documentation. Coronary heart disease was defined as history of acute myocardial infarction or angina pectoris.

To determine stroke type, brain imaging was performed as soon as possible and included systematic brain MRI. The radiology department of the university hospital devoted the MRI machine to suspected patients with stroke 24/7. The radiologist (M.M.) reviewed brain imaging to determine stroke type. Definite and probable ischemic strokes (ISs) were further subdivided according to the Oxfordshire Community Stroke Project[16] classification into 5 subtypes: total anterior circulation infarction, partial anterior circulation infarction, lacunar infarction, posterior circulation infarction, and multiple territory infarctions. ERMANCIA II team met every week to exclude or include the suspected cases and to classified infarction patients according to the Trial of ORG 10172 in Acute Stroke Treatment criteria.

Disability was assessed using the mRS at months 1, 3, and 12. Investigators assessed hospitalized patients at the bedside, whereas a trained research staff member interviewed by phone at home patients or next of kin using a simplified mRS questionnaire.[17] For the current study, short-term outcomes at day 30 were considered. Death was recorded in medical charts screening or at the time of phone interview. The date of death was carefully noted and all death status was confirmed by death certificate checking.

For complete case ascertainment and assessment see online-only Data Supplement.

Statistical Analysis

All original data from ERMANCIA I study were reviewed and reanalyzed. The numerator for calculation of incidence rate was the number of all FESs in Afro-Caribbean population recorded during the 2 study periods. The denominator was based on data provided by French National Institute for Statistics and Economic Studies (www.insee.fr). In both studies, Afro-Caribbean subjects were estimated at 95% in overall population. ERMANCIA I and II focused on FESs in Afro-Caribbean patients and Afro-Caribbean population numbers were used as denominators for incidence rates calculation. Crude annual incidence rates per 100 000, with 95% confidence intervals (CIs), were calculated using Poisson distribution. Age-standardized rates were calculated using the direct method and the World Health Organization world population as the external reference.[18] Incidence rate ratio with 95% CIs and P trends in 30-day outcomes obtained from simple Poisson regression models were assessed for statistical significance at the 5% level.

The 30-day case-fatality was defined as death from any cause. Case-fatality ratios were expressed in percentage and defined as the number of death within 30 days after the onset divided by the number of patients with FES. At 1 month, a good outcome was defined as mRS ≤2, whereas a poor outcome was defined as mRS >2. The χ^2 test and Student t test were used to examine differences in nominal and continuous values. All analyses were performed in SAS 9.3 (SAS Institute, Inc, Cary, NC) and MS Excel software.

Results

FES was identified in 544 Afro-Caribbean patients during the ERMANCIA II study period. For complete cases ascertainment results, see online-only Data Supplement.

Trends in FESs Characteristics

Table 1 shows the characteristics of the 580 and 544 first-ever Afro-Caribbean strokes identified during each 12-month study periods (1998–1999 and 2011–2012). Changes are apparent in the demographic profile with a trend for older and more male patients in 2012. Frequencies of premorbid vascular risk factors were unchanged for hypertension, diabetes mellitus, alcoholism, and history of coronary disease, whereas dyslipidemia, smoking, and AF were significantly higher in ERMANCIA II study. Half (51.8%) of ERMANCIA II

Table 1. Characteristics of Cases in ERMANCIA I and ERMANCIA II

	ERMANCIA I (1998–1999) n=580	ERMANCIA II (2011–2012) n=544	P Value
Age, y	71.2±14	72±15	ns
Male sex, %	49.1	53.7	ns
Hypertension	401 (70.5)	378 (70.2)	ns
Percentage of treatment	77	83.2	0.05
Diabetes mellitus	171 (30.1)	154 (28.8)	ns
Percentage of treatment	ND	83.8	...
Dyslipidemia	67 (11.8)	120 (22.6)	ns
Percentage of treatment	ND	69.4	...
BMI>24 kg/m²	ND	242 (51.8)	...
Current smokers	ND	57 (11.4)	...
Smokers>10 pack-years	40 (7)	88 (17.7)	<0.001
Alcohol abuse	83 (14.6)	46 (9.8)	ns
Atrial fibrillation	78 (13.5)	98 (18.8)	0.04
Percentage of anticoagulation treatment	ND	37.6	...
Coronary disease	33 (5.8)	23 (4.5)	ns
Peripheral arterial disease	76 (13.4)	28 (5.4)	<0.001
Premorbid antiplatelet use	ND	101 (19.5)	
Premorbid mRS			
1–2	ND	47 (8.9)	...
3–5	ND	36 (6.8)	...
NIHSS at admission	ND	8.4±8.9	...
Stroke type			
Ischemic stroke	463 (79.9)	439 (80.7)	ns
Primary intracerebral hemorrhage	83 (14.4)	84 (15.4)	ns
Subarachnoid hemorrhage	20 (3.5)	17 (3.2)	ns
Undetermined	14 (2.4)	4 (0.7)	ns
Ischemic OCSP classification			
Total anterior circulation infarction	67 (14.5)	63 (14.4)	ns
Partial anterior circulation infarction	207 (44.7)	220 (50.1)	ns
Lacunar cerebral infarction	107 (23.1)	48 (10.9)	<0.001
Posterior cerebral infarction	62 (13.4)	73 (16.6)	ns
Multiple infarction	9 (1.9)	25 (5.7)	0.05
Not classifiable	10 (2.2)	10 (2.3)	ns

Nominal values are expressed as number of cases (%) and continuous values as mean±SD. BMI indicates body mass index; ERMANCIA, Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; and OCSP, Oxfordshire Community Stroke Project.

patients had a body mass index >24 kg/m². Rate of treated hypertension was significantly higher (83.2 versus 77%; P<0.05) over time. Although stroke types were the same in the 2 studies, ERMANCIA II patients with IS showed a lower rate of lacunar infarction and a higher proportion of multiple infarction than ERMANCIA I patients.

Trends in FESs Incidence

In 2012, crude incidence rates for FESs were 146.6/100 000 overall (95% CI, 134–159). The rate was higher for men,

171.2 (95% CI, 152–190) than for women, 125.7 (95% CI, 110–141). The overall world age-standardized incidence rate was 77 (95% CI, 70–84). Over 13 years, world age-standardized rates significantly decreased by 31% in overall, by 26% in men and by 34% in women. Whereas a significant decrease was seen in stroke rate among the population aged between 55 and 84 years, we found a significant increase in young aged 35 to 44 years (incidence rate ratio [95% CI], 2.25 [1.07–3.70]) and particularly in young women (4.43 [2.43–8.09]). There were other sex-specific differences in temporal trends in rates. Whereas the incidence decline was significant in men (26%), the decreases did not reach significance among each age decade. Stroke incidence decline (34%) was deeper in women than in men. The decrease was particularly profound in women aged 65 to 74 years (−69%) and 75 to 84 years (−43%; Table 2). The Figure illustrates stroke incidences decline in overall, male, and female population between the 2 studies. In ERMANCIA I population, the exponential growth of stroke incidence occurred after 64 years, whereas it happened 10 years later in ERMANCIA II. This difference was emphasized in female population.

World age-standardized rates for stroke types showed downward trends during the 2 studies. However, only IS rates were significantly different in overall and in women (Table 3).

Trends in FES 30-Day Outcomes

Table 4 compares sex- and stroke type–specific 30-day outcomes in both studies. Proportion of patients assessed by phone interview and data obtained from next-of-kin reports were higher in ERMANCIA I than in ERMANCIA II (65.9% versus 51.5%; P<0.0001 and 16.6% versus 12.3%; P=0.04). Overall 30-day case-fatality ratio did not change significantly (19.3% versus 17.6%). No differences were found in proportion of early death (<2 days; 28.8% versus 28.1%) and in acute critical care unit death (30.4% versus 35.4%) between the 2 studies. Proportion of patients with a good outcome at 1 month was higher in ERMANCIA II than in ERMANCIA I study (47% versus 37.6%; P=0.03).

Discussion

Despite population aging in Martinique, crude FES incidence was not increased compared with our previous study conducted 13 years ago. In our Afro-Caribbean population, ERMANCIA II study showed significant decline of 30% in age-adjusted FESs incidence rate overtime. This trend mirrors those reported in previous studies[4–6,19,20] and supports evidence that Martinique belongs to the group of high-income countries.[3]

As previously reported in black population,[21,22] we found a high prevalence of hypertension and diabetes mellitus. Prevalence of these 2 major risk factors for stroke was stable, whereas proportion of dyslipidemia and smokers increased significantly over 13 years. It is particularly striking that a range of stroke risk factors remained stable or increased over time, whereas stroke incidence rate declined. The higher proportion of blood pressure–lowering medication use in 2012 compared with 1999 could partly account for stroke incidence rate decline.[4] To our knowledge, ERMANCIA constitutes the first study revealing a decrease in stroke incidence rate

Table 2. Age- and Sex-Specific Annual Rates (per 100 000) and Rate Ratio of First-Ever Stroke Events in Martinique, 1999 and 2012

Age at Diagnosis, y	ERMANCIA I (1999)			ERMANCIA II (2012)			Incidence Rate Ratio (95% CI)
	Events, n	At Risk, n	Incidence Rates per 100 000 (95% CI)	Events, n	At Risk, n	Incidence Rates per 100 000 (95% CI)	
Total population							
0–34	14	186 258	7.5 (4–12)	8	152 393	5.2 (2–9)	0.70 (0.23–2.13)
35–44	13	58 033	22.4 (10–35)	26	51 592	50.4 (31–70)	2.25 (1.07–3.70)
45–54	51	42 318	120.5 (88–155)	53	60 089	88.2 (64–112)	0.73 (0.56–1.06)
55–64	82	30 913	265.2 (209–324)	76	46 468	163.5 (127–200)	0.62 (0.41–0.85)
65–74	152	24 708	615.1 (511–714)	108	31 523	342.6 (278–407)	0.56 (0.39–0.74)
75–84	168	14 398	1166.8 (1002–1365)	156	20 353	766.4 (646–887)	0.66 (0.50–0.82)
≥85	100	5631	1775.8 (1391–2111)	117	8436	1386.9 (1136–1638)	0.78 (0.61–1.18)
All ages	580	362 259	160.1 (149–172)	544	370 854	146.6 (134–159)	0.92 (0.73–1.15)
World age-standardized rates	...	...	111 (102–120)	...	...	77 (70–84)	0.69 (0.49–0.89)
Men							
0–34	8	91 747	8.7 (3–15)	1	73 825	1.3 (0–4)	0.16 (0.03–0.95)
35–44	9	27 308	32.9 (11–55)	9	22 134	40.6 (14–67)	1.23 (0.78–1.95)
45–54	34	19 475	174.5 (114–233)	35	27 229	128.5 (86–171)	0.74 (0.49–1.12)
55–64	51	14 455	352.8 (251–450)	48	21 167	226.7 (162–286)	0.64 (0.44–1.03)
65–74	80	11 107	720.2 (558–882)	80	14 540	550.2 (429–670)	0.76 (0.51–1.09)
75–84	77	5943	1295.6 (998–1594)	84	8739	961.2 (755–1160)	0.74 (0.49–1.12)
≥85	26	1829	1421.5 (861–1983)	35	2882	1214.4 (812–1616)	0.85 (0.61–1.21)
All ages	285	171 864	165.8 (146–186)	292	170 516	171.2 (152–190)	0.97 (0.77–1.19)
World age-standardized rates	...	...	122 (107–137)	...	...	90 (79–101)	0.74 (0.58–0.94)
Women							
0–34	6	94 511	6.3 (1–11))	7	78 568	8.9 (2–15)	1.40 (0.51–3.88)
35–44	4	30 725	13.0 (1–26)	17	29 458	57.7 (30–85)	4.43 (2.43–8.09)
45–54	17	22 843	74.4 (39–111)	18	32 860	54.7 (30–80)	0.74 (0.52–1.14)
55–64	31	16 458	188.3 (120–256)	28	25 301	110.6 (70–152)	0.59 (0.36–1.02)
65–74	72	13 601	529.3 (403–651)	28	16 983	164.8 (104–226)	0.31 (0.16–0.87)
75–84	91	8455	1076.2 (850–1305)	72	11 614	619.9 (477–763)	0.57 (0.52–0.64)
≥85	74	3802	1946.3 (1490–2399)	82	5554	1476.4 (1157–1796)	0.76 (0.55–1.11)
All ages	295	190 395	154.9 (138–182)	252	200 338	125.7 (110–141)	0.81 (0.64–0.99)
World age-standardized rates	...	...	104 (92–116)	...	...	69 (60–78)	0.66 (0.49–0.92)

Incidence rate ratio was adjusted for age and sex and obtained by a Poisson regression model. CI indicates confidence interval; and ERMANCIA, Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux.

overtime in a black population with its usual high burden of stroke risk factors. Previous studies on blacks have been conducted in multiethnic population[9,10] and have shown that overtime, stroke incidence reduced in white group but not in black group. In these multiracial populations, socioeconomic status discrepancy[12] and sustained inequalities in risk[11] may partly account for the observed ethnic differences. Our study supports the hypothesis that the weight of prevention program access is major in stroke incidence reduction particularly in the high-risked black population. Mirroring our results, higher stroke incidence rates in men than in women have been reported in several populations,[23,24] including black population.[25] Moreover, authors pointed out that the greatest

disparity was in those aged 55 to 74 years, whereas difference was less evident in the young and the elderly.[26,27] Whereas studies have reported a men/women incidence ratio stability[26] or decline overtime,[27,28] we found a significant increase of this ratio between the 2 study periods. Indeed, female stroke incidence rates showed dramatic falls in those aged 65 to 74 years (−69%) and 75 to 84 years (−43%). The classic exponential growth of age-specific incidence curve in stroke was delayed by 10 years (64–74 years) in female population between 1999 and 2012. Any increase proportion of postmenopausal therapy in women could not account for such a delay.[29] In male population, poor adherence to prescribed medications and to lifestyle recommendations may account for a weaker stroke incidence
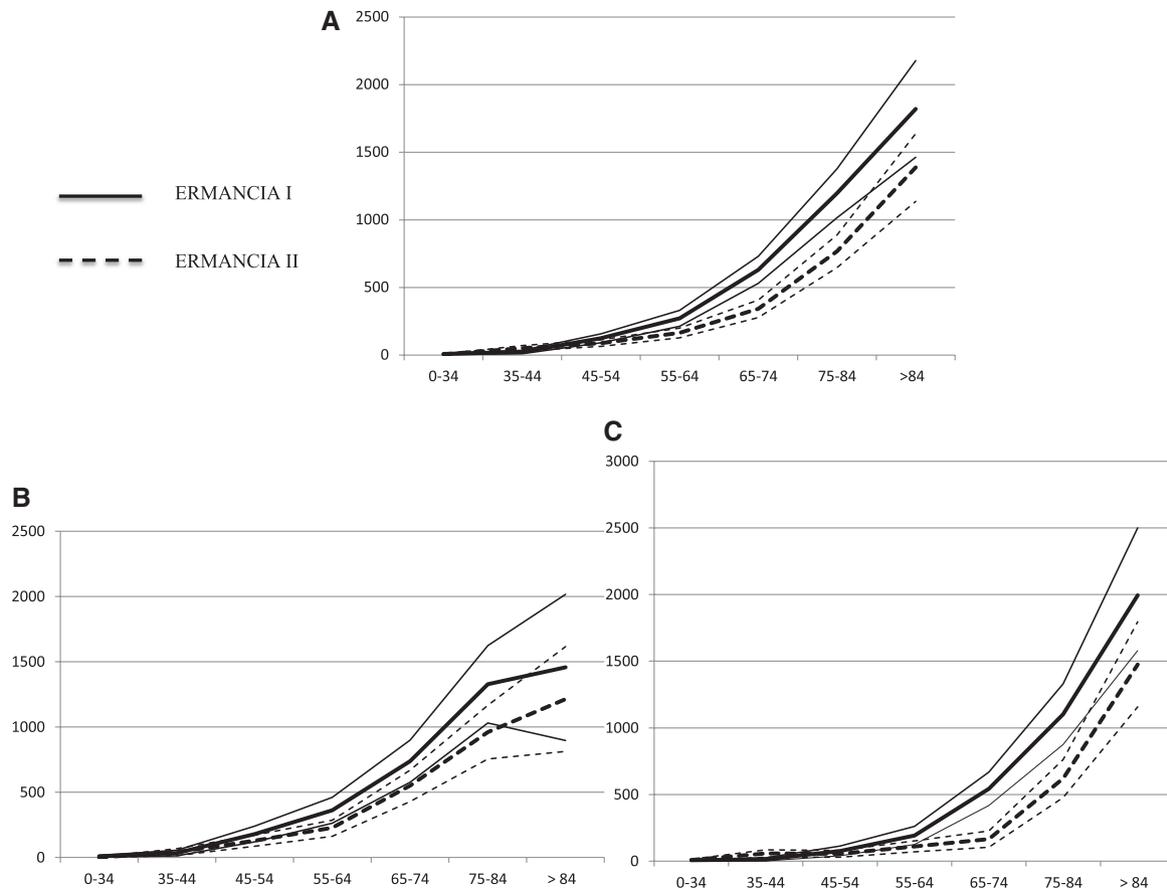
Figure. Age-specific incidence rates (per 100 000) in the overall (**A**), men (**B**), and women (**C**) population in Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux (ERMANCIA I; 1999) and ERMANCIA II (2012) for all types of stroke combined.

decrease in men than in women. Uncontrolled hypertension is related to a significantly elevated risk of stroke[30] and young men have usually a lower rate of hypertension control compared with age peer women.[31] In Martinique, Inamo et al[32] showed major sex-related differences in the control of hypertension. An unexpected high rate of adequate treatment (44.7%) was found in women, whereas men experienced low rate of blood pressure control (13.3%). Moreover, educational campaign on stroke risk and signs disclosed a higher efficiency in women than in men.[33]

Increase of risk factors such as smoking and obesity could account for the significant stroke rate elevation found in young aged 35 to 44 years in our population. This is in accordance with a recent study that notifies a stroke incidence rising in young people.[34]

In our study, only IS showed consistent reduction in rate in overall and women. We noted a decrease in lacunar infarction proportion and an increase in multiple infarction rate. Discrepancy in imaging methodology between the 2 studies may partly account for these differences. In ERMANCIA I, computed tomographic scan was used to analyze IS subtypes, whereas MRI has been extensively performed in ERMANCIA II. MRI diffusion-weighted imaging detects multiple acute small infarctions with a higher sensibility than computed tomographic scan[35] and is also able, in our experience, to declassified lacunar infarction defined by computed tomographic scan in partial or posterior cerebral infarction.

Overall 30-day case-fatality was 17.6%, which is within the lowest rates reported from high-income countries.[3] No significant difference was found between the 2 studies in overall strokes (17.6% versus 19.3%; *P*=0.64). Conflicting results are reported on case-fatality rates. Register-based studies usually noted decline,[19,20] whereas population-based studies reported an overall stable rate.[4–6] Population-based epidemiological studies capture all patients with stroke including those with rapidly deteriorating symptoms who are not involved in trials assessing stroke unit management[36] and who may not be recognized in register-based studies. In both studies, about one quarter of 30-day case-fatality patients died within 2 days and about one third was immediately admitted in acute critical care unit shunting stroke unit department. Consequently, despite acute stroke management upgrading overtime, prognosis improvement of early deteriorating patients with stroke remains a challenge.

A higher proportion of independent patients assessed at 30-day was noted overtime (47% versus 37.6%; *P*=0.002). These data may be in relation with the deep difference on stroke management between 1999 and 2012 in Martinique. Indeed, a majority of ERMANCIA II patients were managed in our comprehensive stroke unit care that incorporates acute care and rehabilitation, whereas ERMANCIA I patients were hospitalized in general ward. It is now admitted that patients who are managed in a stroke unit are more likely to regain independence than those who do not receive stroke unit care.[37]

Table 3. Annual Age-Standardized (to the World Health Organization Population) Rates (per 100 000) With 95% CI for Major Stroke Types in Martinique, 1999 and 2012

Major Stroke Types	ERMANCIA I (1999) Incidence Rates per 100 000 PY (95% CI)	ERMANCIA II (2012) Incidence Rates per 100 000 PY (95% CI)	Incidence Rate Ratio (95% CI)
Total population			
IS	86.7 (78–95)	60.1 (54–66)	0.69 (0.50–0.97)
PICH	17.3 (13–21)	12.3 (10–15)	0.71 (0.36–1.42)
SAH	5.1 (3–7)	3.6 (2–5)	0.70 (0.17–2.69)
UND	2.5 (1–4)	1.3 (0–3)	0.52 (0.06–4.10)
Men			
IS	91.2 (79–104)	69.9 (46–94)	0.77 (0.57–1.03)
PICH	22.9 (16–29)	17.3 (7–28)	0.76 (0.43–1.42)
SAH	5.6 (2–9)	0.6 (0–2)	0.11 (0.01–1.48)
UND	1.7 (0–3)	0	...
Women			
IS	84.2 (73–95)	51.6 (46–59)	0.61 (0.42–0.88)
PICH	12.4 (8–16)	7.5 (4–11)	0.60 (0.24–1.58)
SAH	4.4 (2–7)	6.1 (3–9)	1.40 (0.41–4.90)
UND	3.4 (1–6)	2.4 (0–5)	0.71 (0.15–4.23)

CI indicates confidence interval; ERMANCIA, Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux; IS, ischemic stroke; PICH, primary intracerebral hemorrhage; SAH, subarachnoid hemorrhage; and UND, undetermined stroke type.

Strengths of our study include the population-based design in a relatively stable population and in a well-delimited island area, the high level of our French healthcare system, the overlapping sources of information identifying both hospitalized and community managed cases, the early access to neuroimaging, and the stroke subtypes assessment by MRI in ERMANCIA II. However, there were some limitations to the study. Certain data were not available, particularly in stroke risk factors and in severe clinical stroke leading to death in few hours or days. The 2 studies differed on neuroimaging assessment, performed by computed tomographic scan in the first study and by MRI in the second one. MRI may have improved the detection of milder strokes in the most recent study. However, milder stroke might have been overestimated in ERMANCIA I. We kept the same stroke definition in the 2 studies and we assume that any potential error in the rates is likely to be small and that the magnitude of the trends is reliable. Stroke incidences were only assessed during 2 time-windows (1999 and 2012) and the absence of linear monitoring precludes a deep understanding of temporal trends in our population. Eventually, outcome measures could be influenced by the higher frequency of next-of-kin reports in ERMANCIA I than in ERMANCIA II.

In summary, there has been a major decrease in the age-specific and sex-specific incidence of FESs in the Afro-Caribbean population of Martinique (FWI) during the past 13 years. Despite aging of our population, the absolute number of stroke remained stable between the 2 studies. The magnitude of rate reduction was significantly higher in women than in men and a dramatic fall was found in women aged 65 to 74 years. The high prevalence of main stroke risk factors such as hypertension and diabetes mellitus remained stable overtime, whereas smoking, dyslipidemia, and AF increased. It seems that efforts to control the growing epidemic of stroke in Martinique through treatment of high blood pressure and diabetes mellitus might be effective. Preventive strategy will have to be sustained and focused on 2 major targets: limitation of new risk factors like smoking and improvement of male population adherence to prevention program.

Disclosures
None.

Table 4. Early (30-Day) Outcomes of First-Ever Strokes in Martinique, 1999 and 2012, by Sex and Stroke Types

	ERMANCIA I (1999)			ERMANCIA II (2012)			P for Trend
	All, % (95% CI)	Men, % (95% CI)	Women, % (95% CI)	All, % (95% CI)	Men, % (95% CI)	Women, % (95% CI)	
Fatal outcome mRS=6							
All stroke types	19.3 (15.5–24.1)	17.9 (12.9–24.8)	20.7 (15.3–28.0)	17.6 (13.3–23.4)	15.1 (9.2–24.6)	20.6 (14.8–28.7)	0.64
IS	11.8 (8.6–16.0)	12.1 (8.7–16.8)	9.3 (4.9–17.7)	9.1 (6.9–11.9)	7.1 (5.0–10.1)	11.4 (7.9–16.5)	0.80
PICH	32.8 (22.7–47.4)	37.3 (26.2–53.2)	22.3 (9.9–50.1)	33.1 (24.5–44.7)	27.4 (19.4–38.8)	39.0 (25.5–59.8)	0.96
SAH	27.1 (11.7–63.1)	32.0 (13.1–78.3)	17.9 (3.5–91.5)	16.5 (7.4–36.8)	42.7 (11.4–160.3)	13.8 (5.5–34.5)	0.26
UND	10.7 (2.8–41.3)	18.2 (3.9–85.3)	7.0 (0.7–72.1)	...	...	...	...
Good outcome mRS<3							
All stroke types	37.6 (30.1–47.0)	41.4 (32.9–52.1)	33.9 (22.5–51.2)	47 (38.5–57.0)	54.5 (44.3–66.9)	38.1 (27.4–53.0)	0.03

P for trend compares outcome rates in overall obtained from simple Poisson regression models adjusted for age; level of significance set at 5%. CI indicates confidence interval; ERMANCIA, Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux; IS, ischemic stroke; mRS, modified Rankin Scale; PICH, primary intracerebral hemorrhage; SAH, subarachnoid hemorrhage; and UND, undetermined stroke type.

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Trends in Incidence and Early Outcomes in a Black Afro-Caribbean Population From 1999 to 2012: Etude Réalisée en Martinique et Centrée sur l'Incidence des Accidents Vasculaires Cérébraux II Study

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Supplemental Methods:

The population of Martinique is served by 12 public hospitals, including the University Hospital of Fort-de-France and 2 other major general hospitals, 2 private hospitals, 332 general practitioners, 2 private neurologists, and 1 on-call physician systems. The only one stroke unit including 23 beds is set in the University Hospital. Three physiotherapy departments are identified and involved in stroke rehabilitation. Three Magnetic Resonance Imaging (MRI) machines are available on the island. Medical care is free of charge, allowing unrestricted access to high-quality medical services within the acute phase of stroke.

Before starting the study, an ERMANCIA II team has been constituted. All public and private neurologists were involved and others investigators were nominated in the four major hospitals with emergency department, the 2 private hospitals, the 3 physiotherapy departments and the 3 major radiology departments. Study information has been given to GPs, cardiologists, geriatrists, neurologists, physiotherapists and radiologists by phone, e-mail, post-mail and seminars. Study procedure booklets have been distributed every 3 months to all GPs and health professional involved in stroke diagnosis or management in the island. They were invited to notice every suspected stroke cases by phone, e-mail or sending directly the patient at one of the two weekly stroke consultations that took place in the Neurology department. Admission lists were checked daily in the 4 public and the 2 private emergency departments. The item "could a stroke be suspected for this patient?" has been added to the emergency electronic charts. Physician needed to tick yes or no to continue to fill the chart. All patients who have been ticked "yes" were seen. Patients identified by GPs and specialists were contacted and examined at hospital or visited at home by a dedicated registrar (K.R.). Discharge lists from the 4 major hospitals were screened, in a monthly manner, on the basis of the *International Classification of Diseases, 10th Revision* (codes I-60, 61, 63, 64, 67.0, and 67.9). Death certificates of all residents of Martinique were examined every month. To avoid missing cases from admission registers, systematic visits were made twice per week to the internal medicine departments of the 4 major hospitals and to the 3 intensive care units of the island.

Supplemental Results

Ascertainment Of ERMANCIA II Cases

Complete surveillance from all sources identified 1006 patients with a possible stroke. A total of 242 were excluded. Of these, 82 patients had transient ischemic stroke, and 160 cases were not attributable to stroke. Overall, 764 strokes (610 FES and 154 recurrent strokes) were recorded during the study period.

Of the 764 stroke events, 689 (90.2%) were ascertained by >1 independent source, and 572 (74.8%) by >2. Stroke patients were usually hospitalized and despite methodical out-of-hospital case search, only 34 patients (95.6%) were managed in the community.

Among the 730 hospitalized patients, 626 (85.8%) were admitted to the University Hospital of Fort-de-France, 95 (13%) to the 2 other major hospitals, and the remaining 9 (1.2%) to the other local public and private hospitals. A total of 446 (61.1%) patients were hospitalized in

the Stroke Unit.

Neuroimaging was obtained in 760 stroke cases (99.4%). The median delay from symptoms onset to the first neuroimaging was 1 day (range, 0 to 108 days) and 80% of all strokes had their imaging within 24 hours. Brain MRI was performed in 81%. No imaging was done in 4 stroke events (0.5%) and 6 strokes diagnosis (0.8%) were completed despite negative MRI.

Among the 610 FESs identified in ERMANCIA II, 570 were in accordance with WHO stroke definition (clinical symptoms > 24 hours) and 544 were documented in AC patients. The further analysis will focus on these 544 AC FESs.

TABLE I: Sex-Specific Characteristics of Cases in ERMANCIA I and ERMANCIA II studies

	ERMANCIA I		ERMANCIA II	
	Men N=285	**Women N=295**	**Men N=292**	**Women N=252**
Age, years ± SD	67.9±14	74.5±14	70.3±13.3	74.1±17.6
Hypertension	182 (64.8)	219 (76)	190 (66.4)	188 (75.2)
% of treatment	*68.1*	*84.5*	*84.6****	*81.9*
Diabetes Mellitus	63 (22.4)	108 (37.5)	73 (25.5)	81 (32.7)
% of treatment	*ND*	*ND*	*81.8*	*85.5*
Dyslipidemia	27 (9.6)	40 (13.9)	54 (19)	66 (26.8)
% of treatment	*ND*	*ND*	*61.7*	*75*
BMI > 24 Kg/m^2	ND	ND	122 (47.7)	120 (56.9)
Current Smokers	ND	ND	47 (17.6)	10 (4.3)
Smokers>10 packs-day	40 (14.2)	0	68 (25.5)**	20 (8.7)***
Alcohol abuse	71 (25.3)	12 (4.2)	42 (15.9)	4 (2.7)
Atrial Fibrillation	35 (12.5)	43 (14.6)	45 (16.1)*	53 (21.9)*
% of anticoagulation treatment	*ND*	*ND*	*33.4*	*41.2*
Coronary disease	13 (4.6)	20 (6.9)	8 (2.9)	15 (6.4)
Peripheral Arterial Disease	27 (9.6)	49 (17)	13 (4.3)	15 (6.7)**
Premorbid anti platelet use	ND	ND	45 (16.4)	56 (23)
Premorbid mRS				
mRs = 1-2	ND	ND	21 (7.3)	26 (10.8)
mRs = 3-4-5	ND	ND	15 (5.2)	21 (8.7)
NIHSS at Admission	ND	ND	7.4±8.4	9.5±9.3
Stroke Type				
Ischemic Stroke	220 (77.2)	243 (82.4)	232 (79.5)	207 (82.1)
Primary Intracerebral Hemorrhage	50 (17.5)	33 (11.2)	58 (19.9)	26 (10.3)
Subarachnoid Hemorrhage	10 (3.5)	10 (3.4)	2 (0.6)*	15 (6)
Undetermined	5 (1.8)	9 (3.1)	0	4 (1.6)
Ischemic OCSP Classification				
Total anterior circulation infarction	23 (10.5)	44 (18.1)	23 (9.9)	40 (19.3)
Partial anterior circulation infarction	100 (45.5)	107 (44)	105 (45.3)	112 (54.1)
Lacunar cerebral infarction	55 (25)	52 (21.4)	38 (16.4)*	13 (6.3)***
Posterior cerebral infarction	34 (15.5)	28 (11.5)	47 (20.3)	25 (12.1)
Multiple infarction	4 (1.8)	5 (2.1)	15 (6.5)*	11 (5.3)
Not Classifiable	4 (1.8)	6 (2.5)	4 (1.7)	6 (2.9)

ND: Not Determined; OCSP: Oxford Community Stroke Project
Sex-specific comparisons were performed between the two study periods. *p<0.05; **p<0.01; ***p<0.001