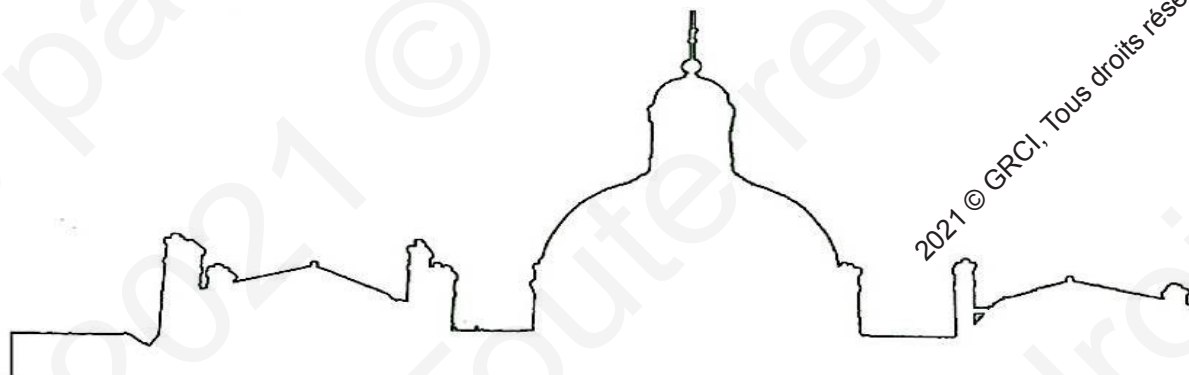


Life-Threatening and Major Cardiac Events during long-distance Races

Updates from the prospective RACE PARIS registry

Paul Guedeney
Pitié Salpêtrière



DÉCLARATION DE LIENS D'INTÉRÊT AVEC LA PRÉSENTATION

Nom de l'orateur : Paul GUEDENEY, Paris

☒ Je n'ai pas de lien d'intérêt potentiel à déclarer relatif à cette présentation

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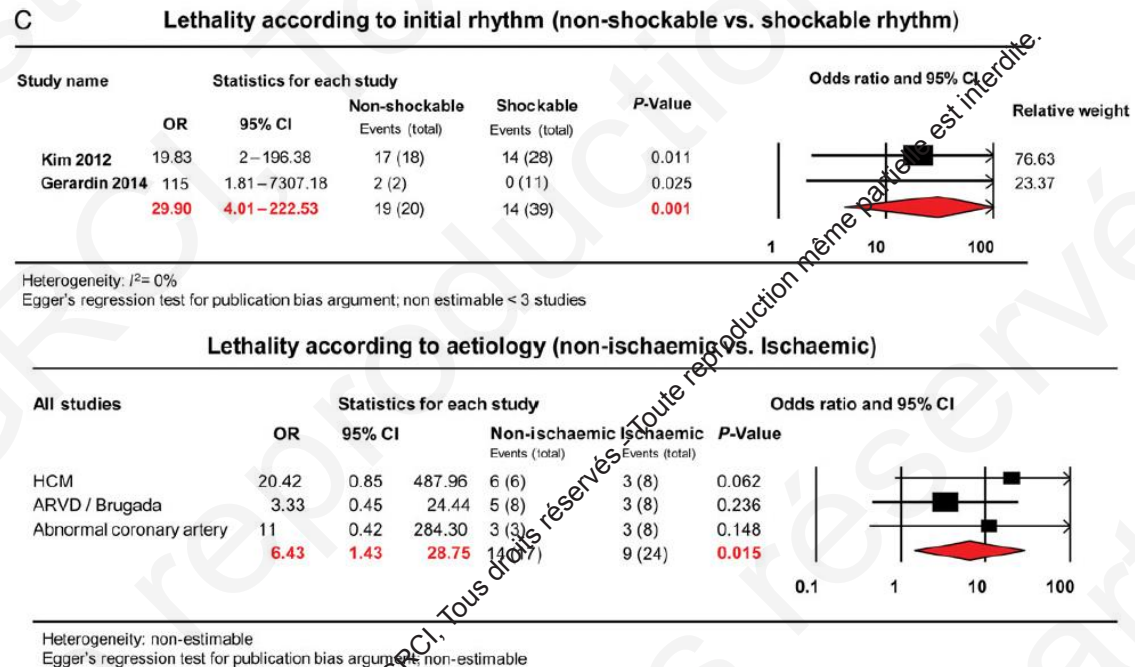
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Background

- **Registre des Accidents Cardiaques lors des courses d'Endurance**
 - Half of millions runners included

Life-threatening/fatal events during Long distance race

- Are rare (3.3/100.000)
- Most often unpredictable
- Mainly due to AMI



Study Objectives

- In this updated analysis, we aimed at providing an update on
 - **Incidence**
 - **Etiology**
 - **Prognosis**

Of major cardiac/fatal events during long distance races

Methods: Study design

- Investigator-initiated study supported by the GRCI
- Including 5 types of annual long-distance races
 - Paris Marathon
 - Paris half marathon
 - Boulogne half marathon
 - Paris 20 km
 - Paris-Versailles (16.2 km)

Methods: Study design

- Race starters' characteristics and race finishers' performances were recorded
- Outside conditions were collected
 - Ambient temperature
 - Hygrometry
 - Cloud cover
- Pollution index
 - ATMO index



INDICE	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	O ₃ (µg/m ³)	PM (µg/m ³)
	Max	Max	Max	Moy jour
10	≥500	≥400	≥240	≥80
9	400-499	275-399	210-239	65-79
8	300-399	200-274	180-209	50-64
7	250-299	165-199	150-179	42-49
6	200-249	135-164	130-149	35-41
5	160-199	110-134	105-129	28-34
4	120-159	85-109	80-104	21-27
3	80-119	55-84	55-79	14-20
2	40-79	30-54	30-54	7-13
1	≤39	≤29	≤29	≤6

Methods: case selection

- Any adverse events occurring **30min before, during and within 2h** after the end of the race were screened for inclusion.
 - *All interventions performed by healthcare organization were centralized by the SAMU*
- **Primary endpoint:**
 - Any death or life-threatening events defined as events requiring urgent on-site medical intervention with hospital admission for at least 24h.
 - Life-threatening events were further categorized as requiring immediate on-site cardiopulmonary resuscitation (CPR) or not.
- The etiology of all major cardiac events was collegially adjudicated
 - After thorough review of all medical records, pre-event electrocardiogram or stress testing, coronary angiography and interview with survivors.

Statistics

- Incidence rates for the total number of cases :
 - Proportion of events divided by the number of participants for stated time intervals.
- Meta-analysis of all registries reporting life-threatening/fatal event during long-distance races
 - To assess estimates of incidence of sudden cardiac arrest and death
 - To determine risk factors for mortality following LDr-related SCA

Octobre 2006 à Septembre 2016

**1,073,722 preselected runners
in 46 consecutive Parisian long-distance races**

Marathons: 353,020 runners
Other LDR: 720,702 runners
Female : 22% of runners
High pollution index: two races (PM10)

Excluded
No medical interventions
Medical interventions without hospital admission
Non-cardiac causes and/or hospitalization <24hours

- Vagal faints with rapid recovery (n=16)
- Moderate hyperthermia (n=2)
- Rhabdomyolysis with acute renal failure (n=2)
- Chest pain and negative medical check-up (n=8)

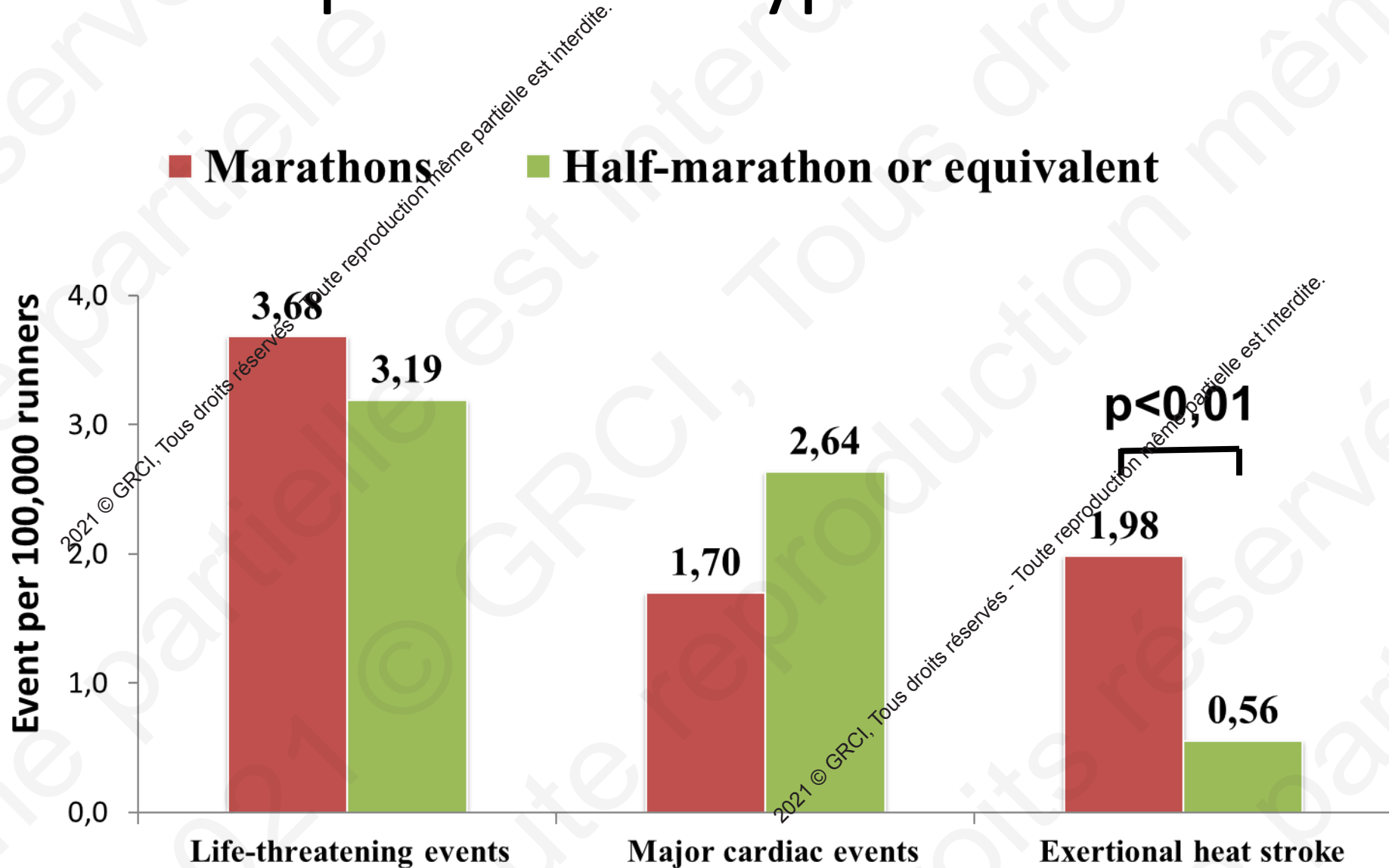
Life-threatening events (n=36)

Non-cardiovascular events
Exertional heat stroke (n=11)

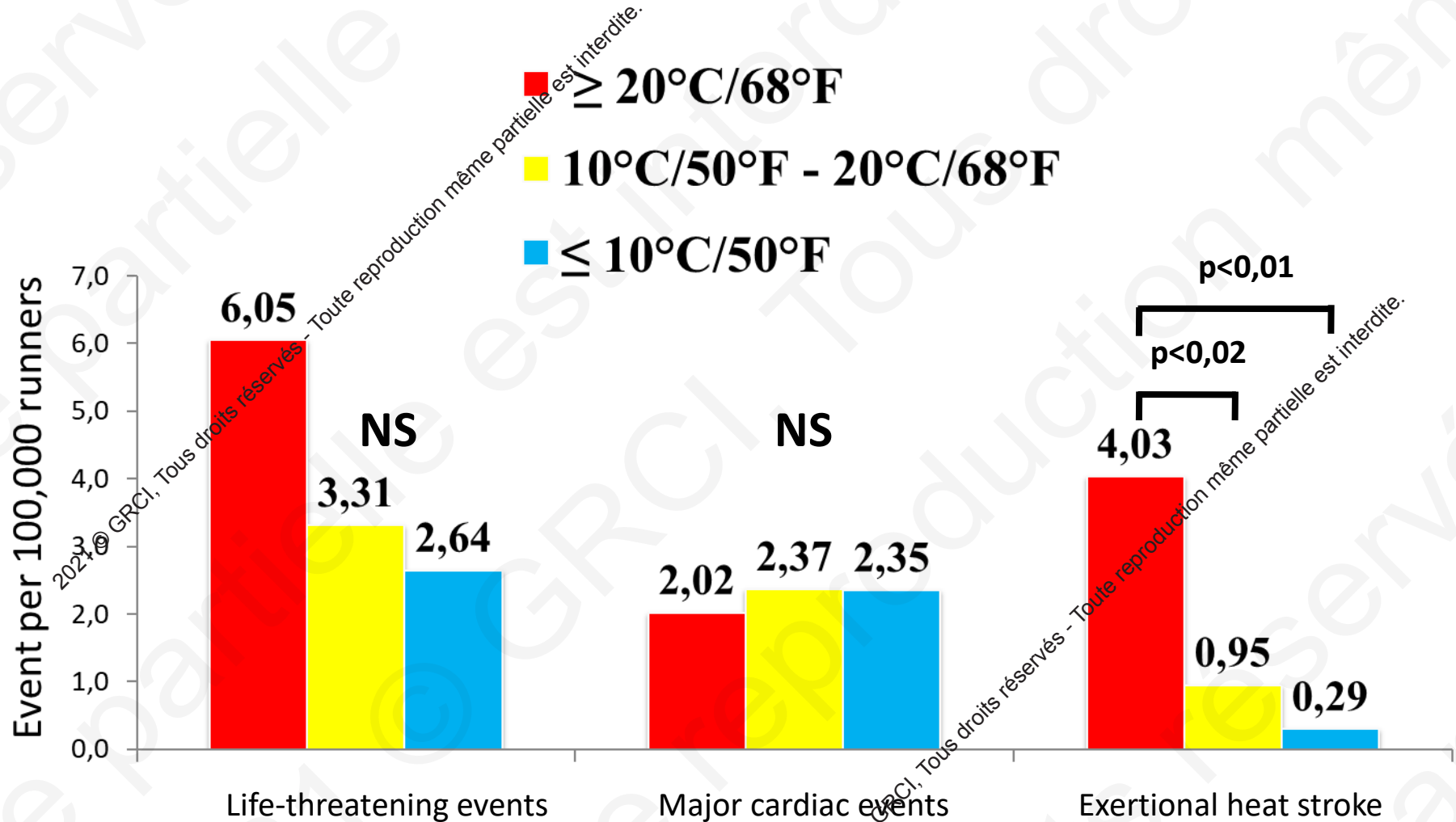
Major cardiovascular events (n=25)

Sudden cardiac arrest (n=18)

Impact of the type of race



Impact of temperature

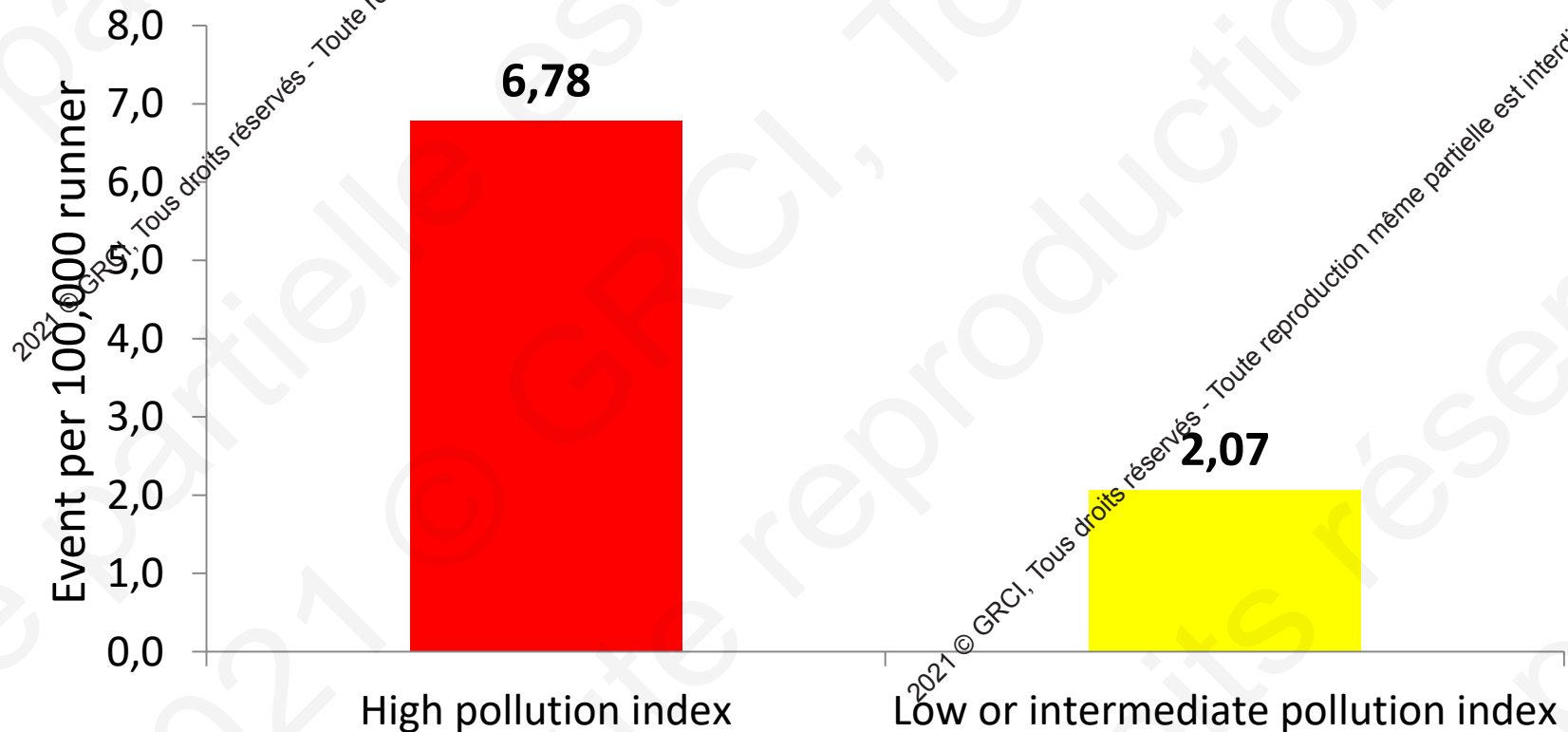




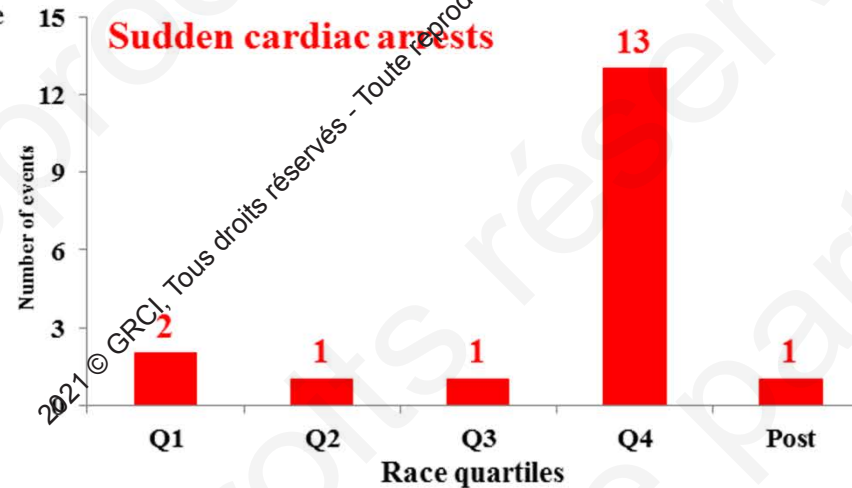
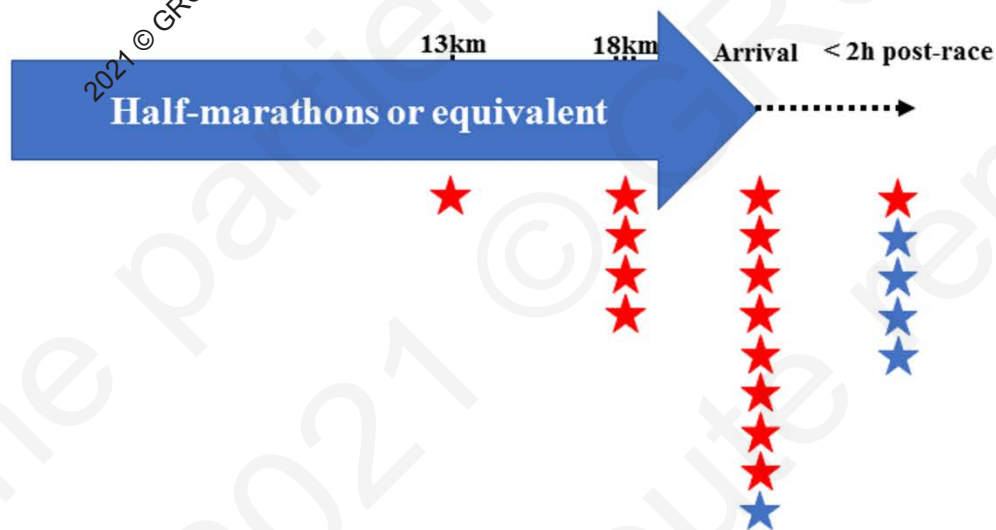
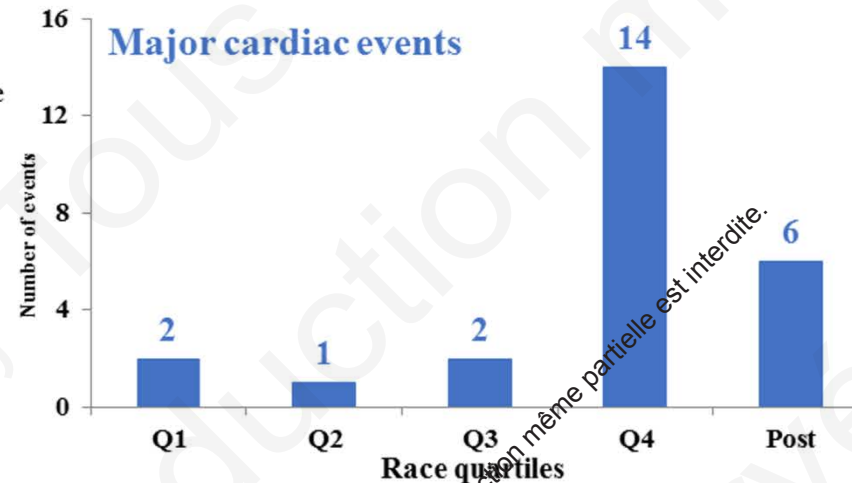
Impact of pollution

Major cardiac events

OR 3.27 95%CI 1.12-9.54 p=0.046



Timing of adverse events



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Major cardiovascular events (n=25)

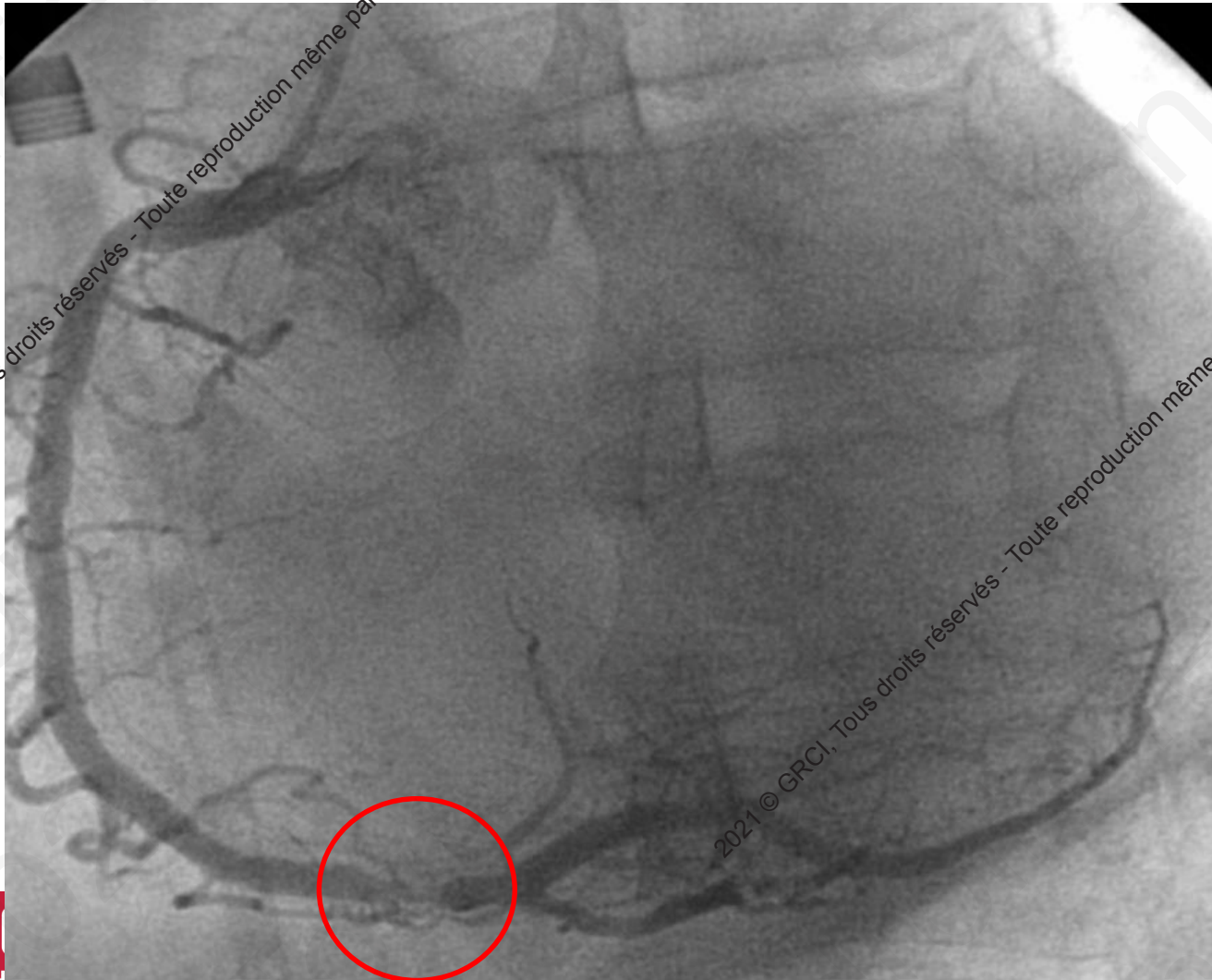
Sudden cardiac arrest (n=18)

Variables of interest	Number of patients
Male sex	24/25 (96%)
Age, years	41.7 ± 10.0
Any known cardiovascular risk factors	14/25 (56%)
Active smoking	4/25 (16%)
Dyslipidemia	4/25 (16%)
Systemic hypertension	1/25 (4%)
Family history of cardiovascular disease	8/25 (32%)
≥2 cardiovascular risk factors	3/25 (12%)
Prior long-distance races	
None	2/25 (8%)
1-5	15/25 (60%)
6-10	3/25 (12%)
>10	5/25 (20%)
Training prior to the index race	
1-3 hours per week	14/25 (56%)
3-5 hours per week	5/25 (20%)
>5 hours per week	6/25 (24%)
Pre-race cardiac testing	
Electrocardiogram	14/25 (56%)
Cardiac stress testing	8/25 (32%)
Atypical symptoms (dyspnea/chest pain)	5/25 (20%)

Variables of interest	Number of patients
Type of life-threatening events	
Cardiac arrest with ventricular fibrillation	11/25 (44%)
Cardiac arrest with asystole	3/25 (12%)
Cardiac arrest with sinus rhythm at first medical contact	3/25 (12%)
Cardiac arrest with complete atrioventricular block	1/25 (4%)
Ventricular tachycardia	1/25 (4%)
Chest pain	5/25 (20%)
Shock	1/25 (4%)
Etiology	
Myocardial ischemia	16/25 (64%)
-Acute coronary syndrome	11/25 (44%)
-Chronic coronary syndrome	2/25 (8%)
-Anomalous connection of coronary artery	1/25 (4%)
-Spontaneous coronary artery dissection	1/25 (4%)
-Myocardial bridging	1/25 (4%)
Brugada syndrome	2/25 (8%)
Arrhythmogenic right ventricular cardiomyopathy	2/25 (8%)
Early repolarization syndrome	1/25 (4%)
Vagal complete atrioventricular block	1/25 (4%)
Exertional heat stroke complicated by shock	1/25 (4%)
Unknown despite extensive investigation	2/25 (8%)
Discharged alive	23/25 (92%)

Exemple of sudden cardiac arrest

Acute thrombosis of the distal right coronary artery



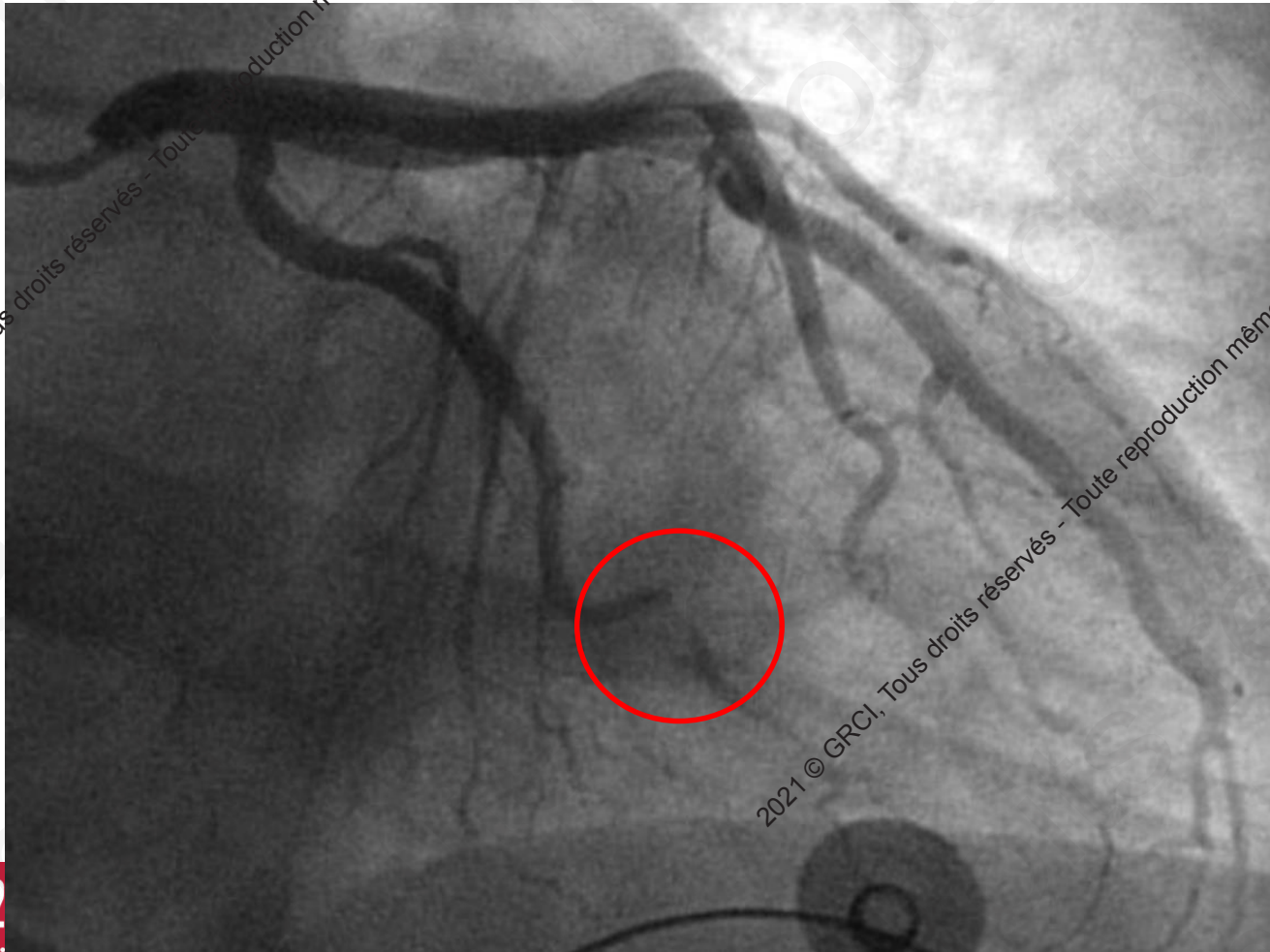
Exemple of sudden cardiac arrest

LAD coronary artery chronic total occlusion



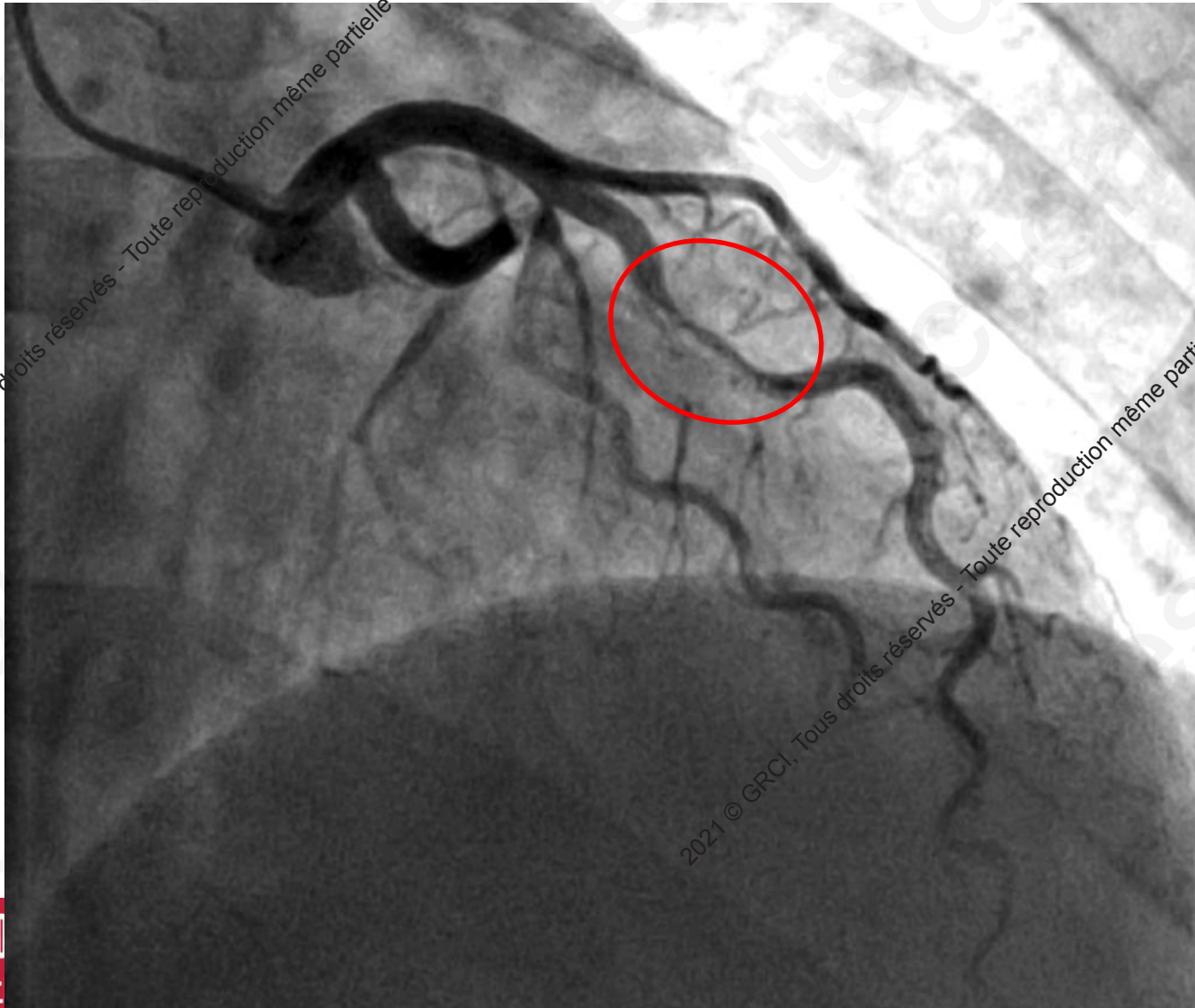
Exemple of sudden cardiac arrest

Spontaneous coronary artery dissection of marginal coronary artery



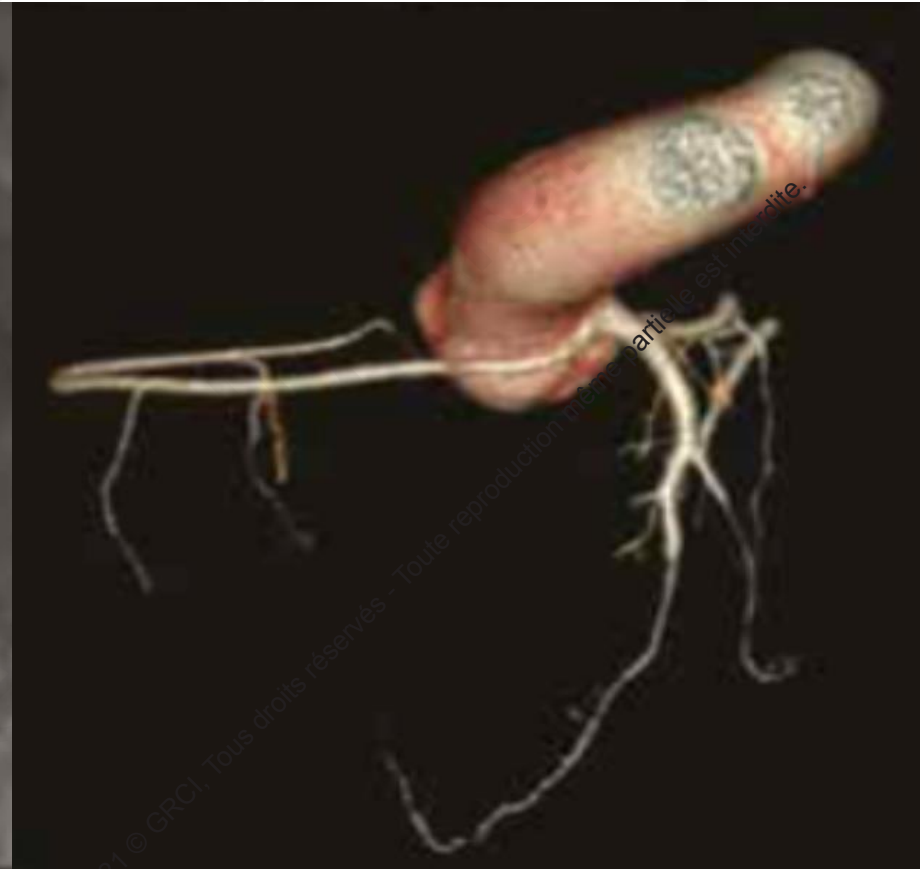
Exemple of sudden cardiac arrest

LAD coronary artery bridging



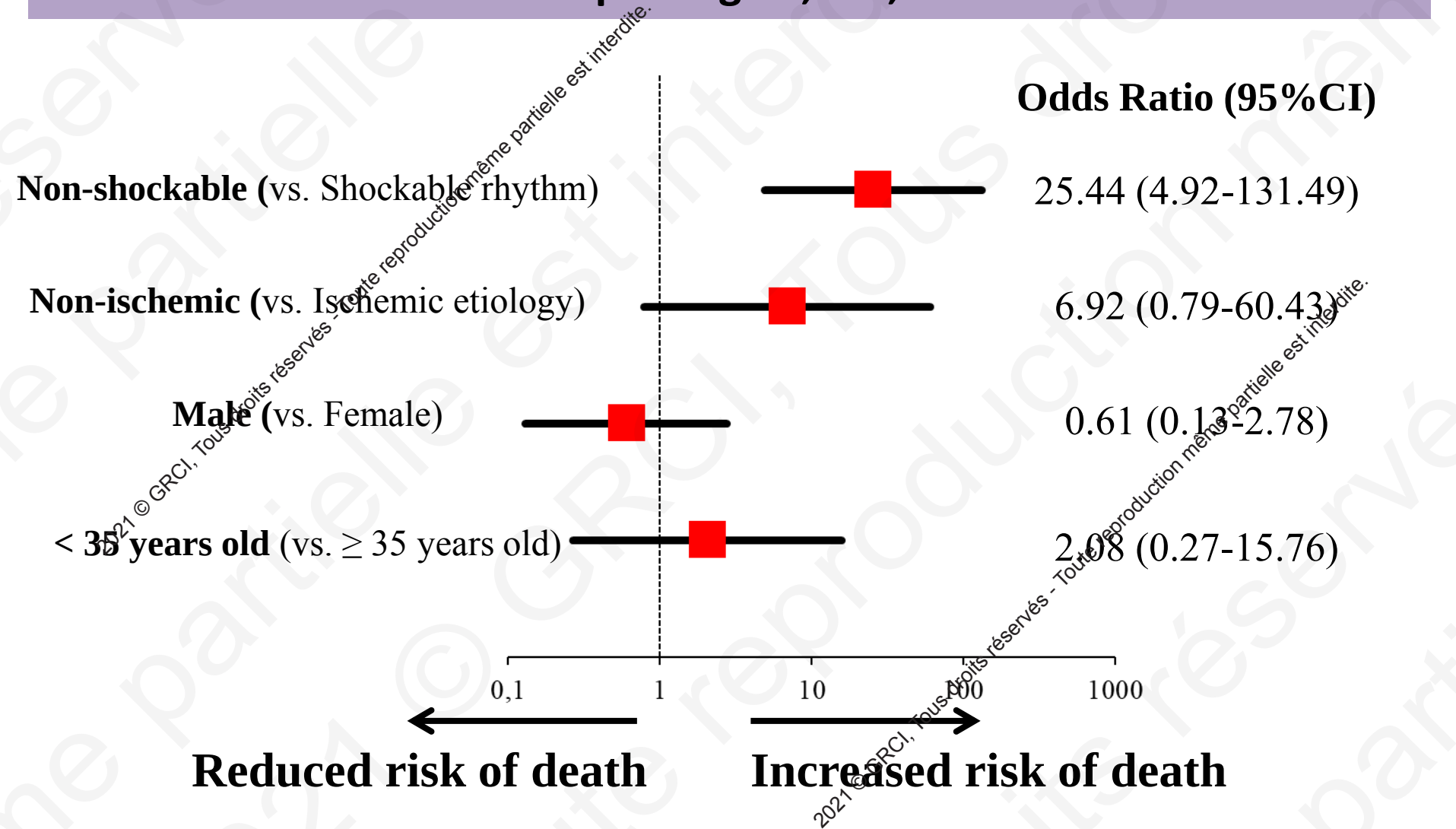
Exemple of sudden cardiac arrest

Anomalous origin of the right coronary artery



Risk factors of mortality after sudden cardiac arrest during LDR

8 studies comprising 16,223,866 runners





46 Long-distance Parisian races 2006-2016
1,073,722 runners



Life-threatening events
3.35 per 100,000

Exertional heat stroke
1.02 per 100,000



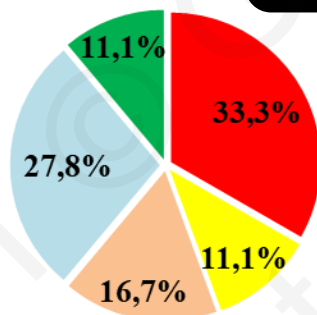
Pre-race symptoms in a 1/3 of patients with myocardial ischemia

Major cardiac events
2.33 per 100,000

Increased by air pollution
OR 3.27 95%CI 1,12-9,54



Sudden Cardiac Arrest
1.67 per 100,000



- Acute thrombosis
- Chronic ischemia
- Other coronary abnormalities
- Arrhythmogenic cardiomyopathy
- Unknown origin