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RECUPERATION DES TAUX D'HÉMOGLOBINE APRÈS DON DE SANG TOTAL EN FRANCE

RECOVERY OF HEMOGLOBIN LEVELS AFTER WHOLE-BLOOD DONATION IN FRANCE

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I have no relevant financial relationships to disclose for this presentation

INTRODUCTION (1)

Background 1

↪ Whole blood (WB) donation

- Decrease of hemoglobin (Hb) levels and loss of about 230 mg of iron
 - Prevention of anemia: turning away donor candidates with low Hb levels, i.e. <12 g/dL for women and 13 g/dL for men (based on Hb levels at previous donation, or capillary or venous sampling)

↪ Achieving France blood components self-sufficiency

- Mandatory for French Blood Establishment (EFS)

INTRODUCTION (1)

Background 2. Factors associated with Hb recovery after WB donation

- **Mean time of Hb recovery** (Kiss et al. 2015)
 - ◆ Mean time of 80% recovery of pre-donation Hb level = 168 days = 24 weeks
 - ◆ Two third of donors did not recover iron stores after the WB donation by 168 days
- **Physiological time** for WB donors to recover from changes **in iron metabolism** = 180 days as evaluated in 46 male WB donors (Schotten et al. 2016)
- **Factors associated with risk of iron deficit**
 - Sex, Menopausal status, time since last donation (Rigas et al. 2014)
 - Number of donations in 3-year period : discrepancy between results (Rigas et al. 2014 ; Daouar et al. 2015)
 - Hb level at the previous WB donation (Custer et al. 2014)

INTRODUCTION (3)

Aims

- ➔ To describe characteristics of WB donors and current deferral rates in 2015
 - In French West Indies (Martinique and Guadeloupe)
 - Most of donors and recipients of blood components are of african-caribbean origin
 - Specific characteristics : high frequency of hemoglobinopathies, distribution of blood group antigens very different from that of caucasian population
 - In continental France
 - Most of donors and recipients of blood components are of caucasian origin
- ➔ To identify factors associated with Hb recovery between two consecutive WB donations

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HAEMOGLOBIN, ANEMIA AND RETURN TO BLOOD DONATION IN PROSPECTIVE WHOLE-BLOOD DONORS IN THE FRENCH WEST INDIES IN 2015

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MATÉRIEL ET MÉTHODES (1)

↪ Candidates to WB donation in French West Indies in 2015

- ◆ Exclusion : candidates deferred for another reason than anemia and first donation

↪ Available informations

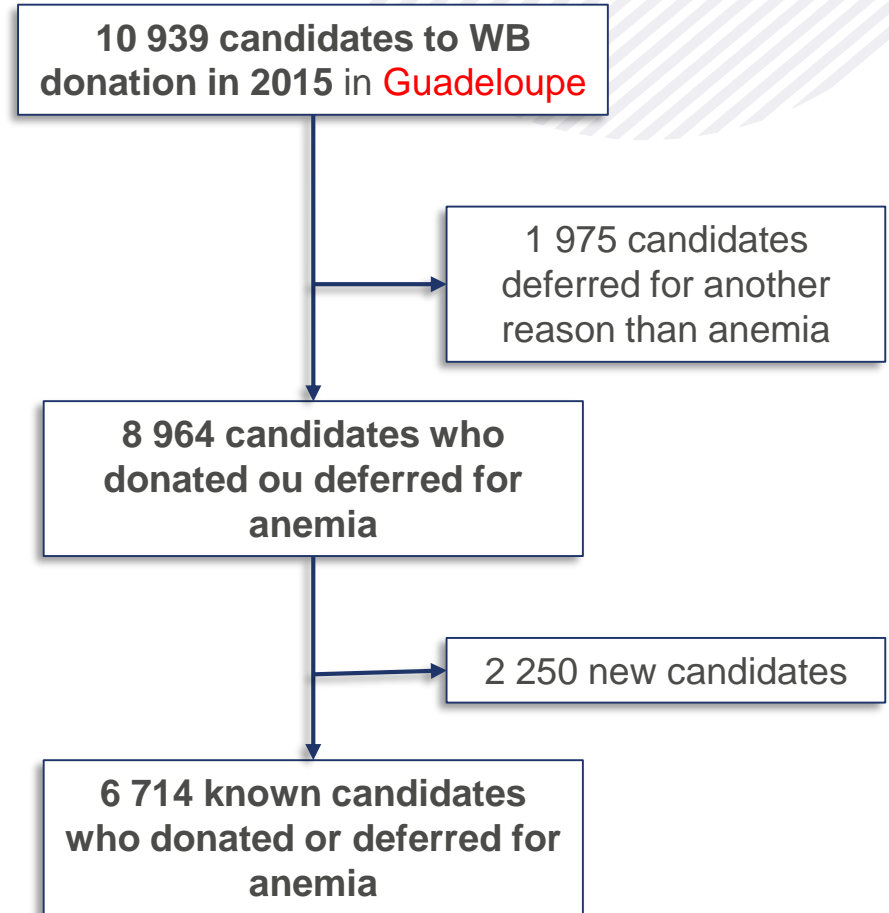
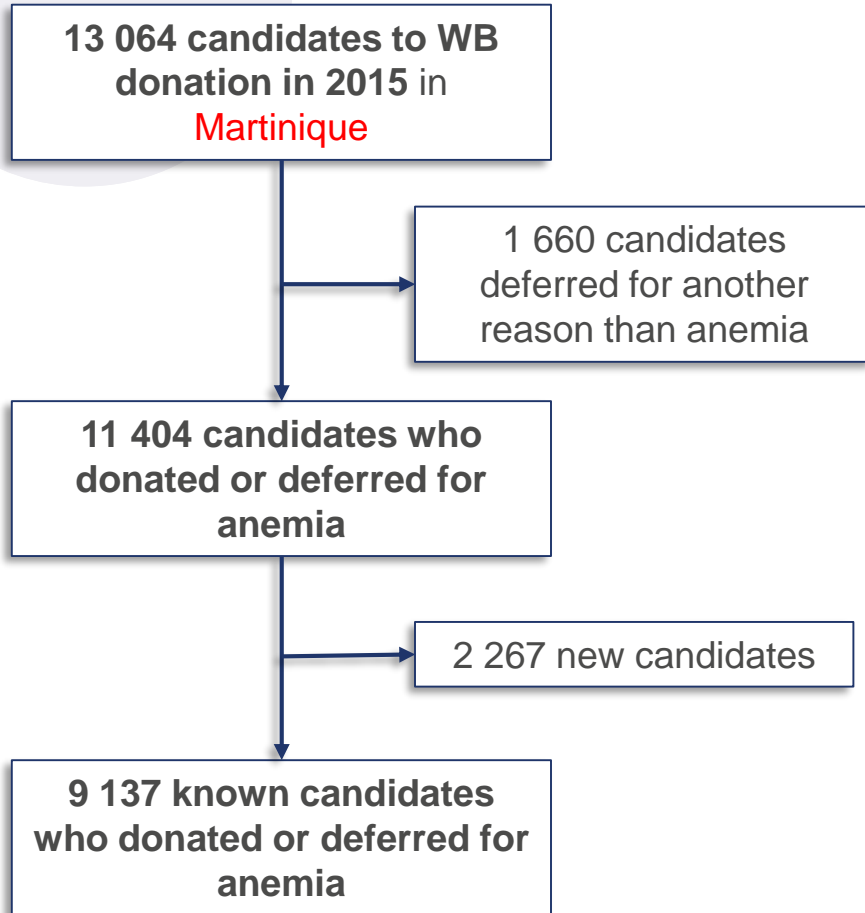
- ◆ sex, date of donation and date of previous donation, outcome of applications (WB donation or deferral for anemia), regional ETS, Hb level at donation and at the previous donation (measured on venous sample as part of blood donor testing), number of previous donations,

↪ Statistical analysis

- ◆ Frequencies Comparison : Chi² test
- ◆ Means comparison : Student' test
- ◆ Medians comparison : Wilcoxon' test
- ◆ The outcome measure was the difference in Hb level between the 2015 donation and previous donation and as named « recovery between donations ». Variables studied to characterize Hb recovery included : time since previous donation, Hb levels at previous donation, number of previous donations - Linear regression model stratified for sex and regional ETS

MATERIAL AND METHODS (2)

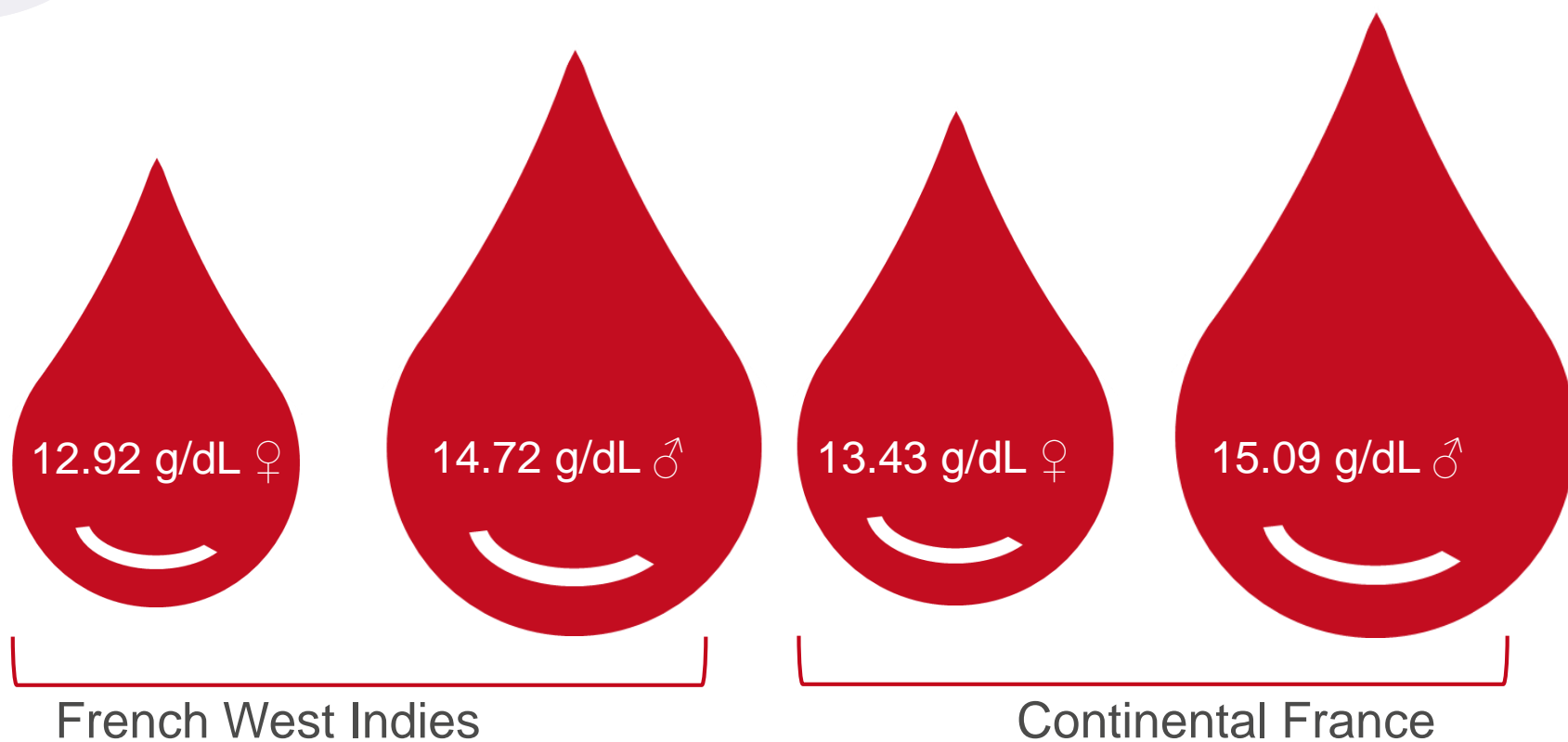
Flowchart



RÉSULTATS (1)

Hemoglobin levels

➔ Mean in French West Indies : 12.92 g/dL ♀ et 14.72 g/dL ♂



RESULTS (2)

Deferral

↪ Global deferral

- 28.1% in Guadeloupe and 20,.8% in Martinique
- Whose more than 1/3 for anemia

↪ Deferral due to anemia

- Much higher in ♀ (15.93%) than in ♂ (3.43%) ($p < 0.0001$)

24%

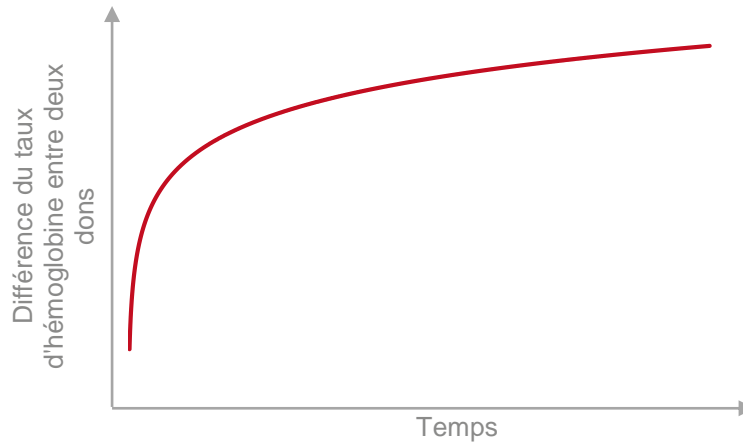
Deferral in
French West indies

RÉSULTATS (5)

Hb levels recovery between two WB donations

↪ Factors associated with Hb level recovery

- ◆ **Time logarithm** (except for men in martinique) : Longer logarithm of time since previous donation was associated with faster recovery



- ◆ **Hb level at previous donation** : higher hb levels were associated with lower levels of recovery between 2 donations
- ◆ **Higher number of previous blood donations in entire life only for women** : the higher the number of previous donations, the higher the Hb recovery

AABB - SAN DIEGO 2017



FACTORS ASSOCIATED WITH THE RECOVERY OF HEMOGLOBIN LEVELS AFTER WHOLE-BLOOD DONATION – HEMOGLOBIN AND RETURN TO BLOOD DONATION OF DONOR CANDIDATES IN CONTINENTAL FRANCE IN 2015

Fillet AM¹, Malard L¹, Folléa G², Djoudi R³, Jacquot C⁴, Charpentier F⁴, Bonneaudeau B⁵, Tiberghien P^{3&6}, Gross S¹

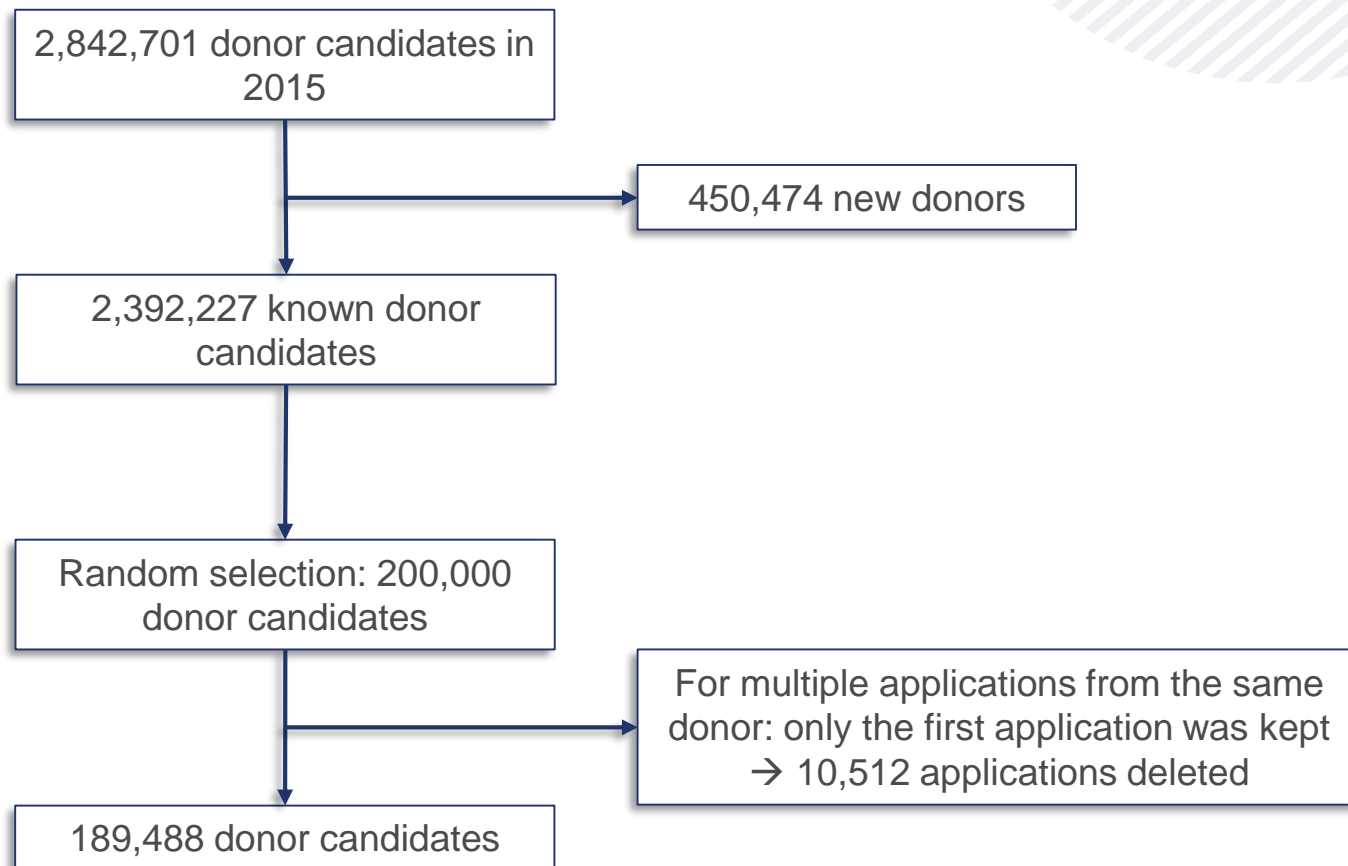
¹EFS, Medical Department, ²Medicine Research and Innovation, General Direction, ³ETS Ile-De-France, ⁴EFS, Collection and production Department, ⁵Research and Technology Transfer Department, ⁶Medicine University, France

MATERIEL ET METHODS (1)

- Random selection of 200,000 donor candidates who presented to donate WB in Continental France in 2015
 - ◆ Selection criteria: at least one donation in the past, collected volume >300 mL at previous donation
 - ◆ Within the random sample, if a donor had applied several times, only the first application was kept
- Variable of interest: Hb recovery assessed on index donation (2015) and defined as Hb reaching the level measured at previous donation
 - ◆ Hb has been measured on venous sample as part of blood donor testing
 - for deferred donor selected on Hb level determined on capillary sample (if previous Hb level was just over the threshold or if previous donation was done more than 2 years ago)
 - for donor who have donated
- Statistical analyses
 - ◆ Logistic regression model stratified by sex:
 - Hb recovery according to age, Body Mass Index (BMI), geographic area, Hb levels at previous donation, time since previous donation, collected volume at previous donation and number of previous donations (lifetime and in the 5 previous years)

MATERIEL ET METHODS(2)

Flowchart

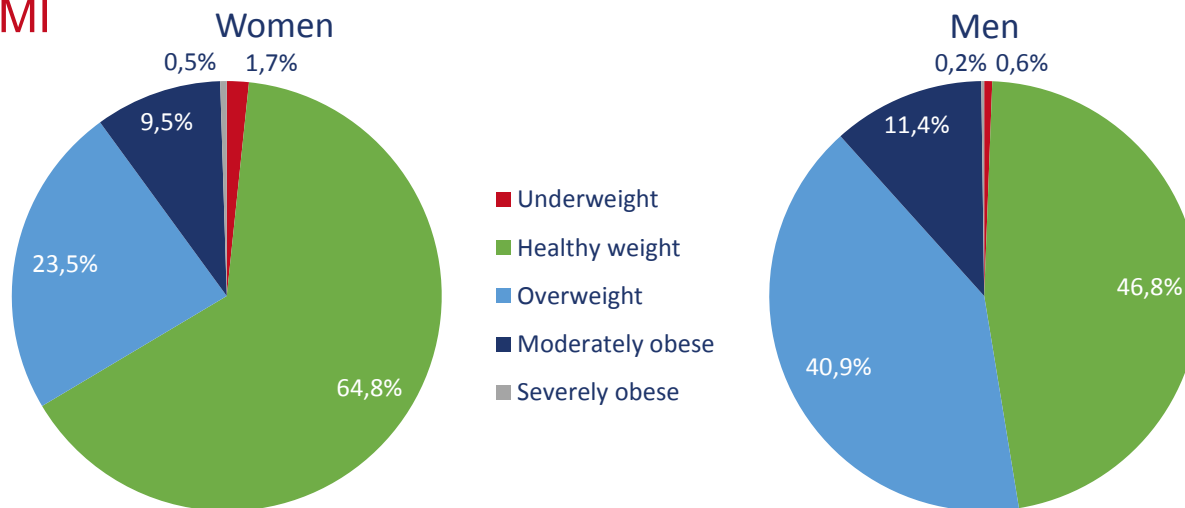


RESULTS (1)

Characteristics of donor candidates who already had donated in their life

- ↪ 48.4% of donor candidates were female
- ↪ Mean age : 41.1 and 45.1 years for women and men respectively

↪ BMI

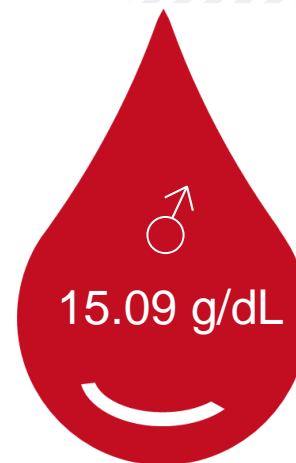
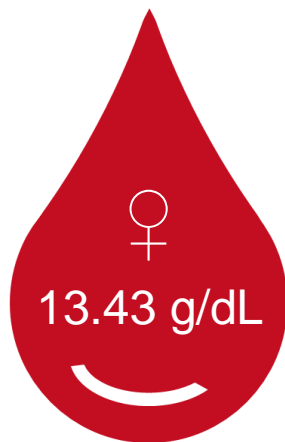


- ↪ Mean number of donations in the 5 previous years : 4.1 for women and 6.0 for men

RESULTS (2)

Hb levels and deferral rate

➔ Mean Hb levels in 2015 among known donor candidates



Mean Hb levels
at previous donation

13.48 g/dL

15.14 g/dL

➔ Deferral :

- ◆ Significantly more frequent in women (11.2%) than men (7.2%) ($p < 0.0001$)
- ◆ Due to anemia (Hb was determined on capillary sample, if previous Hb level was just over the threshold or if previous donation was done more than 2 years ago) significantly more frequent in women than in men ($p < 0.0001$)
 - 25.7% of deferred women i.e. 2.9% of female donor candidates
 - 8.6% of deferred men i.e. 0.8% of male donor candidates

RESULTS (3)

Time since previous donation and recovery of Hb levels at donor's return in 2015

↪ Median time since previous donation

- 30.0 weeks among women (mean: 59.5 weeks)
- 21.1 weeks among men (mean: 44.6 weeks)

↪ Recovery of Hb levels

- 48.5% among women
- 49.8% among men

49.2%

Of donor candidates
had recovered
Hb levels

RESULTS (4)

Factors associated with Hb recovery between 2 consecutive WB donations

TABLE 1. LOGISTIC REGRESSION MODEL: ASSOCIATION OF HB RECOVERY WITH TIME, AGE, COLLECTED VOLUME AND HB LEVELS AT PREVIOUS DONATION, NUMBER OF PREVIOUS DONATIONS IN THE 5 PREVIOUS YEARS AND LIFETIME

	WOMEN (N=74 977)			MEN (N=83 696)		
	OR	95% CI	p	OR	95% CI	p
Time since previous donation (months)	0.96	[0.95 ; 0.96]	***	0.96	[0.96 ; 0.97]	***
▶ Logarithm of time since previous donation	2.66	[2.53 ; 2.79]	***	1.69	[1.61 ; 1.77]	***
Donor age (decade)	1.04	[1.03 ; 1.06]	***	0.96	[0.95 ; 0.97]	***
Volume withdrawn at previous donation (dL)	1.00	[1.00 ; 1.00]	ns	1.00	[1.00 ; 1.00]	ns
▶ Hb level at previous donation	0.46	[0.45 ; 0.47]	***	0.52	[0.51 ; 0.53]	***
▶ Tens of previous donation in the 5 previous years	1.42	[1.31 ; 1.53]	***	1.01	[0.96 ; 1.07]	ns
Tens of previous donation in lifetime	1.05	[1.03 ; 1.07]	***	1.00	[0.99 ; 1.01]	ns
BMI			***			***
Underweight	0.86	[0.76 ; 0.98]	*	0.77	[0.64 ; 0.93]	**
Overweight	1.08	[1.04 ; 1.13]	***	1.15	[1.12 ; 1.19]	***
Moderately obese	1.13	[1.07 ; 1.19]	***	1.19	[1.14 ; 1.25]	***
Severely obese	1.11	[0.88 ; 1.41]	ns	1.01	[0.74 ; 1.37]	ns
Healthy weight	-	-	-	-	-	-

Ns: non-significant; *p < 0.05; **p < 0.01; ***p < 0.001

OR : odds ratio adjusted for the geographical area ; CI: confidence interval

DISCUSSION (1)

↪ Significant differences between men and women

- Hb levels → consistent with literature (Anaes, 1998)
- Rate of deferral due to anemia → consistent with literature (Mast *et al.* 2014)
- Median time since previous donation → consistent with literature (Cable *et al.*, 2012)

↪ 3 main factors associated with higher likelihood of Hb recovery

- Longer logarithm of time since previous donation
- Lower level of Hb at previous donation → consistent with literature (Custer *et al.* 2014)
- Higher number of blood donations in the 5 previous years (only for women) → literature is mixed and hardly comparable with our findings
 - In a Brazilian study, deferral was higher in individuals who did not donate in the previous 13 months (Dauar *et al.*, 2015)
 - Women who donated 6 times in the previous year had less than one-half the odds of low Hb deferral vs women who donated only once (Mast *et al.*, 2010) ↔ Selection bias among high-frequency donors?
 - In our study, the number of donations was registered for the 5 previous years, not just one year, thus donors donating 6 times per year might be different from donors donating often in the 5 previous years.

DISCUSSION (2)

Weaknesses of the study

- ↪ Unavailability of data on WB donors deferred for another cause than anemia
- ↪ Unavailability of data : about physiological status (hormonal status), dietary habits and other possible variables involved in Hb recovery

CONCLUSION AND PERSPECTIVES

- ➔ Three main factors associated with higher likelihood of Hb recovery after WB donation :
 - Probably linked with
 - Hematopoiesis stimulation
 - Selection bias among high-frequency donors
 - Identical factors although different populations studied

- ➔ Only 49.2% of donor candidates in continental France had recovered Hb levels of previous donation, in order to prevent iron deficiency further studies are needed in France
 - To assess iron stores in donors
 - To assess inter-donation intervals