Emerging Issues in Living Kidney Donation
(Problèmes émergents chez les donneurs de rein vivants)

Naim Issa, MD, FASN
Division of Nephrology and Hypertension
Mayo Clinic, Rochester, Minnesota, USA

Nouméa, Nouvelle Calédonie
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Pre-Test Question 1

What is a primary predictor for post-donation End Stage Renal Disease **(ESRD)**?

Quel est le facteur prédictif principal de IRCT après le don?

A. Age
B. Relative with ESRD (Histoire famillale de IRCT)
C. Pre-donation hypertension in selected donors
D. All of the above

Pre-Test Question 2

What is a non-ESRD risk for donors?

Quel est le risque non-rénal pour les donneurs vivants?

A. Increased acute kidney injury (IRA) risk during hospitalizations
B. Pre-eclampsia
C. Cardiovascular diseases
D. All of the above

Outline/Learning Objectives

- Review the latest evidence on long-term safety of living kidney donation

1. Survival

2. ESRD risk

3. Non-ESRD medical risk:

- Cardiovascular risk
- Obese donors outcomes
- Pregnancy risk
- Other emerging medical issues

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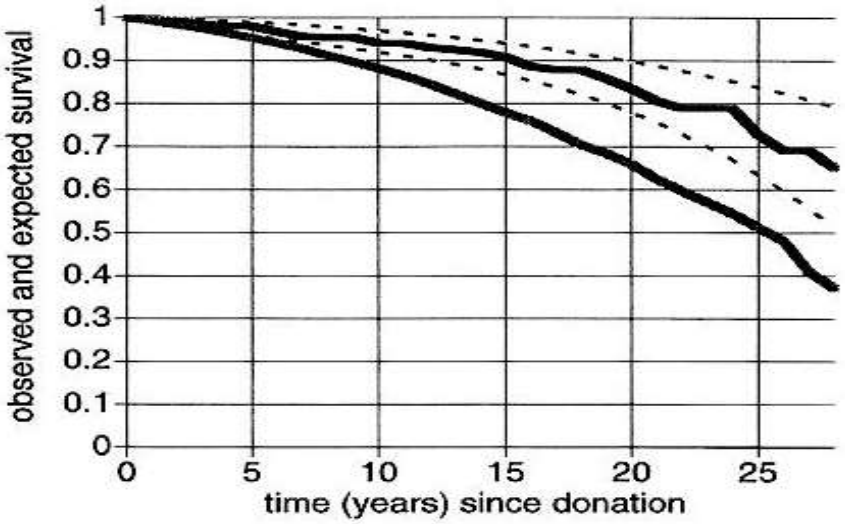
Living Donors Compared to the General Population

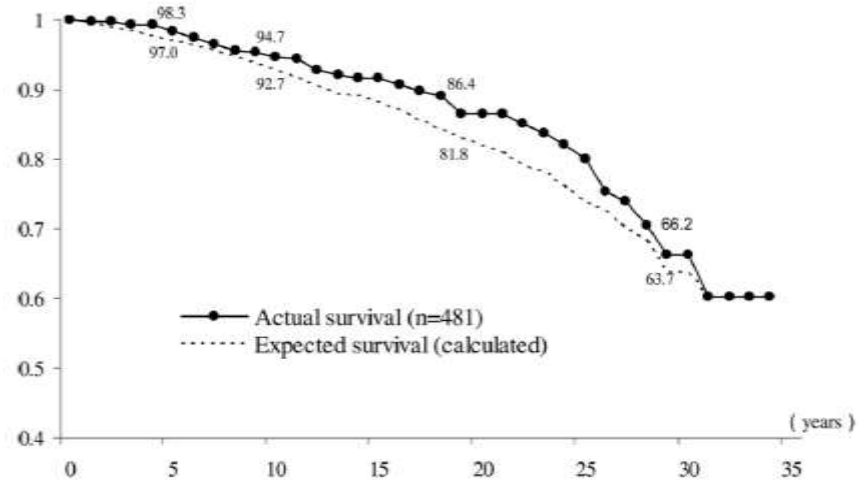
Country	Setting	n	f/u (yrs)
❑ **Sweden[1]**	Single center	430	1-35
❑ **Minnesota, USA[2]**	Single center	3,698	1-45
❑ **Japan[3]**	Single center	481	1-35
❑ **Norway[4]**	Single (national center)	2,269	1-48
❑ **France[5]**	Single center	310	1-53

1) Sweden – Fehman-Ekholm et al, Transplantation 64:976-8, 1997
2) USA – Ibrahim et al, NEJM 360:459-60, 2009
3) Japan- Okamoto M, Transplantation 2009; 87:419–423
4) Norway – Mjoen et al, Nephrol Dial Transplant, 27:443-7, 2012
5) France – Fournier et al, Transplant International 25:385-90, 2012

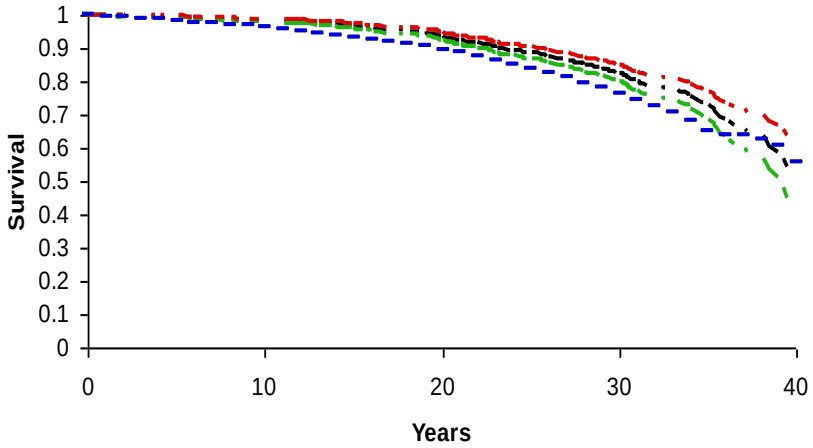
Comparable Survival of Living Donors Vs. General Population *Worldwide*



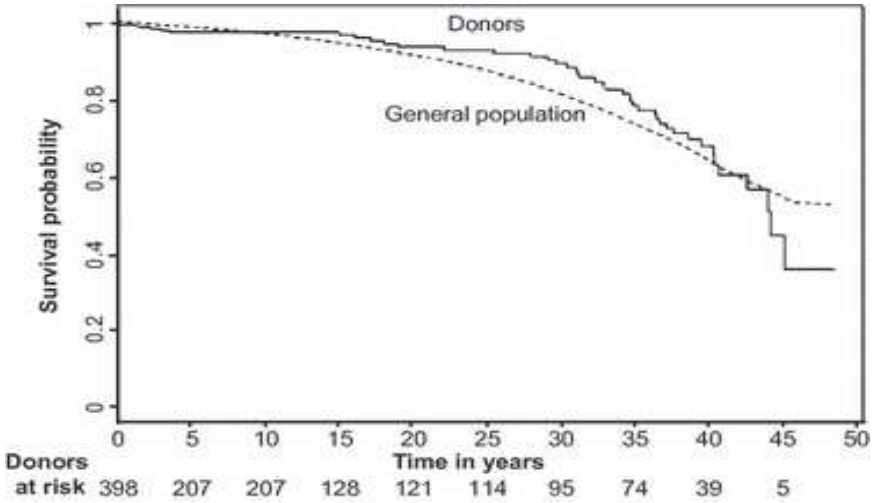
Sweden



Japan



USA



France

Donors Survival Vs. *Healthy* Population Controls

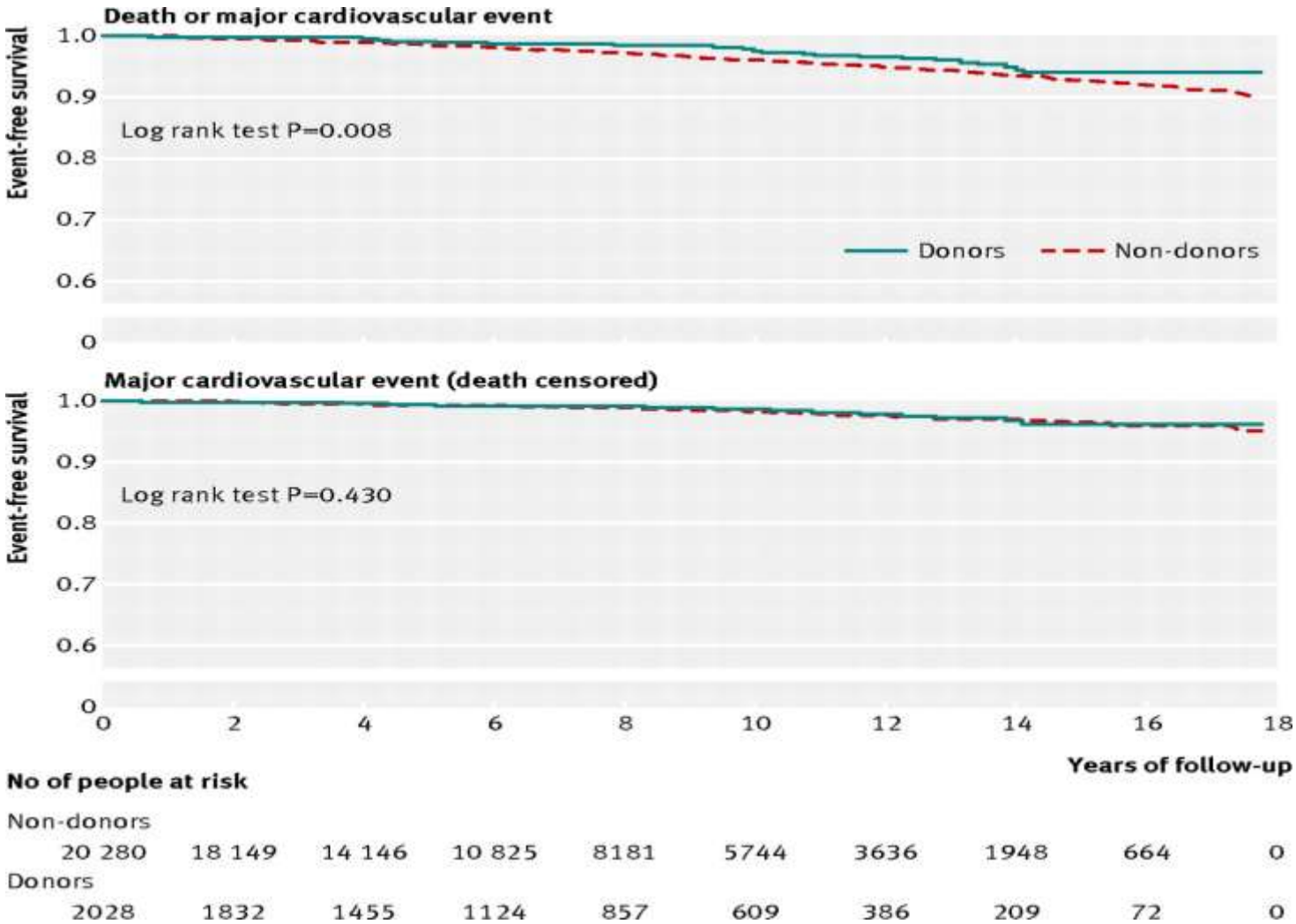
Country	Setting	n	f/u (yrs)
❑ **USA**[6]	National registry	80, 347	1-15
❑ **Canada**[7]	Province (Ontario)	2,028	1-18

Vs. Healthy Controls

6) USA – Segev et al, JAMA 303:959-966, 2010

7) Canada – Garg et al, BMJ 344:e1203, 2012

Comparable or *Even Better* Donors' Survival Vs. *Healthy Population Controls*



Garg A X et al. Cardiovascular disease in kidney donors: matched cohort study, *BMJ 2012;344:e1203*

Why Living with 1 Kidney is a Concern?

- **Removal of 1 kidney is associated with the <u>overall</u> loss of about 20-30% of renal function**

- **Why is the loss of even a small-moderate amount of renal function a concern?**

So why this can be a concern?

In the general population:

a) mild decrease in GFR is associated with increased risk of cardiovascular disease & death

b) ↓ GFR has been associated with increased risk for development of ESRD

Go AS, et al. N Engl J Med 2004; 351:1296–1305
Matsushita K, et al.. Lancet 2010; 375: 2073–2081
Tonelli M et al. J Am Soc Nephrol 2006; 17: 2034–2047

More Donor Concerns:

The Obese Donor; Donors who gain weight &/or develops DM &/or HTN

For those donors with ***obesity, and/or subsequent*** **development of obesity &/or HTN, or type 2 diabetes mellitus:**

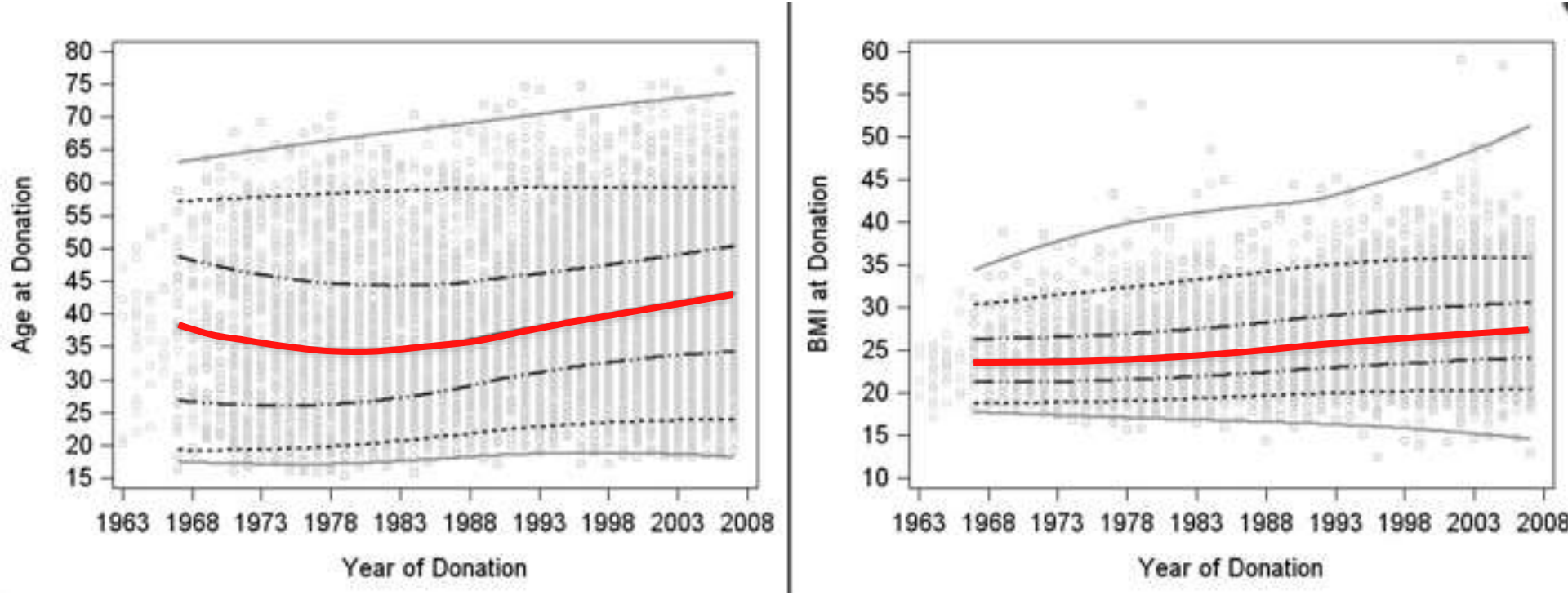
- ***Is progression of <u>renal disease</u> accelerated by nephrectomy?***

- ***Is the post-donation reduction of GFR confers higher <u>cardiovascular risk</u>?***

➢ La principale préoccupation des donneurs de reins vivants: prise de poids (obésité), développement de diabète et / ou d'hypertension après le don

Increase of Donors Older than 40 years from 38% to 51%
Donors with Obesity Increased from 8% to 26%

- Les donneurs de rein vivants sont plus en plus obèses et plus âgés aux États-Unis



Renal and Lung Living Donors Evaluation (RELIVE) Study Consortium (Mayo Clinic, U of Alabama, U of Minnesota):
8,951 kidney donors between 1963 & 2007

Taler SJ. et al. Am J Transplant. 2013 Feb;13(2):390-8.

Outline/Learning Objectives

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- Obese donors outcomes
- Pregnancy risk
- Other emerging medical issues

ESRD Has Been Reported in Donors

But there was no ↑ in ESRD vs. General Population

1) USA – Kasiske et al. – Meta-analysis (non-donors post-uninephrectomy & donors) *Kidney International, 1995*
2) Sweden – Fehman-Ekholm et al., *Transplantation, 1996*
3) Canada – Garg et al., Meta-analysis, *Kidney International, 2006*
4) USA – Ibrahim et al., *NEJM, 2009*
5) Japan – *Transplantation. 2009*
6) USA – Lentine et al., *NEJM, 2010*
7) Norway – *Nephrol Dial Transplant, 2012*
8) France – Fournier et al., *Transplant International, 2012*

These 2 Studies Suggested ↑ Donor Risk

kidney INTERNATIONAL
ISN Official journal of the International Society of Nephrology
http://www.kidney-international.org
clinical investigation

Long-term risks for kidney donors

Geir Mjøen[1], Stein Hallan[2,3], Anders Hartmann[1], Aksel Foss[1], Karsten Midtvedt[1], Ole Øyen[1], Anna Reisæter[1], Per Pfeffer[1], Trond Jenssen[1], Torbjørn Leivestad[4], Pål- Dag Line[1], Magnus Øvrehus[2], Dag Olav Dale[1], Hege Pihlstrøm[1], Ingar Holme[5], Friedo W. Dekker[6] and Hallvard Holdaas[1]

Research

Original Investigation

Risk of End-Stage Renal Disease Following Live Kidney Donation

Highlights of Norwegian Study

Mjøen et al.:1,901 donors *compared to* 32,621 controls:

9 donors developed ESRD (*absolute risk = 0.47%*)

- *All 9 were relatives* of the recipients
- 6/9 had *immunologic disease (which would have affected both kidneys)*
- Median time to ESRD – 18.7 yrs

Relative Risk of ESRD was 11.4x vs. Non-donors

• **Une insuffisance rénale chronique avancée peut apparaître chez les donneurs, mais à un taux inférieur à celui de la population générale**

Mjøen G, Kidney Int. 2014 Jul;86(1):162-7, Epub 2013 Nov 27

USA Study

Muzaale et al, JAMA, 311:579-86, 2014

- 96,217 donors studied: *compared to* 9,634 controls
- 99 donors developed ESRD (*absolute risk* = 0.1%)
- Median follow up: 7 years

Absolute cumulative ESRD incidence:

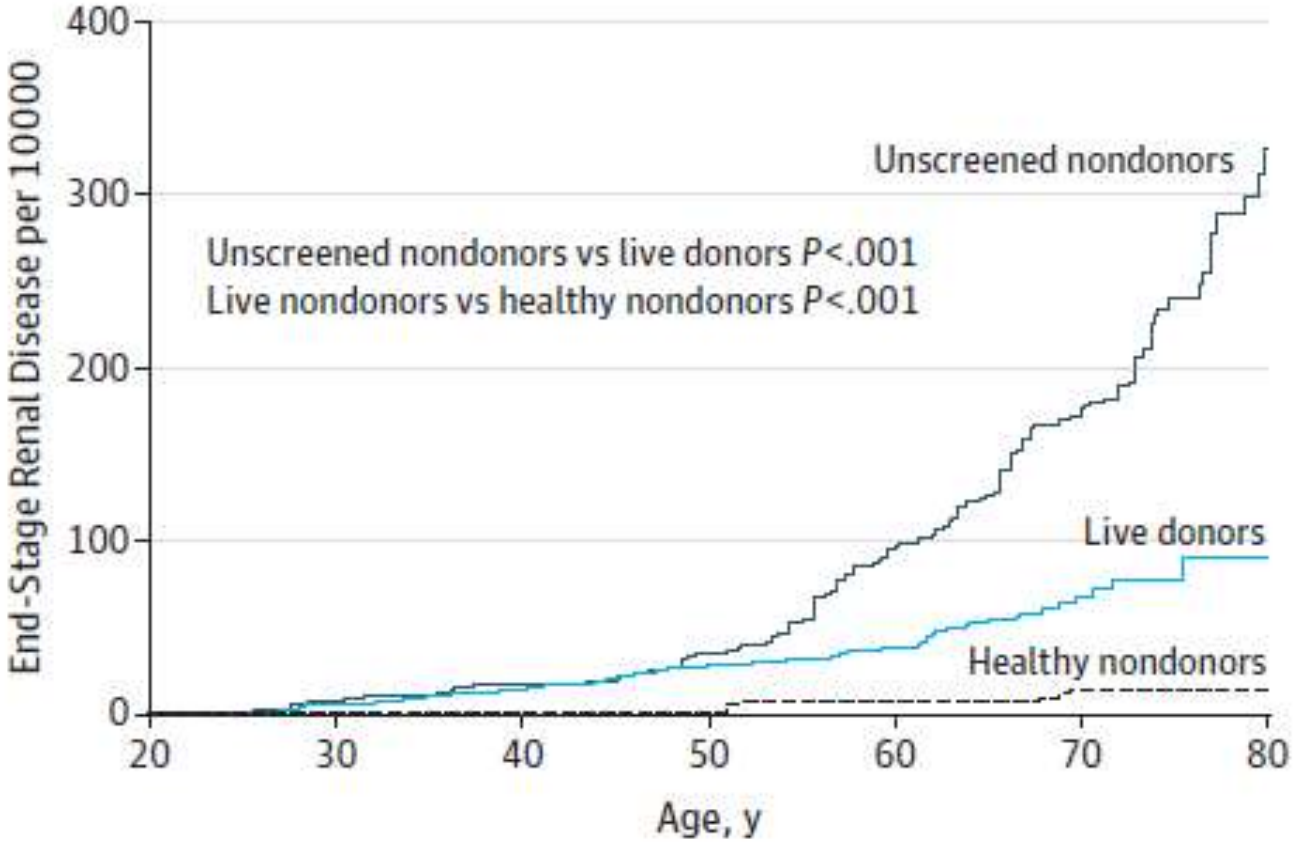
Donors: 90/10000

Healthy Controls: 14/10000

Estimated ***Relative Risk*** of **ESRD** ⇧ ***8x*** *in Donors*

Muzaale et al, Risk of End Stage Renal Disease Following Live Kidney Donation, JAMA, 311:579-588, 2014

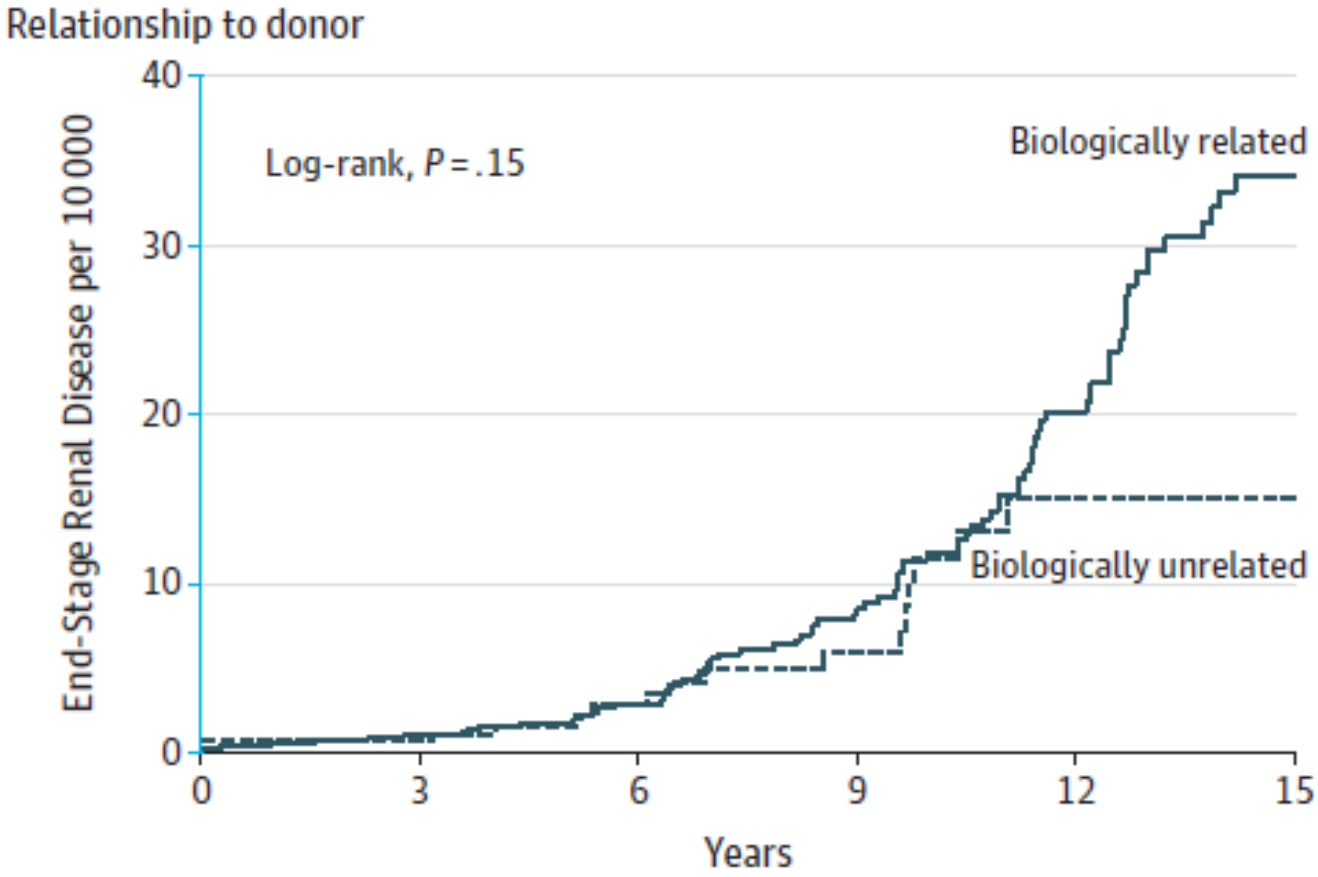
Lifetime Absolute Risk of ESRD



- Donors: **90/10,000**
- Healthy controls: **14/10,000**
- General population: **330/10,000**

Muzaale et al, Risk of End Stage Renal Disease Following Live Kidney Donation, JAMA, 311:579-588, 2014

Biologically Related Donors Had Higher 15-yr ESRD Risk



Muzaale et al, Risk of End Stage Renal Disease Following Live Kidney Donation, JAMA, 311:579-588, 2014

These 2 Studies Have **Major** Limitations

Low event rate

Control groups

Statistical techniques

Limited F/u (JAMA study, USA)

Wide 95% CI

Different time periods

Confounding factors

Key Point – *Most of the ESRD that has been reported in donors has occurred in* ***donors RELATED to their recipients***

- **Plus grande fréquence d'insuffisance rénale chronique avancée chez les donneurs biologiquement LIÉS à leurs receveurs**

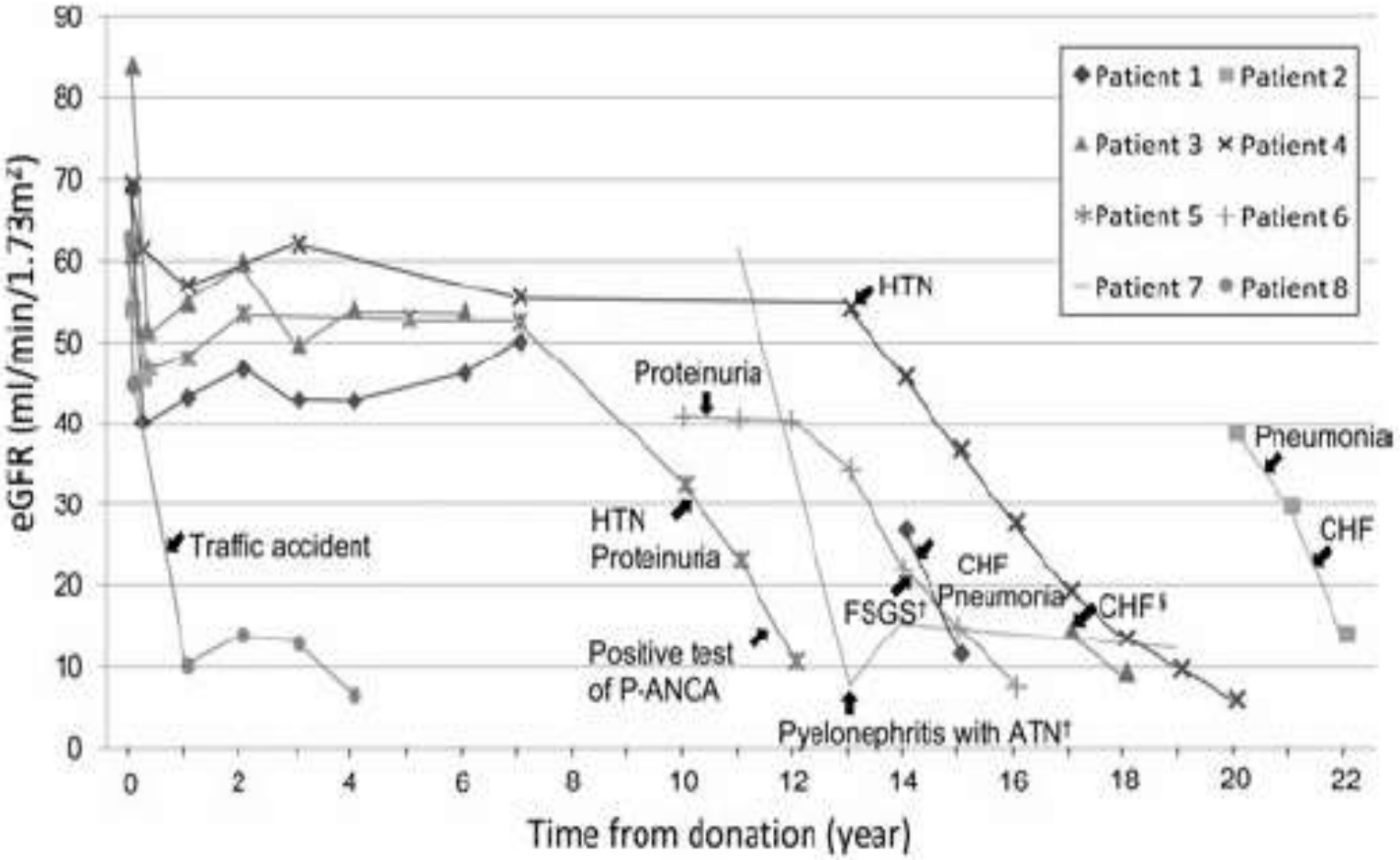
Mjøen G, Kidney Int. 2014 Jul;86(1):162-7, Epub 2013 Nov 27
Muzaale AD, JAMA. 2014 Feb 12;311(6):579-86

So The Question is: “How Do Living Donors Develop ESRD?”

- Is ESRD due to a ***slow steady deterioration in GFR*** that is associated with aging?

- Is ESRD due to ***new-onset disease*** after donation?

How Do Living Kidney Donors Develop ESRD?



Kido R et al. How do living kidney donors develop end-stage renal disease? Am J Transplant.2009 Nov;9(11):2514-9

Long-term ***Non-ESRD*** Kidney Donor Risks

- Cardiovascular risk
- Obese donors outcomes
- Pregnancy risk
- Other emerging medical issues

Living Donation & Cardiovascular Risk

Increased CVD Disease and Mortality?

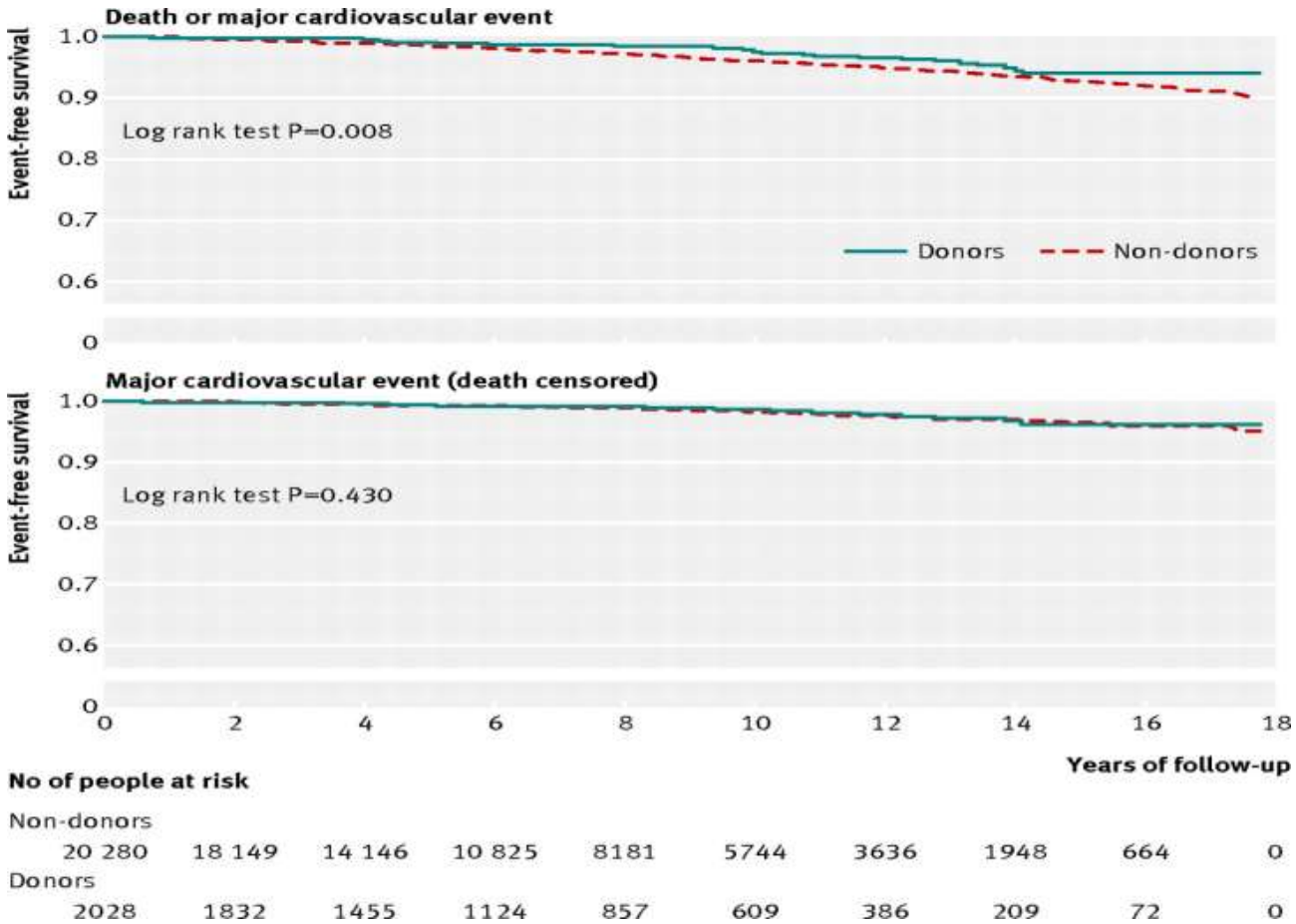
- Compared to general population, **NO DIFFERENCE**
- Donors Compared to *Healthy Population Controls*

Country	Setting	n	median f/u
USA	National registry	80, 347	6.3**yrs*
Segev et al, JAMA 2010			
Canada	Province (Ontario)	2,028	6.0***yrs*
Garg et al, Transplantation 2008			
USA	> 55 years	3,368	7.8**yrs
Reese et al, AJT 2014			

**** No difference in mortality*** ***** no difference in CVD or mortality***

- *Les études n'ont pas montré une incidence plus élevée de maladie cardiovasculaire ou une mortalité accrue après un don de rein vivant par rapport à la population générale*

Comparable or *Even Better* Donors' Survival Vs. *Healthy Population Controls*

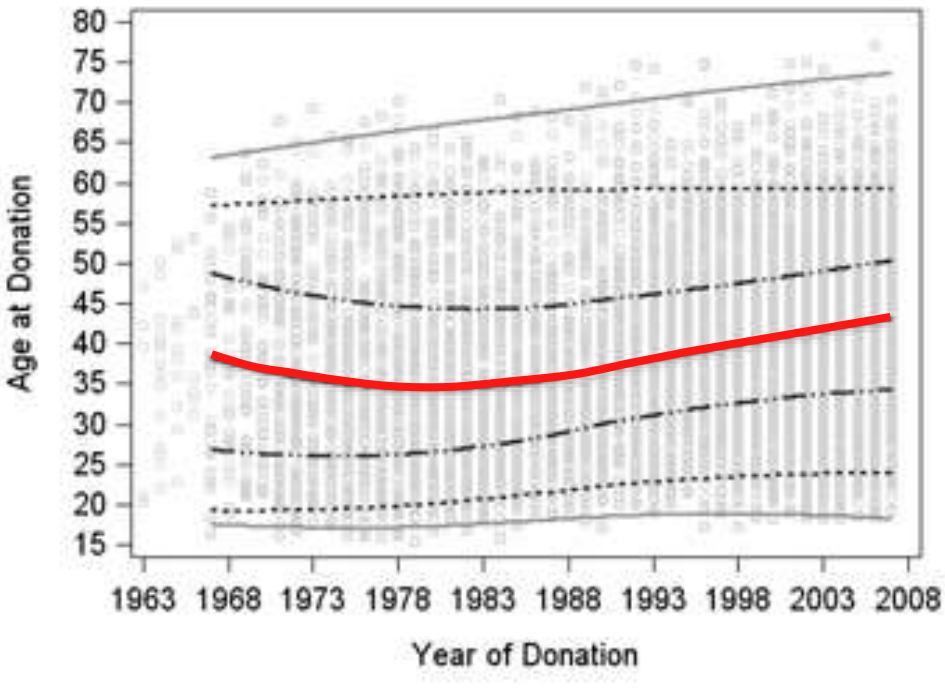


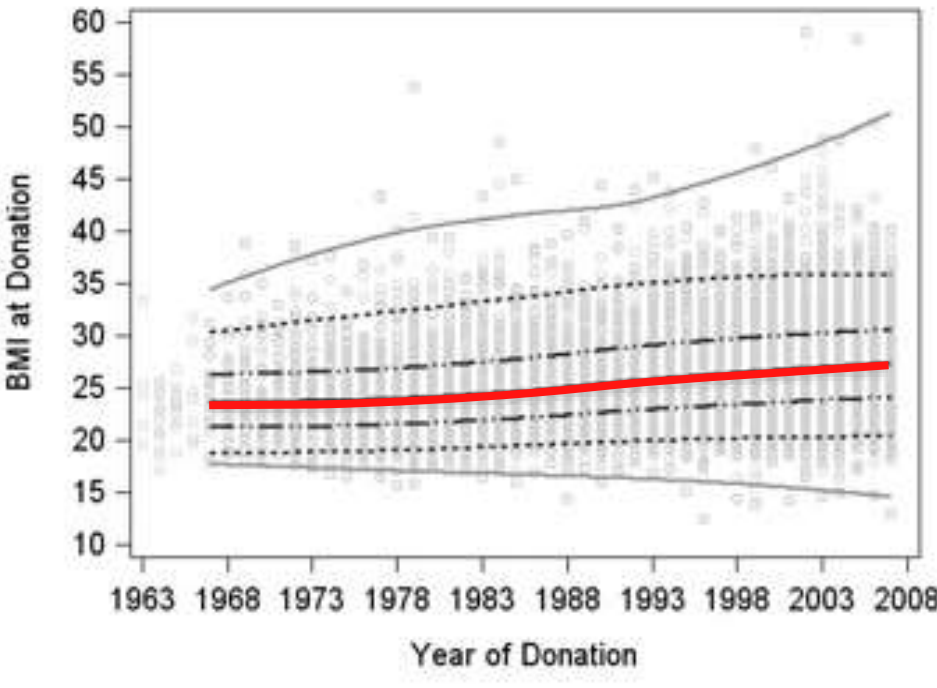
Garg A X et al. Cardiovascular disease in kidney donors: matched cohort study, *BMJ 2012;344:e1203*

Obese Donors Outcomes

Donors with Obesity Increased from 8% to 26%

- Mean BMI of donors has increased over time from 24.3 in the 1970's to 27.3 Kg/m^2 in the 2000's
- > 25% of all living kidney donors in the 2000's are obese compared to fewer than 8% in the 1970's





Renal and Lung Living Donors Evaluation (RELIVE) Study Consortium (Mayo, UAB, UMN): 8,951 living kidney donors between 1963 & 2007

Taler SJ. et al. Am J Transplant. 2013 Feb;13(2):390-8.

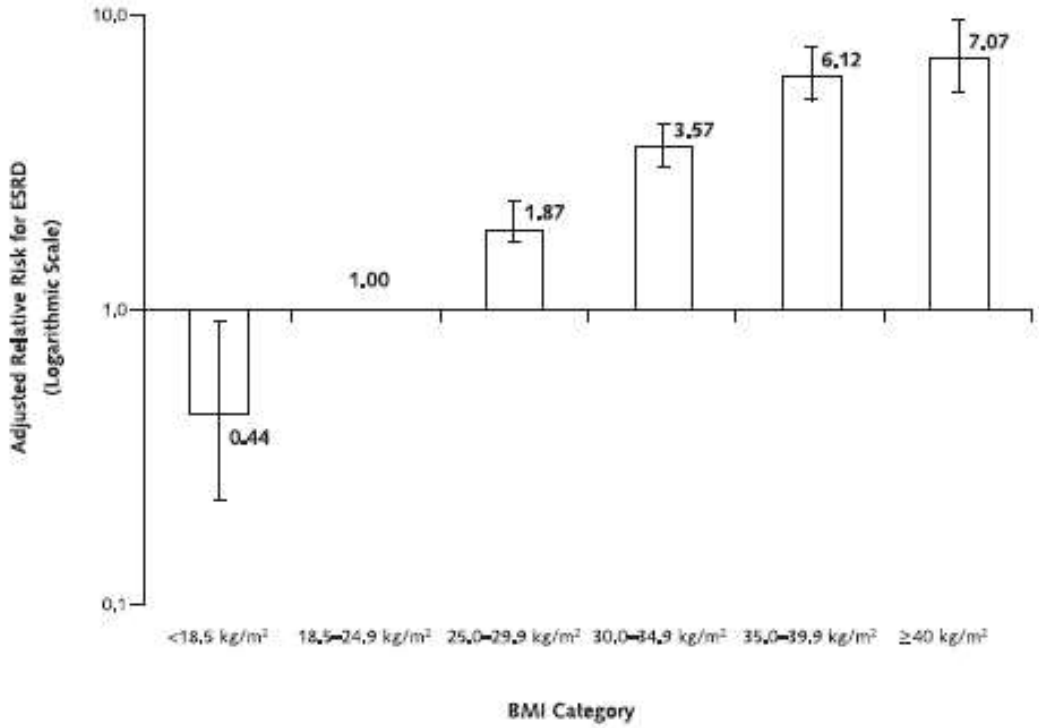
Obese Individuals have a 3.57- fold Higher Risk for ESRD

(compared to individuals considered normal weight)

(BMI 18.5-24.9 kg/m^2)

General Population

Figure. **Adjusted relative risk for end-stage renal disease (*ESRD*) by body mass index (*BMI*).**



Model adjusted for Multiphasic Health Checkup period, age, sex, race, education level, smoking status, history of myocardial infarction, serum cholesterol level, proteinuria, hematuria, and serum creatinine level. Error bars represent 95% CIs.

Hsu CY ET AL, Body mass index and risk for end-stage renal disease. Ann Intern Med. 2006

Obese Donors have Higher ESRD Risk

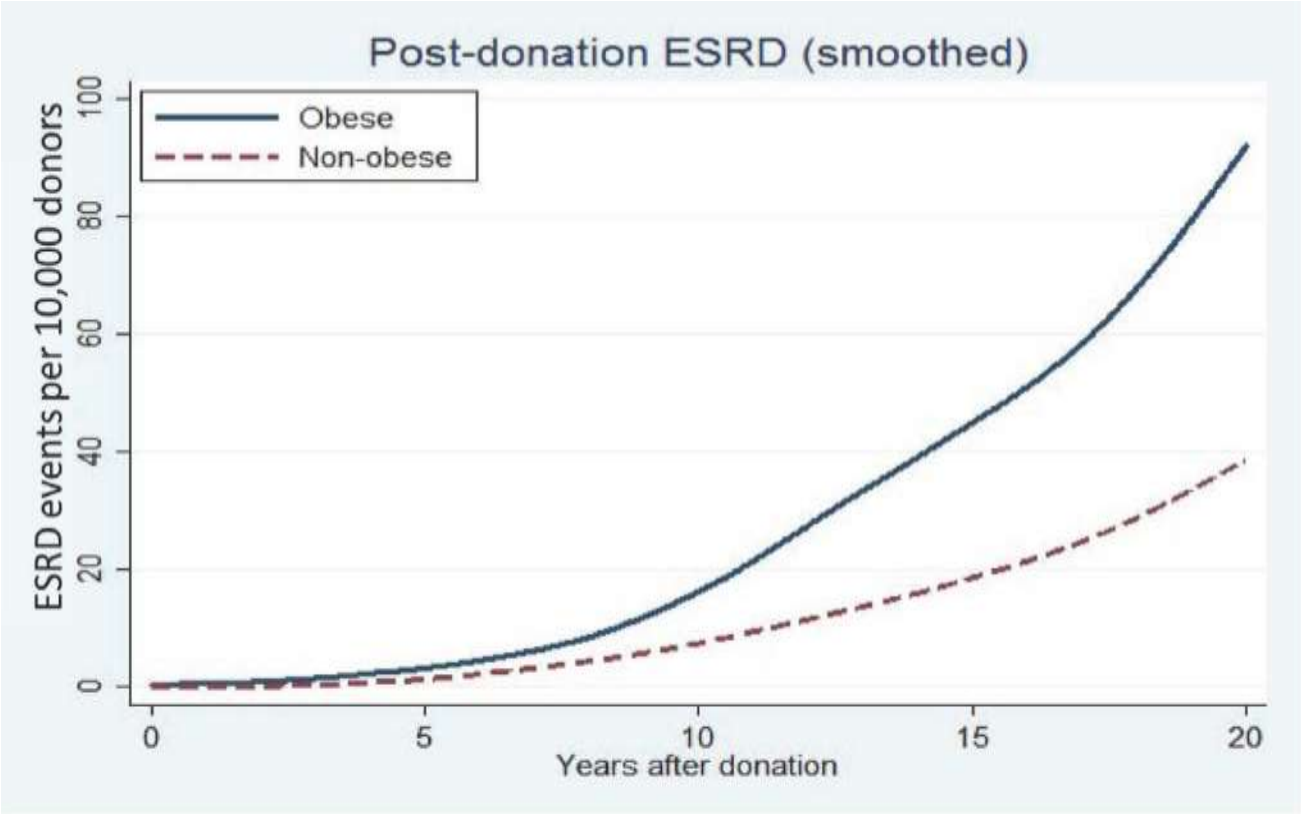


Figure 1.
Cumulative incidence of post-donation ESRD events among living kidney donors by obesity status at time of donation.

n=119,769 live kidney donors
OPTN/SRTR data linked to CMS data for ascertainment of ESRD

Locke JE ET AL, Obesity increases the risk of end-stage renal disease among living kidney donors. Kidney Int. 2017

Obese Donors have Higher ESRD Risk

- **Obese live kidney donors** had a significant **86% increased risk of ESRD compared to their non-obese counterparts** (adjusted HR 1.86; 95% CI 1.05-3.30)
- **For each unit increase in BMI above 27 kg/m^2 there was an associated significant 7% increase in ESRD risk** (adjusted HR 1.07; 95% CI 1.02–1.12)

Table 2

Cumulative incidence of ESRD events per 10 000 living donors estimated from the multiple imputation analyses (10/1/1987–6/30/2013).

Obesity status	5-years	10-years	15-years	20-years
Obese (BMI $\geq$ 30 kg/m^2)	3.2	15.2	42.5	93.9
Non-obese (BMI $<$ 30 kg/m^2)	1.0	7.4	17.5	39.7

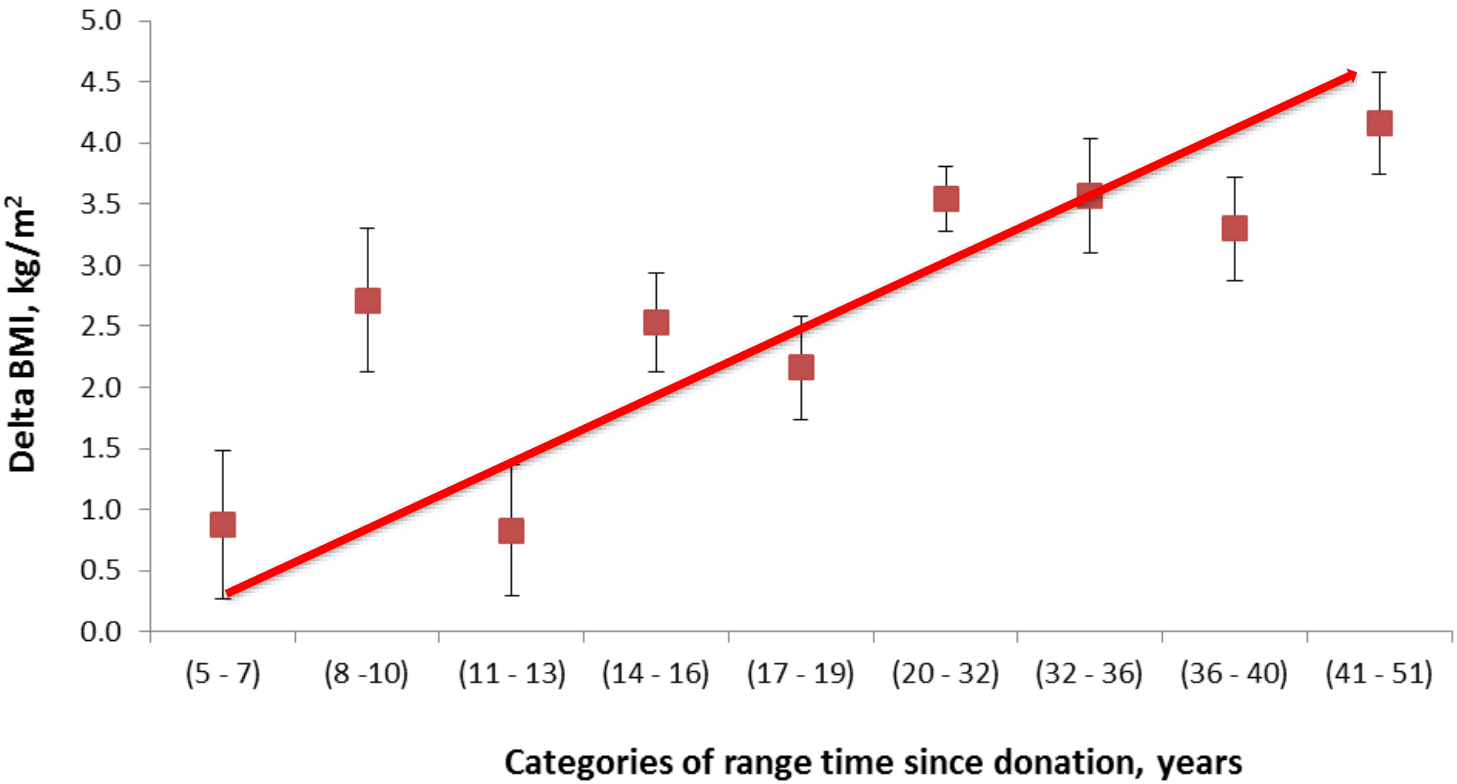
Adjusted for age, sex, ethnicity, blood pressure, baseline eGFR & relationship to recipient

Locke JE et al., Obesity increases the risk of end-stage renal disease among living kidney donors. Kidney Int. 2017

Change in Post-Donation BMI by Time Interval: Most Donors Gained Weight!

F/u for at least 5 years; adjusted for age at donation, ethnicity, gender & BMI at donation

(N=940 donors)



Issa N. et al, **Weight Gain after Kidney Donation: Association with Increased Risks of Type 2 Diabetes and Hypertension,** ***Clin Transplant. 2018 Sep;32(9):e13360. doi: 10.1111/ctr.13360. Epub 2018 Aug 18***

Donors with High Post-donation Weight Gain Had *Higher Risk for HTN &/or DM2* Compared to Those who Lost Weight or had Minimal Weight Gain

HTN RR 1.93 (95% CI 1.51-2.46) (p<0.001) and/or DM2 RR 3.19 (95% CI 1.55-6.55) (p<0.0001)

	Tertiles of percent change in BMI				
	-2.14 (-15.96 - -0.08)	1.43 (-0.05 - 3.96)	5.87 (1.78 - 22.48)		
Clinical outcomes		**RRs (95% CI)**		**linear trend**	**p value**
HTN	1	1.73 (1.32, 2.29)	1.93 (1.51, 2.46)	**1.35 (1.21, 1.51)**	**< 0.0001**
Diabetes	1	2.64 (1.22, 5.75)	3.19 (1.55, 6.55)	**4.18 (2.05, 8.50)**	**< 0.0001**
CVD	1	1.13 (0.72, 1.77)	1.2 (0.81, 1.77)	1.09 (0.92, 1.28)	0.3
Proteinuria	1	0.73 (0.37, 1.45)	1.02 (0.58, 1.79)	1.04 (0.85, 1.28)	0.7
eGFR < 60	1	1.51 (0.48, 4.76)	1.72 (0.73, 4.01)	1.28 (0.74, 2.25)	0.4
eGFR < 45	1	0.76 (0.45, 1.28)	0.94 (0.63, 1.40)	0.99 (0.77, 1.26)	0.9
eGFR < 30	1	0.83 (0.29, 2.34)	1.03 (0.47, 2.27)	1.03 (0.66, 1.62)	0.9
Death	1	0.45 (0.21, 0.95)	0.49 (0.28, 0.83)	0.70 (0.50, 1.00)	0.05

Linear trend is by tertile of percent change in BMI. HRs for ESRD could not be calculated due to lack of cases in more than one categories. RRs was adjusted for age, sex, family history of diabetes and hypertension and systolic and diastolic blood pressure, blood glucose, BMI, smoking and eGFR all at time of donation.

Issa N. et al*, Weight Gain after Kidney Donation: Association with Increased Risks of Type 2 Diabetes and Hypertension, *Clin Transplant. 2018 Sep;32(9):e13360. doi: 10.1111/ctr.13360. Epub 2018 Aug 18

Should Women Planning Future Pregnancies Be Donors?

Les femmes qui planifient de futures grossesses doivent-elles être des donneuses?

Risk of Gestational Hypertension or Preeclampsia was **Higher** Post- Kidney Donation

Table 3. Maternal and Fetal Outcomes of Pregnancies after Cohort Entry in Living Kidney Donors and Matched Nondonors.

Outcome	Pregnancies in Donors (N=131)	Pregnancies in Nondonors (N=788)	Odds Ratio (95% CI)	P Value*
	no. of events (%)			
Primary outcome: gestational hypertension or preeclampsia	15 (11)	38 (5)	2.4 (1.2–5.0)	0.01
Secondary outcomes				
Gestational hypertension†	7 (5)	17 (2)	2.5 (0.9–6.5)	0.06
Preeclampsia	8 (6)	21 (3)	2.4 (1.0–5.6)	0.05
Cesarean section	41 (31)	224 (28)	1.2 (0.7–2.1)	0.44
Postpartum hemorrhage	≤5 (≤4)‡	24 (3)	0.9 (0.3–2.9)	0.91
Preterm birth with gestation of <37 wk	10 (8)	52 (7)	1.2 (0.5–2.5)	0.70
Low birth weight of <2500 g	8 (6)	31 (4)	1.7 (0.7–4.0)	0.21

Donor Nephrectomy Outcomes Research (DONOR) Network: (Ontario, Canada)

Garg AX et al. N Engl J Med 2014

Pregnancies **after Donation** Should be Considered **"High Risk"**

- Ibrahim et al, AJT, 9:825, 2009 *(USA)*

  Higher risk of gestational diabetes, HTN & preeclampsia

- Reisaeter et al, AJT 9:820, 2009 *(Norway)*

  Matched donors with population controls

  Preeclampsia increased in donors

- Garg et al, NEJM, 372;124, 2015 *(Ontario, Canada)*

  Matched 85 donors with 510 healthy controls

  Gestational hypertension or preeclampsia *more common in donors:* ***(11%) vs. controls (5%)***

Implications *- Pregnancies after donation should be considered* ***"high risk"*** *with frequent BP checks*

- **La grossesse après un don de rein vivant doit être considérée comme un risque élevé**

Other Potential Attributable Risks?

Donor Nephrectomy Outcomes Research (DONOR) Network: *(Ontario, Canada)*

- Fractures: No evidence of increased fragility fracture risk: Am J Kidney Dis, 59: 770, 2012
- Serious G.I. bleeding: No significant difference; Clin Transplant, 28:530, 2014
- Gout: Donors more likely to be given a diagnosis of gout (3.4% vs 2.0: HR 1.6; P<0.001). AJKD 65: 925, 2015
- Nephrolithiasis: no difference in the rate of kidney stones with surgical intervention in donors; Am J Transplant.13(11):2935-44, 2013
- AKI/Acute dialysis during any hospital stay: no difference: Nephrol Dial Transplant. 27(8):3291-5, 2012

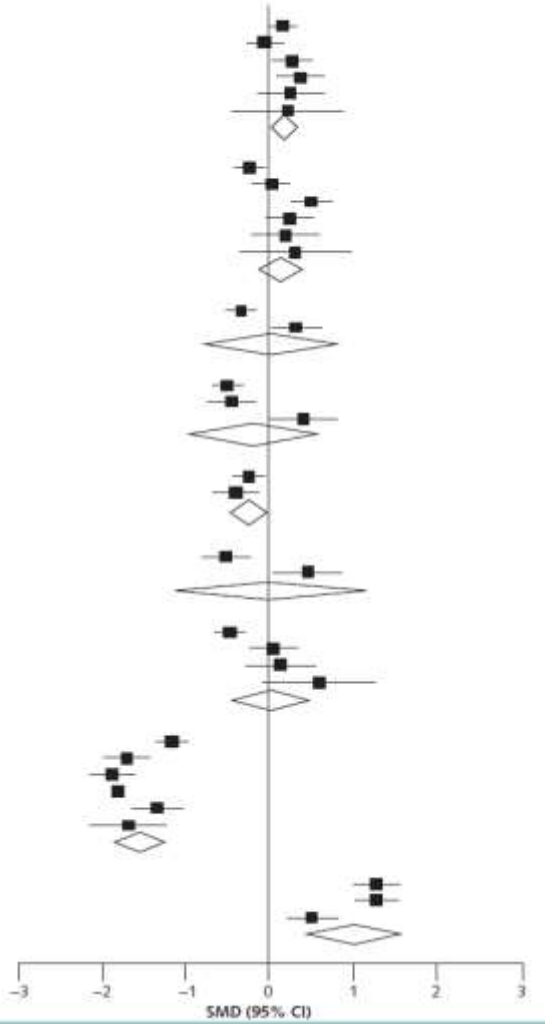
No Increase in All-cause Mortality, Cardiovascular Disease, Hypertension, or Diabetes Mellitus 2 in Living Kidney Donors than in Non-donors

Metanalysis:

- 52 studies, comprising 118,426 living kidney donors and 117,656 nondonors
- 23 studies from North America,10 from Europe, 2 from Australia, 5 from South America, 12 from other or several regions
- Donors had higher diastolic blood pressure and lower estimated glomerular filtration rates

Figure 2. Meta-analysis of SMD in blood pressure and biomarkers in living kidney donors compared with nondonor control participants.

Study, Year (Reference)	Participants, n		Mean Value		Selection	Matching
	Donor	Control	Donor	Control		
Diastolic blood pressure, *mm Hg*						
Ibrahim et al, 2009 (14)	255	255	73	71	+	+++
Kasiske et al, 2015 (15)	182	170	72	73	+++	++
Doshi et al, 2013 (16)	103	235	80	77	+++	+++
Seyahi et al, 2007 (17)	101	99	78	75	+++	+
Moody et al, 2016 (18)	57	46	78	76	+++	++
Shehab-Eldin et al, 2009 (19)	14	25	80	79	+	
Total	712	830				
Systolic blood pressure, *mm Hg*						
Ibrahim et al, 2009 (14)	255	255	122	126	+	+++
Kasiske et al, 2015 (15)	182	170	118	117	+++	++
Doshi et al, 2013 (16)	103	235	125	118	+++	+++
Seyahi et al, 2007 (17)	101	99	118	114	+++	+
Moody et al, 2016 (18)	57	46	123	121	+++	++
Shehab-Eldin et al, 2009 (19)	14	25	126	124	+	
Total	712	830				
Triglyceride level, *mg/dL*						
Ibrahim et al, 2009 (14)	255	255	125	174	+	+++
Seyahi et al, 2007 (17)	101	99	139	117	+++	+
Total	356	354				
Cholesterol level, *mg/dL*						
Ibrahim et al, 2009 (14)	255	255	186	205	+	+++
Seyahi et al, 2007 (17)	101	99	180	199	+++	+
Moody et al, 2016 (18)	56	44	206	190	+++	++
Total	412	398				
HDL cholesterol level, *mg/dL*						
Ibrahim et al, 2009 (14)	255	255	50	55	+	+++
Seyahi et al, 2007 (17)	101	99	44	49	+++	+
Total	356	354				
LDL cholesterol level, *mg/dL*						
Seyahi et al, 2007 (17)	101	99	109	127	+++	+
Moody et al, 2016 (18)	52	44	124	108	+++	++
Total	153	143				
Glucose level, *mg/dL*						
Ibrahim et al, 2009 (14)	255	255	91	103	+	+++
Seyahi et al, 2007 (17)	101	99	91	91	+++	+
Moody et al, 2016 (18)	55	43	88	86	+++	++
Shehab-Eldin et al, 2009 (19)	14	25	99	92	+	
Total	425	422				
eGFR, *mL/min/1.73 m²*						
Ibrahim et al, 2009 (14)	255	255	64	82	+	+++
Young et al, 2012 (20)	198	98	73	98	+	
Kasiske et al, 2015 (15)	180	168	70	93	+++	++
Doshi et al, 2013 (16)	103	235	77	109	+++	+++
Seyahi et al, 2007 (17)	101	99	75	100	+++	+
Moody et al, 2016 (18)	57	46	59	86	+++	++
Total	894	901				
Serum creatinine level, *mg/dL*						
Young et al, 2012 (20)	198	98	1.03	0.78	+	
Doshi et al, 2013 (16)	103	235	1.20	0.90	+++	+++
Rizvi et al, 2016 (21)	90	90	1.12	0.99	+++	+++
Total	391	423				



O'Keeffe LM, Mid- and Long-Term Health Risks in Living Kidney Donors: A Systematic Review and Meta-analysis, Ann Intern Med. 2018 Feb 20;168(4):276-284

Higher risk for **End-stage Renal Disease** (**RR, 8.83** [95% CI, 1.02 to 20.93]) and **Preeclampsia** in Female Donors (**RR, 2.12** [CI, 1.06 to 4.27])

- **ESRD:**

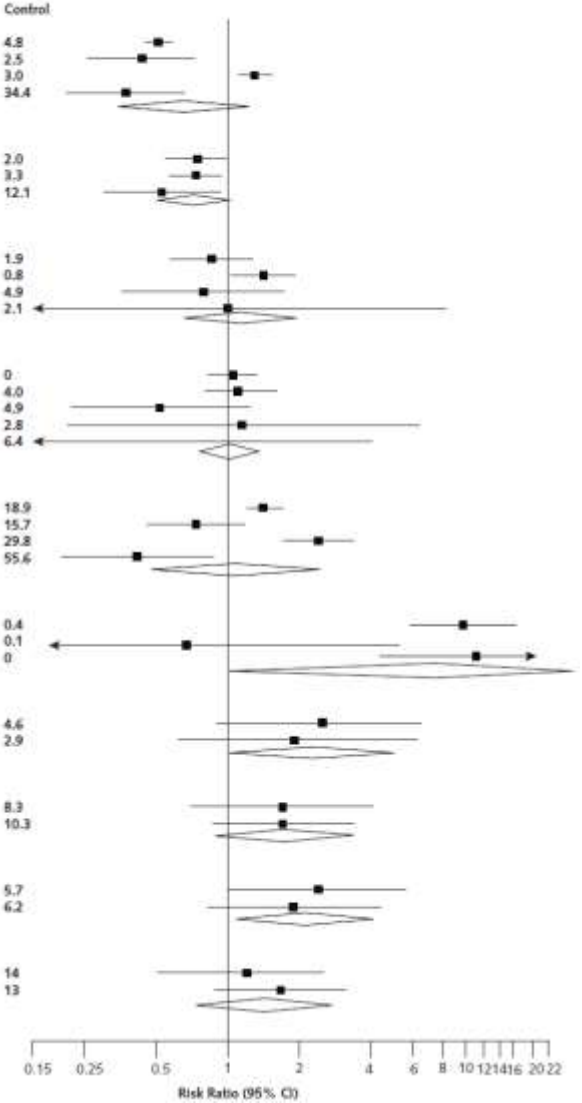
Despite the increased RR, donors had **low absolute risk for ESRD** (incidence rate: **0.5 event** [CI, 0.1 to 4.9 events] per 1000 person-years)

- **Preeclampsia:**

Incidence rate, **5.9 events** [CI, 2.9 to 8.9 events] **per 100 pregnancies**

Figure 3. Meta-analysis of relative risks for selected clinical end points in living kidney donors compared with nondonor control participants.

Study, Year (Reference)	Events, n/n		Selection	Matching	Incidence Rate*	
	Donor	Control			Donor	Control
All-cause mortality						
Segev et al, 2010 (22)	1205/80 347	272/9364	++	+++	2.5	4.8
Garg et al, 2012 (23)	16/2028	365/20 280	++	++	1.1	2.5
Mjøen et al, 2014 (24)	224/1901	2425/32 621	++	+++	7.9	3.0
Berger et al, 2011 (25)	22/219	59/219	++	+++	16.4	34.4
Total	1467/84 495	3121/62 484				
Cancer						
Lentine et al, 2012 (26)	55/4650	75/4650	+	+	1.5	2.0
Mjøen et al, 2012 (27)	84/2269	339/6807	+	+	2.5	3.3
Ibrahim et al, 2009 (14)	21/255	37/255	+	+++	6.9	12.1
Total	160/7174	451/11 712				
Cardiovascular disease						
Garg et al, 2012 (23)	26/2028	287/20 280	++	++	1.7	1.9
Mjøen et al, 2014 (24)	68/1901	688/32 621	++	+++	2.4	0.8
Ibrahim et al, 2009 (14)	12/255	15/255	+	+++	3.9	4.9
Rizvi et al, 2016 (21)	1/90	1/90	+++	+++	1.9	2.1
Total	107/4274	991/53 246				
Diabetes						
Reese et al, 2014 (28)	NA/1312	NA/1312	++	++	0	0
Garg et al, 2008 (29)	35/1278	159/6369	++	++	4.4	4.0
Ibrahim et al, 2009 (14)	8/255	15/255	+	+++	2.6	4.9
Doshi et al, 2013 (16)	2/103	4/235	+++	+++	2.8	2.8
Rizvi et al, 2016 (21)	2/90	3/90	+++	+++	3.8	6.4
Total	47/3038	181/8261				
Hypertension						
Garg et al, 2008 (29)	205/1278	746/6369	++	++	26.7	18.9
Ibrahim et al, 2009 (14)	37/255	48/255	+	+++	12.1	15.7
Doshi et al, 2013 (16)	42/103	42/235	+++	+++	58.3	29.8
Rizvi et al, 2016 (21)	13/90	26/90	+++	+++	24.9	55.6
Total	297/1726	862/6949				
ESRD						
Muzaale et al, 2014 (30)	99/96 217	17/9364	++	+++	3.1	0.4
Lam et al, 2012 (31)	1/2027	14/20 270	++	++	0.1	0.1
Mjøen et al, 2014 (24)	9/1901	22/32 621	++	+++	0.3	0
Total	109/100 145	53/62 255				
Gestational hypertension						
Garg et al, 2015 (32)	7/131	17/788	++	+++	10.8	4.6
Reisaeter et al, 2009 (33)	3/106	314/21 511	+		5.7	2.9
Total	10/237	331/22 299				
Low birthweight						
Garg et al, 2015 (32)	8/131	31/788	++	+++	12.4	8.3
Reisaeter et al, 2009 (33)	9/106	1110/21 511	+		17.0	10.3
Total	17/237	1141/22 299				
Preeclampsia						
Garg et al, 2015 (32)	8/131	21/788	++	+++	12.4	5.7
Reisaeter et al, 2009 (33)	6/106	666/21 511	+		11.3	6.2
Total	14/237	687/22 299				
Preterm birth						
Garg et al, 2015 (32)	10/131	52/788	++	+++	15.5	14
Reisaeter et al, 2009 (33)	11/106	1397/21 511	+		20.8	13
Total	21/237	1449/22 299				



O'Keeffe LM, Mid- and Long-Term Health Risks in Living Kidney Donors: A Systematic Review and Meta-analysis, Ann Intern Med. 2018 Feb 20;168(4):276-284

Limitations to all of These Data*

- Almost all the long-term data, to date, have been provided by a very small number of groups*:*

(Single center or small registry studies in Europe, Japan & the USA **OR** large "inaccurate registries" in Canada and the USA)

- Finding controls for donors' outcomes studies is problematic
- There are little long-term data on the ***Non-Caucasian*** donors
- Donor acceptance criteria have expanded over the years:
  - Now include selected ***Older*** donors; donors with ***HTN***; ***Obese*** donors
  - Long-term studies are necessary in these subgroups!

La principale limite dans les résultats des études sur des donneurs vivants aux États-Unis est le manque de comparaison avec une population témoin saine et la plupart des études publiées portaient principalement sur des donneurs de race blanche

****Personal Viewpoint and Opinion***

Conclusions

- (I believe)* living kidney donation <u>remains relatively safe</u> with some **small** long-term **acceptable** risk, that warrants:

a) Meticulous selection by transplant providers **(caution in obese, younger..)**

b) Diligent counseling of potential donors with immediate **family h/o kidney disease**

c) Encouraging all donors to have regular (long-term) health screening post-donation

Les dons de reins vivants sont relativement sûrs, à l'exception de certains petits risques acceptables à long terme

****Personal Viewpoint and Opinion***

Pre-Test Question 1

What is a primary predictor for post-donation End Stage Renal Disease **(ESRD)**?

Quel est le facteur prédictif principal de IRCT après le don?

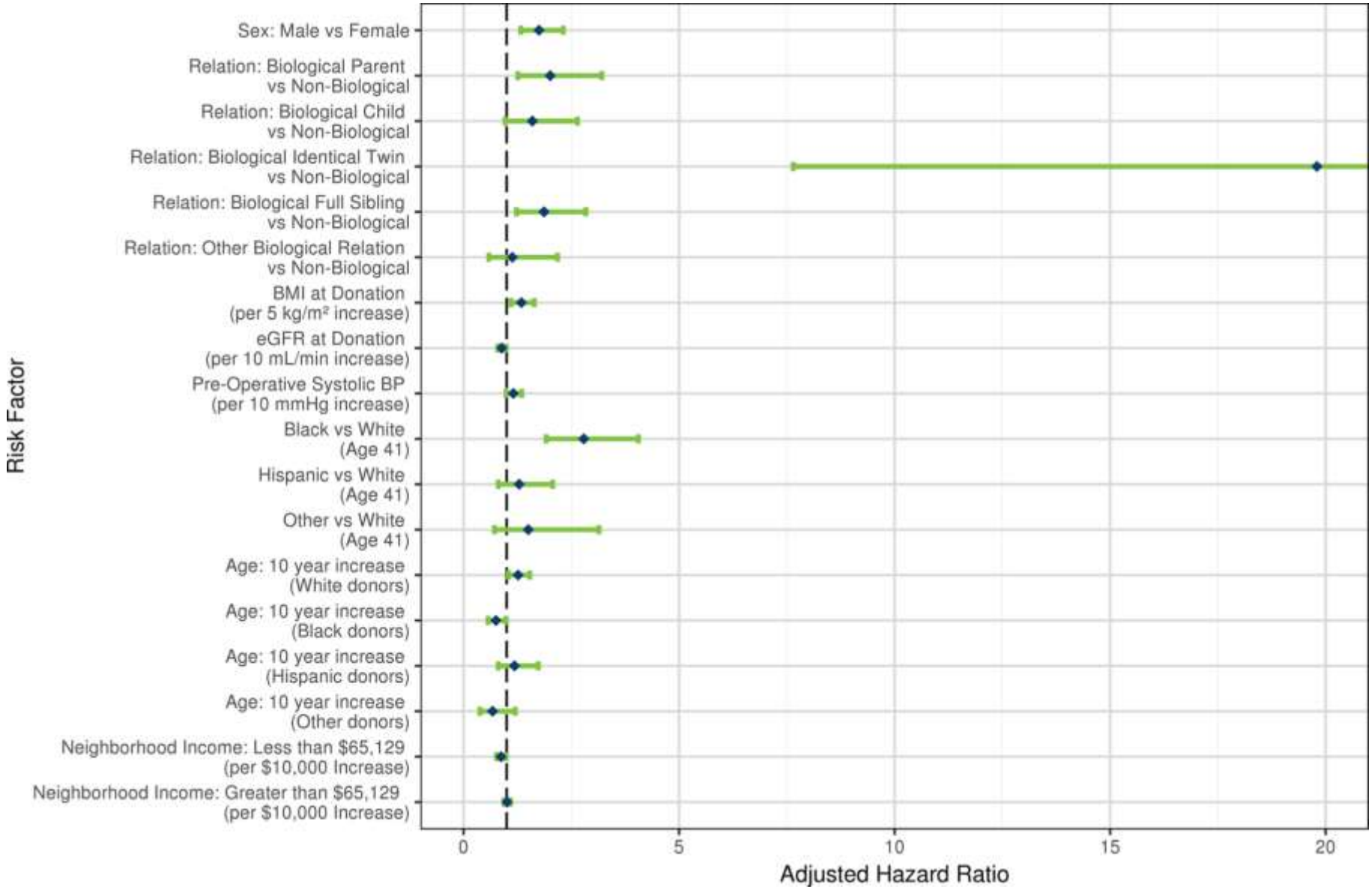
A. Age
B. Relative with ESRD (Histoire famillale de IRCT)
C. Pre-donation hypertension in selected donors
D. All of the above

Post-Test Question 1

Correct Answer: B. 1st degree relative with ESRD

Most of the ESRD that has been reported in living donors has occurred in donors related to their recipients

Biologically Related Donors had **Higher Risk** for Death-Censored **ESRD**



Wainright JL, Risk of ESRD in prior living kidney donors, Am J Transplant. 2018 May;18(5):1129-1139

Pre-Test Question 2

What is a non-ESRD risk for donors?

Quel est le risque non-rénal pour les donneurs vivants?

A. Increased acute kidney injury (IRA) risk during hospitalizations
B. Pre-eclampsia
C. Cardiovascular diseases
D. All of the above

Post-Test Question 2

Correct Answer: C. Pre-eclampsia

- **Pre-eclampsia and high blood pressure rates were higher among women who were pregnant after having donated a kidney, but all other outcomes were lower among donors**
- AKI/Acute dialysis during any hospital stay: no difference: Nephrol Dial Transplant. 27(8):3291-5, 2012
- **Cardiovascular disease are less prevalent:** from the slides- Compared to the general population, *no increased risk of CVD or mortality*

MAYO CLINIC

Thank You!

Questions & Discussion