CKD classification

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Nephrology, Dialysis, Transplantation

CHU Sart Tilman

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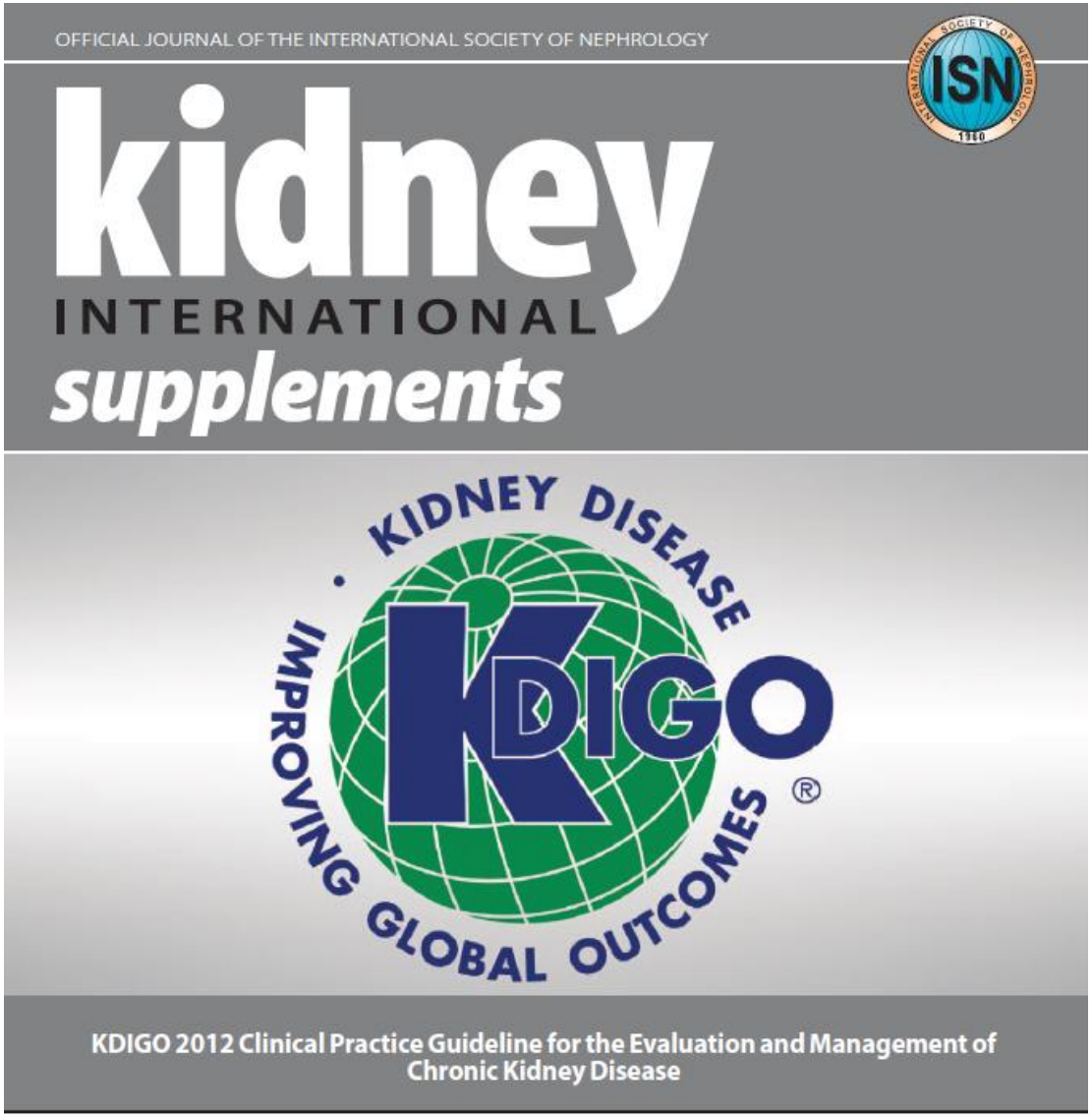
BELGIUM

Defining normality in medicine…

- Difficult (at least not so simple)
- Relevant
- Sometimes « dangerous » (risk of «oversimplification»)

International guidelines in Nephrology



GFR categories in CKD **Chronic Kidney Disease**

GFR category	GFR (ml/min/1.73 m^2)	Terms
G1	≥90	Normal or high
G2	60–89	Mildly decreased*
G3a	45–59	Mildly to moderately decreased
G3b	30–44	Moderately to severely decreased
G4	15–29	Severely decreased
G5	<15	Kidney failure

Abbreviations: CKD, chronic kidney disease; GFR, glomerular filtration rate.
*Relative to young adult level
In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

1.4.1: Evaluation of chronicity

1.4.1.1: In people with GFR <60 ml/min/1.73 m^2 (GFR categories G3a-G5) or markers of kidney damage, review past history and previous measurements to determine duration of kidney disease. (*Not Graded*)

- If duration is >3 months, CKD is confirmed. Follow recommendations for CKD.
- If duration is not >3 months or unclear, CKD is not confirmed. Patients may have CKD or acute kidney diseases (including AKI) or both and tests should be repeated accordingly.

60 mL/min/1.73 m^2

Justification of this cut-off

- Half of normal measured GFR but arbitrary
- Simplicity
- Because GFR < 60 mL/min/1.73 m² is associated with a higher mortality risk

Associations of kidney disease measures with mortality and end-stage renal disease in individuals with and without diabetes: a meta-analysis

Caroline S Fox, Kunihiro Matsushita, Mark Woodward, Henk J G Bilo, John Chalmers, Hiddo J Lambers Heerspink, Brian J Lee, Robert M Perkins, Peter Rossing, Toshimi Sairenchi, Marcello Tonelli, Joseph A Vassalotti, Kazumasa Yamagishi, Josef Coresh, Paul E de Jong, Chi-Pang Wen, Robert G Nelson, for the Chronic Kidney Disease Prognosis Consortium

Associations of kidney disease measures with mortality and end-stage renal disease in individuals with and without hypertension: a meta-analysis

Bakhtawar K Mahmoodi, Kunihiro Matsushita, Mark Woodward, Peter J Blankestijn, Massimo Cirillo, Takayoshi Ohkubo, Peter Rossing, Mark J Sarnak, Bénédicte Stengel, Kazumasa Yamagishi, Kentaro Yamashita, Luxia Zhang, Josef Coresh, Paul E de Jong, Brad C Astor, for the Chronic Kidney Disease Prognosis Consortium

ONLINE FIRST

Age and Association of Kidney Measures With Mortality and End-stage Renal Disease

BMJ 2013;346:f324 doi: 10.1136/bmj.f324 (Published 29 January 2013)

RESEARCH

Associations of estimated glomerular filtration rate and albuminuria with mortality and renal failure by sex: a meta-analysis

Association of estimated glomerular filtration rate and albuminuria with all-cause and cardiovascular mortality in general population cohorts: a collaborative meta-analysis

*Chronic Kidney Disease Prognosis Consortium**

Lancet 2010; 375: 2073–81

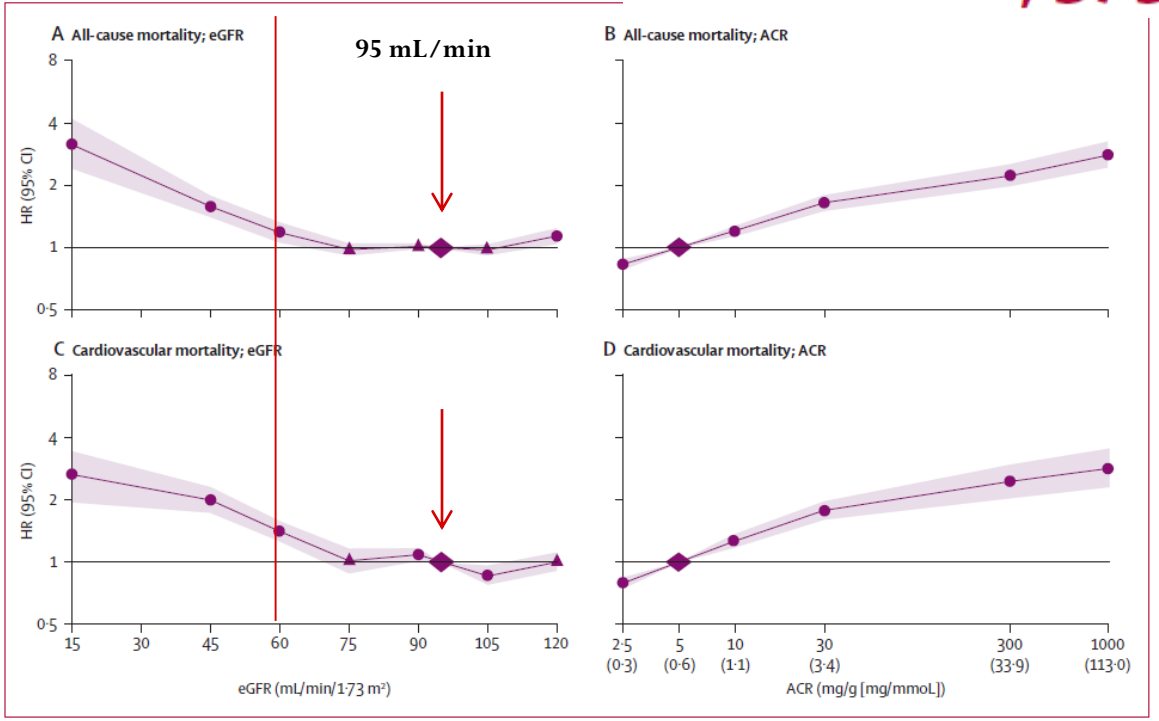


Figure 2: **Hazard ratios and 95% CIs for all-cause and cardiovascular mortality according to spline estimated glomerular filtration rate (eGFR) and albumin-to-creatinine ratio (ACR)**

Hazard ratios and 95% CIs (shaded areas) according to eGFR (A, C) and ACR (B, D) adjusted for each other, age, sex, ethnic origin, history of cardiovascular disease, systolic blood pressure, diabetes, smoking, and total cholesterol. The reference (diamond) was eGFR 95 mL/min/1·73 m² and ACR 5 mg/g (0·6 mg/mmol), respectively. Circles represent statistically significant and triangles represent not significant. ACR plotted in mg/g. To convert ACR in mg/g to mg/mmol multiply by 0·113. Approximate conversions to mg/mmol are shown in parentheses.

- 105,872 subjects from 14 studies with ACR
- 1,128,310 subjects from 7 studies with dipstick

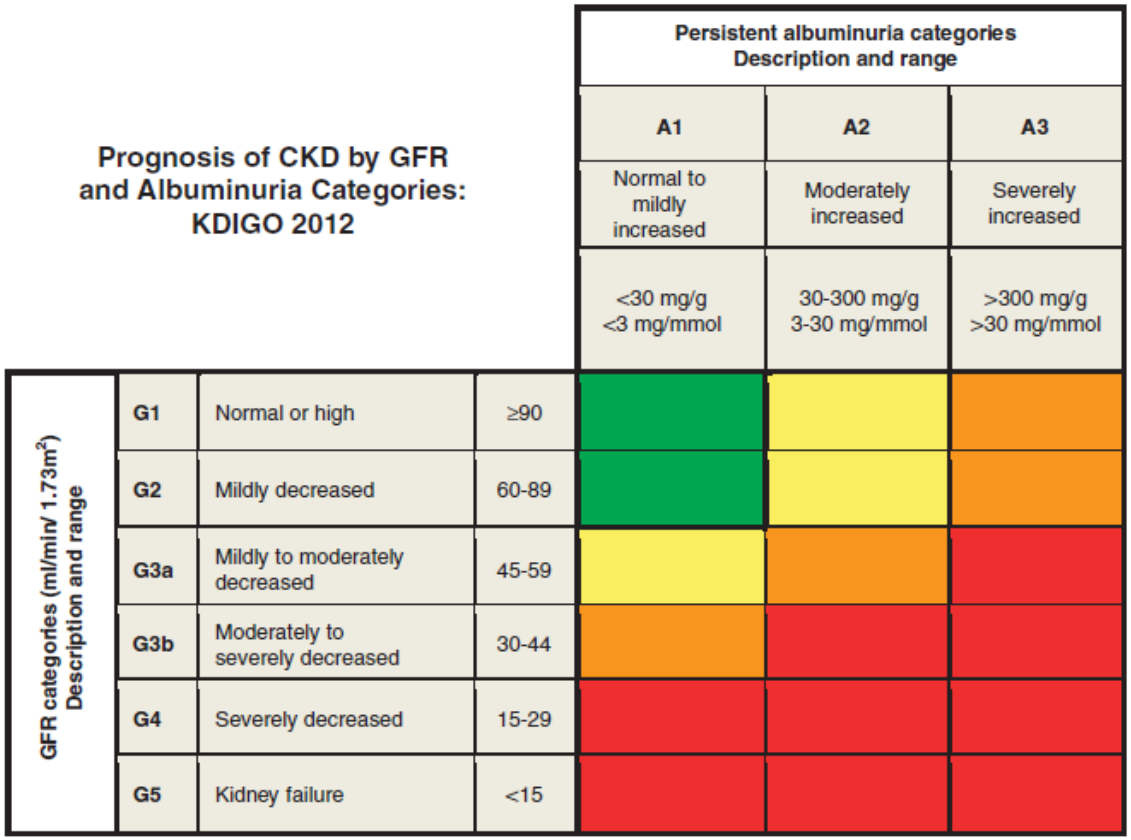


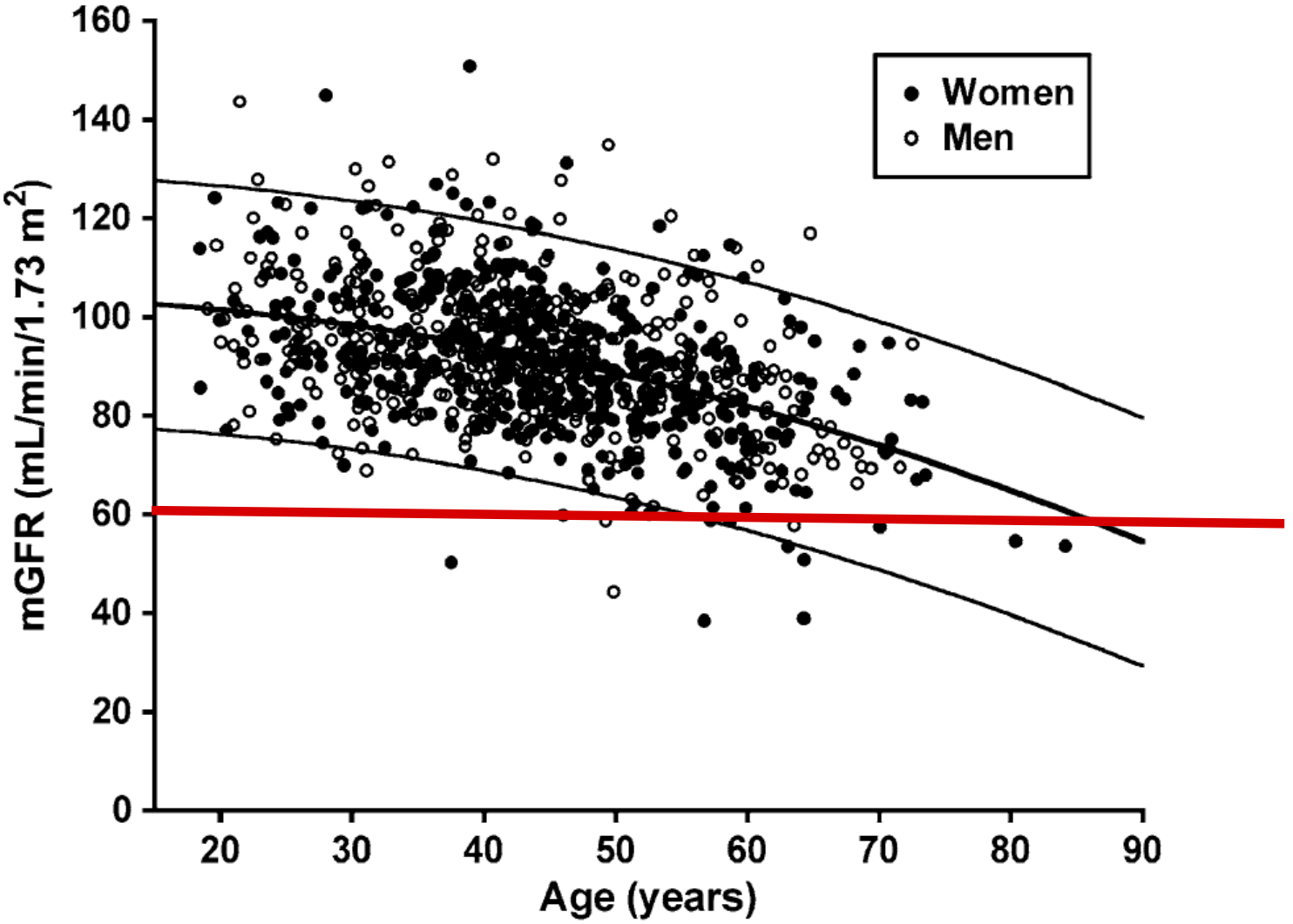
Figure 9| Prognosis of CKD by GFR and albuminuria category. Green, low risk (if no other markers of kidney disease, no CKD); Yellow, moderately increased risk; Orange, high risk; Red, very high risk. CKD, chronic kidney disease; GFR, glomerular filtration rate; KDIGO, Kidney Disease: Improving Global Outcomes. Modified with permission from Macmillan Publishers Ltd: *Kidney International*. Levey AS, de Jong PE, Coresh J, et al.[30] The definition, classification, and prognosis of chronic kidney disease: a KDIGO controversies conference report. Kidney Int 2011; 80: 17-28; accessed http://www.nature.com/ki/journal/v80/n1/full/ki2010483a.html

- Impressive sample but…
- Observational
- Estimated GFR
- Jaffe and non (or few) calibrated creatinine
- Not confirmed at 3 months
- Statistics

Why to focus on the elderly?

Why does it matter in the elderly?

- Aging is not a disease
- Aging is the highest risk factor for mortality
- Aging is « normally » associated with decline in functions
- …and this is also the case for GFR…



GFR measured by ^{51}Cr-EDTA in 904 living kidney donors

Blake GM et al, Int Urol Nephrol, 2013, p1445

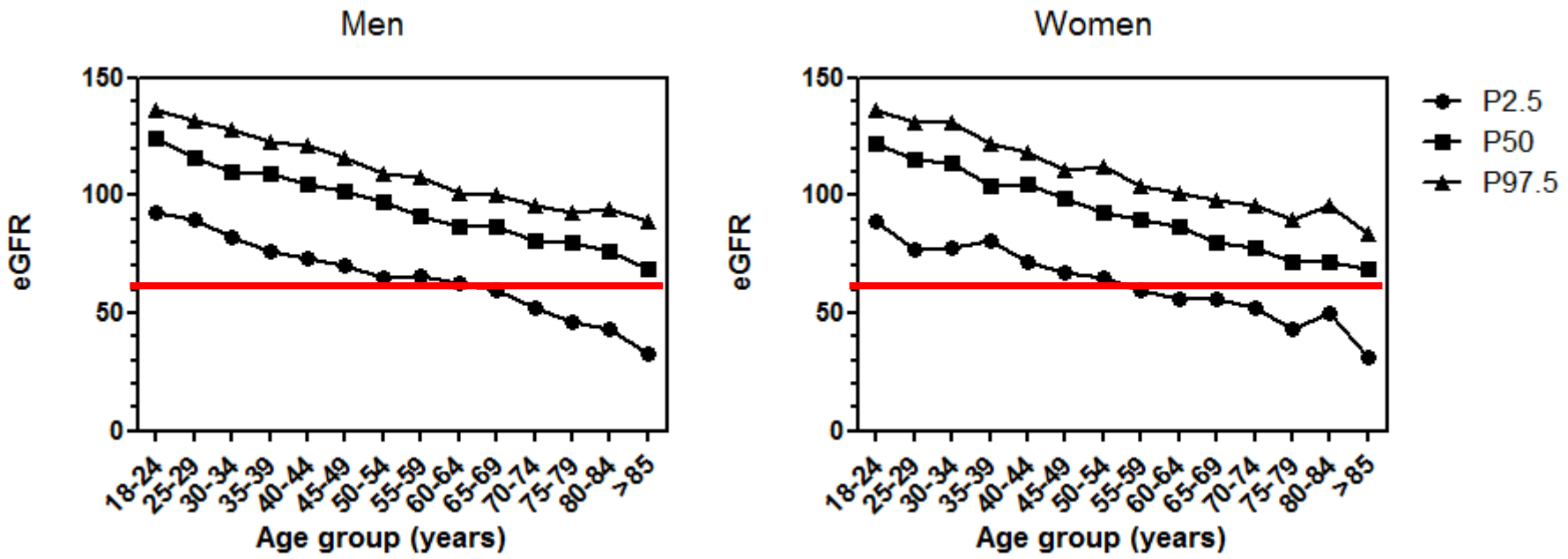
- Healthy population in the Netherlands
- CKD-EPI equation to estimate GFR
- No diabetes, no hypertension, no specific therapy, no albuminuria
- 1663 men 2073 women

Nephrol Dial Transplant (2011) 26: 3176–3181
doi: 10.1093/ndt/gfr003
Advance Access publication 16 February 2011

Introduction of the CKD-EPI equation to estimate glomerular filtration rate in a Caucasian population

Jan A.J.G. van den Brand[1], Gerben A.J. van Boekel[1], Hans L. Willems[2], Lambertus A.L.M. Kiemeney[3], Martin den Heijer[3,4] and Jack F.M. Wetzels[1]

[1]Department of Nephrology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands, [2]Department of Laboratory Medicine, Radboud University Medical Centre, Nijmegen, The Netherlands, [3]Department of Epidemiology, Biostatistics and Health Technology Assessment, Radboud University Medical Centre, Nijmegen, The Netherlands and [4]Department of Endocrinology, Radboud University Medical Centre, Nijmegen, The Netherlands


Men
Women
eGFR
150
100
50
0
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
>85
Age group (years)
P2.5
P50
P97.5

So...

- A unique cut-off overestimates CKD in the elderly

But…

- What about the prognostic argument?
- Is it relevant from an epidemiological point of view?
- Is it nihilism?
- Do we have an alternative?

Justifying the choice of an equation and/or a threshold because a better prognostic performance is questionable and confusing

Comparison of Risk Prediction Using the CKD-EPI Equation and the MDRD Study Equation for Estimated Glomerular Filtration Rate

Kunihiro Matsushita, MD, PhD
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Jonathan R. Emberson, PhD
Tazeen H. Jafar, MD, MPH
Sun Ha Jee, PhD, MHS
Kevan R. Polkinghorne, FRACP, PhD
Anoop Shankar, MD, MPH, PhD
David H. Smith, RPh, PhD
Marcello Tonelli, MD, SM
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Chi-Pang Wen, MD, DrPH
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Ron T. Gansevoort, MD, PhD
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for the Chronic Kidney Disease Prognosis Consortium

Context The Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation more accurately estimates glomerular filtration rate (GFR) than the Modification of Diet in Renal Disease (MDRD) Study equation using the same variables, especially at higher GFR, but definitive evidence of its risk implications in diverse settings is lacking.

Objective To evaluate risk implications of estimated GFR using the CKD-EPI equation compared with the MDRD Study equation in populations with a broad range of demographic and clinical characteristics.

Design, Setting, and Participants A meta-analysis of data from 1.1 million adults (aged ≥18 years) from 25 general population cohorts, 7 high-risk cohorts (of vascular disease), and 13 CKD cohorts. Data transfer and analyses were conducted between March 2011 and March 2012.

Main Outcome Measures All-cause mortality (84 482 deaths from 40 cohorts), cardiovascular mortality (22 176 events from 28 cohorts), and end-stage renal disease (ESRD) (7644 events from 21 cohorts) during 9.4 million person-years of follow-up; the median of mean follow-up time across cohorts was 7.4 years (interquartile range, 4.2-10.5 years).

Results Estimated GFR was classified into 6 categories (≥90, 60-89, 45-59, 30-44, 15-29, and <15 mL/min/1.73 m^2) by both equations. Compared with the MDRD Study equation, 24.4% and 0.6% of participants from general population cohorts were reclassified to a higher and lower estimated GFR category, respectively, by the CKD-EPI equation, and the prevalence of CKD stages 3 to 5 (estimated GFR <60 mL/min/1.73 m^2) was reduced from 8.7% to 6.3%. In estimated GFR of 45 to 59 mL/min/1.73 m^2 by the MDRD Study equation, 34.7% of participants were reclassified to estimated GFR of 60 to 89 mL/min/1.73 m^2 by the CKD-EPI equation and had lower incidence rates (per 1000 person-years) for the outcomes of interest (9.9 vs 34.5 for all-cause mortality, 2.7 vs 13.0 for cardiovascular mortality, and 0.5 vs 0.8 for ESRD) compared with those not reclassified. The corresponding adjusted hazard ratios were 0.80 (95% CI, 0.74-0.86) for all-cause mortality, 0.73 (95% CI, 0.65-0.82) for cardiovascular mortality, and 0.49 (95% CI, 0.27-0.88) for ESRD. Similar findings were observed in other estimated GFR categories by the MDRD Study equation. Net reclassification improvement based on estimated GFR categories was significantly positive for all outcomes (range, 0.06-0.13; all $P < .001$). Net reclassification improvement was similarly positive in most subgroups defined by age (<65 years and ≥65 years), sex, race/ethnicity (white, Asian, and black), and presence or absence of diabetes and hypertension. The results in the high-risk and CKD cohorts were largely consistent with the general population cohorts.

Conclusion The CKD-EPI equation classified fewer individuals as having CKD and more accurately categorized the risk for mortality and ESRD than did the MDRD Study equation across a broad range of populations.

JAMA. 2012;307(18):1941-1951 www.jama.com

GLOMERULAR FILTRATION RATE (GFR) is used in the diagnosis of chronic kidney disease (CKD)[1,2] and is an independent predictor of all-cause and cardiovascular mortality and kidney failure in a wide range of populations.[3-6] Clinical guidelines recommend reporting estimated GFR when serum creatinine level is measured[1,2]; 84% of US laboratories report estimated GFR.[7] Although the Modification of Diet in Renal Disease (MDRD) Study equation is recommended for estimating GFR,[1,2,8,9] the Chronic Kidney

Open Access Research

BMJ Open

Glomerular filtration rate (GFR) during and after STEMI: a single-centre, methodological study comparing estimated and measured GFR

Dimitrios Venetsanos, Joakim Alfredsson, Mårten Segelmark, Eva Swahn, Sofia Sederholm Lawesson

N=40

Table 4 Correlation, bias, precision and accuracy (P30) of prediction equations to estimate relative mGFR (mL/min/1.73 m^2)

At discharge	Correlation (R)	Bias, median error (%)	Precision (IQR), mL/min/1.73 m^2	P30 (95% CI)
CG	0.73	−1.2 (−1.3)	22.5	75.0% (62% to 88%)
MDRD-IDMS	0.78	−0.8 (−1.3)	17.9	82.5% (70.5% to 94.5%)
CKD-EPI	0.81	0.9 (1.5)	17.1	82.5% (70.5% to 94.5%)
rG-CystC	0.89	−12.2 (−17.8)	14.8	80.0% (68% to 92%)

Bias was defined as the median percentage error between eGFR and mGFR; positive values indicate an overestimation of mGFR. Precision was assessed as the IQR expressed in mL/min/1.73 m^2 of the difference eGFR—mGFR. Accuracy within 30% (P30) was the percentage of estimates within 30% of mGFR. Correlation between eGFR and mGFR was reported as correlation coefficients (R).
CG, Cockcroft-Gault; CKD-EPI, Chronic Kidney Disease-Epidemiology Collaboration; eGFR, estimated glomerular filtration rate; mGFR, measured GFR; MDRD-IDMS, Modification of Diet in Renal Disease—Isotope Dilution Mass Spectrometry; rG-CystC, relative Grubb cystatin C.

Cockcroft is the worst to estimate mGFR

Open Access Research

BMJ Open

Prevalence and prognostic impact of chronic kidney disease in STEMI from a gender perspective: data from the SWEDEHEART register, a large Swedish prospective cohort

Sofia Sederholm Lawesson,[1] Joakim Alfredsson,[1] Karolina Szummer,[2] Mats Fredrikson,[3] Eva Swahn[1]

N=37,991

Even though the two renal function equations both incorporate age in the equation, they handle the variables differently mathematically. In the present study, we could show that prognosis following an MI, both short-term and long term, is better described by the CG formula in men and women, and this is consistent with previous studies.[9]

- Estimation GFR
- Prediction of outcomes

- DIFFERENT TOPICS

Back to the « prognostic » argument

ORIGINAL CONTRIBUTION

ONLINE FIRST

Age and Association of Kidney Measures With Mortality and End-stage Renal Disease

Stein I. Hallan, MD, PhD
Kunihiro Matsushita, MD, PhD
Yingying Sang, MS
Bakhtawar K. Mahmoodi, MD, PhD
Corri Black, MBChB, MSc, FFPH
Areef Ishani, MD, MS
Nanne Kleefstra, MD, PhD
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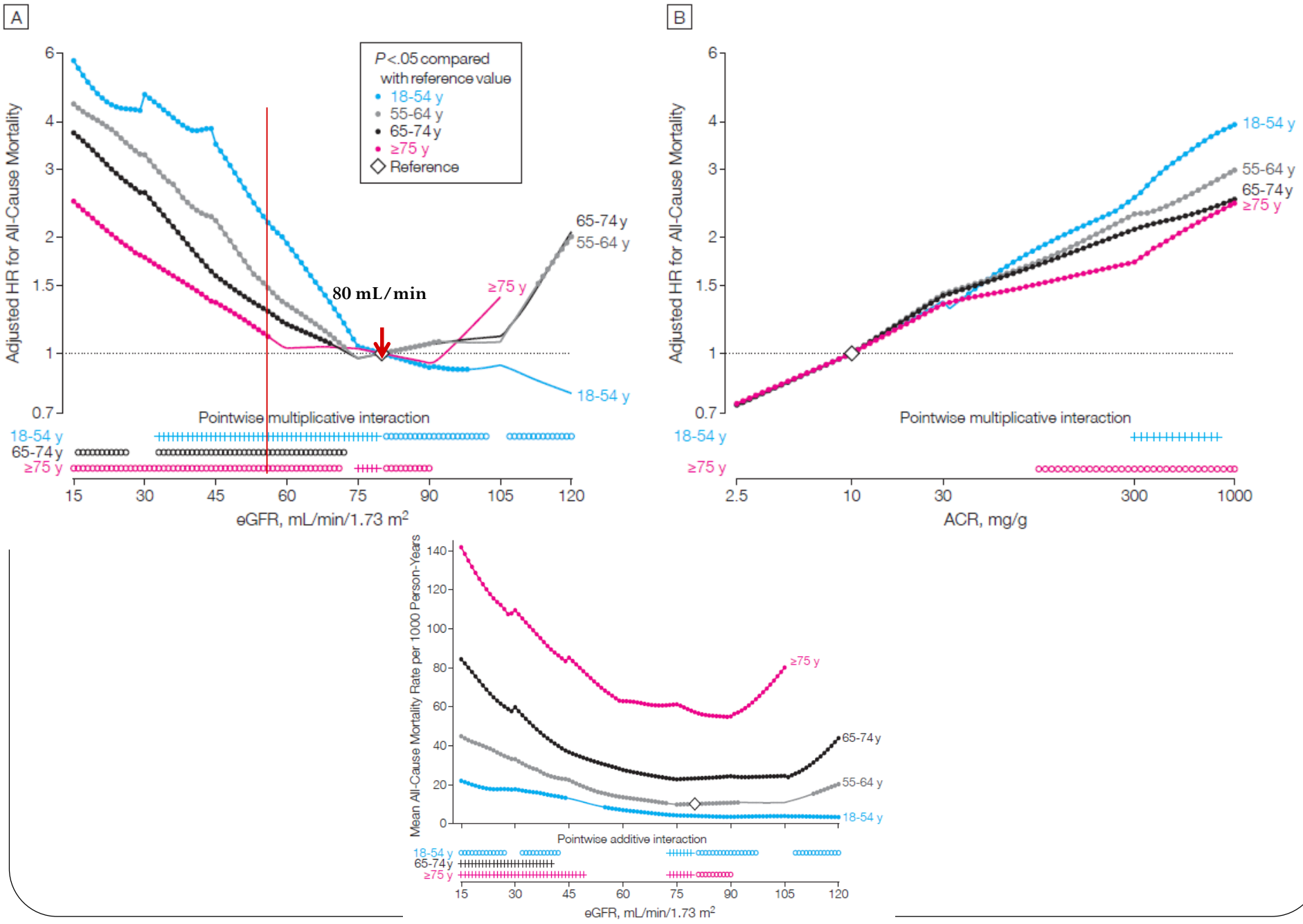
Brad C. Astor, PhD, MPH
Ron T. Gansevoort, MD, PhD
Adeera Levin, MD
Chi-Pang Wen, MD, MPH, DrPH
Josef Coresh, MD, PhD
for the Chronic Kidney Disease Prognosis Consortium

JAMA. 2012;308(22):2349-2360

N=2,051,044
33 general or high risk cohorts
13 CKD cohorts
Mean follow-up: 5.3 years

Figure 1. Adjusted Hazard Ratios (HRs) for All-Cause Mortality and Mean Mortality Rates According to eGFR and ACR Within Each Age Category



Once again…

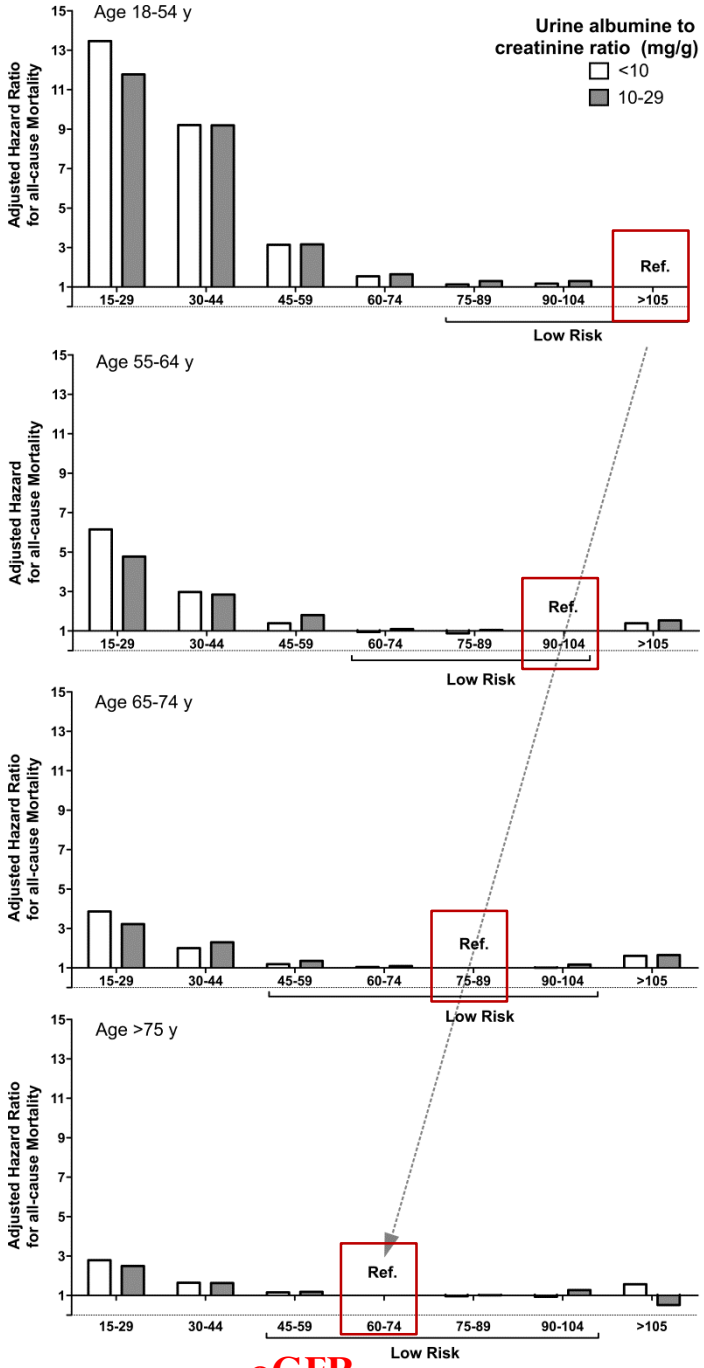
- *Impressive sample but…*
- *Estimated GFR*
- *Jaffe and non (or few) calibrated creatinine*
- *Not confirmed at 3 months*
- Age is a variable of the equation

Age 18-54 y =>

Age 55-64 y =>

Age 65-74 y =>

Age >75 y =>



eGFR

JAMA. 2012;308(22):2349-2360

Courtesy from Andrew Rule, Mayo Clinic
Adv Chronic Kidney Dis. 2016, 23, p19

Delanaye P, Clin Biochem Rev, 2016, 37, p17

So...

- A unique cut-off overestimates CK**D** in the elderly

But…

- **What about the prognostic argument?**

It can be challenged…

Stage 3A (without other kidney damage) is not CKD in the elderly

- Is it relevant from an epidemiological point of view?
- Is it nihilism?
- Do we have an alternative?

Is it relevant or purely semantic?

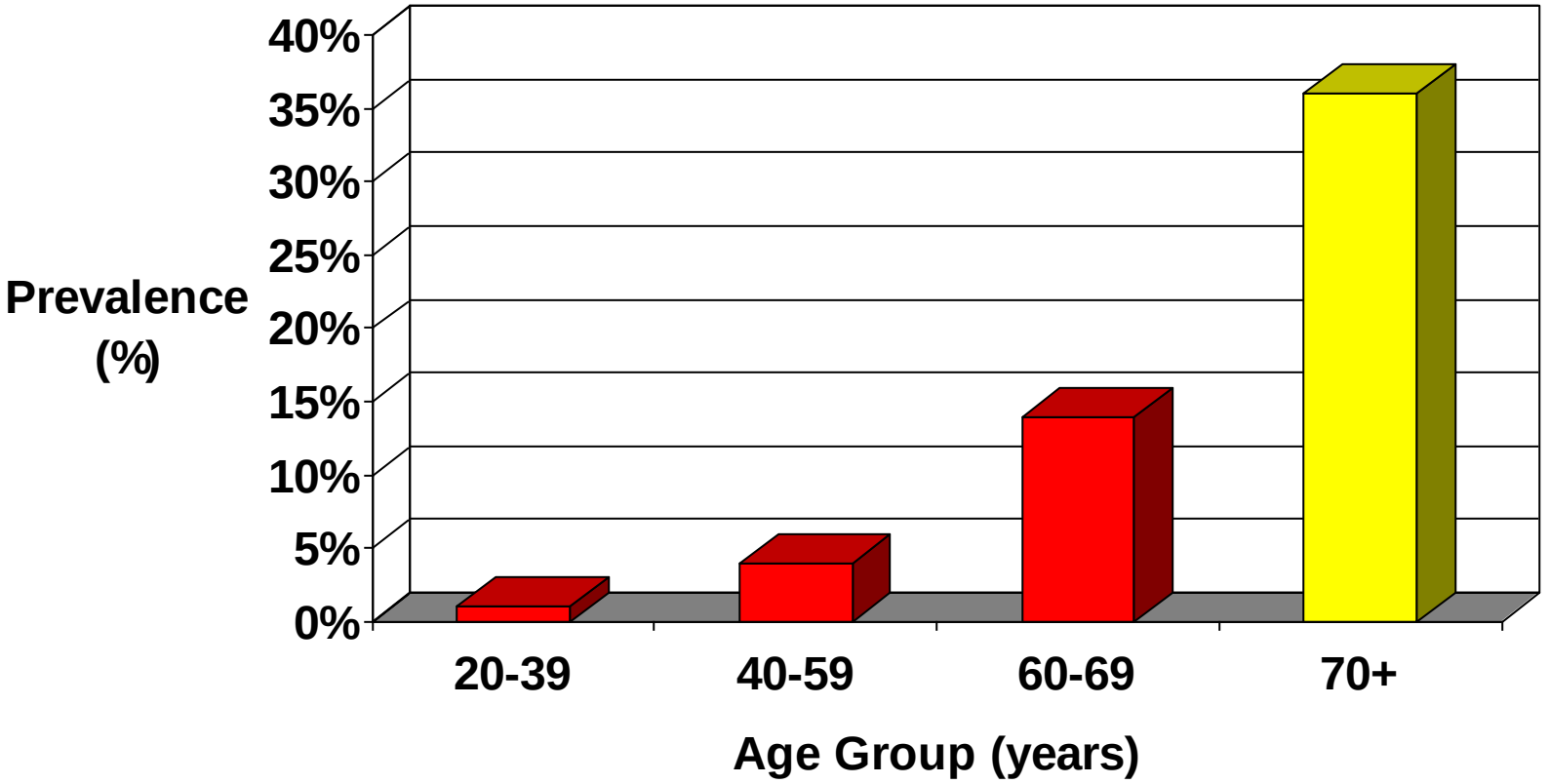
CKD prevalence: 11.5%

CKD prevalence based on eGFR only: 4.8%

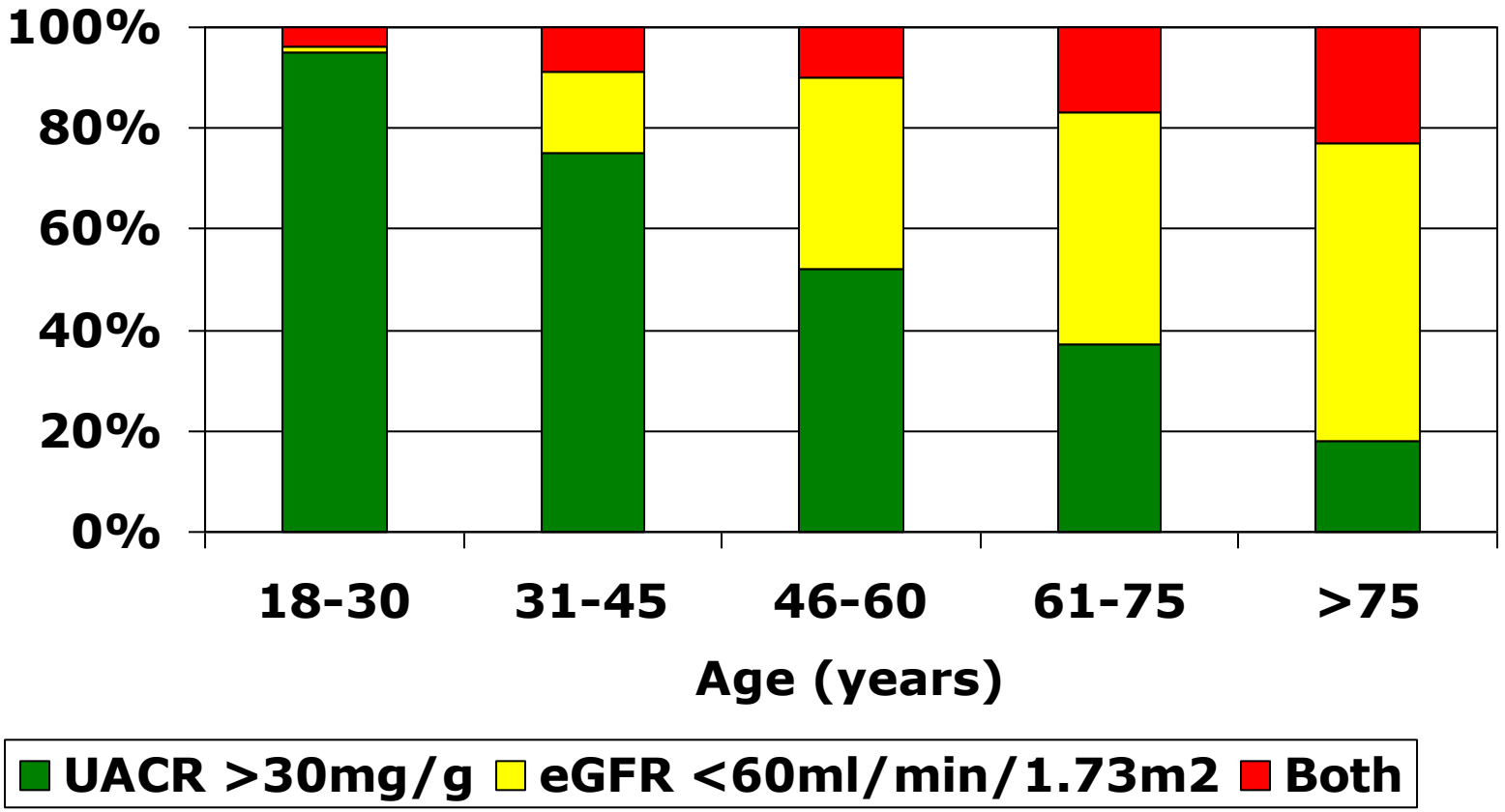
Percentage of US Population by eGFR and Albuminuria Category: KDIGO 2012 and NHANES 1999-2006

GFR categories (ml/min/ 1.73m²) Description and range			Persistent albuminuria categories Description and range: A1 Normal to mildly increased <30 mg/g <3 mg/mmol	A2 Moderately increased 30-300 mg/g 3-30 mg/mmol	A3 Severely increased >300 mg/g >30mg/mmol	
G1	Normal or high	≥90	55.6	1.9	0.4	57.9
G2	Mildly decreased	60-89	32.9	2.2	0.3	35.4
G3a	Mildly to moderately decreased	45-59	3.6	0.8	0.2	4.6
G3b	Moderately to severely decreased	30-44	1.0	0.4	0.2	1.6
G4	Severely decreased	15-29	0.2	0.1	0.1	0.4
G5	Kidney failure	<15	0.0	0.0	0.1	0.1
			93.2	5.4	1.3	100.0

Prevalence of stage 3 according to age in NHANES study



Characteristics of CKD populations



Courtesy by RJ Glassock, Adapted from James MT, et al Lancet 375:1296, 2010

Data from Belgium (Liège)

Delanaye *et al. BMC Nephrology* 2013, **14**:57
http://www.biomedcentral.com/1471-2369/14/57

BMC Nephrology

RESEARCH ARTICLE Open Access

Creatinine-or cystatin C-based equations to estimate glomerular filtration in the general population: impact on the epidemiology of chronic kidney disease

Pierre Delanaye[1*], Etienne Cavalier[2], Olivier Moranne[3], Laurence Lutteri[2], Jean-Marie Krzesinski[1] and Olivier Bruyère[4]

CKD screening (bus) on a voluntary basis, >50 y
n=4189,
Mean age:63±7 y

- If CKD is defined as eGFR<60 mL/min/1.73 m², CKD prevalence is 9.81%

- If CKD is defined as eGFR<60 mL/min/1.73 m² for younger than 65 y AND eGFR<45 mL/min/1.73 m² for older than 65 y, CKD prevalence is 4.37%

So...

- A unique cut-off overestimates CK**D** in the elderly

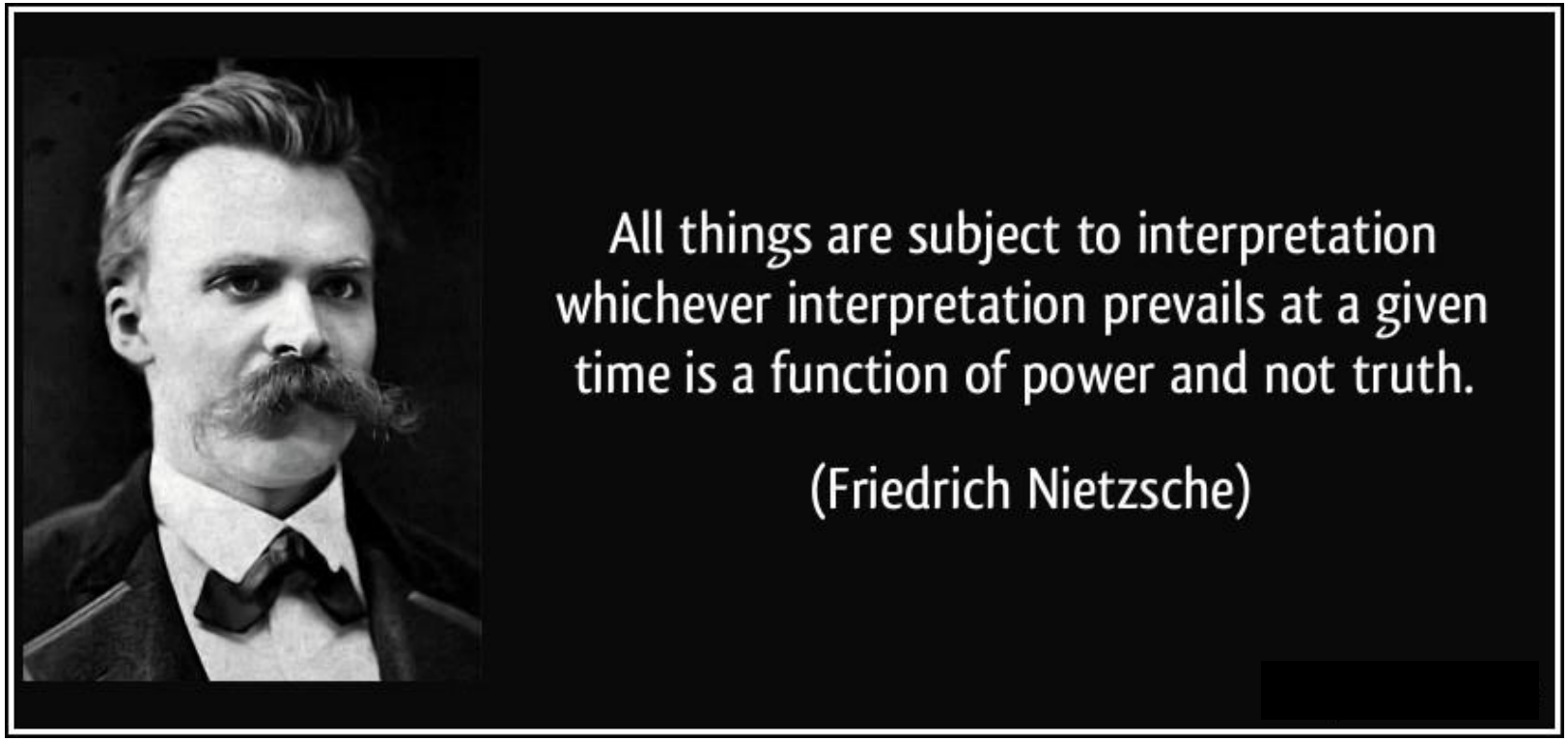
But…

- What about the prognostic argument?
- **Is it relevant from an epidemiological point of view?**

The impact on the epidemiology (epidemic?) of CKD is high!

- Is it nihilism?
- Do we have an alternative?

Is it nihilism?



Research

Original Investigation

Interpreting Treatment Effects From Clinical Trials in the Context of Real-World Risk Information

End-Stage Renal Disease Prevention in Older Adults

Ann M. O'Hare, MA, MD; John R. Hotchkiss, MD; Manjula Kurella Tamura, MD, MPH; Eric B. Larson, MD, MPH; Brenda R. Hemmelgarn, MD, PhD; Adam Batten, BA; Thy P. Do, PhD; Kenneth E. Covinsky, MD, MPH

JAMA Intern Med. 2014;174(3):391-397.

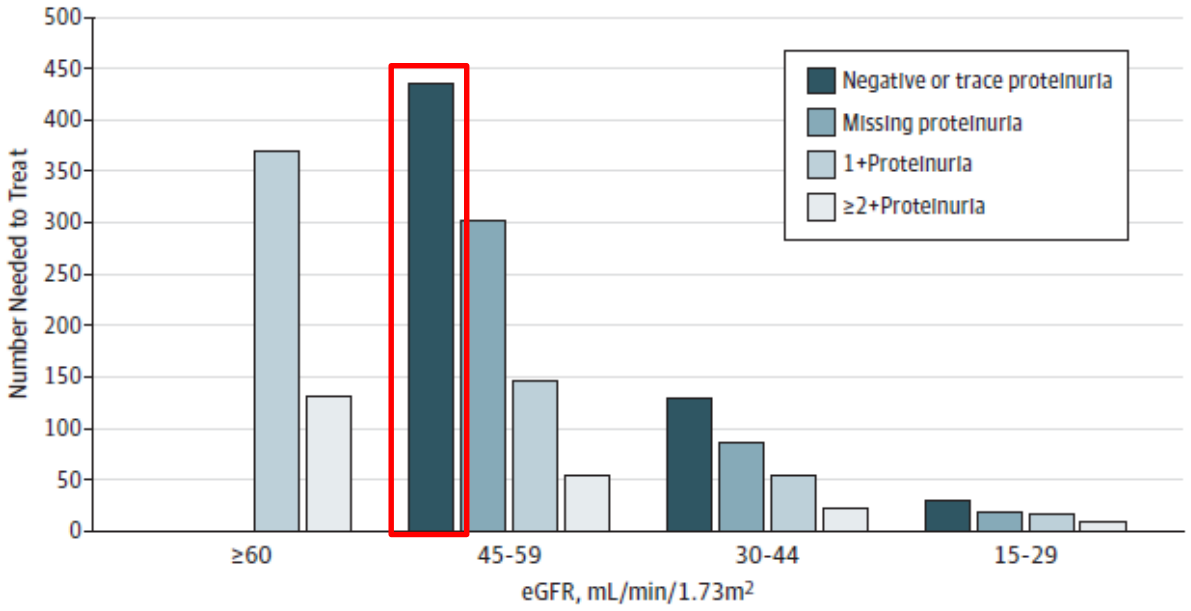
VA
Age>70 y
Mean age: 77.8 ± 4.6 y
eGFR: 48 ± 11.7 ml/min/1.73 m²
n=371.470

Protective effect of ACE inhibitors to prevent ESRD

Table 1. Entry Criteria and Outcomes of Major Trials Reporting a Protective Effect of ACE Inhibitors or ARBs on Progression to ESRD

				Entry Criteria				Mortality, %		ESRD, %		ESRD Outcomes[a]		
Source	No. of Patients	Intervention	Mean FU, y	Age, y	DM	Renal Function	Dipstick Proteinuria Measurement	Control Group	INT Group	Control Group	INT Group	RRR, %	ARR, %	NNT
Brenner et al,[18] 2001	1513	Losartan potassium vs placebo	3.4	31-70	Yes	Scr level, 1.3-3.0 mg/dL	ACR >300 mg/g	20.3	21.0	25.5	19.6	23.0	5.9	17
Lewis et al,[19] 1993	409	Captopril vs placebo	3.0	18-49	Yes	Scr level, ≤2.5 mg/dL	Urine protein level, ≥500 mg/g	6.9	3.9	15.4	9.7	37.0	5.7	18
Ruggenenti et al,[20] 1999	352	Ramipril vs placebo	2.6	18-70	Type 1 DM excluded	CrCl, 20-70 mL/min	Stratum 1: urine protein level ≥1 and <3 g/d	0	1.0	20.7	9.1	56.0	11.6	9
Agodoa et al,[21] 2001	1094	Ramipril vs amlodipine besylate	3.0	18-70	No	GFR, 20-65 mL/min/ 1.73 m^2	Urinary ratio of protein to creatinine levels, ≤2.5 mg/mg	6.0	4.1	14.8	10.8	27.0	4.0	25

Figure. Number Needed to Treat (NNT) to Prevent 1 Case of End-Stage Renal Disease (ESRD) Over 10 Years



The NNT is calculated assuming a 30% reduction in relative risk over 10 years.

So…

- A unique cut-off overestimates CK**D** in the elderly

But…

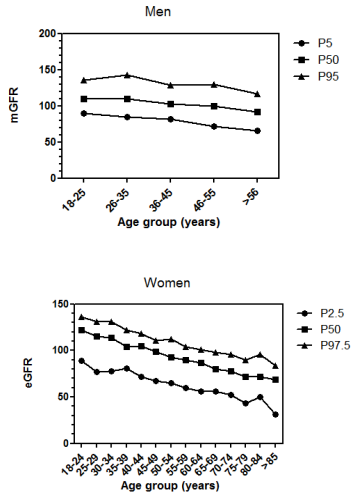
- What about the prognostic argument?
- Is it relevant from an epidemiological point of view?
- **Is it nihilism?**

No, but to include the « true » CKD patients in future RCT and prevent disillusions if healthy subjects are actually included

- Do we have an alternative?

Alternatives

- Percentiles (like pediatrics)



- Too complex…
- …maybe not with help from labs…

Alternatives

- Stage 3A (without any kidney damage) is not CKD anymore if age > 65 years
- Stage 3B and 45 mL/min become the pathological level if age > 65 years

Prognosis of CKD by GFR and albuminuria category

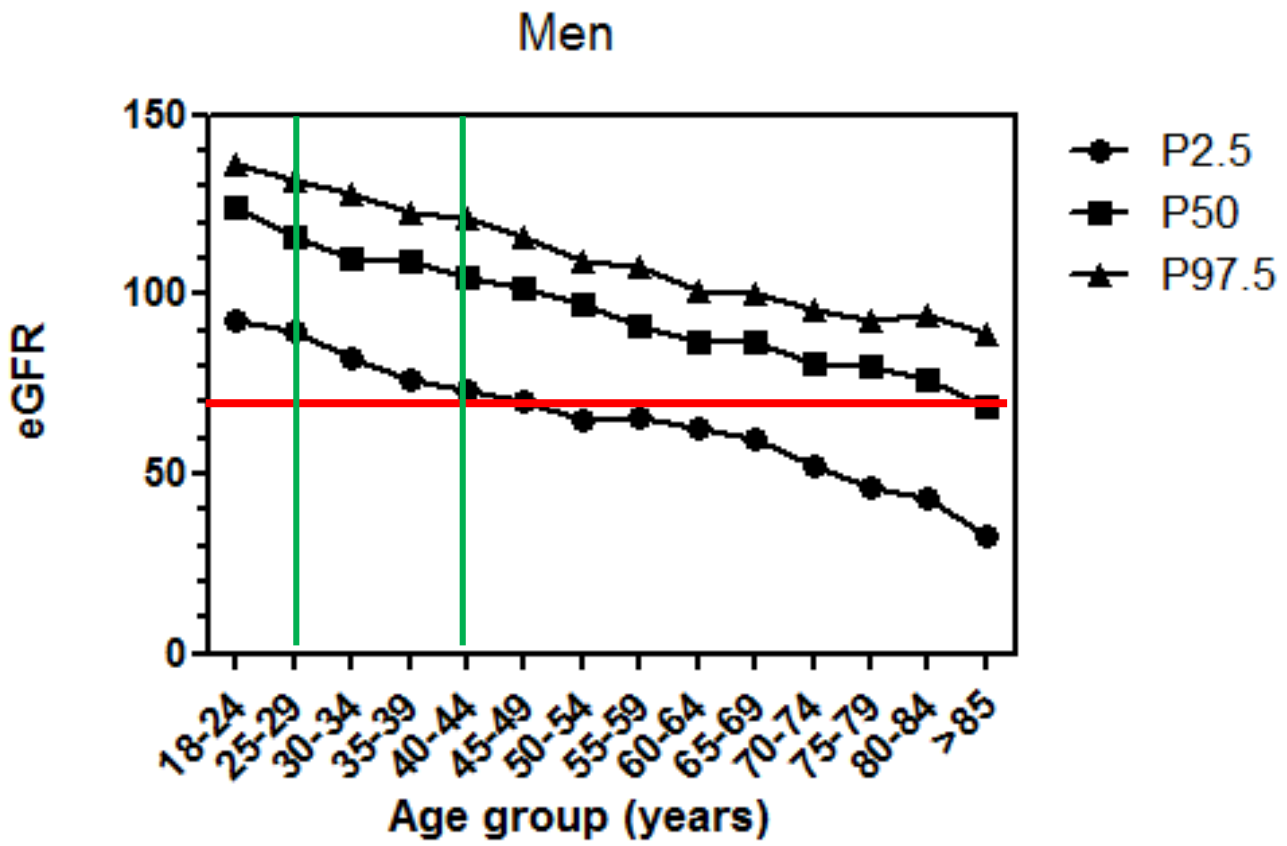
Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012

GFR categories (ml/min/ 1.73 m²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-300 mg/g 3-30 mg/mmol	>300 mg/g >30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59	>65 y / ≤65 y		
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	<15			

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk.

With the unique threshold…

- We miss also young CKD patients…
- A 25 years old patient with an eGFR at 70 mL/min or 65 mL/min: is it really normal?


Men
150
100
50
0
eGFR
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
>85
Age group (years)
P2.5
P50
P97.5

- We also propose that eGFR threshold for CKD is 75 mL/min for subjects younger than 40 y

Pediatr Nephrol (2015) 30:821–828
DOI 10.1007/s00467-014-3002-5

ORIGINAL ARTICLE

Abnormal glomerular filtration rate in children, adolescents and young adults starts below 75 mL/min/1.73 m^2

Hans Pottel · Liesbeth Hoste · Pierre Delanaye

www.kidney-international.org clinical investigation

Chronic kidney disease, hypertension, diabetes, and obesity in the adult population of Morocco: how to avoid "over"- and "under"-diagnosis of CKD

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- Two Moroccan towns
- 26-70y, n=10,524
- Creatinine and disptick
- Chronicity confirmed at 3 months

Chronicity of decreased eGFR was investigated in 78.9% of the subjects ($n = 285$) with CKD3A, 3B, 4, and 5. The remaining were deceased or lost to follow-up. The majority (75%) of false positives were found in the subjects with CKD3A. Thirty-two percent of the CKD3A subjects and 7.4% of the CKD3B subjects had an eGFR >60 ml/min/1.73 m^2 when reinvestigated after 3 months or longer. Subjects with CKD4 and 5 ($n = 51$) remained in these low eGFR categories, and 11 were on dialysis, died, or lost to follow-up after 3 months or longer.

32% false + in CKD3a

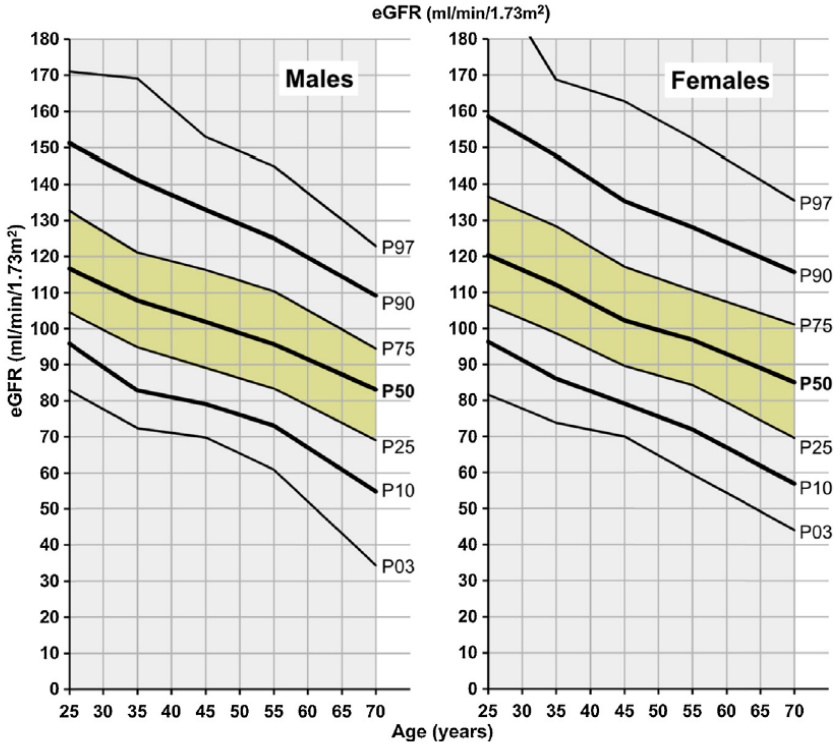

Fig. 2. Estimated glomerular filtration rate (eGFR) distribution showing the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentile within the gender and age categories ($n = 10{,}524$). The "normal" decline in eGFR of the study population is 0.75 mL/min/1.73 m^2 per year.
From [22] with permission.

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Editorial Comment

EDITORIAL COMMENT

Epidemiology of chronic kidney disease: think (at least) twice!

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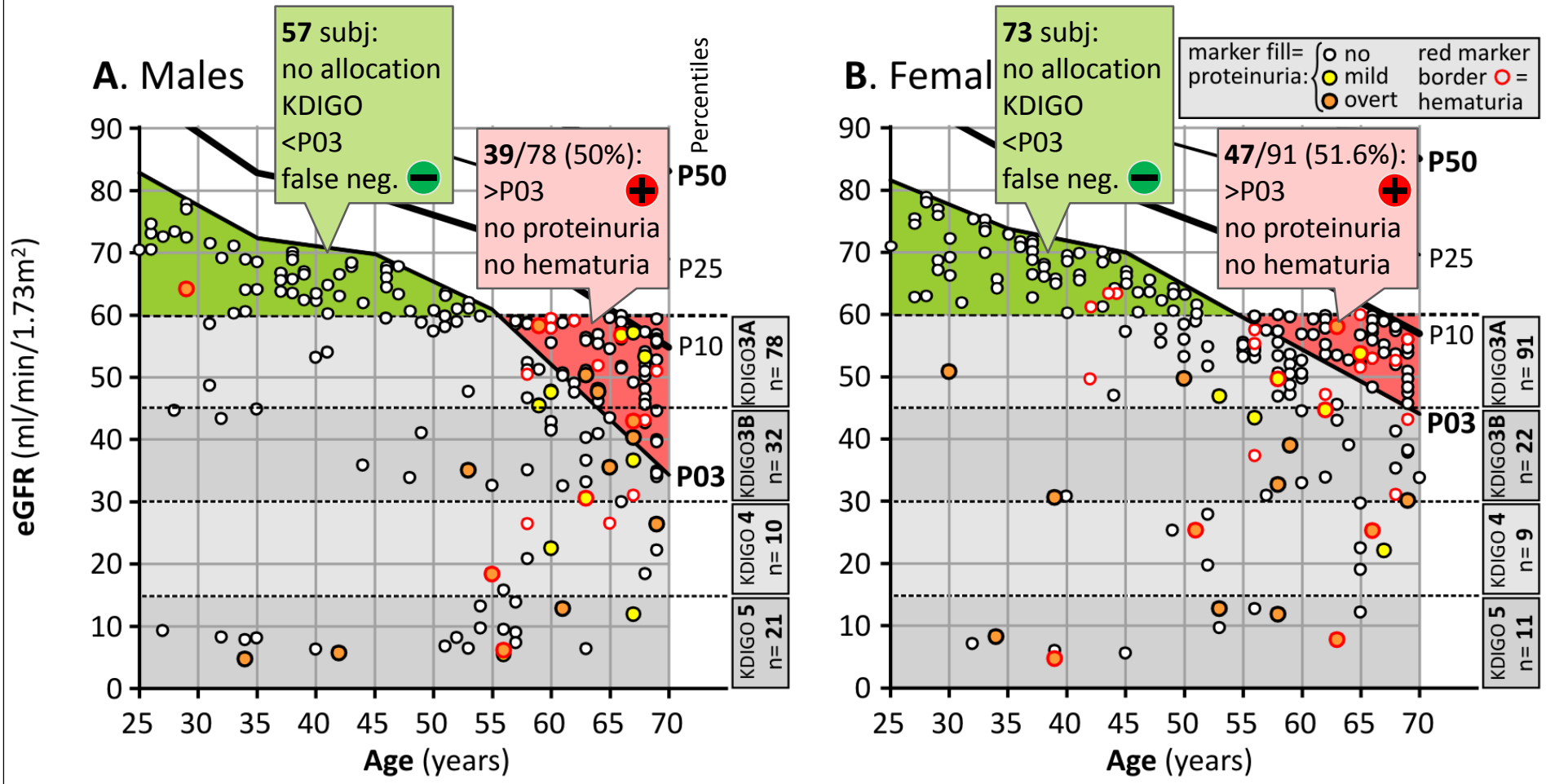
False negatives and false positives by using the arbitrary threshold of eGFR for classifying CKD3-5



Conclusions

- Defining normality is not easy
- There is still debate to know if elderly with decreased GFR (and no albuminuria) suffer from ***Disease***
- Decreasing GFR with aging is physiological
- Age-calibration for CKD definition could help for

  - a better apprehension of the CKD epidemiology
  - is considered in hypertension (see JNC-8 guidelines)
  - a better focus on diseased patients for future interventional RCT
  - reassure the elderly subject with "normal" decreased GFR without albuminuria, diabetes nor HTA
  - in the elderly, "*primum non nocere*" is important

- KDIGO should evolve !

VIEWPOINT

An Age-Calibrated Classification of Chronic Kidney Disease

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Should current guidelines be changed to require age calibration for diagnosis and classification of chronic kidney disease? —Yes.

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VIEWPOINT

Chronic Kidney Disease in Older People

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Should current guidelines be changed to rec calibration for diagnosis and classification o kidney disease? —No.

"There are no norms. All people are exceptions to a rule that doesn't exist."
— Fernando Pessoa

Thank you for your attention