

Performance of the European Kidney Function Consortium (EKFC) creatinine-based equation in American cohorts

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BACKGROUND

The new creatinine-based European Kidney Function Consortium (EKFC) equation has been developed and validated in datasets of European subjects. This equation is based on rescaled creatinine, with the rescaling factor (Q-value) which is the median normal value of serum creatinine in a given population. The EKFC equation performed well across the whole age spectrum. However, the validation was limited in Black and non-Black Americans.

METHODS

Cross-sectional analysis with separate pooled datasets for validation from 9 US research and clinical studies with measured GFR, age, sex, and self-reported race available. Two strategies were considered with population specific Q-values in Black and non-Black men and women (EKFC_{PS}) or a race-free Q value (EKFC_{RF}) which is the mean of the Q values obtained in Black and non-black populations. Performance (bias, precision and accuracy within 30% (P30) was compared with the CKD-EPI₂₀₂₁ equation.

Description of the cohorts						
Cohorts	Sample Size	Age (years)	Measured GFR (mL/min/1.73m ²)	% of women	% of Black subjects	Proportion of individuals with urinary clearance data available
All	12,854	56.0 [22.1]	37 [46]	44.3	21.7	93.2
AASK	1,844	54.5 [16.0]	57 [35]	35.9	100	100
ALTOLD	381	43.3 [19.0]	97 [18]	65.1	1.8	0
CRIC	1,194	59.0 [17.7]	48 [28]	44.4	44.7	100
CRISP	217	34.0 [13.0]	93 [34]	59.0	11.1	100
DCCT/EDIC	809	31.0 [9.0]	119 [25]	47.8	1.4	100
GENOA/EKFC	1,093	66.1 [12.1]	80 [27]	56.6	0	100
Mayo Clinic	5,069	59.0 [21.0]	50 [40]	44.6	2.0	100
MDRD	1,756	51.0 [21.0]	36 [29]	39.5	12.4	100
PERL	491	52.0 [15.0]	70 [25]	33.6	10.8	0

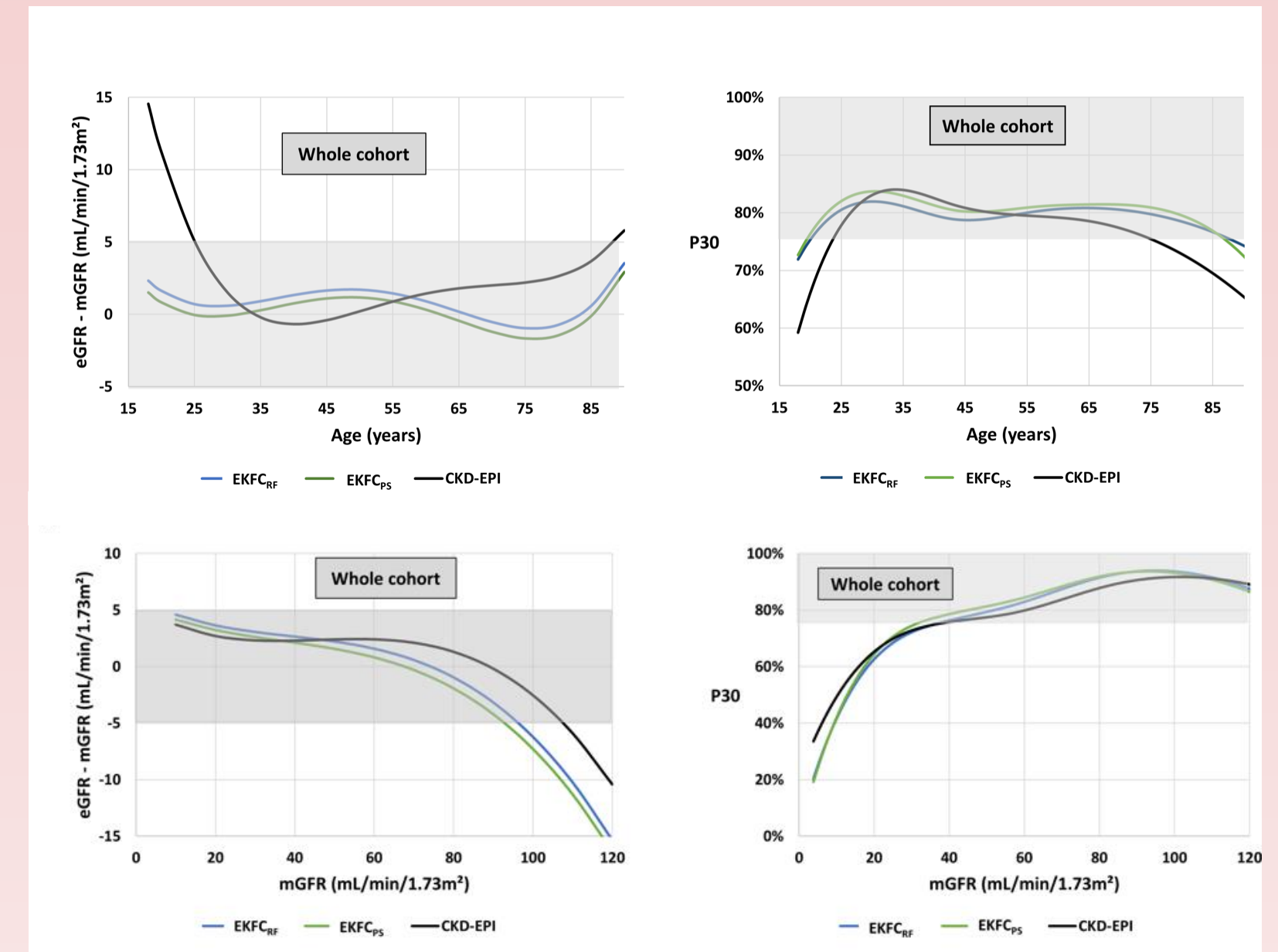
Results are expressed in % or Median [interquartile range]. GFR: glomerular filtration rate

RESULTS

In the whole adult population (n=12,854), the EKFC_{PS} equation showed no statistical bias (0.14 95%CI [-0.07;0.35] mL/min/1.73m²), and the statistical bias of the EKFC_{RF} (0.74 [0.51;0.94] mL/min/1.73m²) was closer to zero than the CKD-EPI₂₀₂₁ equation (1.22 [0.99;1.47] mL/min/1.73m²). The percentage of estimated GFR within 30% of measured GFR was similar for CKD-EPI₂₀₂₁ (79.2% [78.5%-79.9%]) and EKFC_{RF} (80.1% [79.4%-80.7%]) but improved with the EKFC_{PS} equation (81.1% [80.5%-81.8%]).

Performance of the CKD-EPI ₂₀₂₁ and EKFC equations to estimate glomerular filtration rate			
	CKD-EPI ₂₀₂₁	EKFC _{RF}	EKFC _{PS}
Whole population, n=12,854			
Median bias (95% CI)	1.22 [0.99; 1.47]	0.74 [0.51; 0.94]	0.14 [-0.07; 0.35]
IQR (Q1; Q3)	16.0 [-6.6; 9.4]	15.7 [-7.6; 8.0]	15.4 [-8.1; 7.3]
P30 (95% CI)	79.2 [78.5; 79.9]	80.1 [79.4; 80.7]	81.1 [80.5; 81.8]
P20 (95% CI)	61.6 [60.7; 62.4]	62.4 [61.6; 63.3]	63.7 [62.9; 64.5]
Non-Black population, n=10,064			
Median bias (95% CI)	2.78 [2.55; 3.04]	1.93 [1.67; 2.18]	0.85 [0.62; 1.09]
IQR (Q1; Q3)	16.1 [-4.8; 11.3]	15.6 [-6.4; 9.3]	15.6 [-7.6; 8.0]
P30 (95% CI)	78.3 [77.5; 79.1]	79.0 [78.2; 79.8]	80.4 [79.6; 81.2]
P20 (95% CI)	61.4 [60.5; 62.4]	61.9 [61.0; 62.9]	63.3 [62.4; 64.3]
Black population, n=2,790			
Median bias (95% CI)	-4.01 [-4.44; -3.56]	-3.12 [-3.70; -2.62]	-2.22 [-2.72; -1.83]
IQR (Q1; Q3)	13.9 [-11.6; 2.3]	14.3 [-11.1; 3.2]	14.1 [-10.0; 4.2]
P30 (95% CI)	82.5 [81.1; 83.9]	83.8 [82.4; 85.2]	83.7 [82.4; 85.1]
P20 (95% CI)	62.1 [60.3; 63.9]	64.3 [62.5; 66.0]	64.9 [63.1; 66.7]
Non-Black women, n=4,605			
Median bias (95% CI)	2.54 [2.20; 2.92]	0.45 [0.08; 0.86]	0.45 [0.08; 0.86]
IQR (Q1; Q3)	16.3 [-5.2; 11.1]	15.7 [-7.9; 7.8]	15.7 [-7.9; 7.8]
P30 (95% CI)	78.9 [77.7; 80.1]	80.9 [79.8; 82.0]	80.9 [79.8; 82.0]
P20 (95% CI)	62.0 [60.6; 63.4]	63.7 [62.3; 65.1]	63.7 [62.3; 65.1]
Non-Black men, n=5,459			
Median bias (95% CI)	3.01 [2.66; 3.43]	3.09 [2.76; 3.41]	1.14 [0.85; 1.43]
IQR (Q1; Q3)	15.9 [-4.5; 11.3]	15.7 [-5.0; 10.7]	15.6 [-7.3; 8.3]
P30 (95% CI)	77.7 [76.6; 78.8]	77.4 [76.3; 78.5]	80.0 [79.0; 81.1]
P20 (95% CI)	60.9 [59.7; 62.2]	60.4 [59.1; 61.7]	63.1 [61.8; 64.4]
Black women, n=1,087			
Median bias (95% CI)	-2.98 [-3.75; -2.30]	-3.39 [-4.12; -2.67]	-3.39 [-4.12; -2.67]
IQR (Q1; Q3)	13.6 [-10.7; 2.9]	14.0 [-11.6; 2.4]	14.0 [-11.6; 2.4]
P30 (95% CI)	79.8 [77.4; 82.2]	80.3 [78.0; 82.7]	80.3 [78.0; 82.7]
P20 (95% CI)	60.5 [57.6; 63.4]	60.8 [57.9; 63.7]	60.8 [57.9; 63.7]
Black men, n=1,703			
Median bias (95% CI)	-4.64 [-5.15; -4.10]	-2.91 [-3.69; -2.30]	-1.35 [-1.97; -0.75]
IQR (Q1; Q3)	14.4 [-12.3; 2.1]	14.4 [-10.7; 3.7]	14.2 [-8.8; 5.4]
P30 (95% CI)	84.3 [82.5; 86.0]	86.0 [84.4; 87.7]	85.9 [84.3; 87.6]
P20 (95% CI)	63.1 [60.8; 65.4]	66.5 [64.2; 68.7]	67.5 [65.2; 69.7]

CKD-EPI₂₀₂₁: race-free Chronic Kidney Disease Epidemiology; EKFC_{RF}: European Kidney Function Consortium with race-free Q-values; EKFC_{PS}: European Kidney Function Consortium with population specific Q-values. IQR: interquartile range. P30: accuracy within 30%, P20: accuracy within 20%. Q1: quartile 1, Q3: quartile 3. Bias and IQR are expressed in mL/min/1.73m². P30 and P20 are expressed in %



CONCLUSION

The EKFC-equation can be used in the USA to estimate GFR incorporating either self-reported race or unknown race at the patient's discretion per hospital registration records. The performance of the EKFC equation is as at least good as the CKD-EPI₂₀₂₁ equation.

AFFILIATIONS

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FINANCIAL DISCLOSURES

Nothing to declare