

# Assessment of a new race-free CKD-EPI 2021<sub>cr</sub> equation — evidence from Labcorp’s national laboratory database

## Background

More than 37 million adults in the United States have kidney diseases, and 90% aren’t aware they have diminished kidney function. A disproportionate number of these people are Black and/or African American, Hispanic or Latino, American Indian or Alaska Native, Asian American, and Native Hawaiian or other Pacific Islander. These Americans also face unacceptable health disparities and inequities in healthcare delivery.<sup>1,2</sup>

Prior equations developed to estimate glomerular filtration rate (GFR), including the Modification of Diet in Renal Disease (MDRD, 2009)<sup>3</sup> and the Chronic Kidney Disease-Epidemiology Collaboration (CKD-EPI, 2012)<sup>4</sup> equations, used a corrected African American calculation in addition to the non-African American equation in order to distinguish apparent statistical differences in estimated glomerular filtration rate (eGFR) test results between those populations. Over the past two years, the National Kidney Foundation and the American Society of Nephrology convened a task force (NKF-ASN Task Force) to re-evaluate the use of race in the estimation of GFR as well as its implications on diagnosis and treatment of patients with or at risk for CKD.<sup>5</sup> The outcome of this endeavor was a new equation developed to not disproportionately disadvantage patients from any particular racial or ethnic group. The new equation now provides a single determination for estimating GFR.

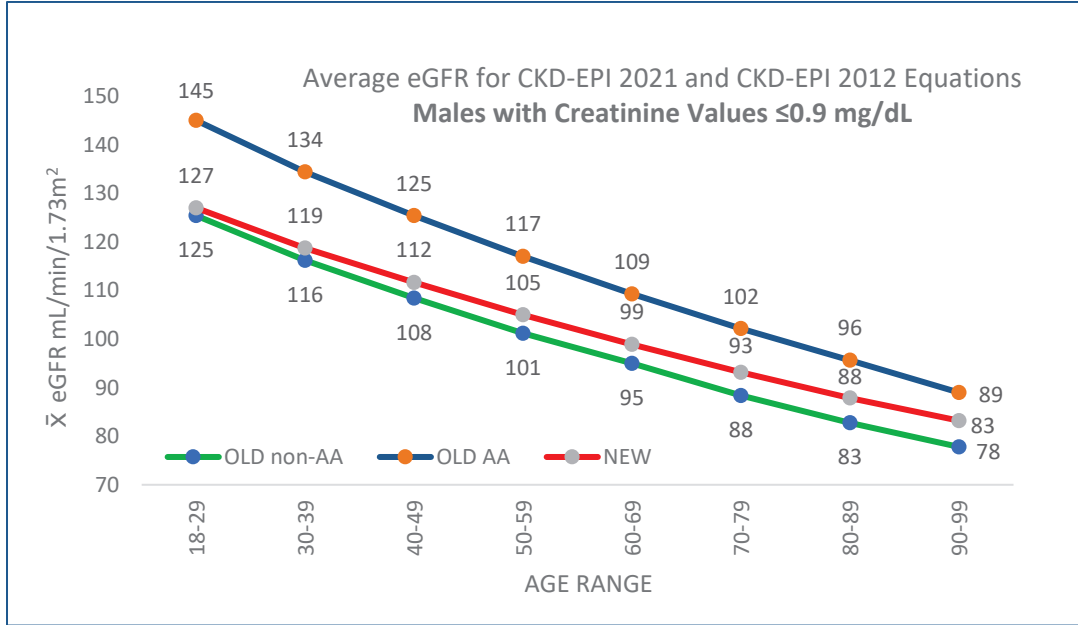
## Result differences between the old CKD-EPI (2012) and the new CKD-EPI 2021<sub>cr</sub> equation

Small differences in results derived from the equations may be noted; however, the vast majority of these differences will not be clinically significant. Using Labcorp’s vast laboratory database and 1.2 million randomly selected patient eGFR test results, the differences between results using the prior and new equations are displayed graphically below. Labcorp does not capture race on the test requisition form, thus the differences noted on the graphs for Black people and/or African Americans are differences in equation calculations only. The terms “Black” and “African American” have been applied interchangeably in past studies although not all Black people self-identify as African American. We use the term “African American” in this report.

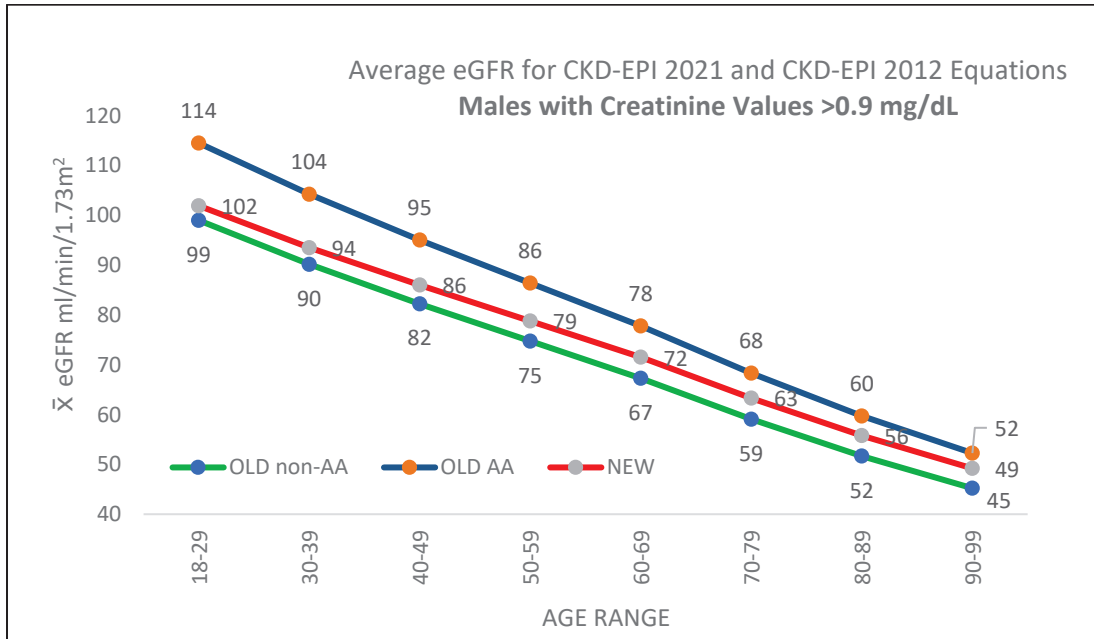
**Legend: Figure 1**

Average eGFR values among the CKD-EPI (2012) and CKD-EPI 2021<sub>cr</sub> equations  
 OLD non-AA, CKD-EPI (2012) equation for non-African Americans  
 OLD AA, CKD-EPI (2012) equation for African Americans  
 NEW, CKD-EPI 2021<sub>cr</sub> race-free equation

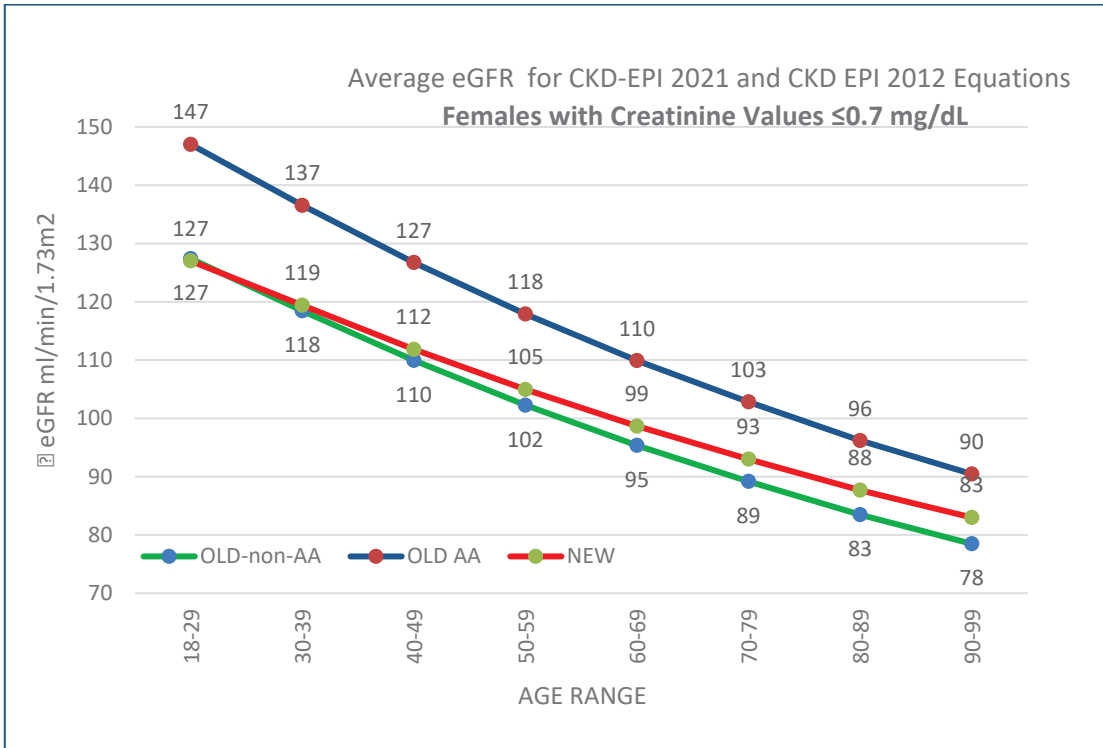
1A



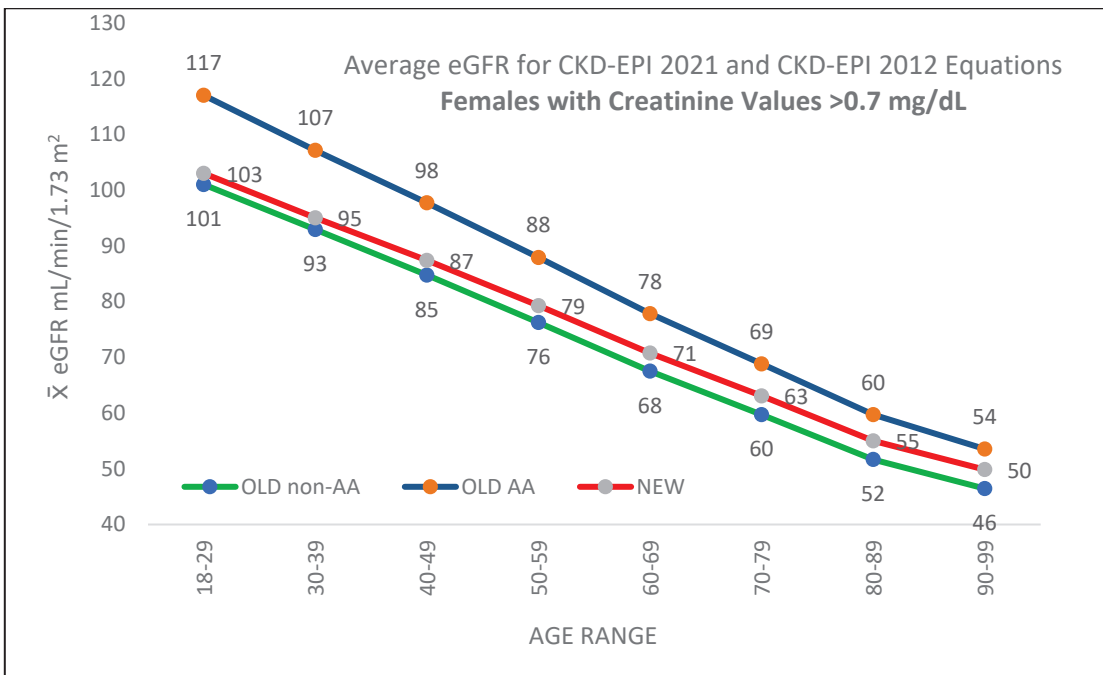
1B



1C



1D



## Differences in eGFR Categories between the CKD-EPI (2012) and the CKD-EPI 2021<sub>cr</sub> equations

Most commonly, test results that have eGFR values close to the eGFR decision points separating the CKD stage categories, e.g., 60 mL/min/1.73m<sup>2</sup> differentiating Stage 2 from Stage 3 CKD, may migrate from one category to the other (up or down), compared to prior results. The clinical significance of this change may be assessed in the context of other laboratory test results such as the urine albumin-creatinine ratio (uACR), time lapse between eGFR results, and the clinical condition of the patient.

### For males with creatinine values ≤0.9 mg/dL

Approximately 14% of eGFR test results change categories when comparing the old CKD-EPI African American (2012) equation to the new CKD-EPI 2021<sub>cr</sub> equation and 12% for the old CKD-EPI non-African American equation.

For creatinine values >0.9mg/dL, the percentages are 18% and 17%, respectively.

### For females with creatinine values ≤0.7 mg/dL

Approximately 16% of eGFR test results change categories when comparing the old CKD-EPI African American (2012) equation to the new CKD-EPI 2021<sub>cr</sub> equation and 10% for the old CKD-EPI non-African American equation.

For creatinine values >0.7mg/dL, the percentages are 20% and 14%, respectively.

No eGFR results change more than one CKD category, and Labcorp's data suggests that the changes in stages involve eGFR values that are close to the CKD stage cutpoints. It is also apparent that the majority of eGFR values that change categories are in the younger population with higher eGFR results. The CKD-EPI 2021<sub>cr</sub> equation will generally yield lower eGFR values when compared to the old CKD-EPI African American 2012 equation, and the old CKD-EPI non-African American equation will yield higher results.

## Percentage of Results in New eGFR Stage Category based on CKD-EPI 2021<sub>cr</sub> Equation

↑ One Category	non-African American Calculations	African American Calculations	↓ One Category	non-African American Calculations	African American Calculations
1 to 2	None	13.80%	5 to 4	0.09%	None
2 to 3a		2.00%	4 to 3b	0.55%	
3a to b		0.90%	3b to 3a	1.43%	
3b to 4		0.25%	3a to 2	2.74%	
4 to 5		0.02%	2 to 1	8.40%	

## CKD-EPI creatinine-cystatin C (2021) equation

The combined NKF-ASN Task Force also included an eGFR equation based on the measurement of both creatinine and cystatin C. The new eGFR creatinine-cystatin C estimating equation may be helpful as a confirmatory test in those clinical scenarios where fluctuating serum creatinine values are present. Diet, muscle wasting diseases, extremes in muscle mass (body building) are examples that may affect serum creatinine concentration, thus biasing the CKD-EPI 2021<sub>cr</sub> eGFR. Including cystatin C in the CKD-EPI estimating equation helps to mitigate these biases. Thus, the new eGFR creatinine-cystatin C estimating equation may more accurately reflect true GFR in these conditions.<sup>6</sup> Differences between the old and new CKD-EPI equations are compared with the new creatinine-cystatin C estimating equation and compiled below. Labcorp does not capture race on the test requisition form, thus the differences noted on the graphs for African Americans are differences in the equation calculations only.

**Legend: Figure 2**

Average eGFR values among the Old CKD-EPI equations, New CKD-EPI equation and the New CKD-EPI creatinine-cystatin C equation

OLD non-AA, CKD-EPI (2012) for non-African Americans

OLD AA, CKD-EPI (2012) for African Americans

NEW, CKD-EPI 2021<sub>cr</sub> race-free equation

NEW CYS, CKD-EPI 2021 creatinine -cystatin C race-free equation

**2A**

Female				
Age Range	Old-AA	Old non-AA	New	New-CYS
18-29	111	96	97	100
30-39	99	86	88	95
40-49	91	77	81	89
40-59	79	69	72	78
60-69	68	59	62	65
70-79	56	49	52	53
80-89	40	43	46	45
90-99	46	40	43	40

**2B**

Male				
Age Range	Old-AA	Old non-AA	New	New-CYS
18-29	109	94	101	101
30-39	91	79	82	93
40-49	79	69	72	84
40-59	72	62	65	74
60-69	65	56	60	65
70-79	57	49	52	54
80-89	48	41	45	44
90-99	48	41	45	41

In summary, the implementation of the Task Force’s recommended eGFR equation (CKD-EPI 2021<sub>cr</sub>) offers the opportunity to standardize to one equation and removes the race-based coefficient since diversity was included in the development of this new equation.<sup>5</sup> Labcorp’s data indicates that the new CKD-EPI (2021) equation will, on average, provide slightly higher eGFR results than did the old CKD-EPI non-African American equation (2012), while the new CKD-EPI (2021) equation will, on average, provide slightly lower eGFR results than did the old CKD-EPI African American equation (2012), especially in the younger age brackets. As a result, those patient values that lie close to the eGFR decision cut-offs may increase one CKD category with the new (CKD-EPI (2021)) equation when compared to the old CKD-EPI non-African American equation (2012), while patient eGFR values may lower one CKD category when compared to the old CKD-EPI African American equation (2012).

**The following tests report an eGFR calculation:**

Test No.	Test Name
245292	Cardiorenal-Glycemic Status
165039	Chronic Fatigue Evaluation Profile
001370	Creatinine
003004	Creatinine Clearance
276024	Creatinine Clearance With Body Surface Area Normalization
023400	Diabetes Comorbidity Assessment
100768	Glomerular Filtration Rate, Estimated (eGFR)
248634	HRT Female Pre Pellet
248692	HRT Male Pre Pellet
140301	Kidney Profile
140302	Kidney Profile Plus Metabolic Panel (8), Basic
140303	Kidney Profile Plus Metabolic Panel (14), Comprehensive
322758	Metabolic Panel (8), Basic
322000	Metabolic Panel (14), Comprehensive
165055	Post COVID CDC Profile
245450	Pre-Exposure Prophylaxis (PrEP) HIV Profile, Female, Baseline
245438	Pre-Exposure Prophylaxis (PrEP) HIV Profile, Female, Monitor
245476	Pre-Exposure Prophylaxis (PrEP) HIV Profile, Male, Baseline
245488	Pre-Exposure Prophylaxis (PrEP) HIV Profile, Male, Monitor
360690	Preeclampsia Monitoring Profile
360640	Preeclampsia Monitoring Profile With 24-Hour Urine
322777	Renal Function Panel

**References**

1. A Statement of Endorsing Use of the 2021 Race-Free Method for Estimating Glomerular Filtration Rate from U.S Pathology and Laboratory Society Leadership. [news release]. New York, NY: National Kidney Foundation; March 9, 2021.
2. Update: Reassessing Inclusion of Race in Diagnosing Kidney Diseases. A joint statement from the National Kidney Foundation and the American Society of Nephrology. [news release]. New York, NY: National Kidney Foundation; August 24, 2021.
3. Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. *Ann Intern Med.* 1999 Mar 16;130(6):461-470.
4. Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. *Ann Intern Med.* 2009 May 5;150(9):604-612.
5. Delgado C, Baweja M, Crews C, et al. A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease. *Am J Kid Dis.* 2021 Sep 23;S0272-6386(21)00828-3.
6. Inker LA, Eneanya ND, Coresh J, et al. New Creatinine- and Cystatin C–Based Equations to Estimate GFR without Race. *N Engl J Med.* 2021 Nov 4; 385(19):1737-1749.

