

USRDS

Identifying Chronic Kidney Disease Using Claims Data: Agreement with Estimated GFR Using Two Different Estimating Equations

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Disclosure of Financial Relationships

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Introduction

- Identification of comorbidity using claims data is common.
- Accuracy of claims-based diagnoses unclear.
- We assessed the agreement of claims-identified CKD with estimated glomerular filtration rate (eGFR) using two different estimating equations:
 - Modification of Diet in Renal Disease (MDRD) 4-variable equation, developed in CKD patients
 - An equation based on both CKD and healthy patients by Rule et al. from the Mayo Clinic (Ann Intern Med 41, 12: 929-937, 2004).

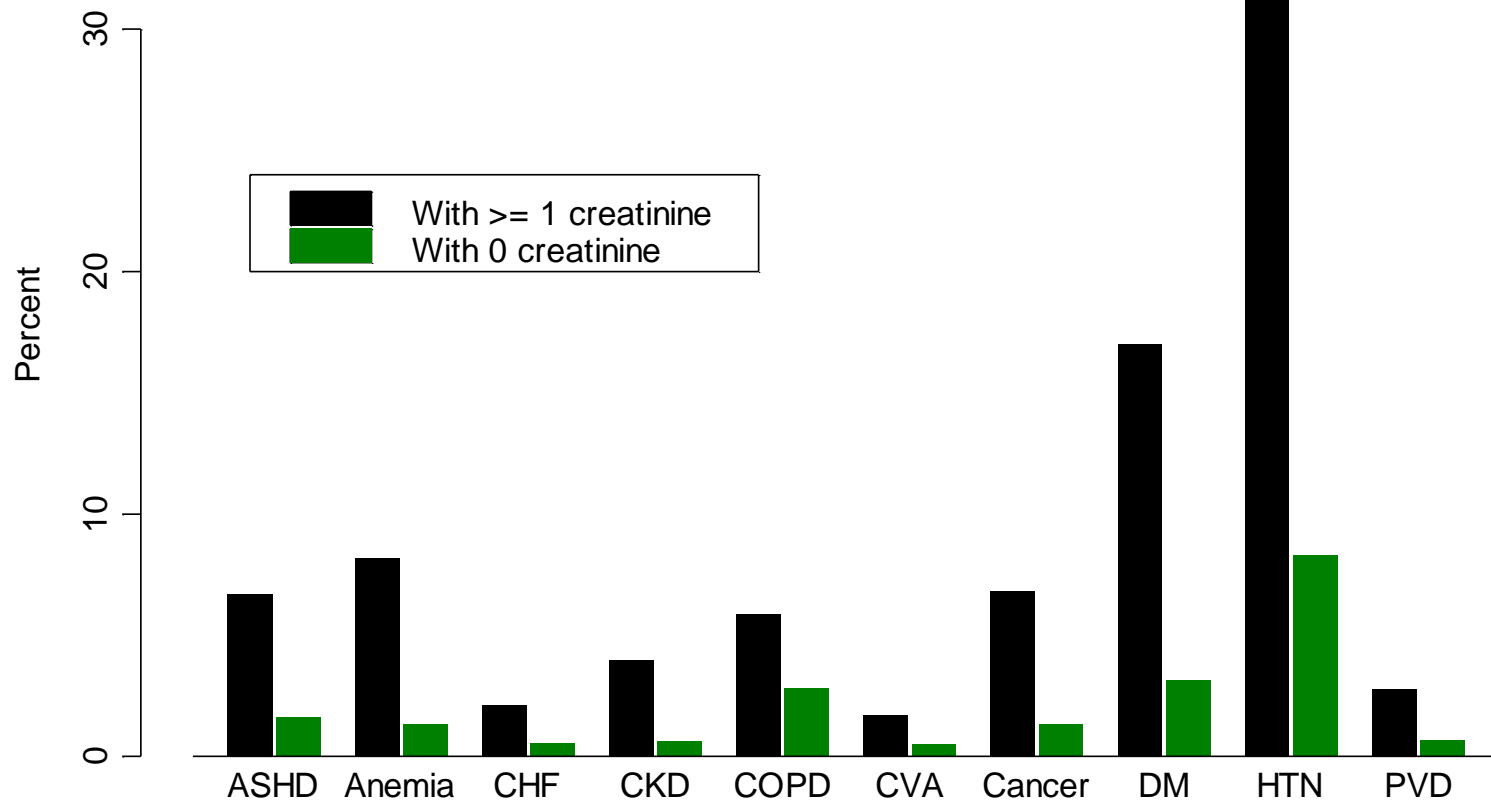
Methods

- **Data Source: Ingenix LabRX Database™**
- **Inclusion Criteria**
 - Insurance coverage for all of 2006
 - At least one serum creatinine measured
 - Age 20 – 64
- **Assessed comorbidity from claims, including presence of CKD, using a standard method requiring ≥ 1 inpatient or ≥ 2 outpatient claims with the appropriate diagnosis code**
- **Calculated eGFR using two equations:**
 - MDRD, 4-variable
 - Mayo, combined CKD and healthy population equation

Patient characteristics; Serum Creatinine Measured vs. Not Measured

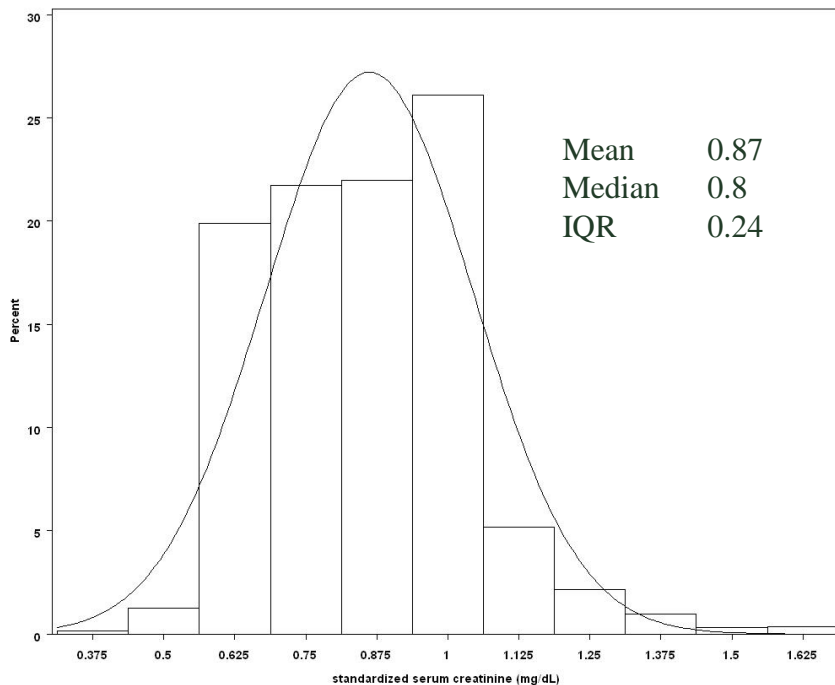
	With \geq 1 Serum Creatinine (n=748,179)		Without Serum Creatinine (n=4,570,278)	
	n	%	n	%
Gender				
Male	329,886	44.1%	2,255,373	49.4%
Female	418,273	55.9%	2,314,148	50.6%
Age				
20-35	136,863	18.3%	1,478,843	32.4%
36-50	311,697	41.7%	1,892,190	41.4%
51-64	299,619	40.0%	1,199,245	26.2%

Patient Comorbidity; Serum Creatinine Measured vs. Not Measured

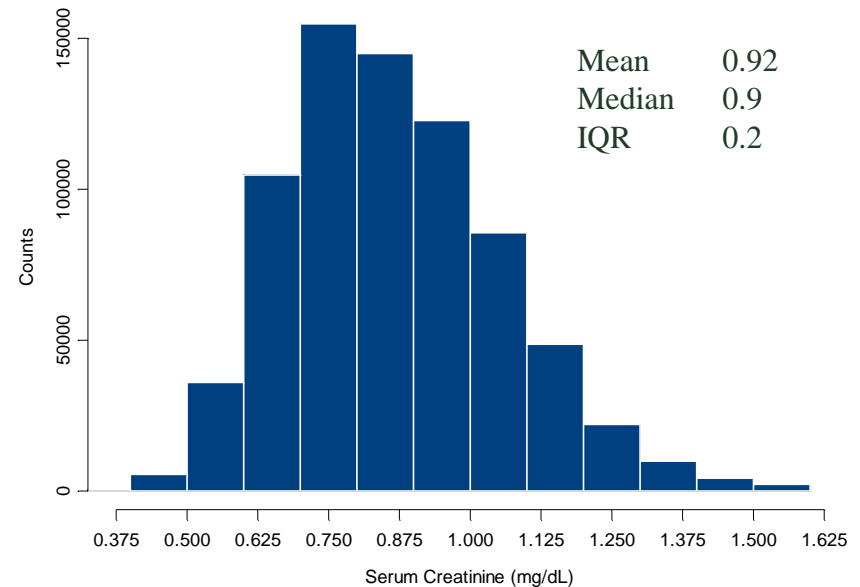


Distribution of Serum Creatinine

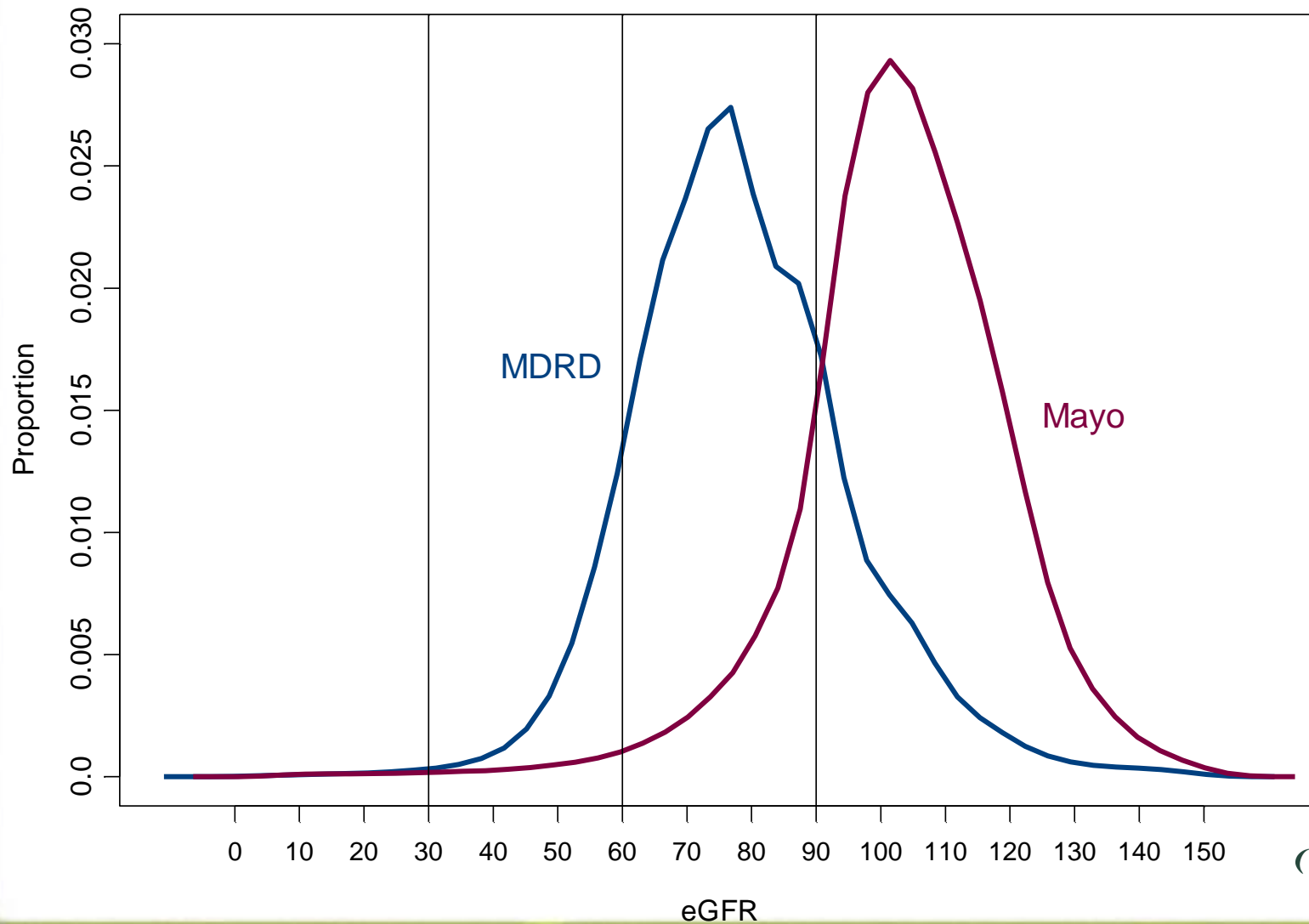
NHANES 2005-2006



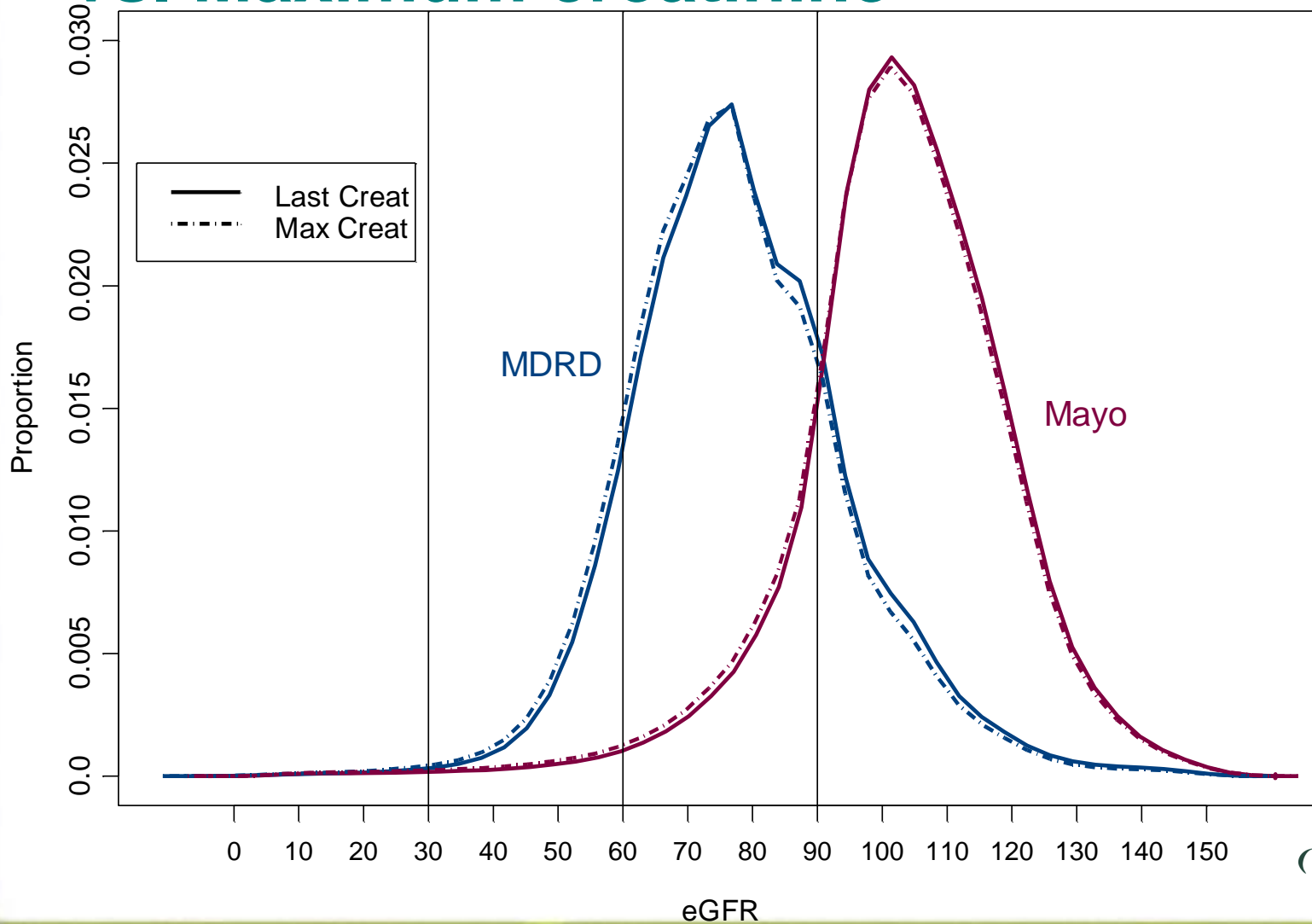
Ingenix I3 2006



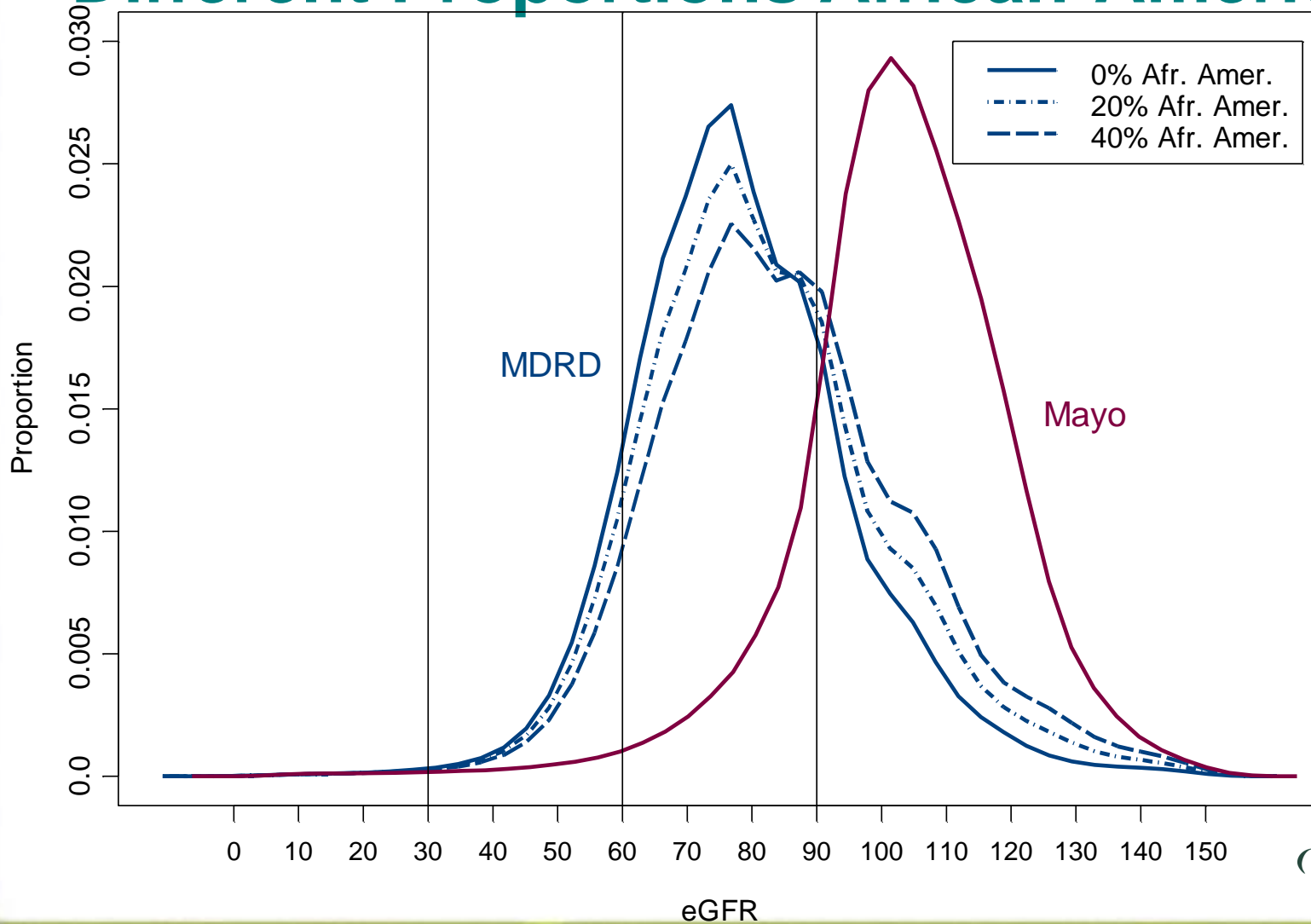
Distribution of eGFR; MDRD vs. Mayo



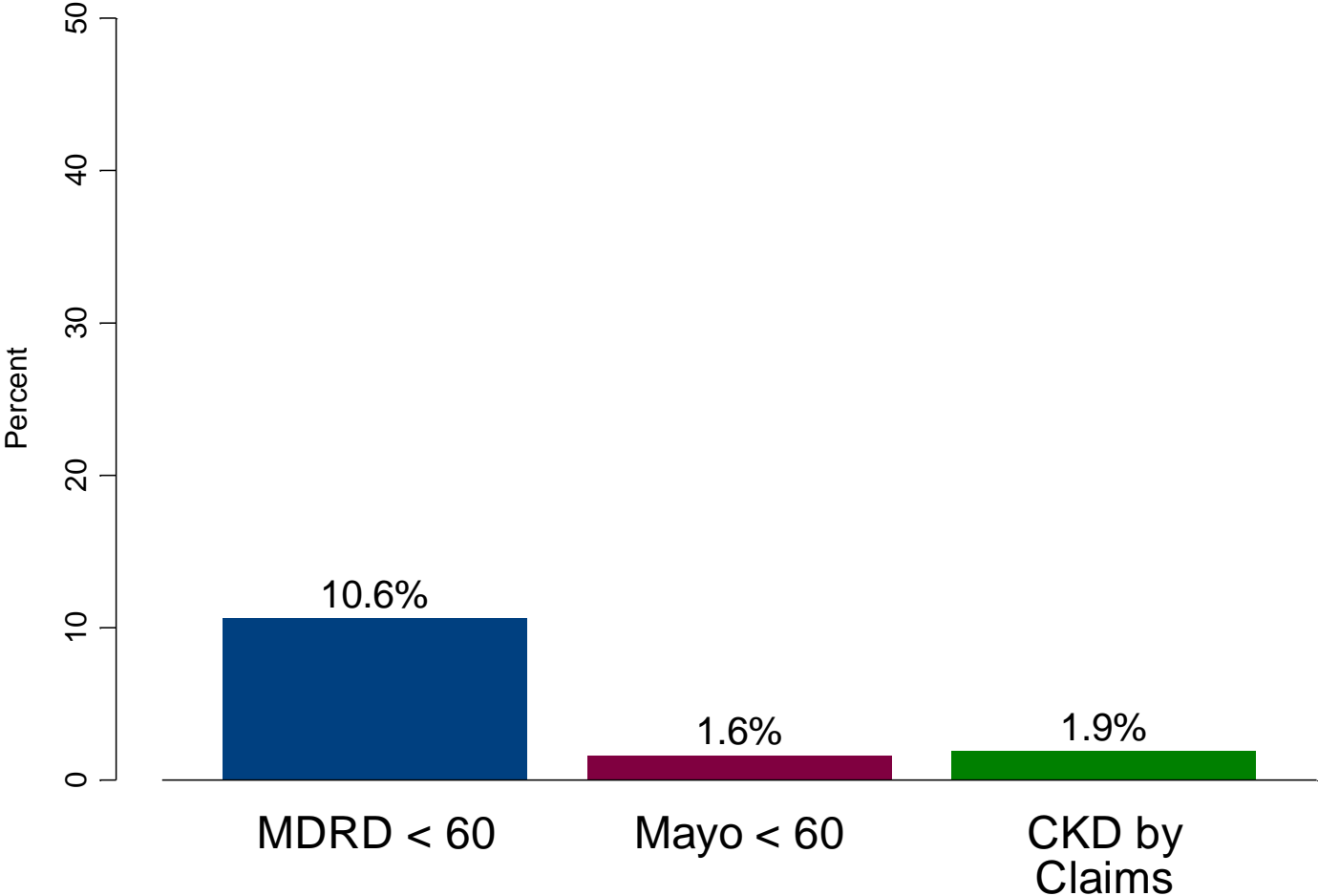
Distribution of eGFR; Last creatinine vs. Maximum creatinine



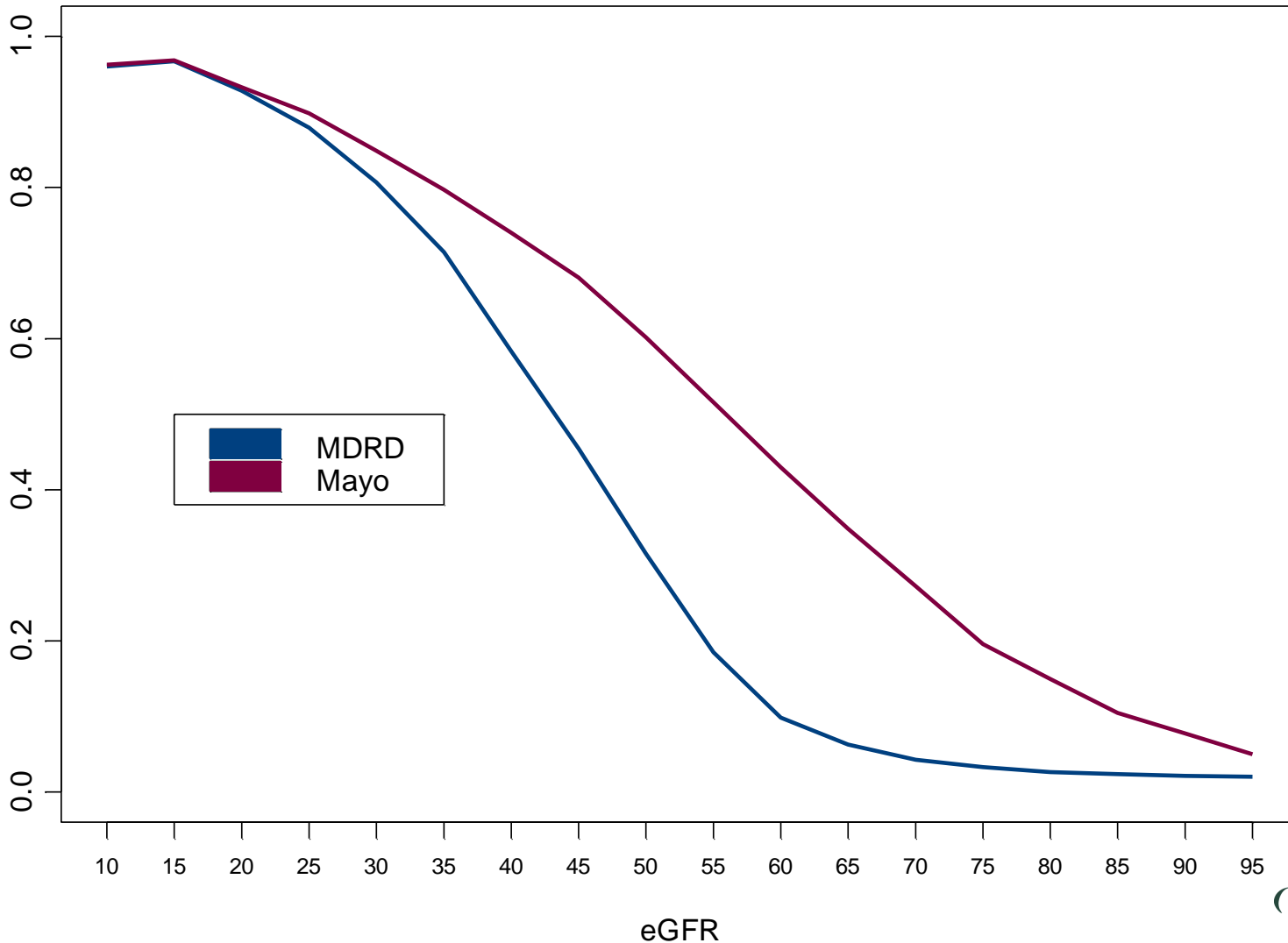
Distribution of eGFR; Assuming Different Proportions African-American



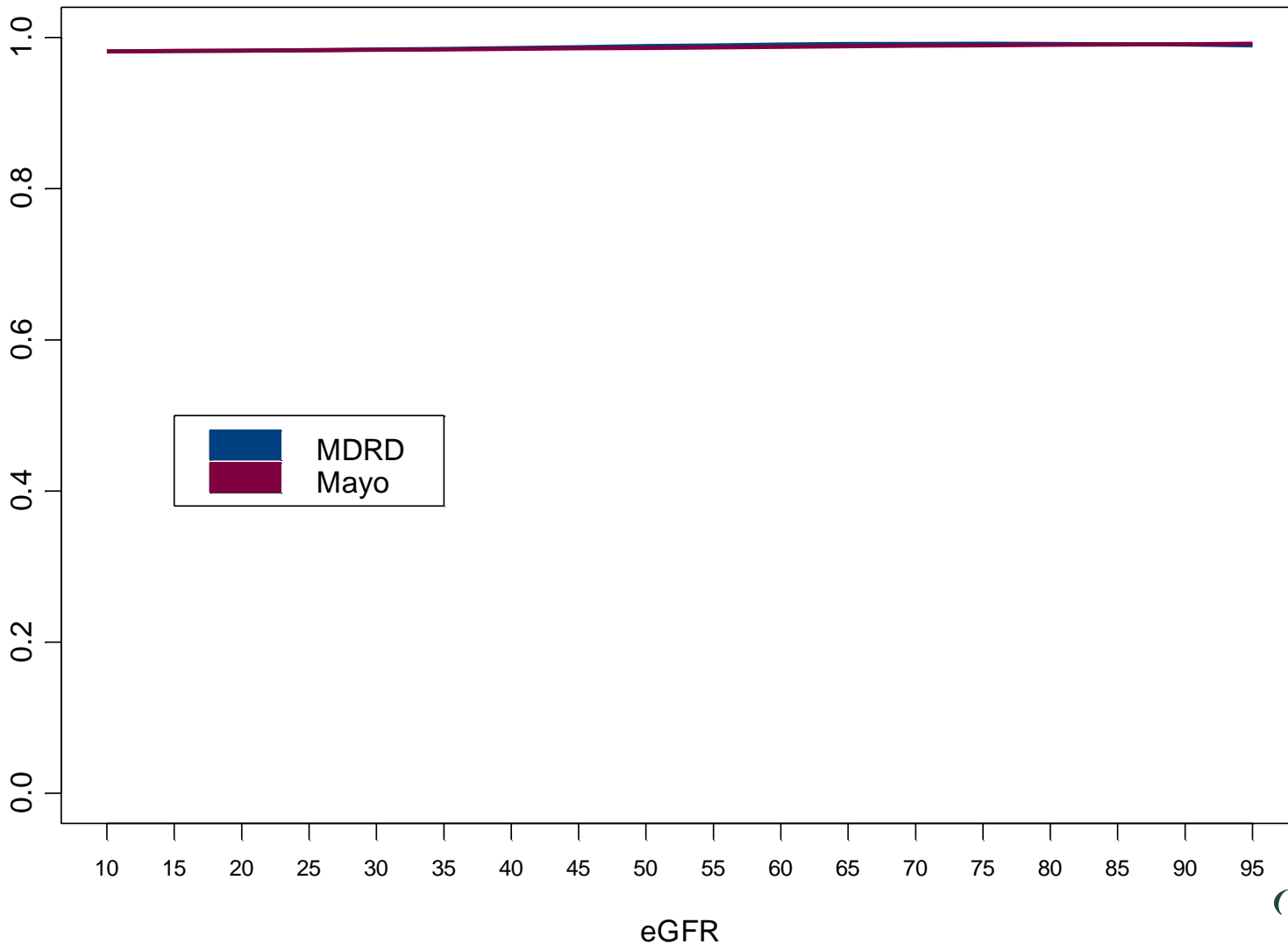
Percent with eGFR < 60 by MDRD vs. Mayo, and Percent with CKD from Claims



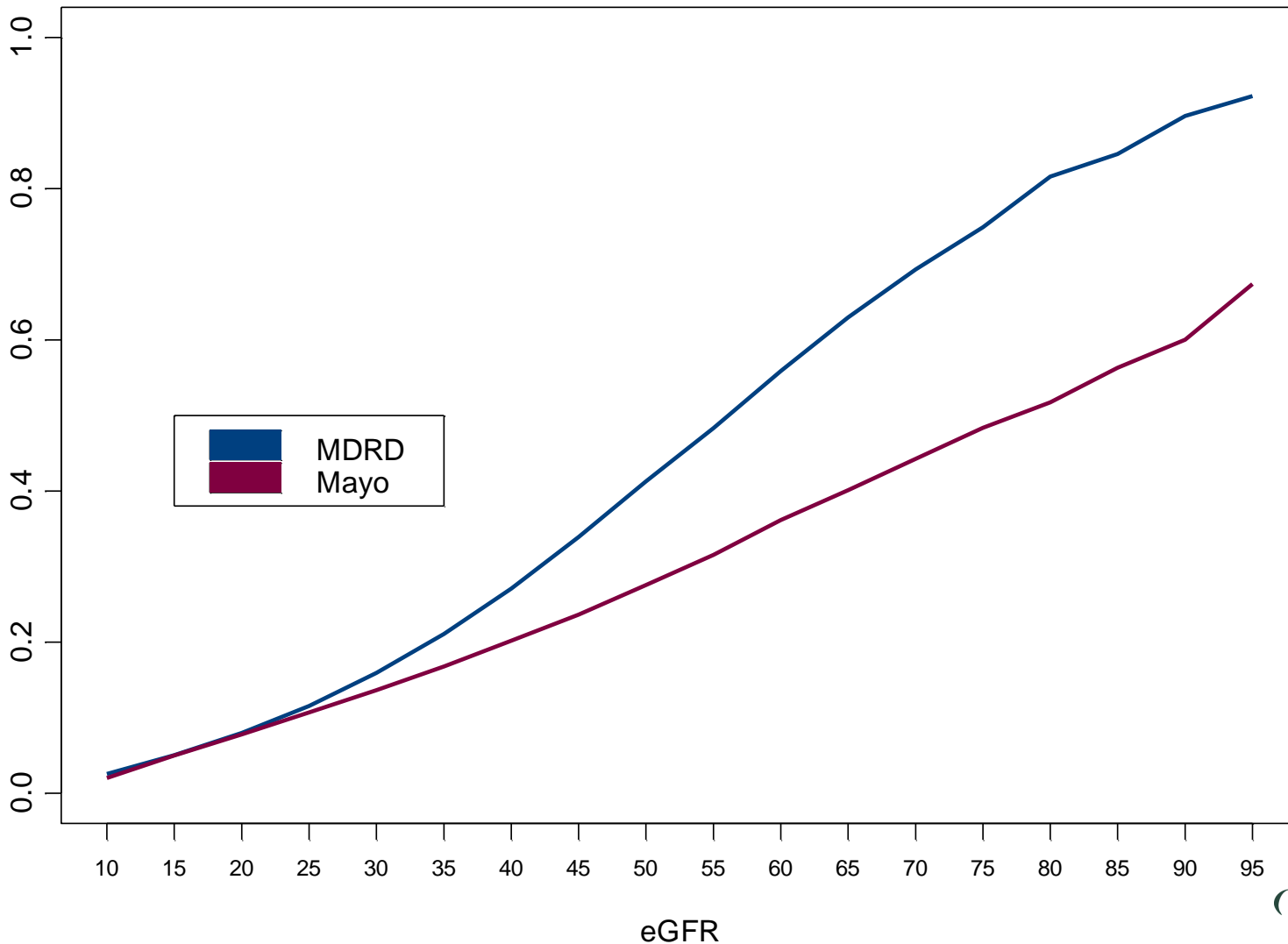
Sensitivity (or PPV) – Pr (CKD from claims | eGFR < X)



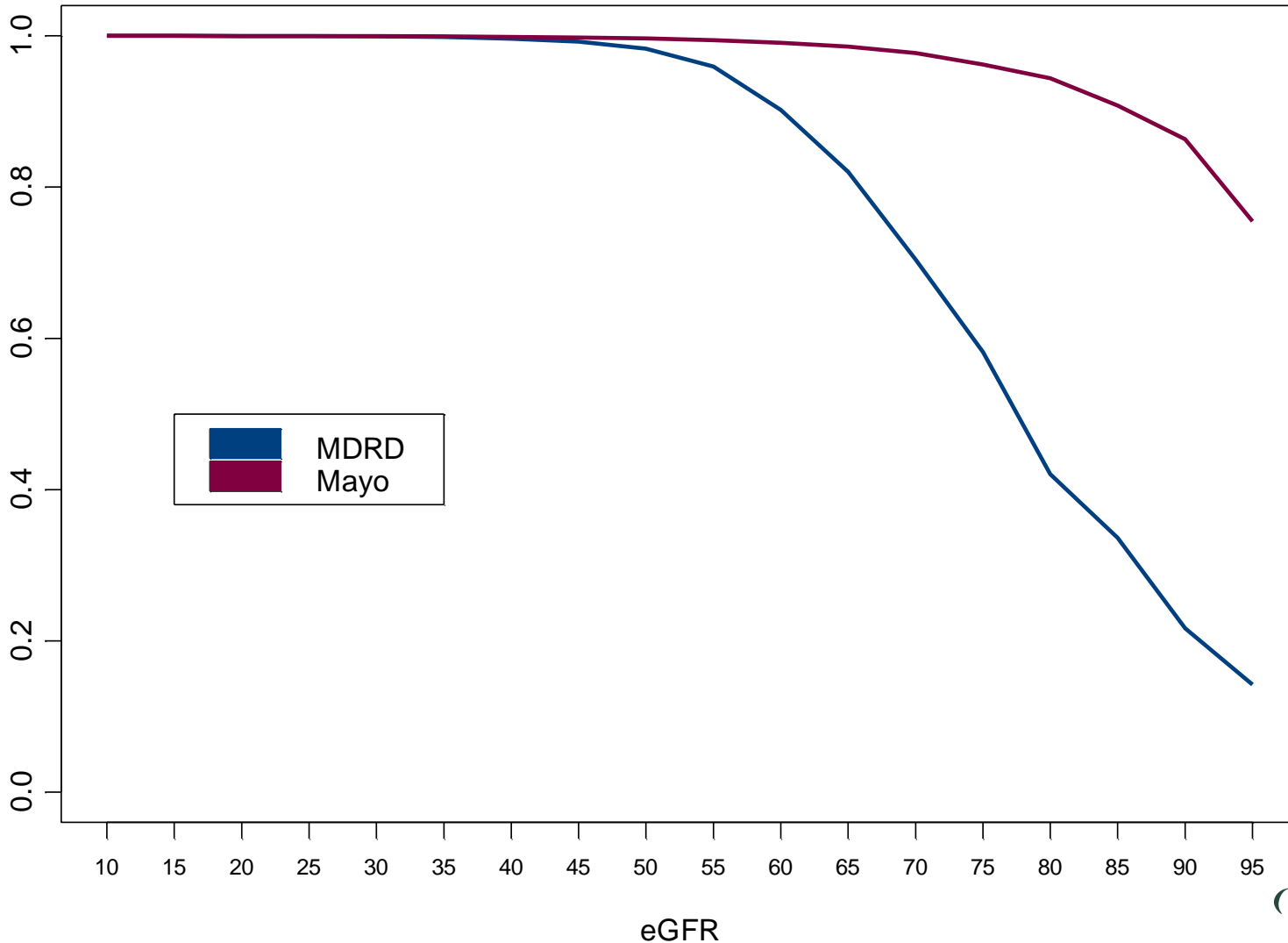
Specificity (or NPV) – Pr (no CKD from claims | eGFR > X)



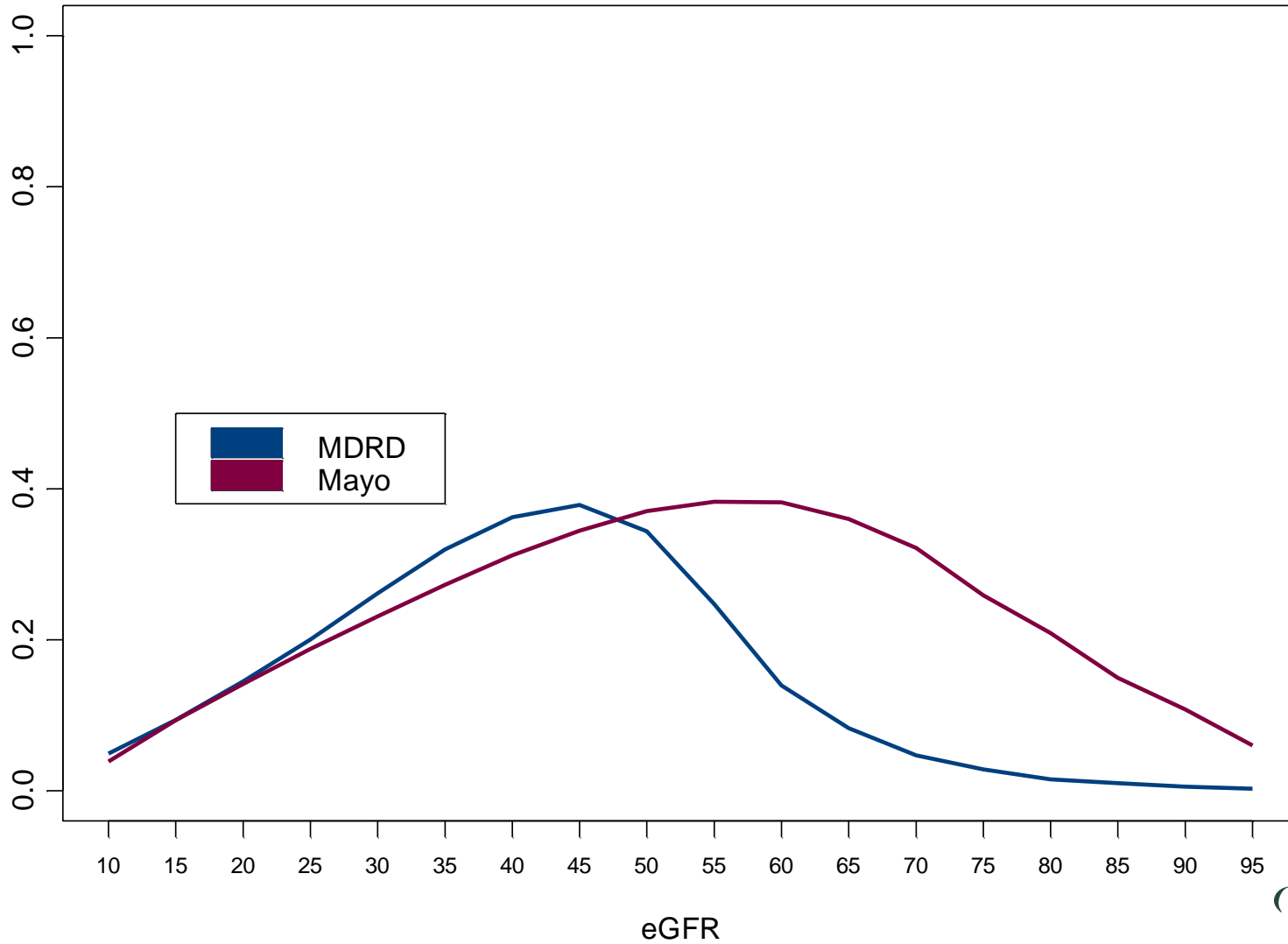
Positive Predictive Value (or sensitivity) – Pr (eGFR < X | CKD from claims)



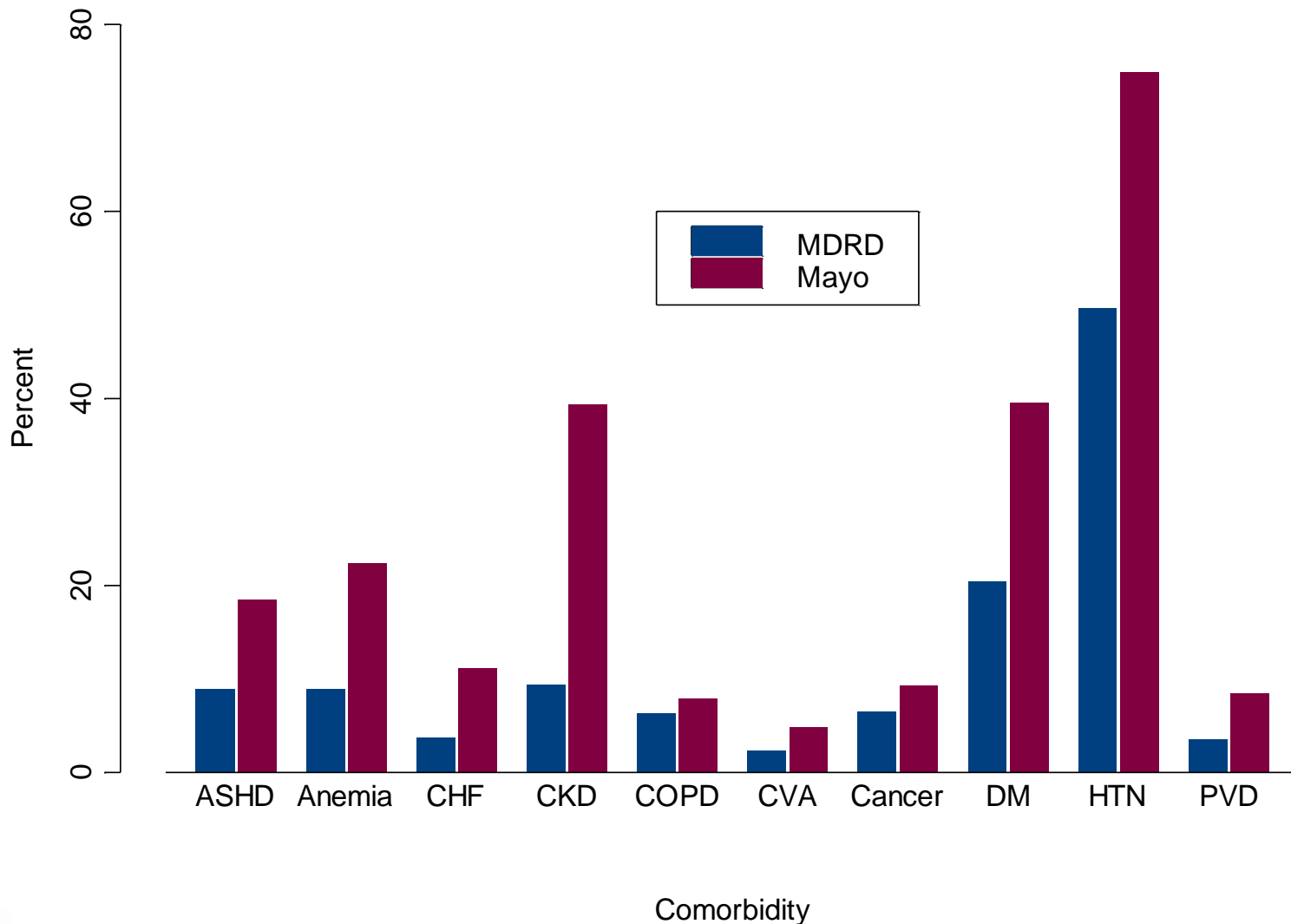
Negative Predictive Value (or specificity) – Pr (eGFR > X | no CKD from claims)



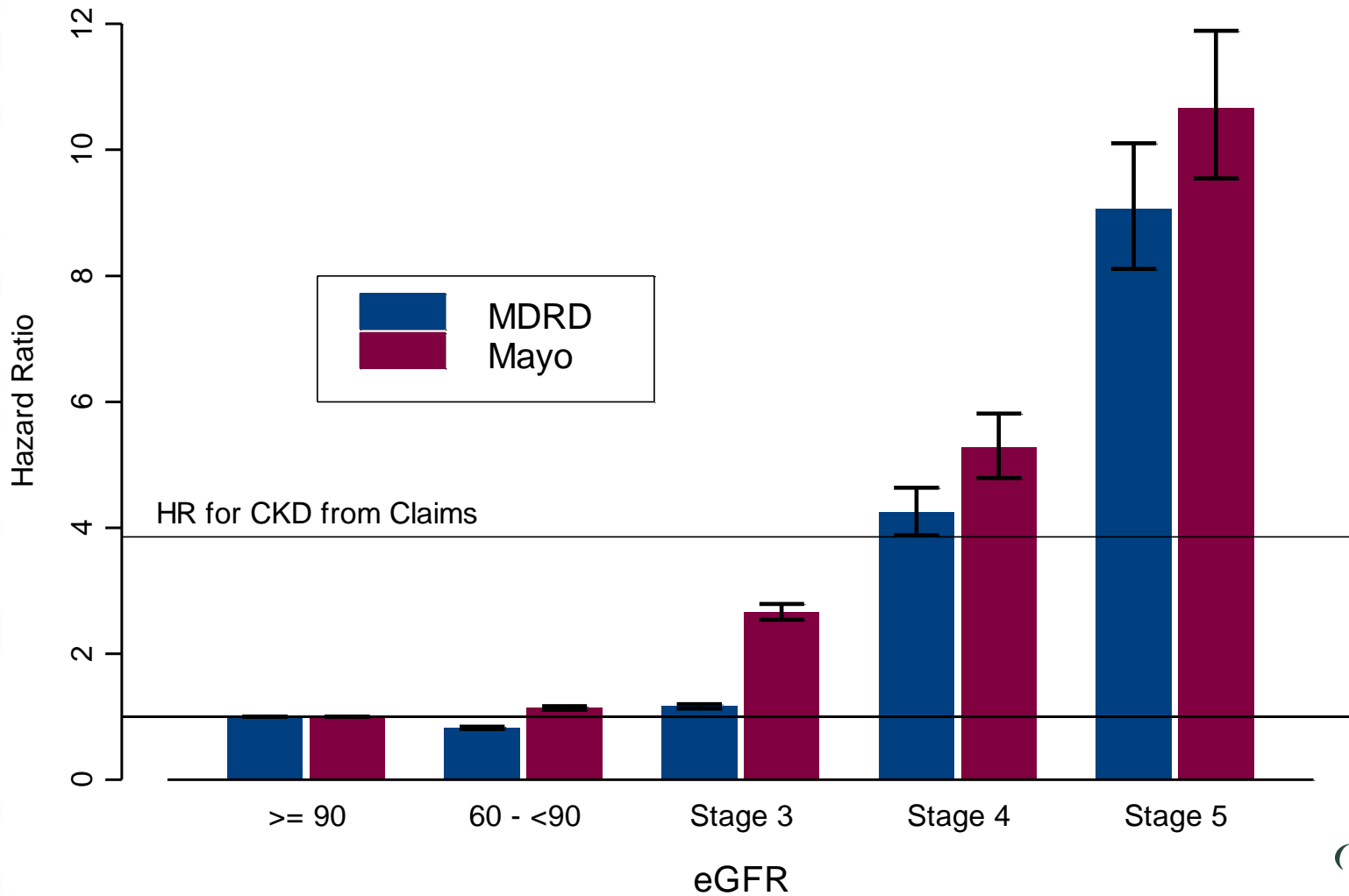
Kappa



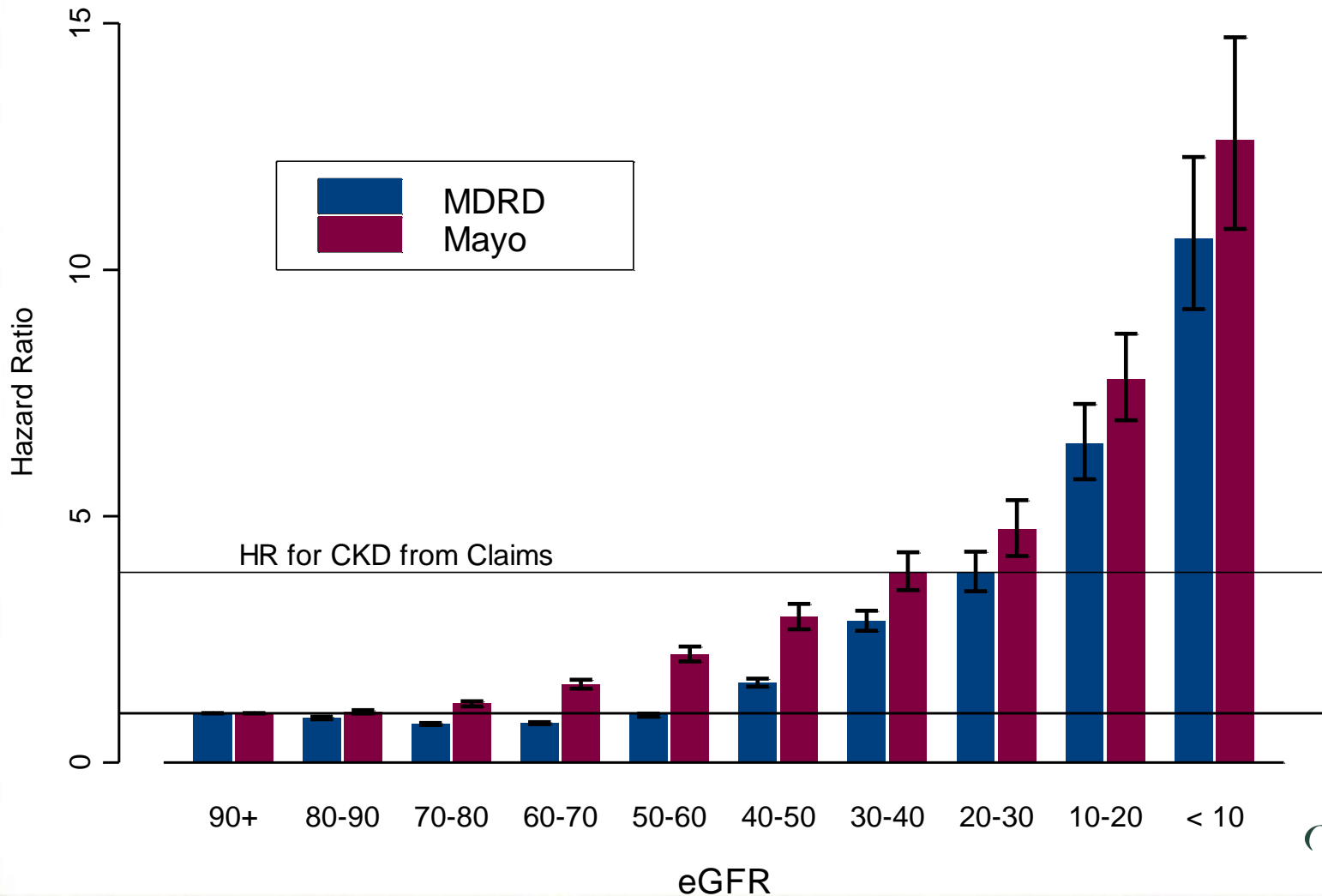
Of Patients with eGFR < 60 by MDRD and Mayo, Percent with Each Comorbidity



Hazard Ratios for Hospitalization by eGFR, MDRD vs. Mayo



Hazard Ratios for Hospitalization by eGFR, MDRD vs. Mayo



Summary

- **Prevalence of eGFR<60 was considerably different for the two equations (10.6% - MDRD vs. 1.6% - Mayo)**
- **Sensitivity (PPV) (Pr (claims-CKD | eGFR < X))**
 - Mayo higher
- **Specificity (NPV) (Pr (no claims-CKD | eGFR > X))**
 - Similar

Summary

- **PPV (Sensitivity) ($\Pr(\text{eGFR} < X \mid \text{claims-CKD})$)**
 - MDRD higher
- **NPV (Specificity) ($\Pr(\text{eGFR} > X \mid \text{no claims-CKD})$)**
 - Mayo higher
- **Kappa**
 - Similar (0.4), but at different eGFR (0.45 for MDRD, 0.55 for Mayo)
- **More monotonic increasing relationship between decreasing eGFR and hazard ratio for hospitalization with Mayo equation**

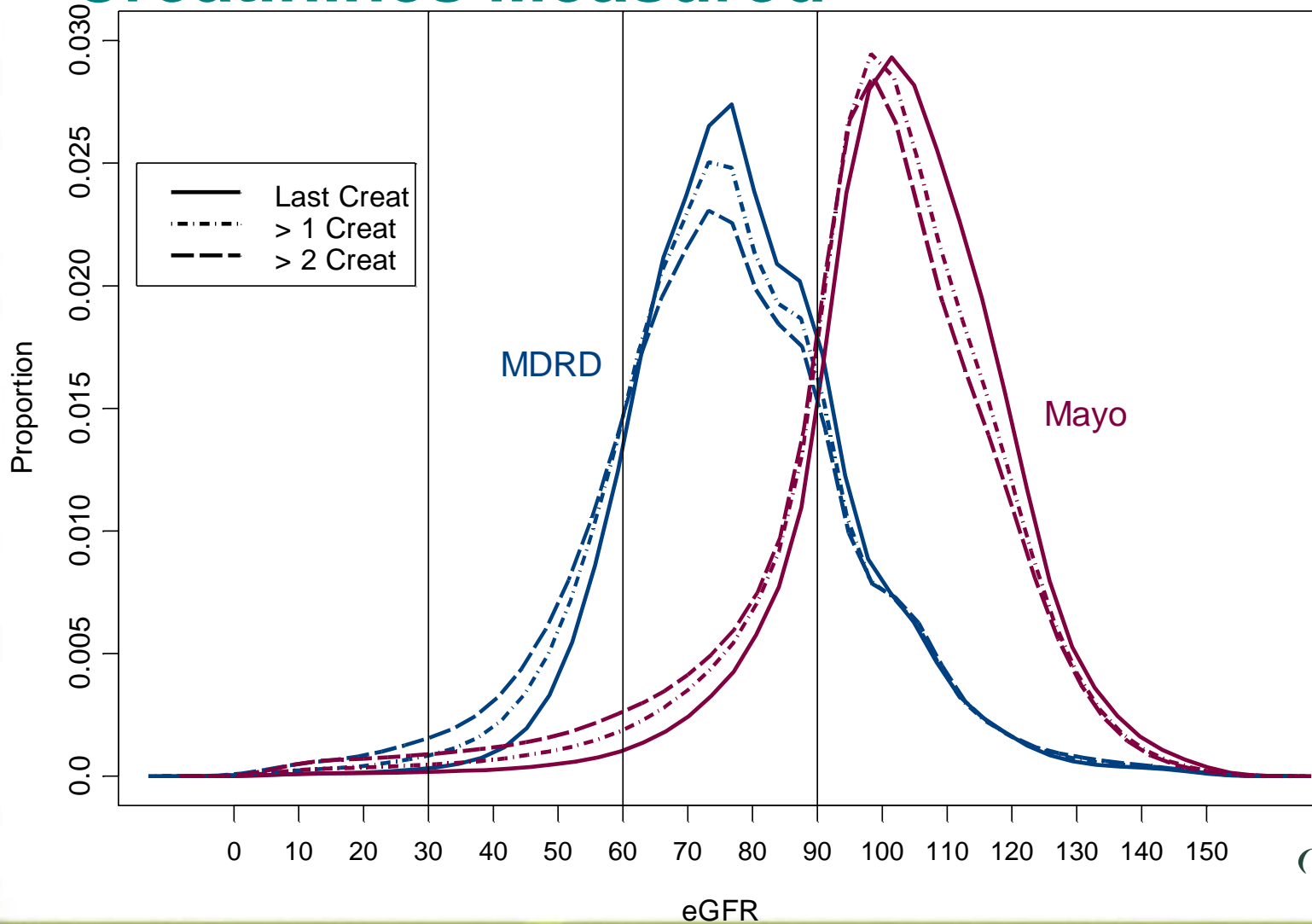
Limitations

- **No gold standard**
 - Neither estimated GFR nor CKD from claims is “truth”
- **Lack of standardization of serum creatinine.**
- **Population with serum creatinine measured as opposed to random sample.**
 - More often measured, higher creatinine, sicker patients
 - Probably does not represent the general population aged 20-64
- **Race**
 - Mayo equation – no adjustment for race
 - MDRD equation – race not in dataset

Conclusions

- Agreement between eGFR by either equation and claims is “fair to moderate” by Kappa (0.4), but at different levels of eGFR:
 - MDRD equation – 45 ml/min 1.73 m²
 - Mayo equation – 60 ml/min 1.73 m²
- Associations between decreasing eGFR and hospitalization using the Mayo equation are more consistent across the range of eGFR, suggesting the MDRD equation may be overestimating CKD prevalence, particularly in early stage 3

Distribution of eGFR; by Number of Creatinines Measured



Comparison of MDRD Stage vs. Mayo Stage

