Validation of the Refined Denver HIV Risk Score Using a National HIV Testing Cohort

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BACKGROUND, OBJECTIVES, and DESIGN

BACKGROUND: The Centers for Disease Control and Prevention (CDC) and US Preventive Services Task Force (USPSTF) recommend routine HIV screening for adolescents and adults. Recently, the Denver HIV Risk Score (DHRS) was developed to identify patients at increased risk for undiagnosed HIV infection and thus to guide HIV screening. A recently refined version of the DHRS includes only demographics, sex with a male, injection drug use, and past HIV test, and has been shown in a preliminary study to help identify patients with HIV infection in the emergency department. The refined DHRS, however, has not been broadly validated.

GOAL: To externally validate the refined DHRS in a national HIV testing cohort from the CDC.

DESIGN: A secondary analysis of HIV testing data from the Program Evaluation and Monitoring System of the CDC's National HIV Prevention Program.

The Refined Denver HIV Risk Score

		SCORE
Patient age		
22-25 or 55-60	+4	
26-32 or 47-54	+10	
33-46	+12	
Male gender	+21	
Patient self-reported race/ethnicity		
Black	+9	
Hispanic	+3	
Does the patient have sex with men, women, or both?		
Men or both	+22	
Has the patient ever injected drugs?		
Yes	+9	
Has the patient ever been tested for HIV?		
Yes	-4	
TOTAL SCORE:		

Patient's who score 30 points or greater should be considered at increased risk for having undiagnosed HIV infection and should be routinely offered HIV testing.

Very Low Risk	Low Risk	Moderate Risk	High Risk	Very High Risk
<20 points	20-29 points	30-39 points	40-49 points	≥50 points

Table. Risk score variables for the complete case cohort (N=4,830,941), stratified by HIV diagnosis and test result, CDC PEMS data, 2008 - 2010.

	Newly-Diagnosed HIV Infection		Confirmed HIV Test Result	
	Yes	No	Positive	Negative
Refined DHRS Variables	**n=30,080**	**n=4,800,861**	**n=44,513**	**n=4,786,428**
Age				
<22 or >60 years	3,926 (13.1)	1,163,132 (24.2)	5,240 (11.8)	1,161,818 (24.3)
22-25 or 55-60 years	5,888 (19.6)	1,017,206 (21.1)	8,029 (18.0)	1,015,065 (21.2)
26-32 or 47-54 years	10,419 (34.6)	1,477,305 (30.8)	15,493 (34.8)	1,472,231 (30.8)
33-46 years	9,847 (32.7)	1,143,218 (23.8)	15,751 (35.4)	1,137,314 (23.8)
Gender				
Female	6,735 (22.4)	2,395,949 (49.9)	11,130 (25.0)	2,391,554 (50.0)
Male	23,345 (77.6)	2,404,912 (50.1)	33,383 (75.0)	2,394,874 (50.0)
Race/Ethnicity				
Black	16,680 (55.5)	2,215,625 (46.2)	24,502 (55.0)	2,207,803 (46.1)
Hispanic	6,020 (20.0)	997,308 (20.8)	9,121 (20.5)	994,207 (20.8)
Other* or White	7,380 (24.5)	1,587,928 (33.1)	10,890 (24.5)	1,584,418 (33.1)
Sexual Practices				
Sex with a male	20,176 (67.1)	2,544,240 (53.0)	27,930 (62.8)	2,536,486 (53.0)
Other Risks				
Injection drug use	1,744 (5.8)	184,738 (3.9)	2,658 (6.0)	183,824 (3.8)
Past HIV test	22,039 (73.3)	3,305,774 (68.9)	36,100 (81.1)	3,291,713 (68.8)

Abbreviations: DHRS = Denver HIV Risk Score; CDC = Centers for Disease Control and Prevention; HIV = human immunodeficiency virus; PEMS = Program Evaluation and Monitoring System.
Percentages do not always add to 100% due to rounding error.
*Represents American or Alaskan Native, Native Hawaiian, or non-Hawaiian Pacific Islander.

Table. Prevalence of HIV infection stratified by geographic region (N=4,830,941), CDC PEMS data, 2008 – 2010.

	Newly-Diagnosed HIV Infection*		Confirmed HIV Positive Test Result†	
Geographical Region	n	(%)	n	(%)
Northeast (N=1,219,070)	6,452	(0.53)	8,322	(0.68)
South (N=2,654,370)	16,561	(0.62)	26,936	(1.01)
Midwest (N=379,345)	2,265	(0.60)	2,677	(0.71)
West (N=492,807)	1,722	(0.82)	5,204	(1.06)
Puerto Rico & USVI (N=85,349)	769	(0.90)	1,374	(1.61)

Abbreviations: CDC = Centers for Disease Control and Prevention; HIV = human immunodeficiency virus; PEMS = Program Evaluation and Monitoring System; USVI = United States Virgin Islands.
* Defined by a confirmed HIV-positive test result and the patient self-reporting having not previously tested positive for HIV infection. † Defined as a positive HIV test result (i.e., with either conventional or rapid EIA) with confirmation by supplemental testing (e.g., Western Blot) regardless of patient self-report of previous HIV test result(s).

Figure. Prevalence of newly identified human immundeficiency virus (HIV) infection within each risk score category in the validation sample, stratified by geographical region, CDC PEMS data, 2008 - 2010. The refined Denver HIV Risk Score ranges from -4 to +73. Bars, 95% confidence interval.

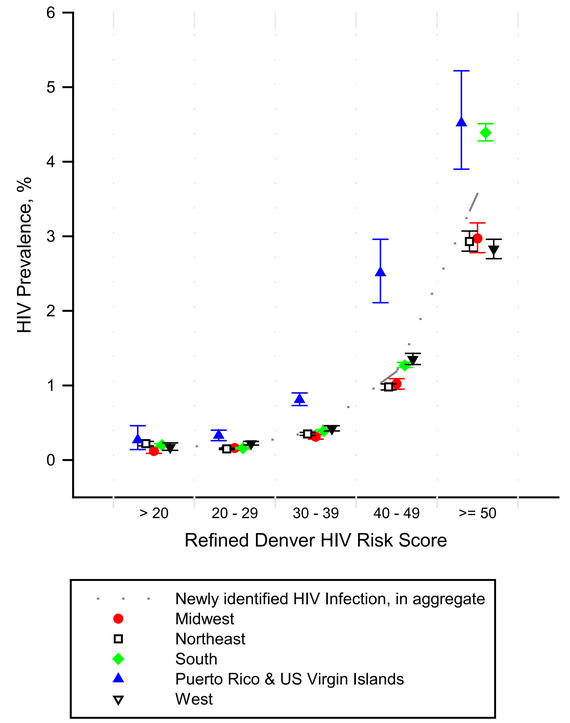


Figure. Discrimination of the refined Denver HIV Risk Score to identify patients at risk for undiagnosed human immunodeficiency virus (HIV) and all HIV infection, CDC PEMS data, 2008 - 2010. The area under the receiver operating characteristic curve was 0.77 (95% confidence interval: 0.77, 0.77) and 0.74 (95% confidence interval: 0.73, 0.74) for newly identified HIV infections and all HIV infections, respectively.

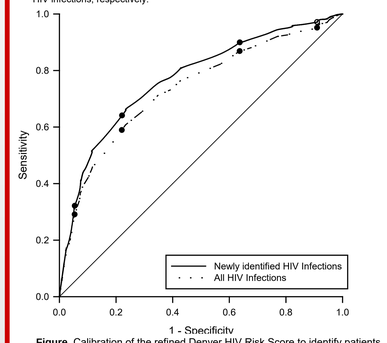
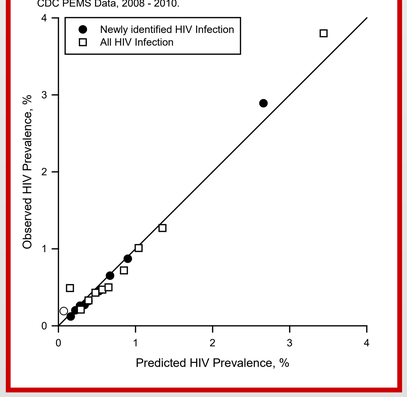


Figure. Calibration of the refined Denver HIV Risk Score to identify patients at risk of undiagnosed and all human immunodeficiency virus (HIV) infection, CDC PEMS Data, 2008 - 2010.



CONCLUSIONS

The refined DHRS accurately categorized patients into significantly different HIV risk groups, regardless of geographic region.

The refined DHRS is a relatively simple tool for quantifying HIV risk and may help identify individuals for HIV testing in a variety of clinical settings.

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