

Title: PheValuator 2.0: Changes to Improve the Performance of the Phenotype Algorithm Evaluation Tool

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- INTRO:**
- Phenotype algorithms are used in nearly all observational research
 - The performance of these algorithms is usually unknown
 - Traditional validation through chart review is expensive, time consuming, and provides incomplete results
 - PheValuator is an open-source tool in the OHDSI toolkit for estimating all the performance characteristics of algorithms
 - Objective: Evaluate performance of PheValuator 2.0 v. 1.0 as compared to gold standard phenotype benchmark

METHODS
Changes to PheValuator 2.0 include:

- 1. New xSpec and xSens**
Example Psoriasis xSpec:
≥2 Diagnosis codes for Psoriasis -30 to -1 days prior to any visit
AND 1 Diagnosis code for Psoriasis -30 to -1 days prior to any visit for the first time in a subject's history
Example Psoriasis xSens:
≥ 1 Diagnosis code for Psoriasis All time to -1 days prior to any visit

- 2. Use of up to 3 time windows for predictive modeling features**
Example for chronic disease:
Window 1: 0-30 days after index
Window 2: 31-365 days after index
Window 3: 366-9999 days after index

- Analysis:** Calculated differences in Positive Predictive Value, Sensitivity, and Specificity from PheValuator 1.0 + 2.0 and the phenotype benchmark set of traditionally validated algorithms
- 19 phenotypes
 - 90 algorithms
 - Across 5 datasets

PheValuator 2.0 produces estimates of Positive Predictive Value for phenotype algorithms comparable to chart review.

Therapeutic Area	Condition	Positive Predictive Value Difference	
		Version 1 Median (IQR)	Version 2 Median (IQR)
Overall	Overall	-21 (-34, -3)	4 (-3, 15)
Cardiovascular	Overall	-25 (-34, -18)	0 (-7, 4)
	Atrial Fibrillation	-32 (-39, -28)	-2 (-3, 1)
	Pulmonary Embolism	-38 (-46, -24.25)	-1.5 (-8.25, 3.25)
	Venous Thromboembolism	-18 (-25, -5)	-3 (-10, 1)
	Ischemic Stroke	-22.5 (-28, -19.75)	4 (2, 5)
	Myocardial Infarction	-31 (-39, -20)	-1 (-6.5, 0.5)
Immunology	Overall	-27 (-39, -4)	7 (-2, 30.25)
	Ankylosing spondylitis	-51 (-59, -41.5)	-2.5 (-10, 5)
	Atopic dermatitis	-8 (-16.5, -2)	39 (26.5, 42.5)
	Ulcerative Colitis	-31 (-37.5, -21.25)	-1 (-5.75, 4)
	Crohns Disease	-32.5 (-39, -26.25)	-2 (-6, 2.75)
	Rheumatoid Arthritis	6 (-11, 16)	38 (23, 48)
	Psoriasis	-23 (-34, -6.5)	9 (-3, 26)
Systemic Lupus Erythematosus	-34 (-42.5, -30)	8 (0, 9)	
Infectious Disease	Overall	-1 (-12.5, 3)	2 (-3, 6)
	Viral Hepatitis C	-2.5 (-11.5, 3)	0.5 (-3, 3.75)
	Viral Hepatitis B	1 (-14.5, 1)	5 (-5.5, 6)
Neurology	Overall	-24 (-31.75, -17)	7 (-8, 12.75)
	Autism	-31.5 (-36, -26.5)	2.5 (-5.25, 7.5)
	Bipolar	-28 (-31.5, -26.25)	13 (11.5, 14.75)
	Epilepsy	-20 (-24, -10.75)	-7 (-18.75, 9.5)
Oncology	Overall	-1 (-4, 4.5)	14 (10, 18)
	Multiple Myeloma	0 (-3.25, 6.5)	13.5 (10, 22)
	Prostate Cancer	-2 (-4, 1.25)	14 (9.5, 16.5)

Therapeutic Area	Condition	Sensitivity Difference	
		Version 1.0 Median (IQR)	Version 2.0 Median (IQR)
Overall	Overall	-39 (-51, -20)	-16 (-37, -6)
Cardiovascular	Pulmonary Embolism	-23 (-31.75, -12.75)	-20 (-28.75, -15.25)
	Venous Thromboembolism	-55.5 (-56, -47)	-42.5 (-44, -40)
Immunology	Rheumatoid Arthritis	-45.5 (-63.25, -34)	-23.5 (-39, -12.25)
	Psoriasis	-20 (-28.5, -16)	4 (-1, 6)
Neurology	Epilepsy	-41 (-41, -36)	-12 (-18, -11)
Oncology	Multiple Myeloma	-37 (-48, -21.75)	-14.5 (-21, -3.25)
	Prostate Cancer	-85 (-87, -85)	-58 (-62, -44)

