RISK ASSESSMENT ACCURACY AND UTILITY IN FINDING CHILD ABUSE/NEGLECT PREVENTION EFFECTS

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NAWRS, Tues., Aug. 1, 9:30am–10:45am, Breakout Session 5, Sky Room

STUDY OBJECTIVES:

I. **COMPARE ACCURACY OF A VALIDATED CHILD ABUSE/NEGLECT (CA/N) RISK MODEL WITH ACCURACY OF RISK MODELS FOR CORONARY HEART DISEASE (CHD) AND CARDIOVASCULAR DISEASE (CVD).**

- **PRINCIPAL FINDING: CA/N RISK MODEL CALIBRATION SUPERIOR TO CHD AND CVD RISK MODEL CALIBRATION**

II. **WITH A VALIDATED CA/N RISK MODEL, FIND AND IDENTIFY THE POSITIVE, NULL, OR NEGATIVE EFFECTS OF CHILD PROTECTIVE SERVICES (CPS) ON 6-MONTH-RISK OF SUBSTANTIATED RECURRENCE OF CA/N, THE OUTCOME CHOSEN BY THE U.S. DHHS AND CONGRESS FOR ASSESSING CPS EFFECTIVENESS.**

- **PRINCIPAL FINDING: RISK X SERVICE MODALITIY INTERACTION: CPS IN-HOME AND FOSTER CARE SERVICES ASSOCIATED WITH REDUCED SIX-MONTH RECURRENCE OF SUBSTANTIATED CA/N (6-M-RSCA/N) FOR HIGH AND VERY-HIGH RISK CASES.**

OBJECTIVE I: STUDY STRATEGY

TO MAKE CA/N, CHD, AND CVD RISK MODEL ACCURACY COMPARISONS POSSIBLE, EVALUATE CA/N RISK MODEL PERFORMANCE USING:

- MEDICAL RISK MODEL VALIDATION DESIGN TYPES
- MEDICAL RISK MODEL ACCURACY MEASURES
- FOR COMPARISONS, USE MEDICAL RESEARCH LITERATURE EVALUATING CHD AND CVD RISK MODEL ACCURACY USING ABOVE DESIGN TYPES AND ACCURACY MEAURES.

MEDICAL RISK ASSESSMENT: LIMITATIONS & ACCURACY

GENERALLY:

- ***CANNOT PREDICT INDIVIDUAL PATIENT/CLIENT OUTCOMES*** (e.g., HEART ATTACKS, CA/N)[1]
- ***CAN PREDICT OUTCOME PROBABILITIES FOR GROUPS OF PATIENTS*** KNOWN TO BE AT DIFFERENT LEVELS OF RISK[1]
- ***ACCURATE (VALID) MEDICAL RISK MODEL: SHOWS CLOSE CORRESPONDENCE BETWEEN PREDICTED AND OBSERVED RESULTS FOR INCOMING, NEW PATIENT/CLIENT GROUPS***[1]

MEDICAL RISK MODEL VALIDATION DESIGN TYPES

NOTE: MEDICAL RISK MODEL VALIDITY IS "GENERALIZABILITY" TO TEMPORALLY NEW CASES[1], ADDRESSES ISSUE OF CHANGE IN CASE MIX (CHARACTERISTICS OF PEOPLE) OVER TIME

- **MEDICAL RISK MODEL VALIDATION DESIGN TYPES:**

1. **INTERNAL** : TESTS RISK MODEL VALIDITY USING MODEL DEVELOPMENT SAMPLE CASES.

   PROBLEMS: OVEROPTIMISTIC (MISLEADING) RESULTS[1], POSITIVE-APPEARING RESULTS DO NOT CONSTITUTE A "VALIDATION".

2. **TEMPORAL:** TESTS GENERALIZBILITY TO TEMPORALLY NEW CASES FROM MODEL DEVELOPMENT SAMPLE SOURCE LOCATIONS (PLACES)

3. **EXTERNAL**: TESTS GENERALIZBILITY TO TEMPORALLY NEW CASES FROM NEW PLACES

MEDICAL RISK MODEL ACCURACY MEASURES

PRINCIPAL MEASURES [2]:

1. DISCRIMINATION (AREA UNDER THE ROC CURVE MEASUREDS BY VALUE OF *C*-INDEX. PERFECT DISCRIMINATION *C*-INDEX = 1.0

2. CALIBRATION (RATIO OF CASES PREDICTED TO CASES OBSERVED DURING FOLLOW-UP SUBSEQUENT TO RISK ASSESSMENT) PERFECT CALIBRATION CASES PREDICTED ÷ CASES OBSERVED DURING FOLLOW-UP = 1.0

SUPPLEMENTARY MEASURE[3]**:**

3. PREDICTED SEPARATION (PSEP = $p_{worst} - p_{best}$)

PERFECT SEPARATION: $p_{worst} - p_{best} = 1.0$, 100% SEPARATION

OBJECTIVE I FINDINGS: CFRA, CHD, AND CVD RISK MODEL DISCRIMINATION FINDINGS

CFRA DISCRIMINATION FINDINGS

	CFRA MODEL DEVELOPMENT SAMPLE	CFRA TEMPORAL VALIDATION SAMPLE (BASELINE RISK CASES)	CFRA EXTERNAL VALIDATION SAMPLE (BASELINE RISK CASES)
N OF CASES	2511	6307	236
***C*-INDEX VALUE**	.7O	0.64	0.74
STAT. SIG	P. < .0005	P. < .0005	P. < .0005
95% CI	.67 to .72	.61 to .66	.66 to .82

CHD RISK MODEL DISCRIMINATION

DISCRIMINATION DESCRIPTIVE STATISTICS FOR *C*-INDEX VALUES FROM 26 CHD RISK MODEL TRIALS FOUND BY LITRATURE REVIEW[6]

MINIMUM	MAXIMUM	MEAN	MEDIUM
0.60	0.84	0.72	0.71

C-INDEX VALUES FOR CFRA SAMPLES ARE WELL WITHIN THE RANGE OF VALUES SEEN FOR CHD MODEL DISCRIMINATION

OBJECTIVE I FINDINGS: CFRA CALIBRATION RESULTS

CFRA RISK GROUP	PREDICTED PROBABILITY OF CA/N FROM MODEL DEV. SAMPLE	N OF NEW CASES IN RISK GROUP	N OF NEW SUBST. CA/N CASES PREDICTED	N OF NEW SUBST. CA/N CASES OBSERVED	RATIO OF PRED. TO OBS. CASES	RATIO OF PRED. TO OBS. CASES MINUS 1.0	ABSOLUTE VALUE OF % DEPARTURE FROM 1.0
CFRA EXTERNAL VALIDATION SAMPLE, N = 236							
VERY-HIGH	.443 (43.3%)	7	3.10	3			
HIGH	.316 (31.6%)	63	19.91	24			
MOD.	0.138 (13.8%)	125	17.25	18			
LOW	.077 (7.7%)	41	3.16	2			
TOTAL		236	43.42	47	0.924	-.076 (-7.6%)	7.6%
CFRA TEMPORAL VALIDATION SAMPLE, N = 6307							
VERY-HIGH	.443 (43.3%)	42	18.61	15			
HIGH	.316 (31.6%)	648	204.77	165			
MOD.	0.138 (13.8%)	3305	456.09	439			
LOW	.077 (7.7%)	2312	178.02	182			
TOTAL		6307	857.49	801	1.071	.071 (7.1%)	7.1%

OBJECTIVE I FINDINGS: CHD AND CVD RISK MODEL CALIBRATION RESULTS[5]

BEST CHD CALIBRATION (SMALLEST DEPARTURE FROM 1.0) SEEN IN SYSTEMATIC REVIEW OF 20 CHD RISK MODEL EVALUATIONS

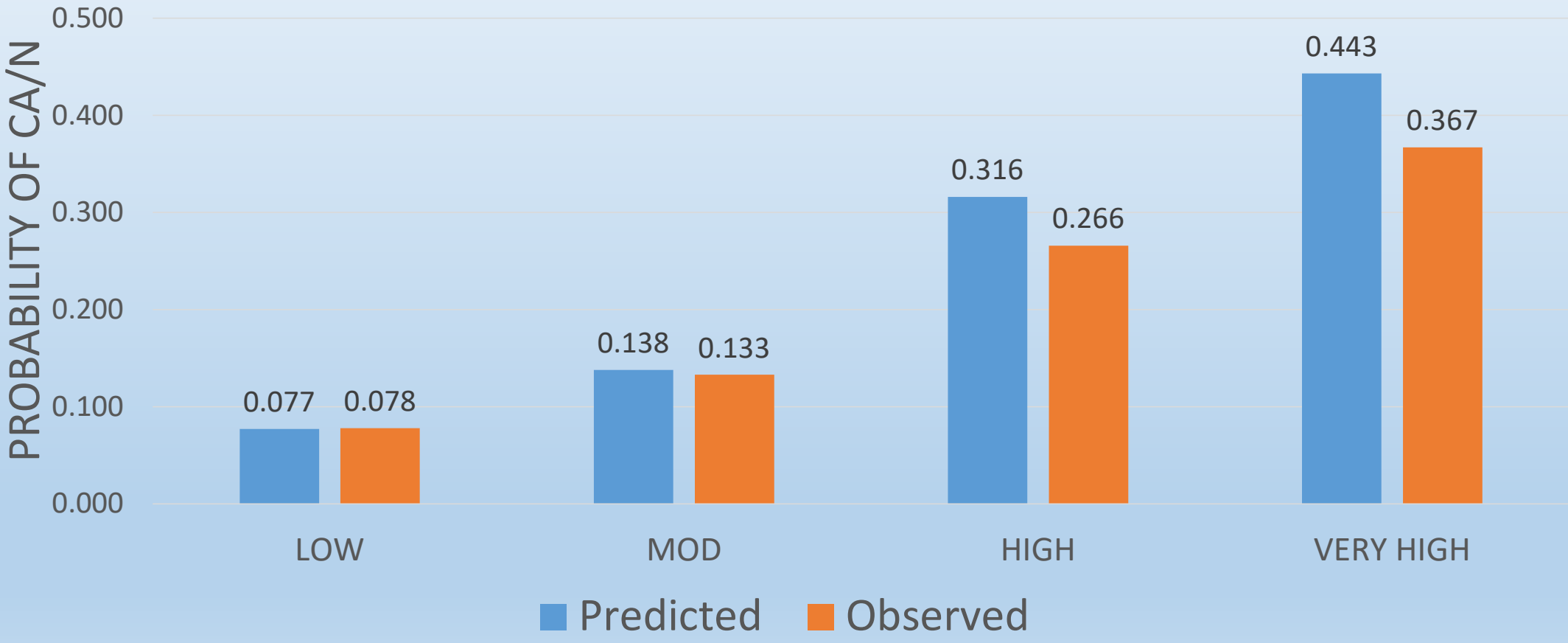
N OF CASES IN COHORT	N OF CASES PREDICTED	N OF CASES OBSERVED	RATIO OF PRED. TO OBS. CASES	RATIO OF PRED. TO OBS. CASES MINUS 1.0	ABSOLUTE VALUE OF % DEPARTURE FROM 1.0
1393	222	206	1.078	0.078 (7.8%)	7.8%

BEST CVD CALIBRATION (SMALLEST DEPARTURE FROM 1.0) SEEN IN SYSTEMATIC REVIEW OF 7 CVD RISK MODEL EVALUATIONS5

1045	94	87	1.080	0.080 (8.0%)	8.0%

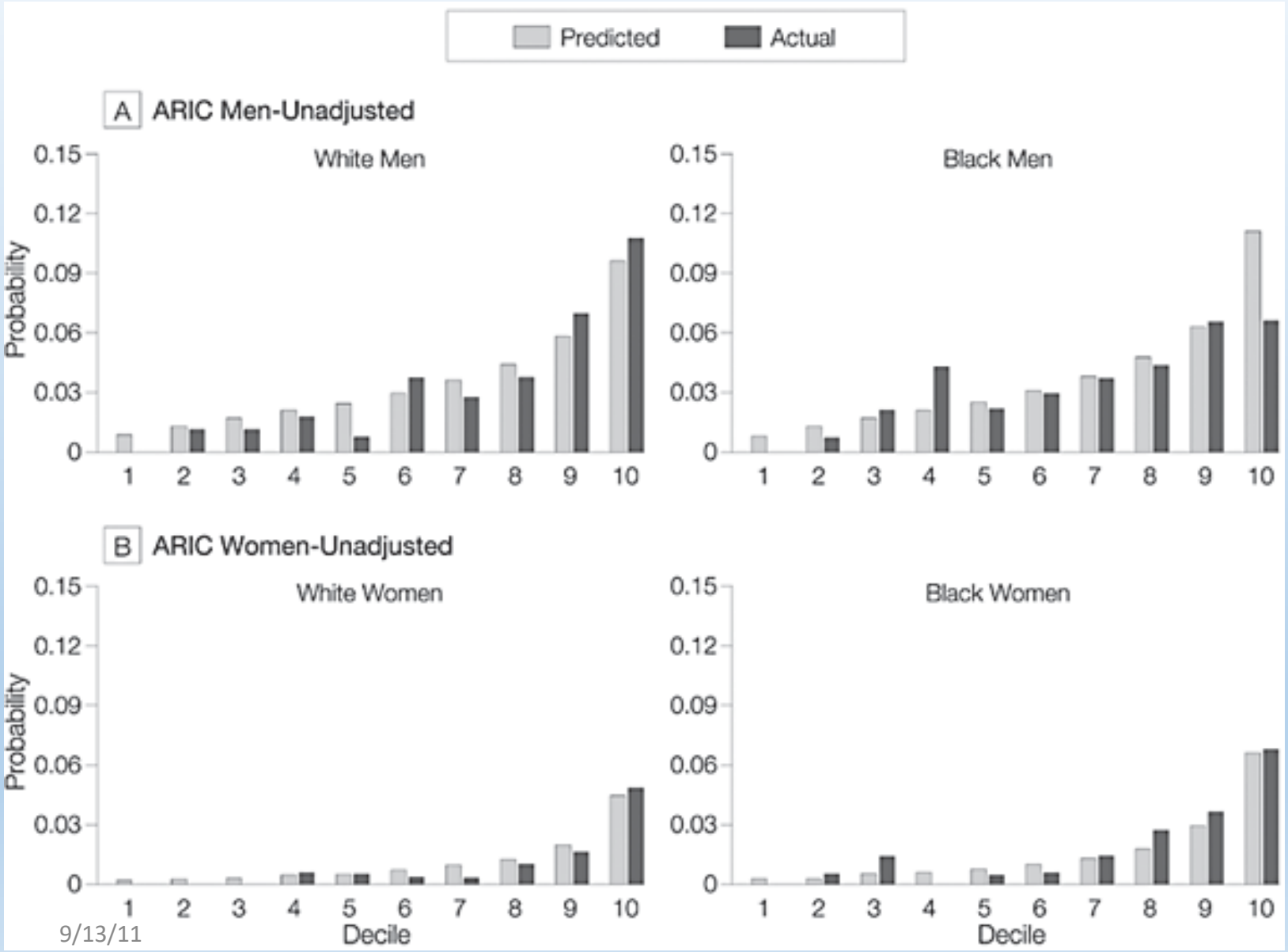
OBJECTIVE I FINDINGS: CFRA PREDICTDED SEPARATION

CFRA PSEP = .443 - .077 = .366, N = 6543, 5 CA. COUNTIES



OBJECTIVE I FINDINGS: FRAMINGHAM CHD RISK MODEL PREDICTDED SEPARATION (PSEP)

PSEP
= .10 - .01
= .09



PSEP
= .12 - .01
= .11

PSEP
= .05- .00
= .05

PSEP
= ..06 - .00
= .06

OBJECTIVE II FINDINGS: POSITIVE, NULL, AND NEGATIVE EFFECTS OF CPS SERVICES ON 6-MONTH RECURRENCE OF SUBSTANTIATED CA/N IN 5 CALIFORNIA COUNTIES

			Columns				
			1	2	3	4	5
			CFRA Risk Levels				
Rows	Service Type	Sub-Rows	Low	Moderate	High	Very-High	Row Total n or %
1	No service given--Baseline Recurrence Rates by Risk Level	a %	4.0%	5.7%	17.8%	22.2%	---
		b *(n)*	*546*	*1536*	*507*	*63*	*2652*
2	In-Home Service (Home visiting)	a %	3.8%	8.3%[1]	11.5%[2]	16.7%	---
		b *(n)*	*53*	*374*	*227*	*42*	*696*
3	Foster Care Placement	a %	7.7%	2.2%	10.6%[3]	4.8%[4]	---
		b *(n)*	*13*	*89*	*151*	*42*	*295*
4	Service Type Oth./Unk./Pend.	a %	5.6%	9.3%	13.5%	11.8%	---
		b *(n)*	*18*	*75*	*74*	*17*	184
5	Risk Level Total n	---	*630*	*2,074*	*959*	*164*	*3,827*
6	Risk level Total % of all 3,287 cases	---	16.5%5	54.2%5	25.1%	4.3%	100.0%

[1] Fisher's Exact Probabilities, 2-sided = .073, 1-sided = .046

[2] Fisher's Exact Probabilities, 2-sided = .029, 1-sided = .018

[3] Fisher's Exact Probabilities, 2-sided = .043, 1-sided = .021

[4] Fisher's Exact Probabilities, 2-sided = .024, 1-sided = .021

[5] 16.5% + 54.2% = 70.7% of services went to lower risk cases not helped by, or possibly made worse by it.