CALCULATING COHEN'S KAPPA

A MEASURE OF INTER-RATER RELIABILITY

FOR QUALITATIVE RESEARCH INVOLVING NOMINAL CODING

WHAT IS COHEN'S KAPPA?

- COHEN'S KAPPA IS A STATISTICAL MEASURE CREATED BY JACOB COHEN IN 1960 TO BE A MORE ACCURATE MEASURE OF RELIABILITY BETWEEN TWO RATERS MAKING DECISONS ABOUT HOW A PARTICULAR UNIT OF ANALYSIS SHOULD BE CATEGORIZED.
- KAPPA MEASURES NOT ONLY THE % OF AGREEMENT BETWEEN TWO RATERS, IT ALSO CALCULATES THE DEGREE TO WHICH AGREEMENT CAN BE ATTRIBUTED TO CHANCE.

JACOB COHEN, A COEFFICIENT OF AGREEMENT FOR NOMINAL SCALES, *EDUCATIONAL AND PSYCHOLOGICAL MEASUREMENT* 20: 37–46, 1960.

THE EQUATION FOR *K*

THE FANCY "K" STANDS FOR KAPPA

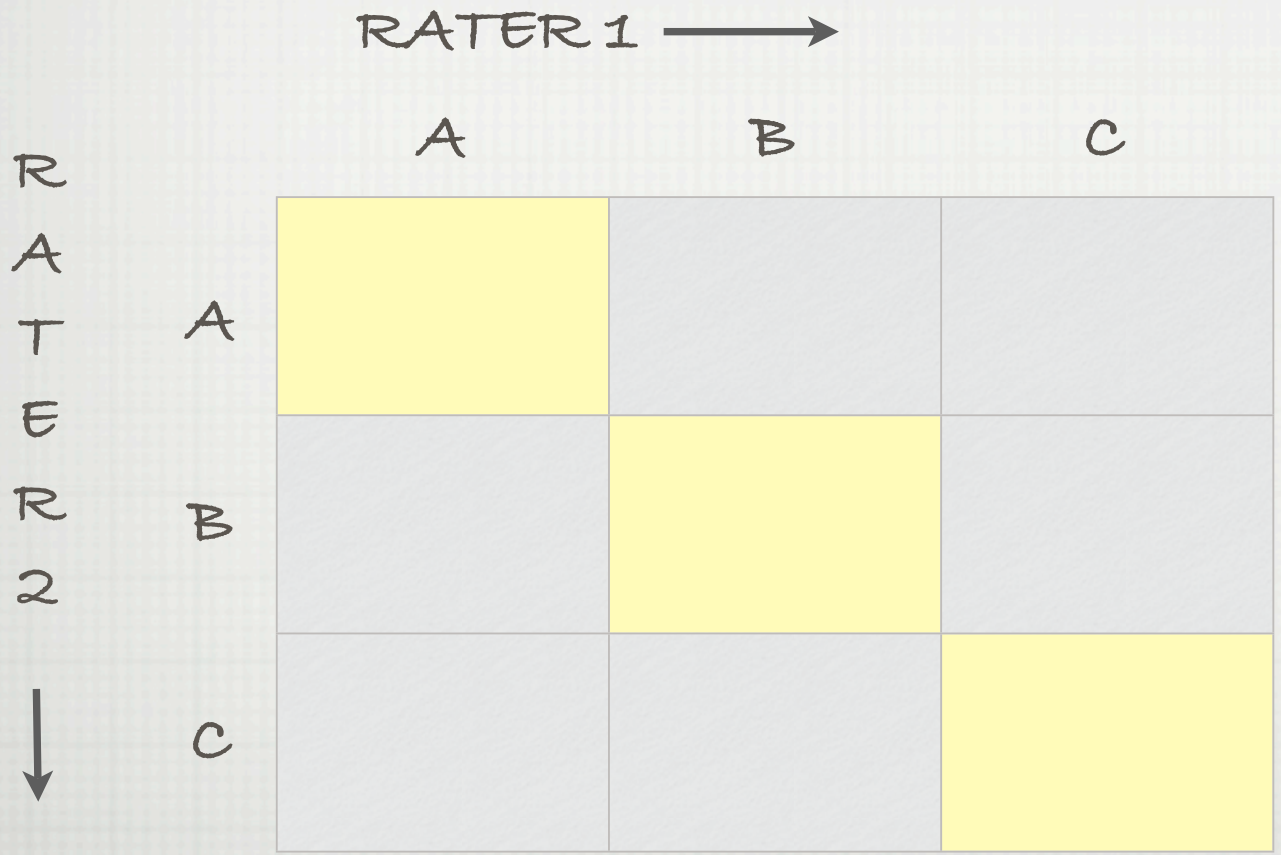
$$\mathcal{K} = \frac{Pr(a) - Pr(e)}{N - Pr(e)}$$

PR(A) = SIMPLE AGREEMENT AMONG RATERS

N = TOTAL NUMBER OF RATED ITEMS, ALSO CALLED "CASES"

PR(E) = LIKLIHOOD THAT AGREEMENT IS ATTRIBUTABLE TO CHANCE

CALCULATING κ BY HAND USING A CONTINGENCY TABLE



THE SIZE OF THE TABLE IS DETERMINED BY HOW MANY CODING CATEGORIES YOU HAVE

THIS EXAMPLE ASSUMES THAT YOUR UNITS CAN BE SORTED INTO THREE CATEGORIES, HENCE A 3X3 GRID

CALCULATING κ BY HAND USING A CONTINGENCY TABLE

RATER 1 ⟶

RATER 2 ↓	A	B	C
A	# of agreements on A	disagreement	disagreement
B	disagreement	# of agreements on B	disagreement
C	disagreement	disagreement	# of agreements on C

THE DIAGONAL HIGHLIGHTED HERE REPRESENTS AGREEMENT (WHERE THE TWO RATERS BOTH MARK THE SAME THING)

DATA: RATING BLOG COMMENTS

- USING A RANDOM NUMBER TABLE, I PULLED COMMENTS FROM ENGLISH LANGUAGE BLOGS ON BLOGGER.COM UNTIL I HAD A SAMPLE OF 10 COMMENTS
- I ASKED R&W COLLEAGUES TO RATE EACH COMMENT: "PLEASE CATEGORIZE EACH USING THE FOLLOWING CHOICES: RELEVANT, SPAM, OR OTHER."
- WE CAN NOW CALCULATE AGREEMENT BETWEEN ANY TWO RATERS

DATA: RATERS 1-5

Item #	1	2	3	4	5	6	7	8	9	10
Rater 1	R	R	R	R	R	R	R	R	R	S
Rater 2	S	R	R	O	R	R	R	R	O	S
Rater 3	R	R	R	O	R	R	O	O	R	S
Rater 4	R	R	R	R	R	R	R	R	R	S
Rater 5	S	R	R	O	R	O	O	R	R	S

CALCULATING κ FOR RATERS 1 & 2

RATER 1 ⟶

RATER 2 ↓

	R	S	O	
R	6 (Item #2,3, 4-8)	0	0	6
S	1 (Item #1)	1 (Item #10)	0	2
O	2 (Item #4 & 9)	0	0	2
	9	1	0	10

ADD ROWS & COLUMNS

SINCE WE HAVE 10 ITEMS, THE TOTALS SHOULD ADD UP TO 10 FOR EACH

CALCULATING κ

COMPUTING SIMPLE AGREEMENT

RATER 1 ⟶

RATER 2 ↓

	R	S	O
R	6 (Item #2,3, 4-8)	0	0
S	1 (Item #1)	1 (Item #10)	0
O	2 (Item #4 & 9)	0	0

ADD VALUES OF DIAGONAL CELLS & DIVIDE BY TOTAL NUMBER OF CASES TO COMPUTE SIMPLE AGREEMENT OR "PR(A)"

(6+1)/10

THE EQUATION FOR *K*: RATERS 1 & 2

WE CAN NOW ENTER THE VALUE OF PR(A)

$$K = \frac{7 - Pr(e)}{10 - Pr(e)}$$

WE ALSO SUBSTITUTE 10 AS THE VALUE OF N

RATERS 1 & 2 AGREED ON 70% OF THE CASES. BUT HOW MUCH OF THAT AGREEMENT WAS BY CHANCE?

PR(A) = SIMPLE AGREEMENT AMONG RATERS

PR(E) = LIKLIHOOD THAT AGREEMENT IS ATTRIBUTABLE TO CHANCE

CALCULATING κ

EXPECTED FREQUENCY OF CHANCE AGREEMENT

RATER 1 ⟶

RATER 2 ↓

	R	S	O
R	6 (5.4)	0	0
S	1 (Item #1)	1 (.2)	0
O	2 (Item #4 & 9)	0	0 (0)

FOR EACH DIAGONAL CELL, WE COMPUTE EXPECTED FREQUENCY OF CHANCE (EF)

$$EF = \frac{\text{ROW TOTAL X COL TOTAL}}{\text{TOTAL \# OF CASES}}$$

EF FOR "RELEVANT" = (6*9)/10 = 5.4

CALCULATING κ

EXPECTED FREQUENCY OF CHANCE AGREEMENT

RATER 1 ⟶

RATER 2 ↓

	R	S	O
R	6 (5.4)	0	0
S	1 (Item #1)	1 (.2)	0
O	2 (Item #4 & 9)	0	0 (0)

ADD ALL VALUES OF (EF) TO GET "PR(E)"

PR(E) =

5.4 + .2 + 0 =

5.6

THE EQUATION FOR *K*: RATERS 1 & 2

WE CAN NOW ENTER THE VALUE OF PR(E) & COMPUTE KAPPA

$$\kappa = \frac{7 - 5.4}{10 - 5.4}$$

$$\kappa = .35$$

THIS IS FAR BELOW THE ACCEPTABLE LEVEL OF AGREEMENT, WHICH SHOULD BE AT LEAST .70

PR(A) = SIMPLE AGREEMENT AMONG RATERS

PR(E) = LIKLIHOOD THAT AGREEMENT IS ATTRIBUTABLE TO CHANCE