

Using SAS to facilitate your systematic review

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Background and Objective

- Literature searches for systematic reviews can generate 1000s of articles that require examination for topic relevance
- It is important that two independent researchers extract the articles for final selection of the articles to avoid errors.¹

- Objective:** To illustrate the utility of SAS in the management of articles for a systematic review coded by two independent reviewers for report eligibility.

Methods

- We searched Pubmed for English language studies focusing on congenital abnormalities and childhood cancer risk using Mesh major focus terms.
- Article details were downloaded from PubMed and saved in an excel file with the Pubmed article URL uniquely identifying each article.
- Articles were independently coded for topic relevance into 8 categories by two raters.
- SAS version 9.3 procedures including PROC IMPORT, PROC SORT, and PROC FREQ were employed to determine articles with coding agreement and to calculate the Kappa statistic (K), a measure of inter-rater agreement.
- Articles where there was disagreement were subsequently identified using PROC FREQ and re-reviewed by both reviewers to reach consensus (not shown).

Results

- A total of 2140 articles were identified for initial review
- Following SAS procedures outlined in Steps 1-4, a total of 59 articles were identified with disagreement between reviewers.
- The articles were discussed for consensus, yielding a final total of 46 articles for review

Step 1: Save excel files with Rater 1 and Rater 2's codes and article URL's as text files

Rater 1 codes

Rater 2 codes

Step 2: Import Rater 1 and Rater 2 files containing codes into SAS

```
PROC IMPORT OUT= WORK.Rater1
DATAFILE=
"C:\Users\kijohnson\Desktop\Rater1.txt"
DBMS=TAB REPLACE; GETNAMES=YES; DATAROW=2; RUN;

PROC IMPORT OUT= WORK.Rater2
DATAFILE=
"C:\Users\kijohnson\Desktop\Rater2.txt"
DBMS=TAB REPLACE; GETNAMES=YES; DATAROW=2; RUN;
```

Step 3: Sort by URL to make sure the articles are in the same order prior to merging and merge datasets

```
proc sort data=Rater1; by url; run;
proc sort data=Rater2; by url; run;

data RlandR2;
merge Rater1 (keep=url title code_Rater1) Rater2 (keep=url code_Rater2); by
url; run;
```

SAS View of merged dataset (n=2140)

Step 4: Run PROC FREQ with the AGREE option to identify articles with rater disagreement and K

```
*use ods lines to generate a RTF file for easy copy and pasting of output
tables to other documents;
ods rtf file="output.rtf";
proc freq data=RlandR2;
tables code_Rater1*code_Rater2/nopercent norow nocol missing agree;
run;
ods rtf close;
```

SAS ODS RTF OUTPUT

The SAS System

The FREQ Procedure

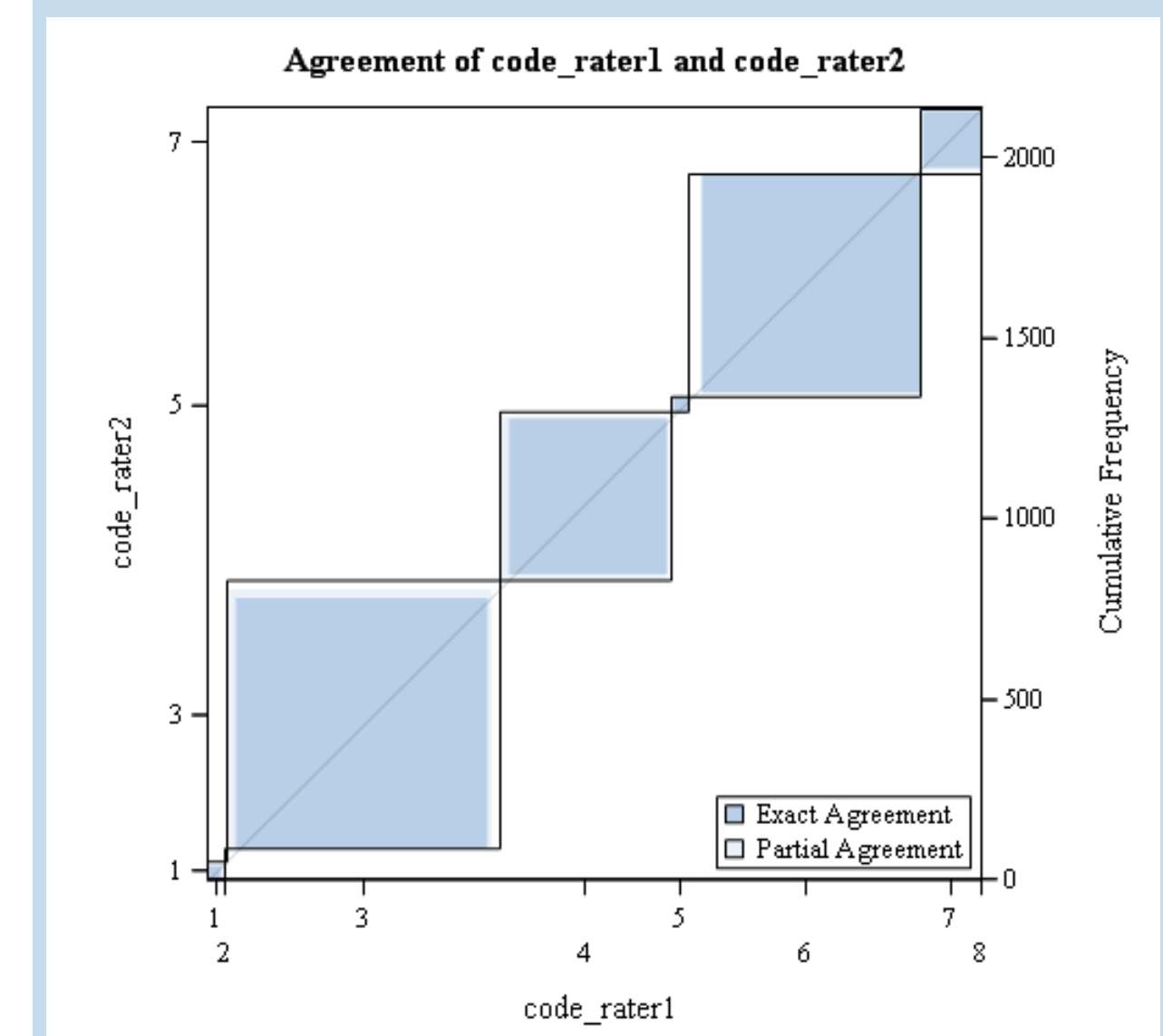
Table of code_rater1 by code_rater2									
code_rater1	code_rater2								
Frequency	1	2	3	4	5	6	7	8	Total
1	39	7	0	1	0	0	0	0	47
2	1	3	3	0	0	1	0	0	8
3	7	15	694	15	0	5	11	5	752
4	0	3	23	435	0	5	6	1	473
5	0	2	7	1	43	0	0	0	53
6	0	3	17	12	0	605	1	2	640
7	0	1	1	0	0	0	161	0	163
8	0	1	1	0	0	0	1	1	4
Total	47	35	746	464	43	616	180	9	2140

Statistics for Table of code_rater1 by code_rater2

Test of Symmetry	
Statistic (S)	69.6120
DF	28
Pr > S	<.0001

Kappa Statistics			
Statistic	Value	ASE	95% Confidence Limits
Simple Kappa	0.8991	0.0076	0.8841 0.9140
Weighted Kappa	0.9054	0.0083	0.8891 0.9217

Sample Size = 2140



Conclusions

- Although referencing software (e.g. Endnote or Refworks) have been extensively used for data management in systematic reviews, SAS can also be used in this context.
- Moreover, unlike referencing programs used for systematic reviews, SAS can be used to calculate statistics (e.g. Kappa) and identify articles with disagreement between raters for further review.



References

- Egger, M., Smith, G. D., & Altman, D. (Eds.). (2008). *Systematic reviews in health care: meta-analysis in context*. John Wiley & Sons.