

### **Research** synthesis

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#### What is research synthesis?

 Research synthesis is the process through which two or more research studies are assessed with the objective of summarizing the evidence relating to a particular question.





# Why do we need research synthesis?

- To make sense of current research (science is cumulative)
  - volume of research is overwhelming
  - access to reports of research is haphazard, and often biased
  - the quality of research is very variable
  - most studies are too small





# What is the science of research synthesis?

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### The medical review article: state of the science. [Mulrow. Ann Int Med, 1987]

"Current medical reviews do not routinely use scientific methods to identify, assess, and synthesize information."





Research synthesis is required for which types of research?

- Basic science research Johanna Horn et al. Nimodipine in animal model experiments of focal cerebral ischaemia. Stroke 2001;32:2433-2438
- Screening/diagnostic tests
- Prevalence/incidence studies
- Prognosis studies
- Effects of practices



## Why is research synthesis important?

- Patients (and the public more generally) suffer directly and indirectly
- Policymakers, practitioners, and patients have inadequate information to guide their choices among alternatives
- Limited resources for health care and new research are used inefficiently





#### Systematic reviews

- protocol development
- critical appraisal
- meta-analysis

Updating/electronic publication







- Why do we need reviews?
- Traditional (narrative) reviews
- Systematic reviews
- By definition a "review" is a retrospective study





#### **Essentials of a systematic review**

- Clear, explicit strategy
- Comprehensive
- Reproducible

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## What constitutes a systematic review?

- Clearly formulated question
- Methods to identify studies (searching)
- Selecting studies
- Critical appraisal





#### What is a systematic review?

A review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies.



#### **Review protocol**

- Systematic reviews are research projects
- Systematic reviews are retrospective studies
- protocol preparation allows `a priori' decisions
- To obtain feedback and criticism for the review before it is finalised





#### Sections of a protocol

- Cover sheet
- Background
- Objectives
- Selection criteria
- Search strategy
- Methods





### Selection criteria

- Types of studies
  - RCTs, placebo-controlled etc.
- Participants
  - sex, age groups, community vs hospital
- Interventions
  - Treatment vs nothing? Placebo?
  - Treatment vs another treatment
- Outcomes
  - Substantive outcomes vs surrogate outcomes
  - Outcomes important for decision-making
  - Outcomes important for users (consumers)





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#### Search strategy

- Search terms
- databases
- handsearching
- expert help usually needed

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#### Methods

- How will you decide to include or exclude a study from the review (critical appraisal)?
  - A priori description
  - Duplicate assessments
  - Quality assessment
  - Missing data





#### Sections of a systematic review

- Cover sheet
- Background
- Objectives
- Selection criteria
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- Description of studies
- Methodological quality of included studies
- Results
- Discussion
- Conclusions
  - Implications for practice
  - Implications for research
- Acknowledgements
- Conflict of interest





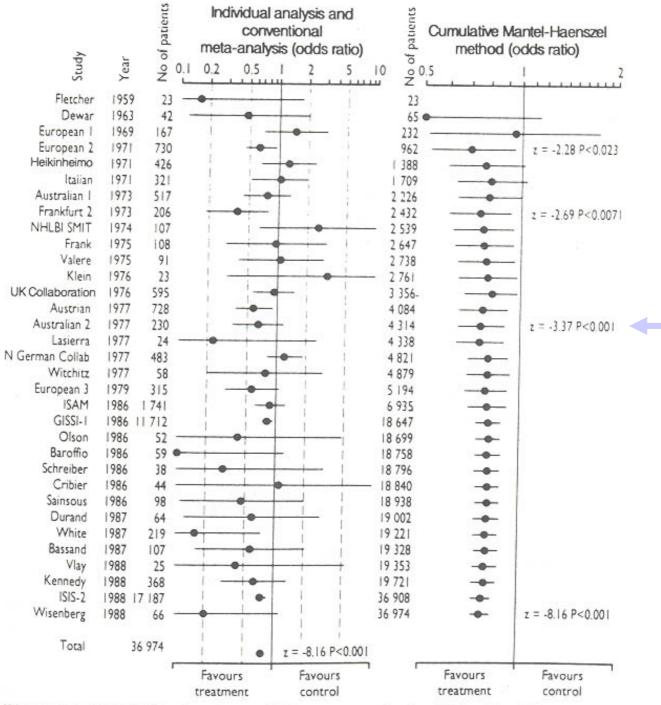
#### What is a meta-analysis?

The use of statistical techniques in a systematic review to integrate the results of the included studies. Also used to refer to systematic reviews that use meta-analysis.





#### 1977



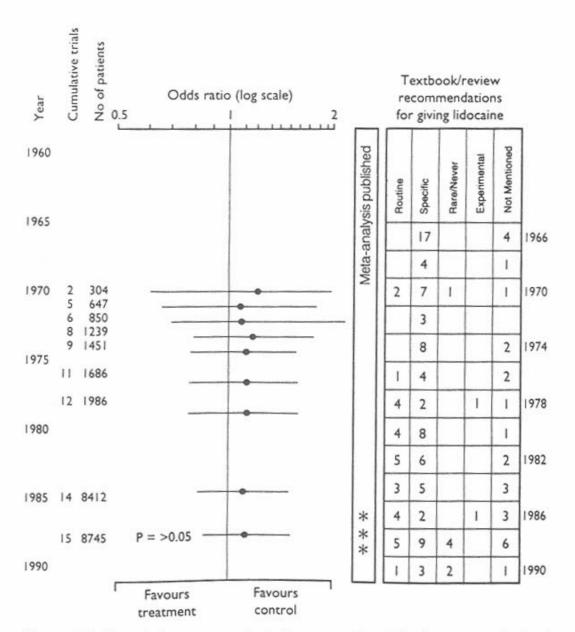
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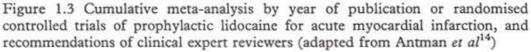
Figure 1.1 Conventional and cumulative meta-analysis of 33 trials of intravenous

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### Corticosteroid treatment for women in preterm labour: effects on neonatal death

	Expt	Ctrl	Relative Risk	RR
Study	n/N	n/N	(95%Cl Fixed)	(95%Cl Fixed)
Neonatal death in babies trea	ted before 1980			
AMSTERDAM 1980	3 / 64	12 / 58	<	0.23 [0.07,0.76]
AUCKLAND 1972	36 / 532	60 / 538		0.61 [0.41,0.90]
BLOCK 1977	1 / 69	5 / 61	←	0.18 [0.02,1.47]
DORAN 1980	4 / 81	11 / 63	<	0.28 [0.09,0.85]
GAMSU 1989	14 / 131	20 / 137		0.73 [0.39,1.39]
MORRISON 1978	3 / 67	7 / 59		0.38 [0.10,1.39]
PAPAGEORGIOU 1979	1 / 71	7 / 75	< <b></b>	0.15 [0.02,1.20]
TAUESCH 1979	8 / 56	10 / 71	<b>_</b>	1.01 [0.43,2.40]
Subtotal (95%Cl)	70 / 1071	132 / 1062	-	0.53 [0.40,0.70]
Chi-square 9.44 (df=7)  Z=4.	50			% 47 az
Neonatal death in babies trea	ted after 1980			
GARITE 1992	9 / 40	11 / 42	<b>_</b>	0.86 [0.40,1.85]
KARI 1994	6 / 95	9/94		0.66 [0.24,1.78]
MORALES 1986	7 / 121	13 / 124	<b>_</b>	0.55 [0.23,1.34]
PARSONS 1988	0 / 23	1 / 22	<	— 0.32 [0.01,7.45]
SCHMIDT 1984	5/49	4 / 31		0.79 [0.23,2.72]
US STEROID TRIAL	32 / 371	34 / 372		0.94 [0.60,1.50]
Subtotal (95%Cl)	59 / 699	72 / 685		0.80 [0.58,1.11]
Chi-square 1.67 (df=5)  Z=1.3	32			

#### **External cephalic version**

#### Comparison: External cephalic version at term Outcome: Non-cephalic births

outcome. Non-ceptain birdis							
	Expt	Ctrl	Relative Risk	Weight	RR		
Study	n/N	n/N	(95%Cl Fixed)	%	(95%Cl Fixed)		
Van Dorsten 1981	8 / 25	19 / 23	<b>_</b>	8.3	0.39 [0.21,0.71]		
Hofmeyr 1983	1/30	20 / 30	←───	8.4	0.05 [0.01,0.35]		
Brocks 1984	17 / 31	29 / 34		11.6	0.64 [0.45,0.91]		
Van Veelen 1989	39 / 89	67 / 90	-	27.8	0.59 [0.45,0.77]		
Van De Pavert 1990	16 / 25	20 / 27	_ <b>_</b>	8.0	0.86 [0.60,1.25]		
Mahomed 1991	18 / 103	87 / 105	-	36.0	0.21 [0.14,0.32]		
Total (95%Cl)	99 / 303	242 / 309	•	100.0	0.42 [0.35,0.50]		
Chi-square 41.34 (df=5)  Z≕	9.95						

Comparison: External cephalic version at term Outcome: Caesarean section									
Study	n/N	n/N	(95%Cl Fixed)	%	(95%Cl Fixed)				
Van Dorsten 1981	7 / 25	17 / 23	<b>_</b>	19.1	0.38 [0.19,0.74]				
Hofmeyr 1983	6 / 30	13 / 30		14.0	0.46 [0.20,1.05]				
Brocks 1984	7 / 31	12 / 34		12.4	0.64 [0.29,1.42]				
Van Veelen 1989	8 / 89	13 / 90		14.0	0.62 [0.27,1.43]				
Van De Pavert 1990	7 / 25	3 / 27		— 3.1	2.52 [0.73,8.69]				
Mahomed 1991	13 / 103	35 / 105		37.4	0.38 [0.21,0.67]				
Total (95%Cl)	48 / 303	93 / 309	-	100.0	0.52 [0.39,0.71]				
Chi-square 8.79 (df=5)	) Z=4.18								

#### Conclusions

- The methodology is well-established for RCTs
- For other types of studies (answering other types of questions) methodology is being developed
  - search
  - critical appraisal
- The principle remains the same





#### Useful resources

- WHO Programme to Map Best Reproductive Health Practices web site (<u>http://www.who.int/reproductive-</u> <u>health/hrp/practices/index.htm</u>)
- WHO Reproductive Health Library
- Cochrane Library
- Cochrane Collaboration web site (<u>http://www.cochrane.org</u>)
- Netting the evidence: (<u>http://www.shef.ac.uk/~scharr/ir/netting/</u>)





stating the objectives of the research

- defining eligibility criteria for studies to be included
- identifying (all) potentially eligible studies
- applying eligibility criteria
- assembling the most complete dataset feasible
- analysing this dataset, using statistical synthesis and

sensitivity analyses, if appropriate and possible

preparing a structured report of the research

