Meta-analysis
A quick overview

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Evidence-based Medicine

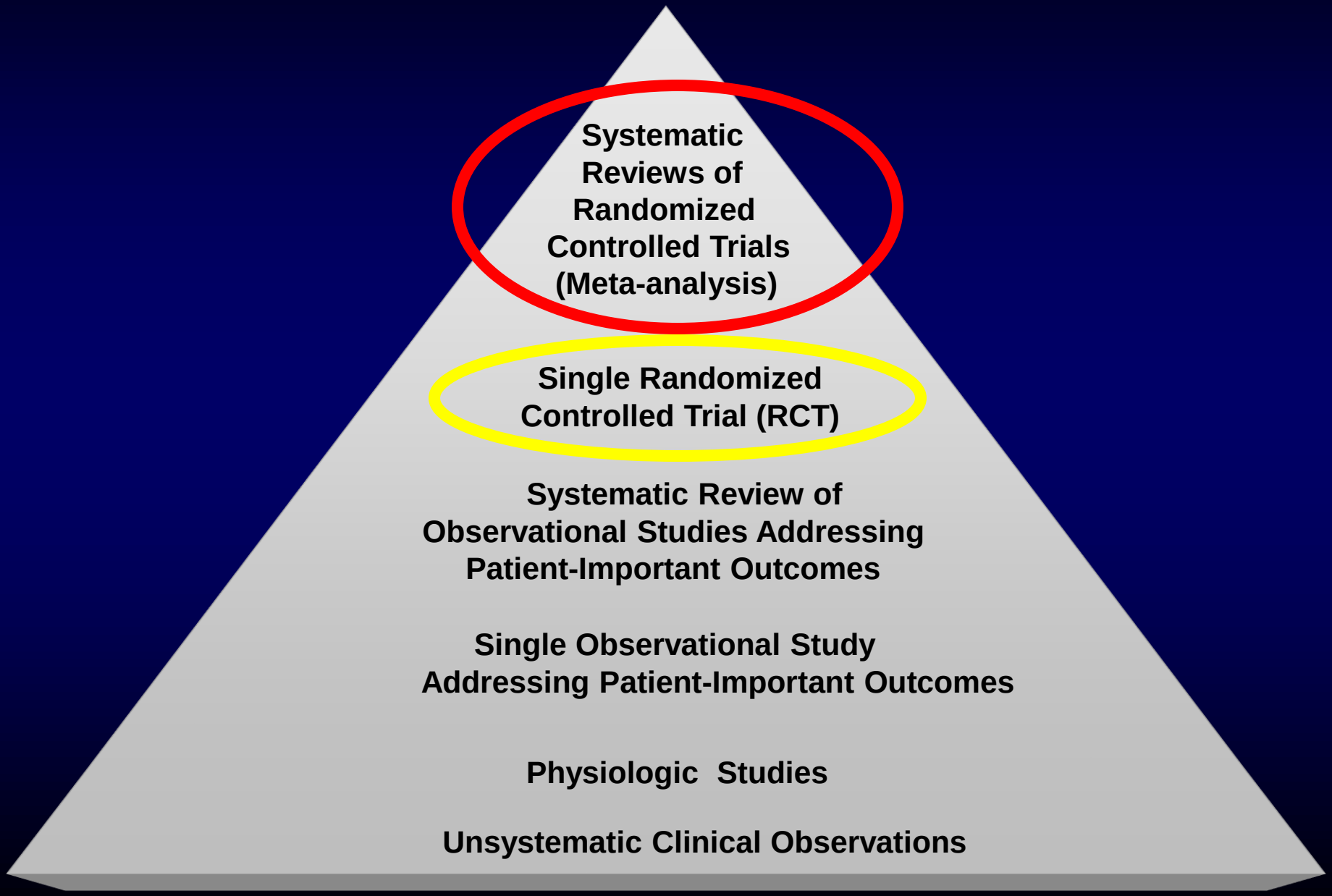
Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.

David Sackett, BMJ, 1996

Meta-analysis vs. randomized controlled trials

Small RCTs	First data on a given problem
Meta-analyses of small RCTs	To generate hypotheses for more reliable RCTs
Large RCTs	To obtain reliable overall answers in adequately powered and designed trials
Meta-analyses of large RCTs	To obtain precise, unbiased, generalizable estimate of treatment effect and also treatment effects in important subgroups

Hierarchy of Evidence



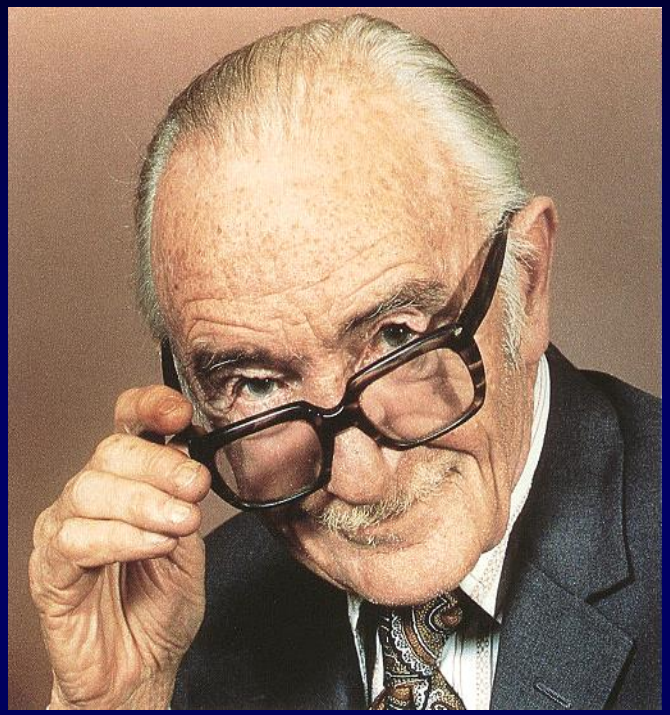
Hierarchy of Evidence

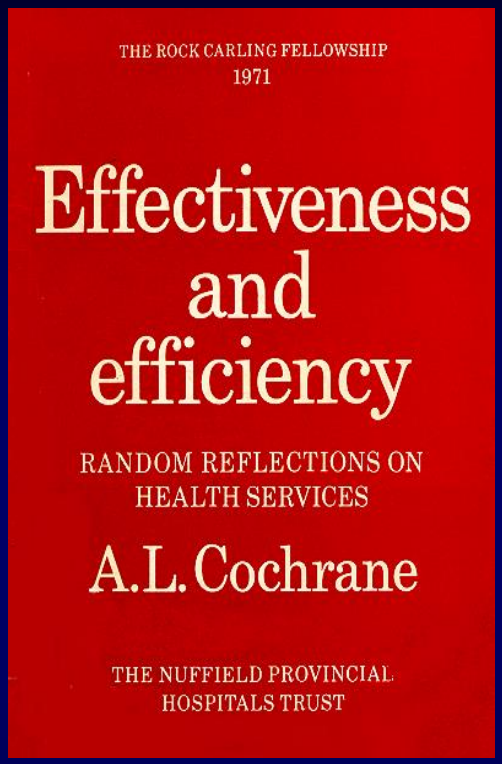
Level	Type of evidence
1A	Systematic review (with homogeneity) of RCTs
1B	Individual RCT (with narrow confidence intervals)
1C	All or none study
2A	Systematic review (with homogeneity) of cohort studies
2B	Individual Cohort study (including low quality RCT, e.g. <80% follow-up)
2C	"Outcomes" research; Ecological studies
3A	Systematic review (with homogeneity) of case-control studies
3B	Individual Case-control study
4	Case series (and poor quality cohort and case-control study
5	Expert opinion without explicit critical appraisal or based on physiology bench research or "first principles"

Levels of Evidence for Therapeutic Studies*

*From the Centre for Evidence-Based Medicine, http://www.cebm.net.

Archie Cochrane





"It is surely a great criticism of our profession that we have not organised a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomised controlled trials."

Cochrane Database of Systematic Reviews

The Cochrane Collaboration - an international network of individuals and institutions committed to preparing, maintaining, and promoting the accessibility of systematic reviews of the effects of health care interventions.

Cochrane
Trusted evidence.
Informed decisions.
Better health.

Centre Cochrane français
Directeur: Pr Ph. Ravaud

http://www.cochrane.fr/

Cochrane Library

Trusted evidence.
Informed decisions.
Better health.

Log in / Register

Search | Search Manager | Medical Terms (MeSH) | Browse

Title, Abstract, Keywords | breast cancer | Go | Save

Search Limits | Search Help | (Word variations have been searched) | Add to Search Manager

Clear

All Results (17650)

- Cochrane Reviews (122)
  - All
  - Review
  - Protocol
- Other Reviews (616)
- Trials (15701)
- Methods Studies (462)
- Technology Assessments (379)
- Economic Evaluations (369)
- Cochrane Groups (1)

- All
- Current Issue

Me Methodology
Dx Diagnostic
Ov Overview
Cc Conclusions changed
Ns New search
Mc Major change

Cochrane Database of Systematic Reviews : Issue 4 of 12, April 2015

Issue *updated daily* throughout month

There are **122** results from **8818** records for your search on '**breast cancer in Title, Abstract, Keywords** in **Cochrane Reviews**'

Pages 1 - 25 | 26 - 50 | 51 - 75 | 76 - 100 | 101 - 122

Sort by Relevance: high to low

Select all | Export all | Export selected

FREE Mammography in combination with **breast** ultrasonography versus mammography for **breast cancer** screening in women at average risk
Gerald Gartlehner , Kylie Thaler , Andrea Chapman , Angela Kaminski-Hartenthaler , Dominik Berzaczy , Megan G Van Noord and Thomas H Helbich
Online Publication Date: April 2013
Review

Regular self-examination or clinical examination for early detection of **breast cancer**
Jan Peter Kösters and Peter C Gøtzsche
Online Publication Date: April 2003
Ns Review

Cancer genetic risk assessment for individuals at risk of familial **breast cancer**
Jennifer S Hilgart , Bernadette Coles and Rachel Iredale
Online Publication Date: February 2012
Ns Review

Systematic Reviews

Aim to:

- **Summarize the existing literature**
- **Resolve conflicts or controversies in the literature, i.e. analyze heterogeneity**
- **Evaluate the need for further studies**

Narrative Vs. Systematic Reviews

Narrative Review	Systematic Review
Research question is often broad	Well-focused clinical question
Search strategy is not defined or systematic	Explicit search strategy, outlining study inclusion/exclusion criteria
Article selection is not systematic	Article selection is specific to inclusion/exclusion criteria
Appraisal of study quality may not be performed	Articles are critically appraised and strengths and weaknesses documented
Qualitative summary of findings	Qualitative or quantitative analysis of findings

Cook DJ, Mulrow CD, Haynes RB. Ann Intern Med 1997;126(5):376-380

What is meta-analysis?

- **Systematic synthesis of several studies focused on a precise research question**

  Is carotid stenting better than surgery for preventing stroke ?

- **Collect all studies relevant to a the research question**

  Find all published journal articles on the topic (pubmed, embase….) according to precise inclusion criteria

- **Calculate an effect size is calculated for each outcome**

  Determine the size/direction of difference between the 2 techniques for each study for stroke, death…

- **Study characteristics**

  Characteristics of patients in each study; age, sex, setting, type of stroke, hypertensive (yes/no), etc.

- **Effect sizes are grouped together (*mean effect*) and compared (subgroup analysis)**

  Do between-techniques differences vary with age, sex, setting, type of stroke, hypertensive yes/no) etc. ?

Meta-analysis: a mixture of qualitative and quantitative processes

- Retrieving articles: a librarian is useful !
- Selecting articles : inclusion criteria of articles, choosing appropriate items
- Extracting the information from the papers included in the meta-analysis (qualitative)
- Calculating effect size: the numerical outcome to be analyzed in a meta-analysis i.e. a summary statistic such as OR, RR, proportion etc… (quantitative)
- Summarizing effect sizes with the appropriate model: central tendency, precision, influence of study/patients characteristics etc… (quantitative)

Meta-analysis: typical method (cochrane handbook)

1. A summary (pooled) intervention effect estimate is calculated as a weighted average of the intervention effects estimated in the individual studies. A weighted average is defined as:

$$\text{weighted average} = \frac{\text{sum of (estimate} \times \text{weight)}}{\text{sum of weights}} = \frac{\sum Y_i W_i}{\sum W_i}$$

where Y_i is the intervention effect estimated in the *i*th study, W_i is the weight given to the *i*th study, and the summation is across all studies.

The bigger the weight given to the *i*th study, the more it will contribute to the weighted average. The weights are therefore chosen to reflect the amount of information that each study contains. For ratio measures (OR, RR, etc), Y_i is the natural logarithm of the measure.

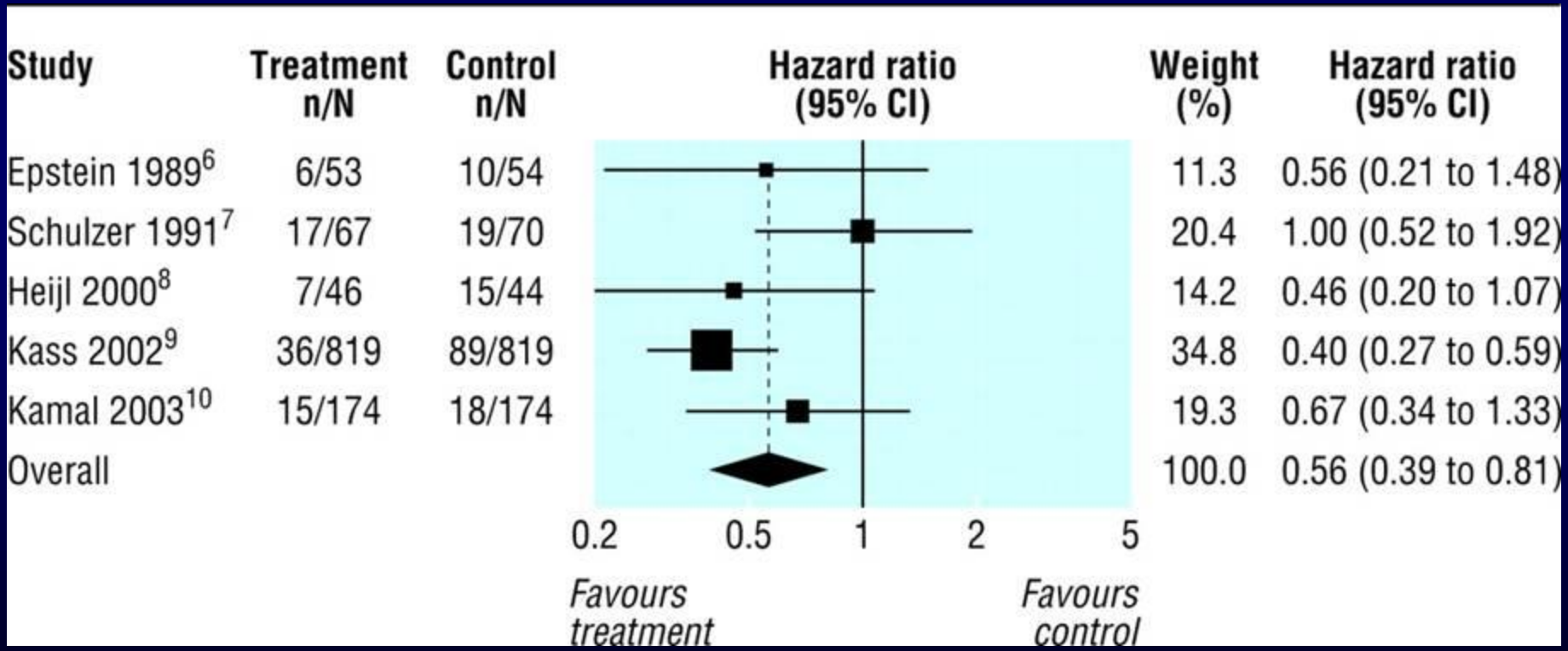
2. The combination of intervention effect estimates across studies may make an assumption that the studies are not all estimating the same underlying intervention effect: suc a M-A is a **random-effects meta-analysis**. Alternatively, if it is assumed that each study is estimating exactly the same quantity a **fixed-effect meta-analysis** is performed.

3. The standard error of the summary (pooled) intervention effect is used to derive a confidence interval, and to derive a P value.

4. Heterogeneity between individual studies study is systematically tested.

Meta-analysis: a standardized, visual presentation of data

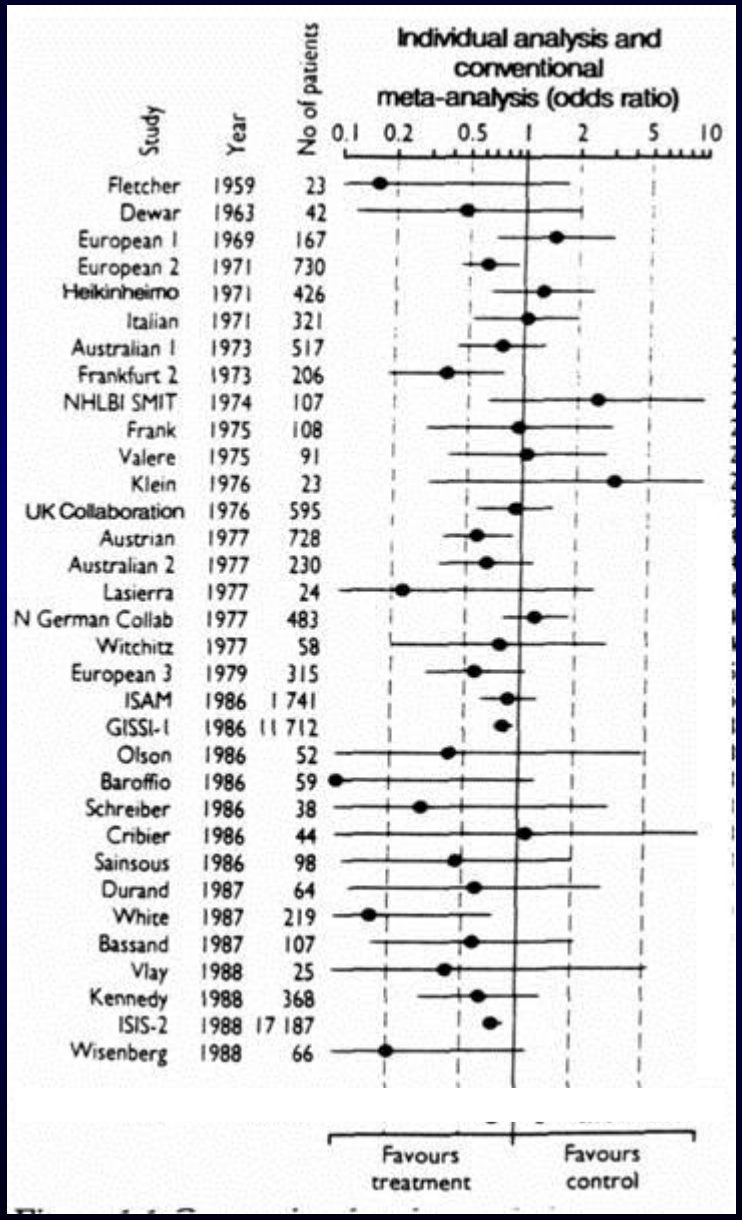
Visual field loss or deterioration of optic disc, or both, among patients randomised to pressure lowering treatment vs. no treatment in ocular hypertension.



Maier, P. C et al. BMJ 2005;331:134

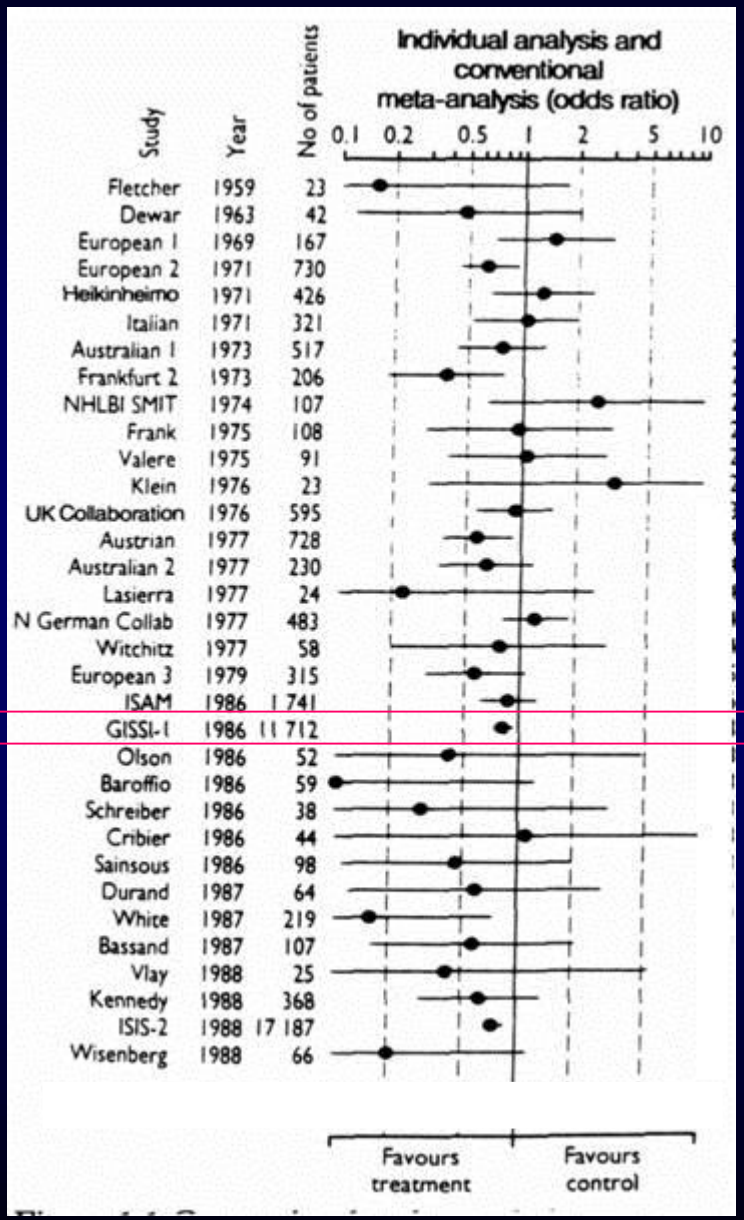
Meta-analysis: a very useful tool

Efficacy of X in disease Y ?

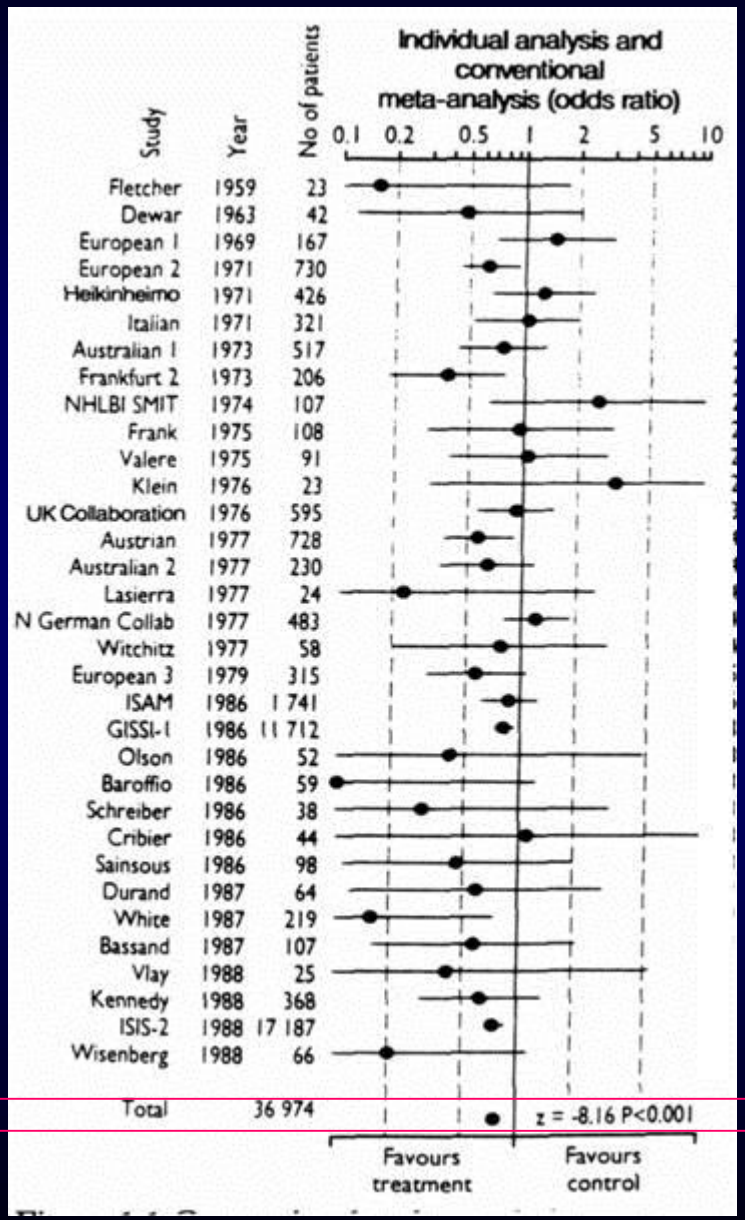


Efficacy of X in disease Y ?

Large RCT



Efficacy of X in disease Y ?

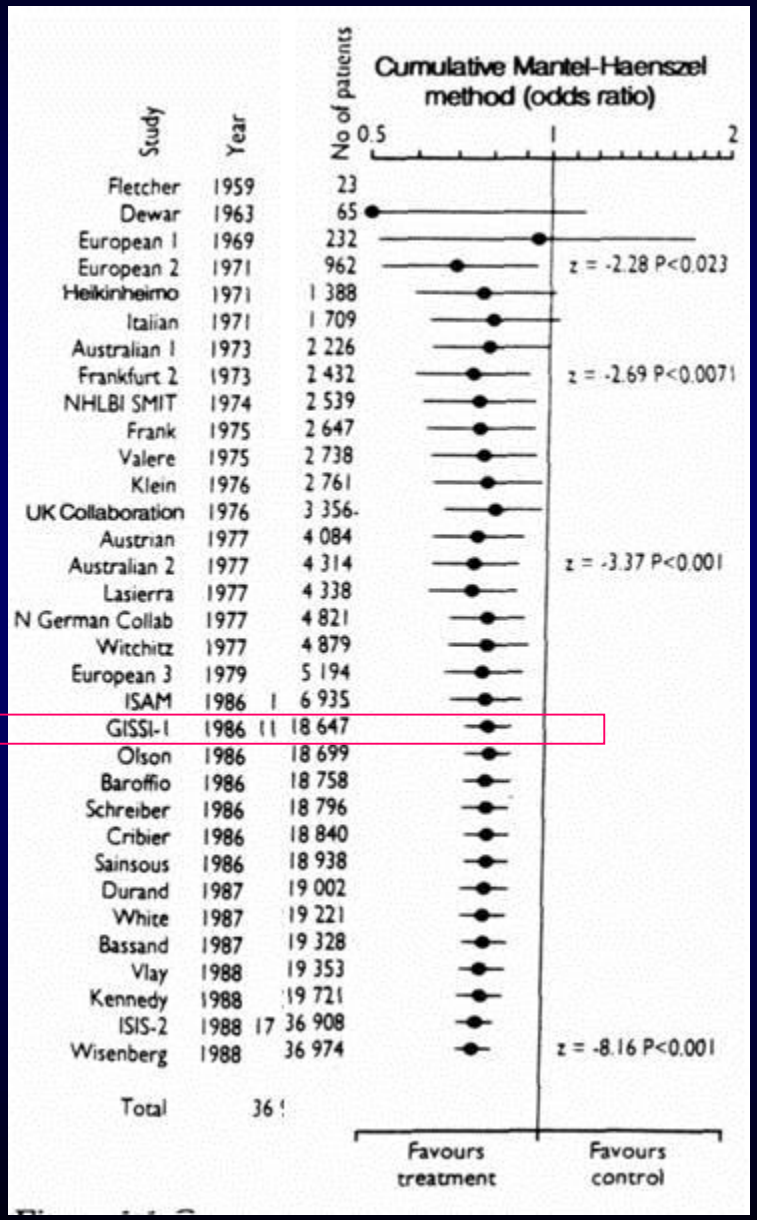


Pooled result

Efficacy of X in disease Y ?

1973

1986



Screening for breast cancer with mammography (Review)

Gøtzsche PC, Nielsen M

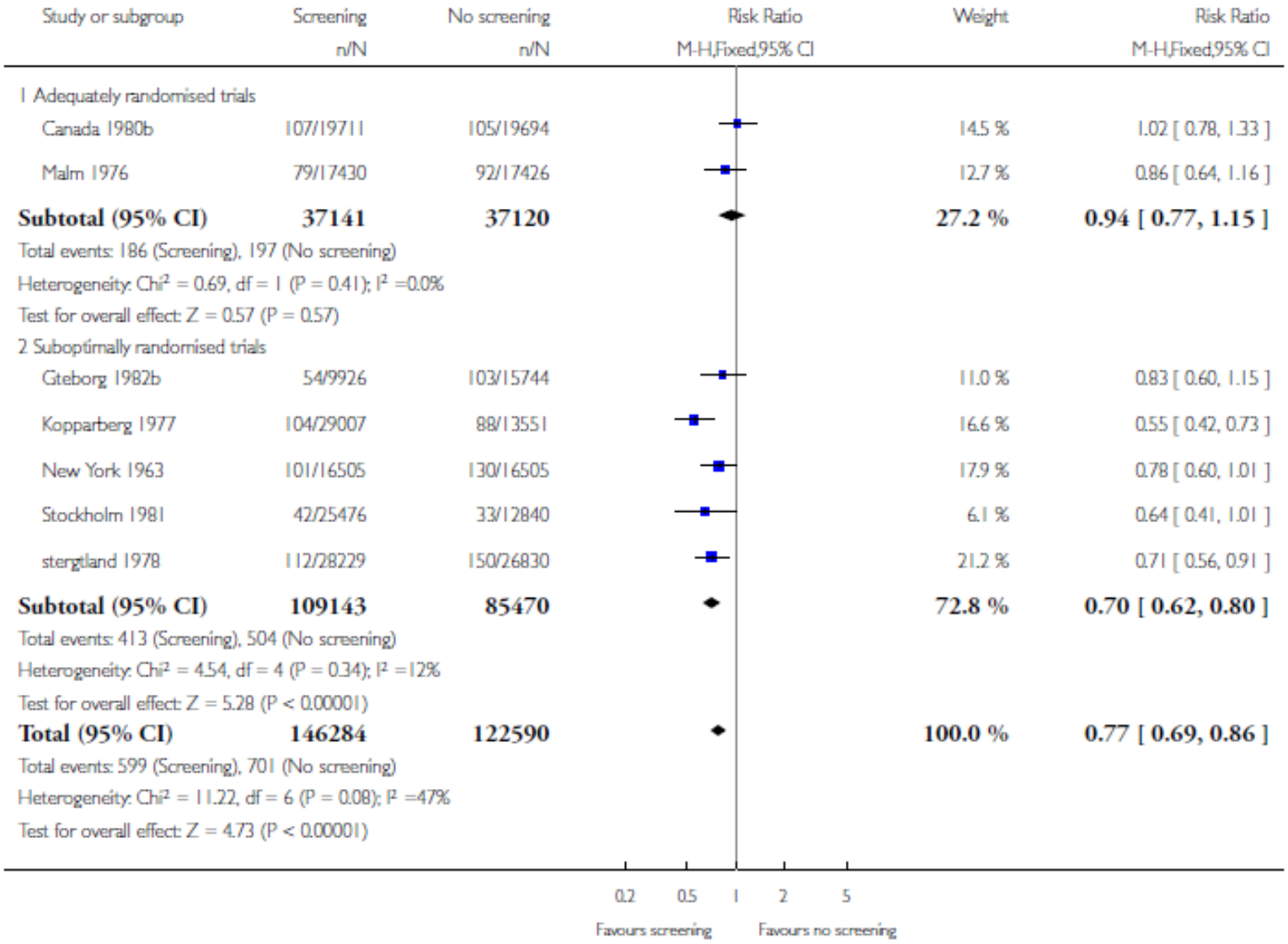
THE COCHRANE COLLABORATION®

Analysis 1.6. Comparison 1 Screening with mammography versus no screening, Outcome 6 Deaths ascribed to breast cancer, 13 years follow up, women at least 50 years of age.

Review: Screening for breast cancer with mammography

Comparison: 1 Screening with mammography versus no screening

Outcome: 6 Deaths ascribed to breast cancer, 13 years follow up, women at least 50 years of age



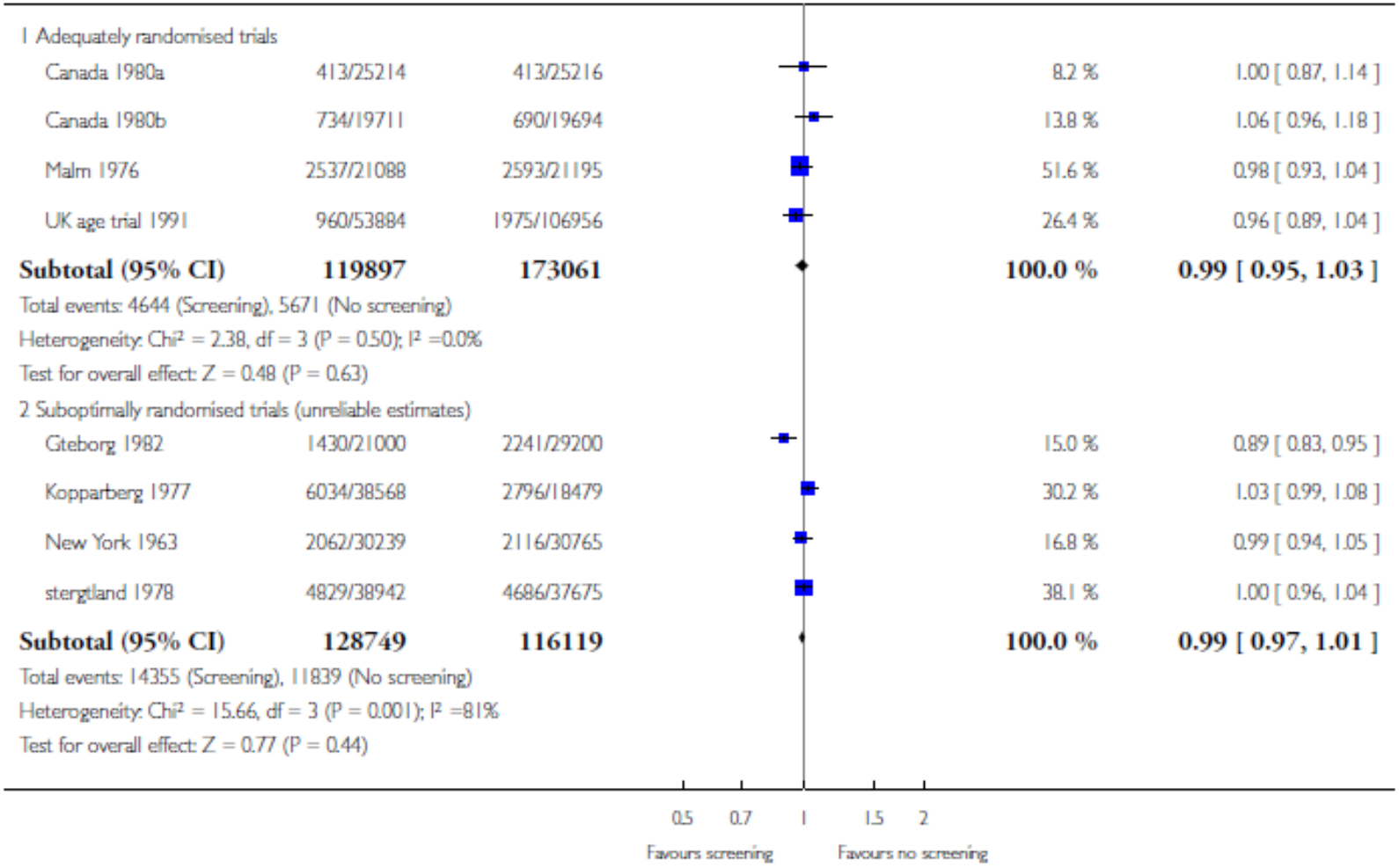
Analysis 1.9. Comparison 1 Screening with mammography versus no screening, Outcome 9 Overall mortality, 13 years follow up.

Review: Screening for breast cancer with mammography

Comparison: 1 Screening with mammography versus no screening

Outcome: 9 Overall mortality, 13 years follow up

Study or subgroup	Screening n/N	No screening n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 Adequately randomised trials					
Canada 1980a	413/25214	413/25216		8.2 %	1.00 [0.87, 1.14]
Canada 1980b	734/19711	690/19694		13.8 %	1.06 [0.96, 1.18]
Malm 1976	2537/21088	2593/21195		51.6 %	0.98 [0.93, 1.04]
UK age trial 1991	960/53884	1975/106956		26.4 %	0.96 [0.89, 1.04]
Subtotal (95% CI)	**119897**	**173061**		**100.0 %**	**0.99 [0.95, 1.03]**
Total events: 4644 (Screening), 5671 (No screening)					
Heterogeneity: $Chi^2 = 2.38$, df = 3 (P = 0.50); I^2 =0.0%					
Test for overall effect: Z = 0.48 (P = 0.63)					
2 Suboptimally randomised trials (unreliable estimates)					
Gteborg 1982	1430/21000	2241/29200		15.0 %	0.89 [0.83, 0.95]
Kopparberg 1977	6034/38568	2796/18479		30.2 %	1.03 [0.99, 1.08]
New York 1963	2062/30239	2116/30765		16.8 %	0.99 [0.94, 1.05]
stergtland 1978	4829/38942	4686/37675		38.1 %	1.00 [0.96, 1.04]
Subtotal (95% CI)	**128749**	**116119**		**100.0 %**	**0.99 [0.97, 1.01]**
Total events: 14355 (Screening), 11839 (No screening)					
Heterogeneity: $Chi^2 = 15.66$, df = 3 (P = 0.001); I^2 =81%					
Test for overall effect: Z = 0.77 (P = 0.44)					



Screening for breast cancer with mammography

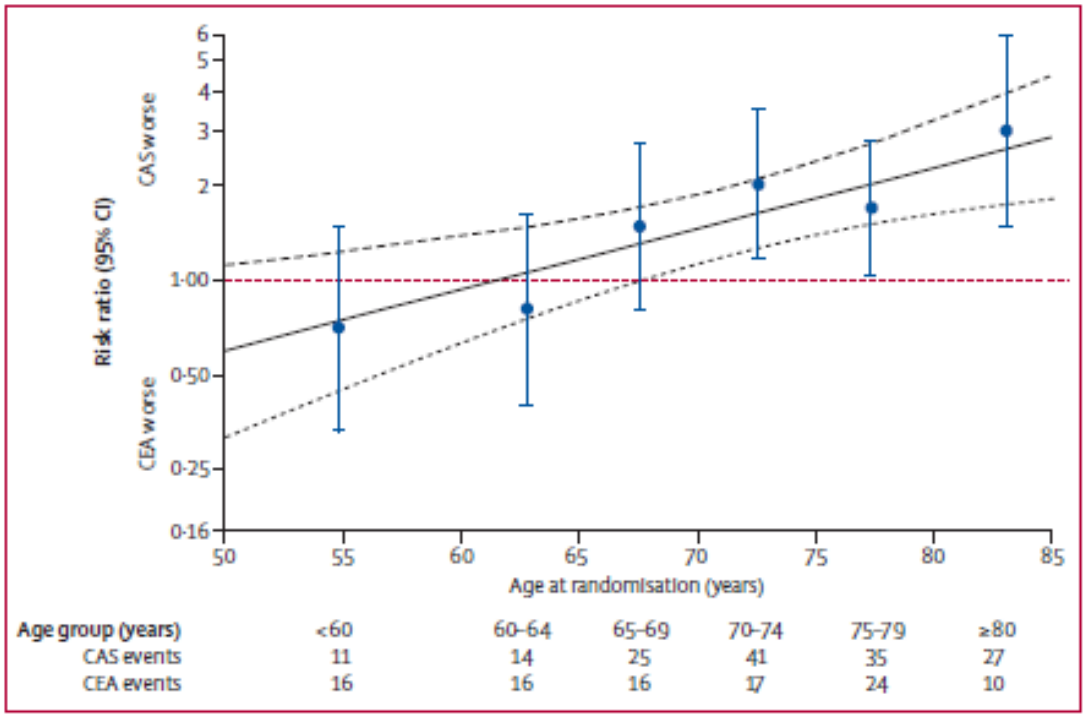
Gøtzsche PC, Nielsen M.
Summary of results

For every 2000 women invited for screening throughout 10 years:

- 1 will have her life prolonged
- 10 healthy women, who would not have been diagnosed if there had not been screening, will be treated unnecessarily.
- 200 will experience important psychological distress for many months because of false positive findings.

Cochrane Database Syst Rev, 2011.

Subgroups Analysis



Age group (years)	<60	60–64	65–69	70–74	75–79	≥80
CAS events	11	14	25	41	35	27
CEA events	16	16	16	17	24	10

Figure 7: **Treatment risk ratios of any stroke or death within 120 days of randomisation by age (both continuous and by age groups)**

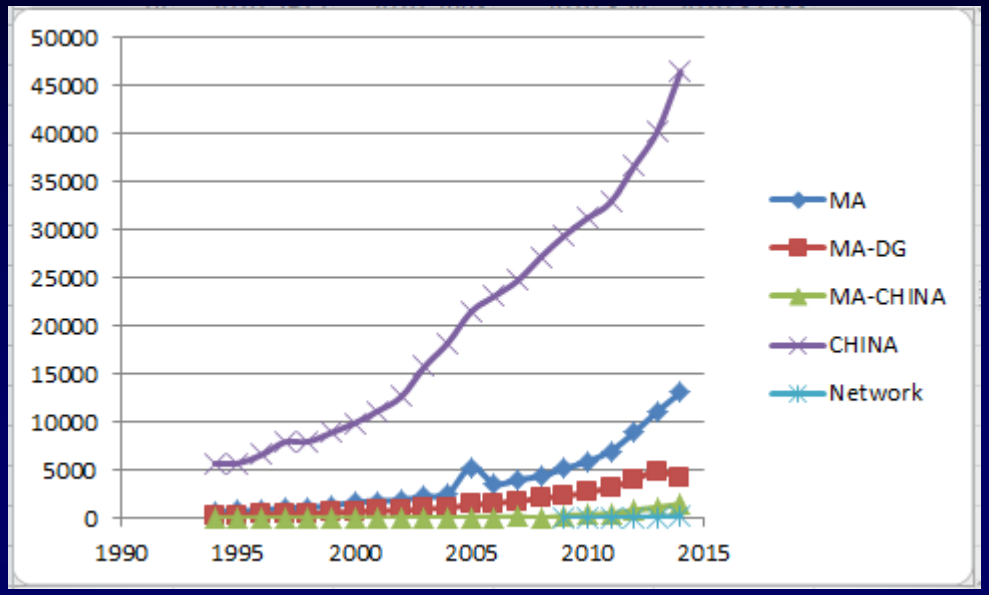
Analysis was by intention to treat. Blue dots and vertical bars represent treatment risk ratios and 95% CIs, respectively, adjusted for source trial for each age group, with carotid endarterectomy (CEA) as the reference group, plotted on a log scale at the mean age in each group. The continuous risk ratios by age (line) and 95% CI (dashed lines) were calculated by use of a binomial regression model containing treatment, continuous age, and their interaction, adjusted for source trial. CAS=carotid stenting.

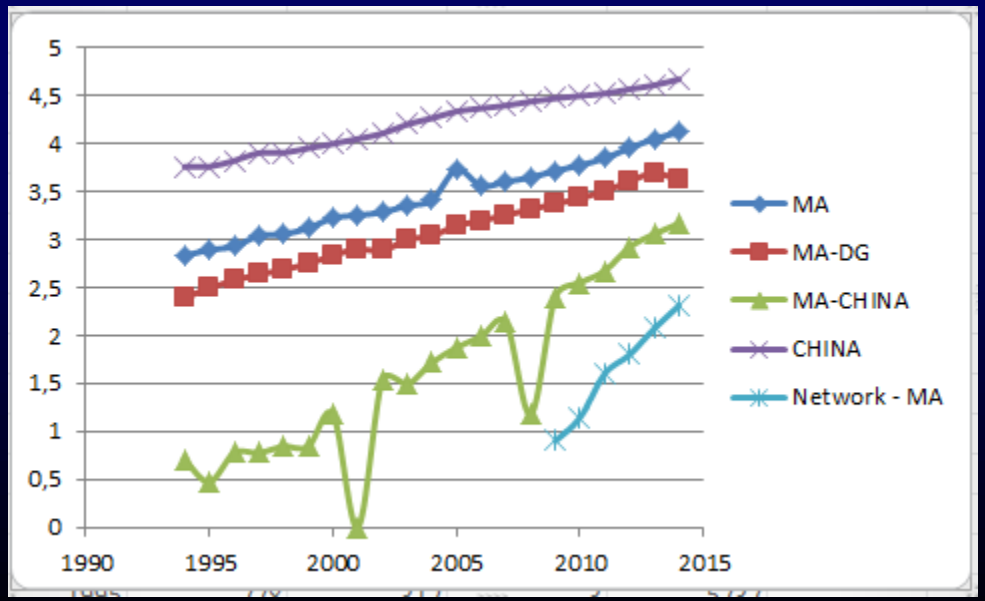
Short-term outcome after stenting versus endarterectomy for symptomatic carotid stenosis: a preplanned meta-analysis of individual patient data. Lancet 2010.

Meta-analysis:
a very useful tool…

… but also an apparently simple and therefore risky tool

Meta analyses: a rapid increase in the medical literature





Count of articles comprising the word "meta analysis" in the title or the abstract

Pubmed, 1994-2014

Table 2. Main factors that influence the quality of a meta-analysis

Level	Problems	Solutions
Identification and selection of trials	• Publication and language bias	• No restriction of inclusion according to publication status or publication language
	• Compliance with selection criteria	• List of excluded trials with reasons for exclusion
Individual trials	• Inadequate randomisation procedure	• Inclusion restricted to randomised trials with allocation concealment
	• Post randomisation exclusion	• Intention-to-treat analysis
	• Unequal follow-up in the treatment groups	• Update follow-up
	• Endpoint evaluation differing in treatment groups	• Objective endpoints, or an evaluation by an investigator not aware of the treatment received
Meta-analysis	• Choice of question	• Clinically relevant question
	• Selection of endpoints	• Use both overall survival and more specific endpoints, such as disease-free survival
	• Follow-up duration	• Update follow-up if necessary
	• Statistical power	• Adequate total sample size
	• Heterogeneity	• Study heterogeneity of treatment effect between trials; in case of heterogeneity, explore its sources
	• Subgroup analyses and indirect comparisons	• Preplanned study of interaction between patient and trial characteristics and treatment effect
	• Multiplicity of statistical tests	• Limited number of exploratory analyses, and validation by new trials
	• Presentation of results	• Detailed description of included trials, display of treatment effects with confidence interval, overall and for each trial, including data allowing further analyses

JP Pignon et C Hill, Lancet Oncology

Some issues in meta-analysis

- Assessment of quality of individual trials
- Quality of meta analysis itself: QUOROM guidelines
- Publication bias
- Summary measure method or individual patient meta-analysis ?

Detection of biases (Cochrane Collaboration method)

Table 8.5.a: The Cochrane Collaboration's tool for assessing risk of bias

Domain	Support for judgement	Review authors' judgement
Selection bias.		
Random sequence generation.	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence.
Allocation concealment.	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment.
Performance bias.		
Blinding of participants and personnel *Assessments should be made for each main outcome (or class of outcomes).*	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study.

Detection of biases (Cochrane Collaboration method)

Domain	Support for judgement	Review authors' judgement
Detection bias.		
Blinding of outcome assessment *Assessments should be made for each main outcome (or class of outcomes).*	Describe all measures used, if any, to blind outcome assessors from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Detection bias due to knowledge of the allocated interventions by outcome assessors.
Attrition bias.		
Incomplete outcome data *Assessments should be made for each main outcome (or class of outcomes).*	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Attrition bias due to amount, nature or handling of incomplete outcome data.

Table 8.5.a: The Cochrane Collaboration's tool for assessing risk of bias

Detection of biases (Cochrane Collaboration method)

Table 8.5.a: The Cochrane Collaboration's tool for assessing risk of bias

Domain	Support for judgement	Review authors' judgement
Reporting bias.		
Selective reporting.	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Reporting bias due to selective outcome reporting.
Other bias.		
Other sources of bias.	State any important concerns about bias not addressed in the other domains in the tool. If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.	Bias due to problems not covered elsewhere in the table.

Quality of MA publication: QUOROM Statement

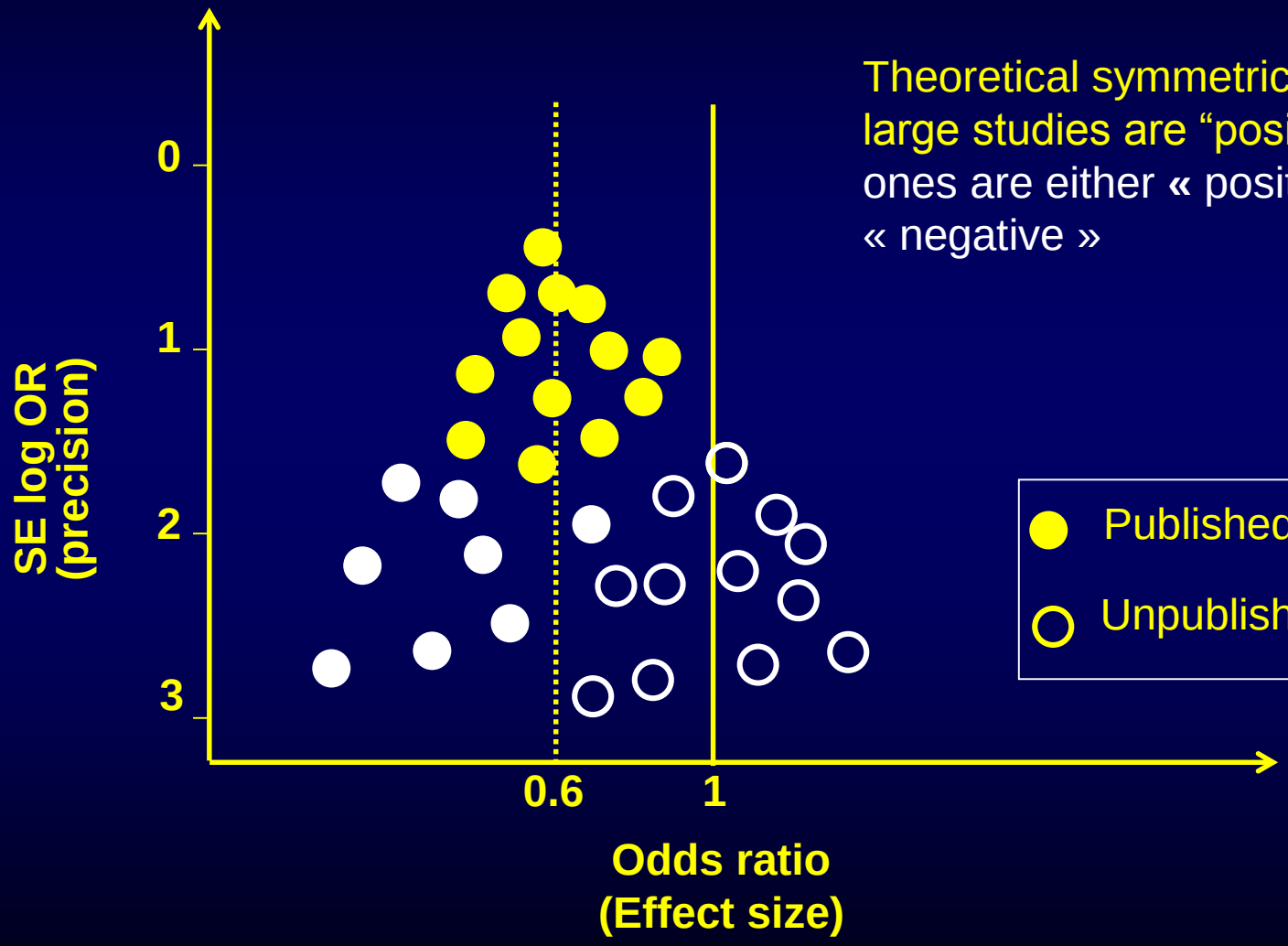
Table 1 Quality of reporting of systematic reviews (meta-analyses)

Heading	Subheading	Descriptor	Reported? (Y/N)	Page number
Title		Identify the report as a systematic review (meta-analysis) of RCTs		
Abstract		Use a structured format		
		Describe		
	Objectives	The clinical question explicitly		
	Data sources	The databases (ie list) and other information sources		
	Review methods	The selection criteria (ie population, intervention, outcome and study design); methods for validity assessment, data abstraction, and study characteristics, and quantitative data synthesis in sufficient detail to permit replication		
	Results	Characteristics of the RCTs included and excluded; qualitative and quantitative findings (ie point estimates and confidence intervals); and subgroup analyses		
	Conclusion	The main results		
		Describe		
Introduction		The explicit clinical problem, biological rationale for the intervention, and rationale for review		
Methods	Searching	The information sources, in detail (eg databases, registers, personal files, expert informants, agencies, hand-searching) and any restrictions (years considered, publication status, language publication)		
	Selection	The inclusion and exclusion criteria (defining population, intervention, principal outcomes, and study design)		
	Validity assessment	The criteria and process used (eg masked conditions, quality assessment, and their findings)		
	Data abstraction	The process or processes used (eg completed independently, in duplicate)		
	Study characteristics	The type of study design, participants' characteristics, details of intervention, outcome definition, Etc, and how clinical heterogeneity was assessed		
	Quantitative data synthesis	The principal measures of effect (eg relative risk), method of combining results (statistical testing and confidence intervals), handling of missing data; how statistical heterogeneity was assessed; a rationale for any a-priori sensitivity and subgroup analyses; and any assessment of publication bias		
Results	Trial flow	Provide a systematic review profile summarising trial flow (see Fig. 1)		
	Study characteristics	Present descriptive data for each trial (eg age, sample size, intervention, dose, duration, follow-up period)		
	Quantitative data synthesis	Report agreement on the selection and validity assessment; present simple summary results (for each treatment group in each trial, for each primary outcome; present data needed to calculate effect sizes and confidence intervals in intention-to-treat analyses (eg 2x2 tables of counts, means and SDs, proportions)		
Discussion		Summarise key findings; discusses clinical inferences based on internal and external validity; interpret the results in light of the totality of available evidence; describe potential biases in the review process (eg population bias); and suggest a future research agenda		

Publication bias in Metaanalysis

- A study showing a beneficial effect of a new treatment is more likely to be published than one showing no effect
- Negative trials assumed to contribute less:
  - Financial aspects (industry)
  - Investigator opinion
  - Journal editors'opinion
- Several methods (such as Funnel Plots) designed to detect publication bias

Publication bias
Graphical approach: Funnel plot (1)

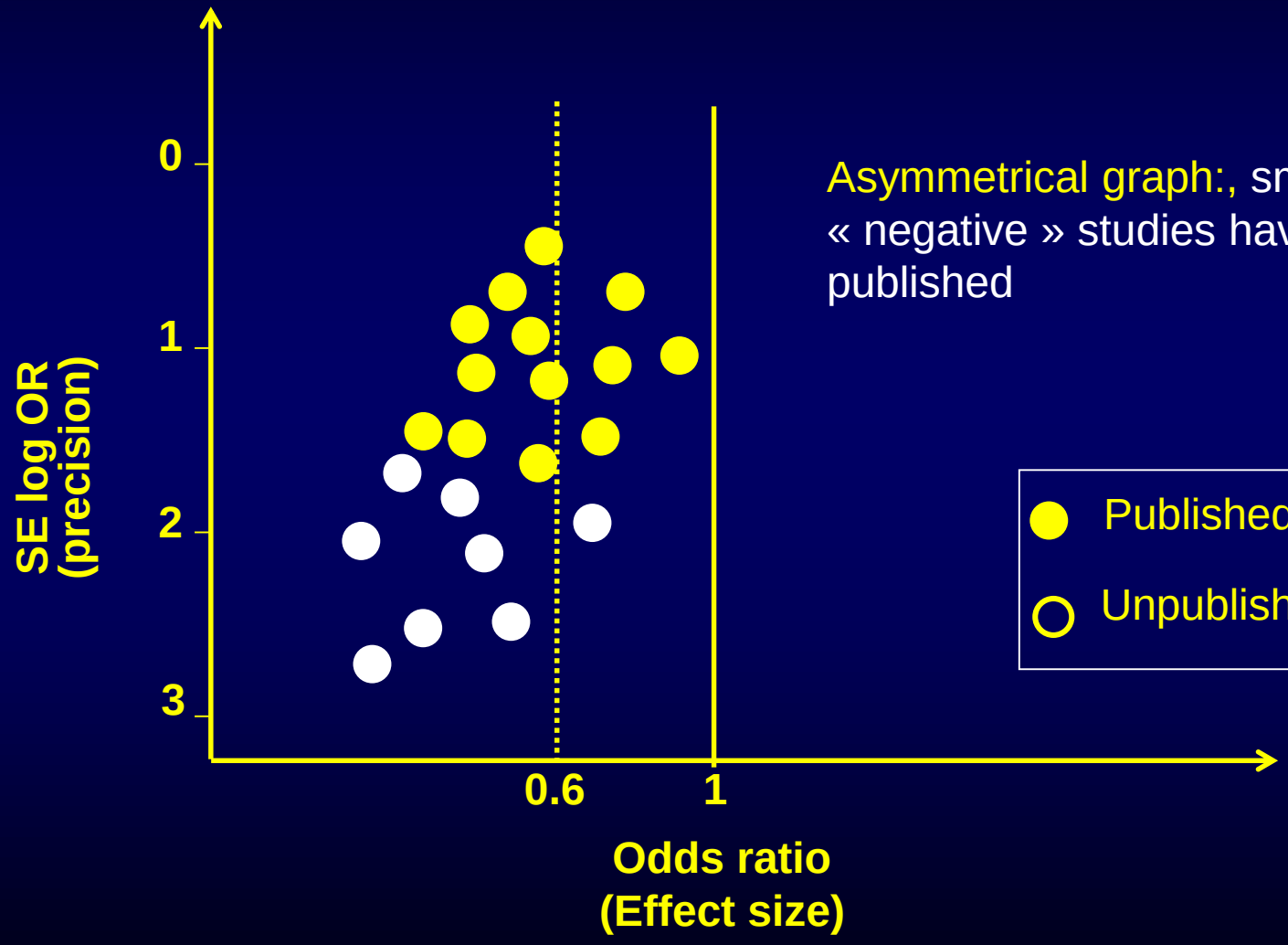


Theoretical symmetrical graph: most large studies are “positives”, small ones are either **«** positive » or « negative »

Published studies

Unpublished studies

Publication bias
Graphical approach: Funnel plot (2)

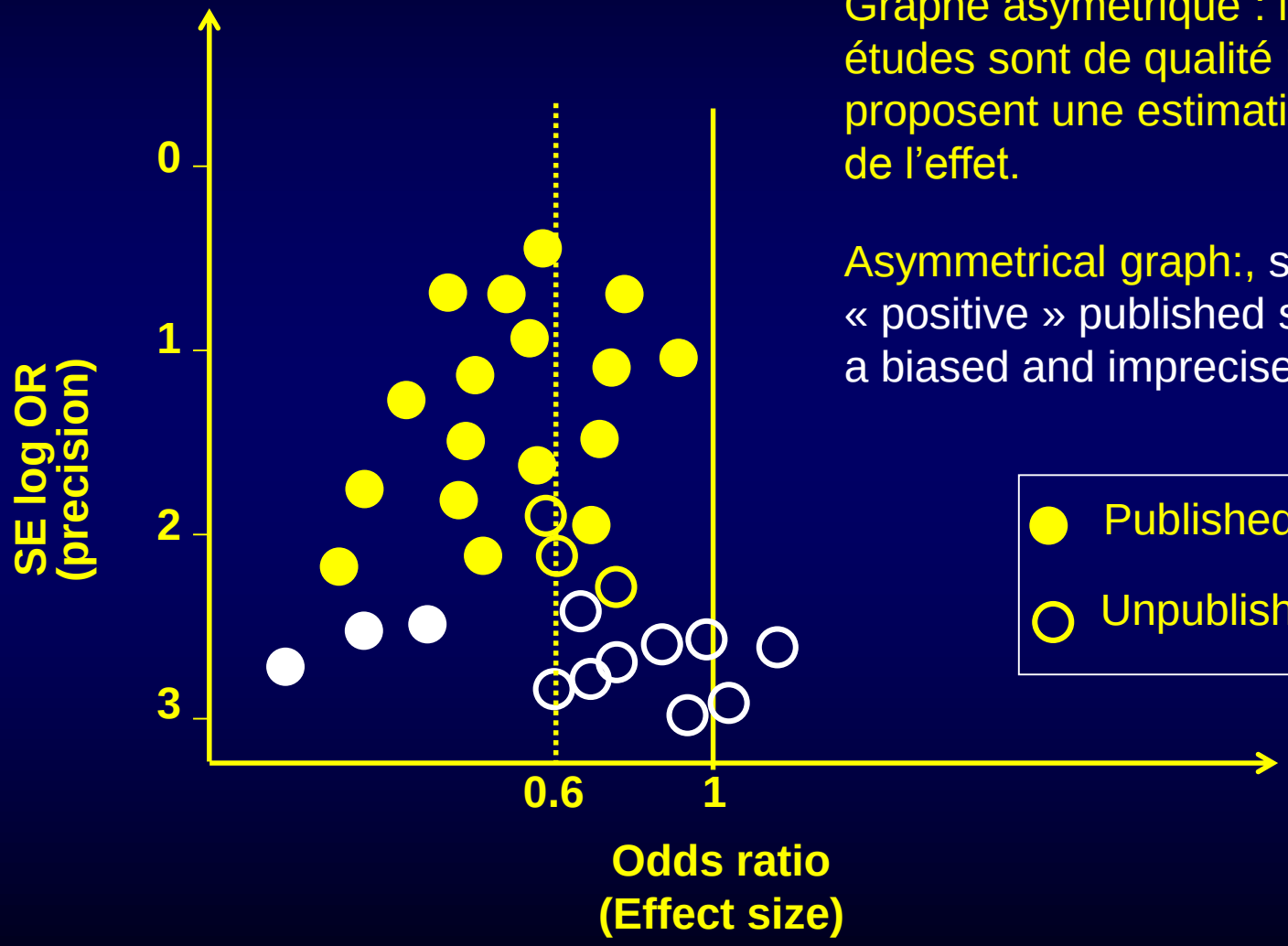


Asymmetrical graph:, small « negative » studies have not been published

Published studies

Unpublished studies

Publication bias
Graphical approach: Funnel plot (3)



Graphe asymétrique : les petites études sont de qualité moyenne et proposent une estimation biaisée de l'effet.

Asymmetrical graph:, small « positive » published studies provide a biased and imprecise effect

Individual Patient Data Meta-analysis?

- Involves the central collection, checking and analysis of regularly **updated** individual patient data
- Include **all** properly randomised trials, published and unpublished
- Include **all** patients in an intention-to-treat analysis

IPD Meta-analyses

- Are frequently considered as the “gold standard” of systematic reviews
- But …
  - Take longer
  - Are more resource intensive
  - Are more costly

than agregate data meta-analysis

IPD vs summary (aggregate) data from study publications

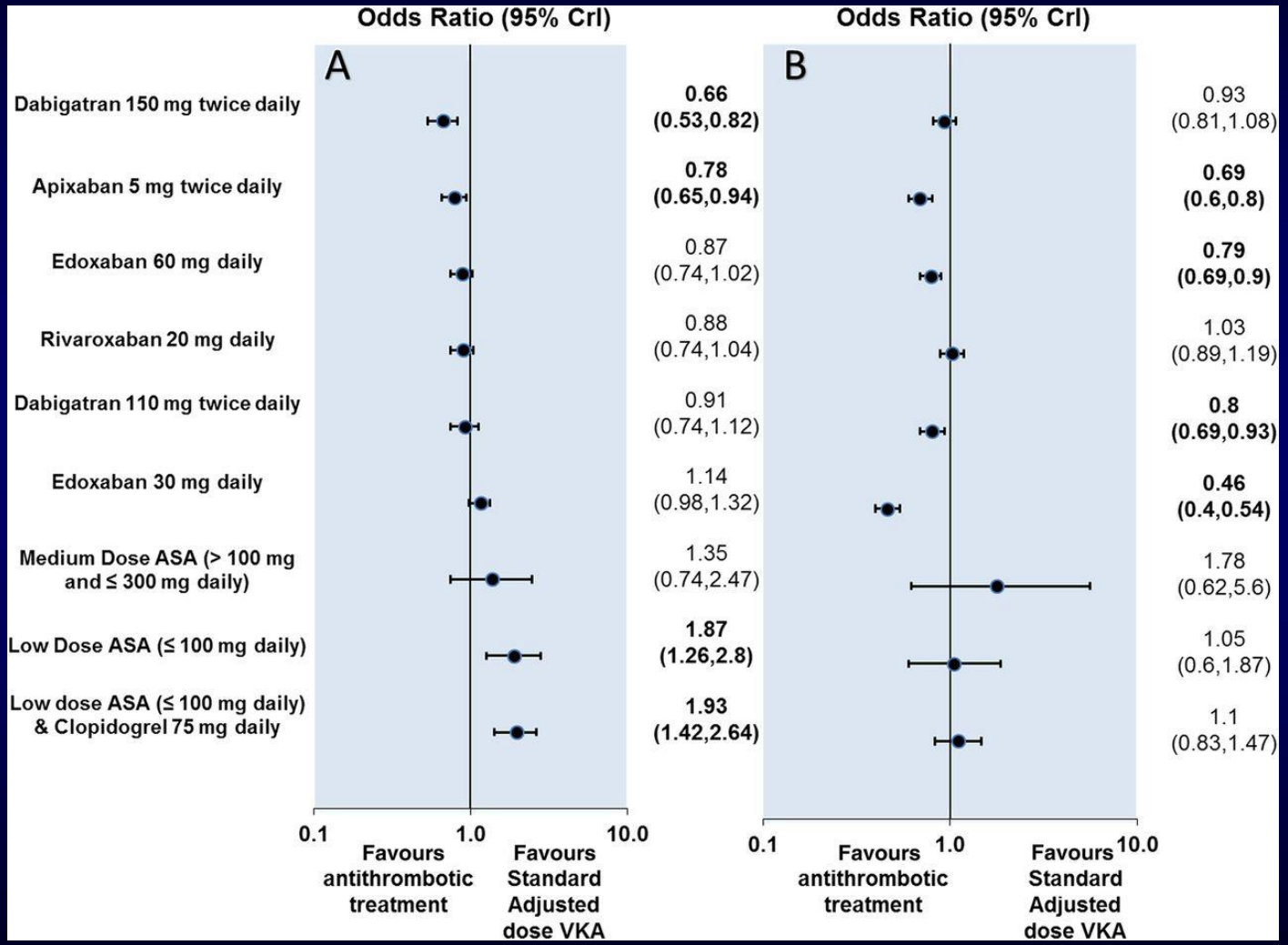
Difference in results are explained by:

- **Exclusion of trials**
- **Exclusion of patients**
- **Time-point of analysis**
- **Length of follow-up**
- **Method of analysis**
- **Inadequate reporting**

IPD allows:

- More flexible analysis of outcomes
- Detailed data checking, standardization of data
- Time-to-event analyses
- Easy subgroup analyses
- Contact with investigators of original study (unpublished data…)

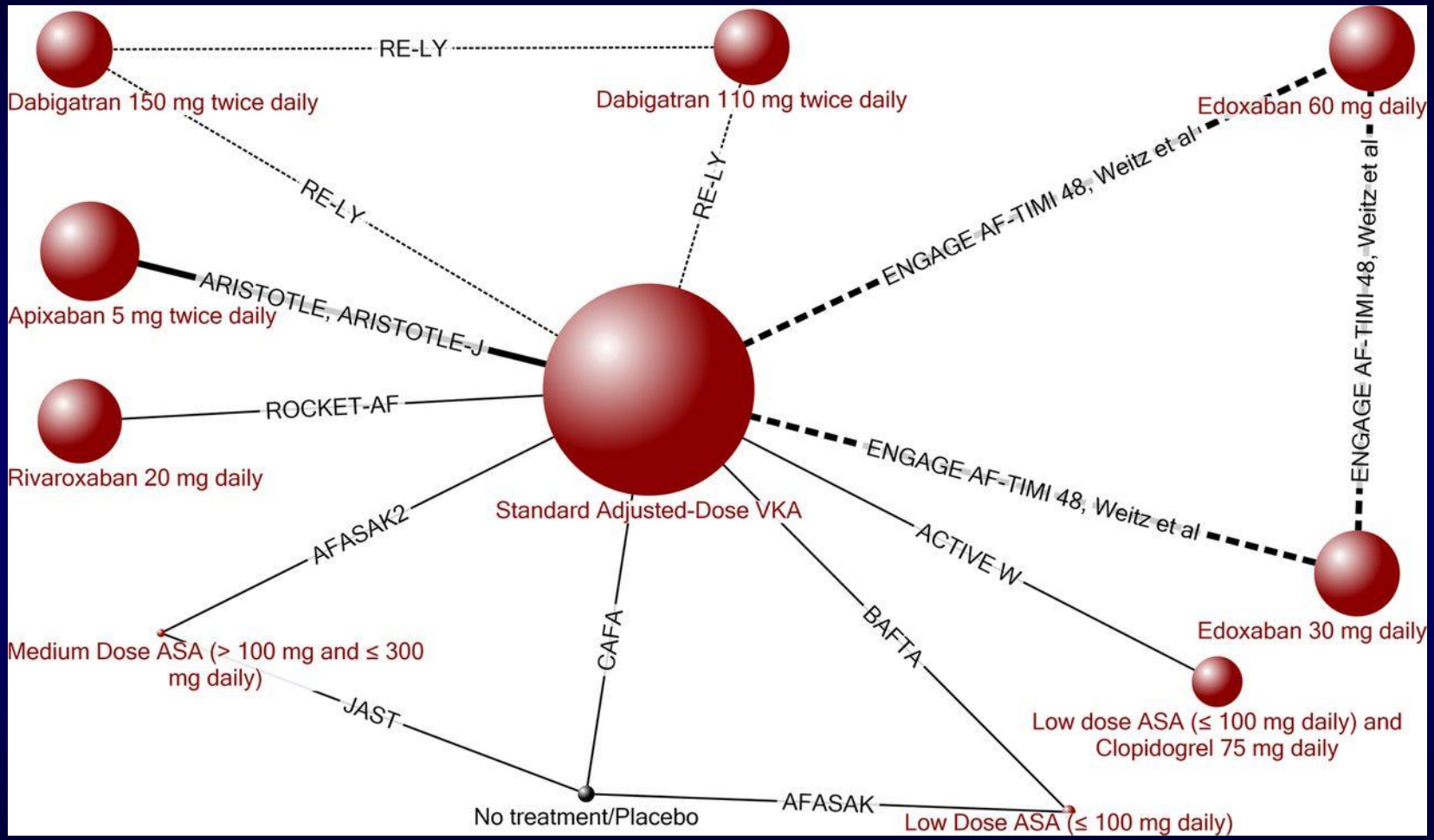
OR for all-cause stroke or systemic embolism (A) and major bleeding (B) in Bayesian network meta-analysis versus standard adjusted dose VKA. CrI, credible interval; VKA, vitamin K antagonist.



Chris Cameron et al. BMJ Open 2014;4:e004301

BMJ Open

A network of studies in stroke prevention



Chris Cameron et al. BMJ Open 2014;4:e004301

Chris Cameron et al. BMJ Open 2014;4:e004301

BMJ Open

OR from network meta-analyses for stroke or systemic embolism and major bleeding for all pairwise comparisons.

Standard Adjusted-Dose VKA	0.93 (0.81,1.08)	**0.69 (0.6,0.8)**	**0.79 (0.69,0.9)**	1.03 (0.89,1.19)	**0.8 (0.69,0.93)**	**0.46 (0.4,0.54)**	1.78 (0.62,5.6)	1.05 (0.6,1.87)	1.1 (0.83,1.47)
0.66 (0.53,0.82)	Dabigatran 150 mg twice daily	**0.74 (0.6,0.91)**	0.84 (0.69,1.03)	1.1 (0.9,1.35)	0.86 (0.74,1.003)	**0.5 (0.4,0.61)**	1.91 (0.66,6.08)	1.13 (0.63,2.04)	1.18 (0.85,1.63)
0.78 (0.65,0.94)	1.19 (0.89,1.58)	Apixaban 5 mg twice daily	1.14 (0.93,1.38)	**1.49 (1.21,1.82)**	1.16 (0.94,1.43)	**0.67 (0.54,0.83)**	2.57 (0.89,8.18)	1.52 (0.85,2.75)	**1.59 (1.16,2.2)**
0.87 (0.74,1.02)	**1.31 (1.002,1.73)**	1.11 (0.87,1.41)	Edoxaban 60 mg daily	**1.31 (1.08,1.59)**	1.02 (0.83,1.25)	**0.59 (0.5,0.69)**	2.27 (0.78,7.17)	1.34 (0.75,2.41)	**1.4 (1.02,1.92)**
0.88 (0.74,1.04)	**1.33 (1.01,1.76)**	1.12 (0.87,1.43)	1.01 (0.8,1.28)	Rivaroxaban 20 mg daily	**0.78 (0.63,0.96)**	**0.45 (0.37,0.56)**	1.74 (0.6,5.48)	1.02 (0.57,1.85)	1.07 (0.78,1.48)
0.91 (0.74,1.12)	**1.38 (1.11,1.74)**	1.17 (0.88,1.53)	1.05 (0.81,1.37)	1.04 (0.8,1.36)	Dabigatran 110 mg twice daily	**0.58 (0.47,0.72)**	2.22 (0.77,7.03)	1.31 (0.73,2.37)	1.37 (0.99,1.9)
1.14 (0.98,1.32)	**1.73 (1.32,2.26)**	**1.45 (1.15,1.84)**	**1.31 (1.13,1.54)**	**1.3 (1.04,1.63)**	1.25 (0.97,1.61)	Edoxaban 30 mg daily	**3.85 (1.32,12.18)**	**2.27 (1.26,4.1)**	**2.38 (1.72,3.3)**
1.35 (0.74,2.47)	**2.04 (1.08,3.9)**	1.72 (0.92,3.24)	1.56 (0.84,2.91)	1.54 (0.83,2.88)	1.48 (0.79,2.8)	1.18 (0.64,2.21)	Medium Dose ASA (> 100 mg and ≤ 300 mg daily)	0.59 (0.17,1.94)	0.62 (0.19,1.84)
1.87 (1.26,2.8)	**2.84 (1.81,4.5)**	**2.39 (1.55,3.72)**	**2.16 (1.42,3.34)**	**2.14 (1.4,3.31)**	**2.05 (1.32,3.23)**	**1.64 (1.08,2.53)**	1.39 (0.74,2.61)	Low Dose ASA (≤ 100 mg daily)	1.05 (0.55,1.97)
1.93 (1.42,2.64)	**2.93 (2.01,4.3)**	**2.46 (1.73,3.54)**	**2.23 (1.58,3.17)**	**2.2 (1.55,3.14)**	**2.11 (1.46,3.07)**	**1.69 (1.21,2.4)**	1.43 (0.73,2.81)	1.03 (0.62,1.7)	Low dose ASA (≤ 100 mg daily) & Clopidogrel 75 mg daily

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Statistical Software for Meta Analysis

- Free Software:
  - EpiMeta: from Epi Info
  - Revman: from Cochrane Collaboration
  - “meta” package in R
  - SAS programs
- Non-free
  - meta module in STATA
  - Metaanalysis software

Meta-analysis: some conclusions

- All domains of medicine
  - Treatment
  - Diagnosis
  - Prognosis
  - Etiology
- Many different methods implemented in SAS, stata or R
- New types of MA currently emerging (network MA)

Meta-analysis: some conclusions (2)

- Impossible to avoid M-A
  - Summary
  - Generation of hypotheses
  - Use for develloping guidelines
  - Use for detremining drug efficacy/efficiency/price
- A good MA implies the collaborative work of at least 3 trained professionals: a statistician, a clinician, a librarian

Fixed Effects or Random Effects Model?

Fixed Effects Model

- Hypothesis: same underlying true effect for all studies
- Pooling: ex, for OR Mantel Haenszel test: test of heterogeneity
- If significant
  - random effects model
- More precise summary estimate

Random Effects Model

- Conduct if test of heterogeneity is significant (shows heterogeneity)
- Assume that TRUE log odds ratio comes from a normal distribution
- Method: DerSimonian and Laird method of calculating Odds' Ratio