

Example name	PTSD
Effect size	Prevalence
Analysis type	Basic, Prediction interval
Level	Basic

Synopsis

This analysis includes eleven studies where mothers whose children suffered with chronic illnesses were evaluated for PTSD. Outcome was the proportion of mothers who showed symptoms of PTSD. The effect size is the prevalence of PTSD.

We use this example to show

- How to enter data from a study that estimates a rate in one group
- How to get a sense of the weight assigned to each study
- How to perform a sensitivity analysis
- How to interpret statistics for effect size
- How to interpret statistics for heterogeneity
- How to compute a prediction interval
- The difference between a confidence interval and a prediction interval

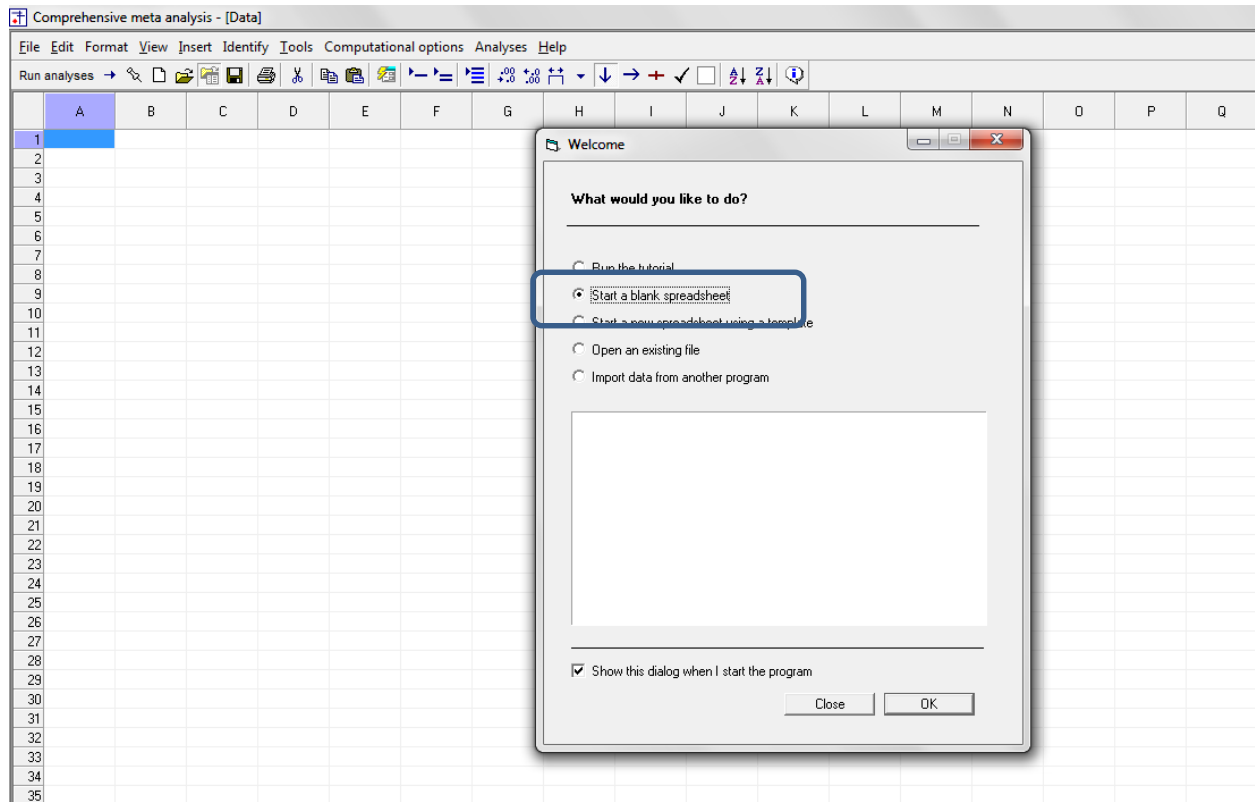
To open a CMA file > [Download and Save file](#) | [Start CMA](#) | [Open file from within CMA](#)

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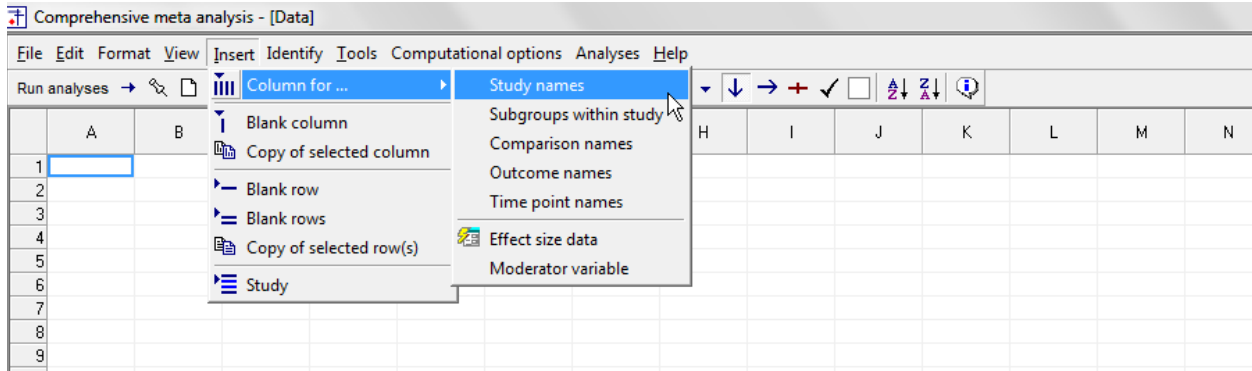
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Start the program

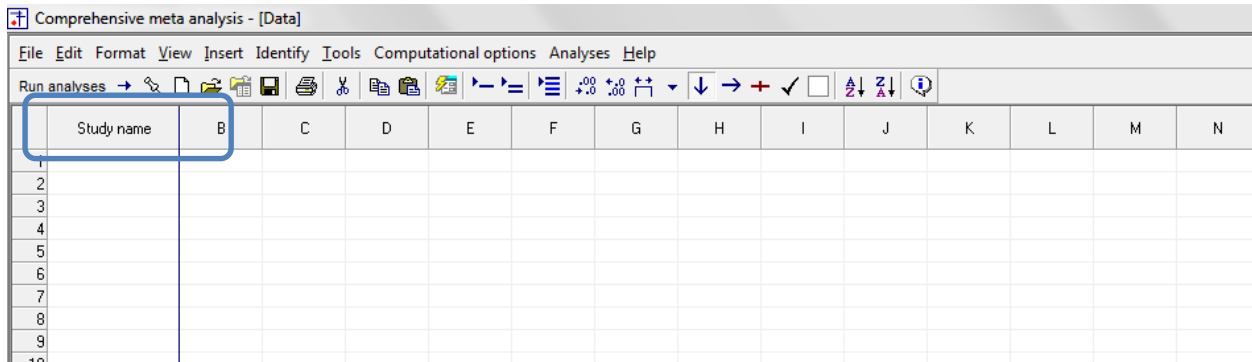
- Select the option [Start a blank spreadsheet]
- Click [OK]



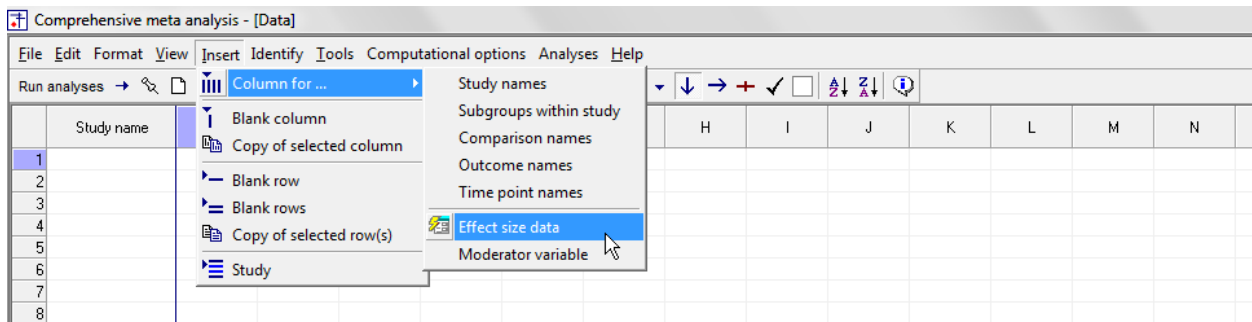
Click Insert > Column for > Study names



The screen should look like this

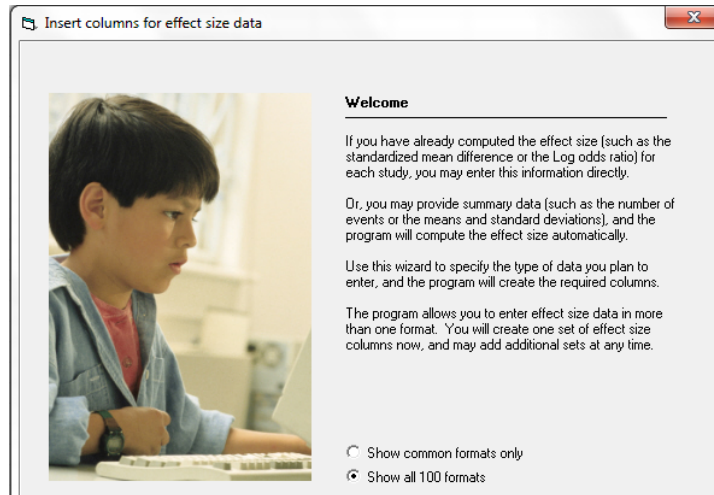


Click Insert > Column for > Effect size data

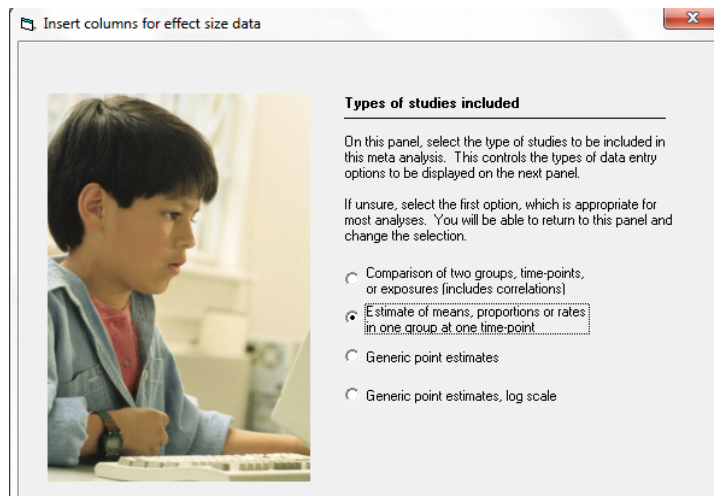


The program displays this wizard

Select [Show all 100 formats]
Click [Next]

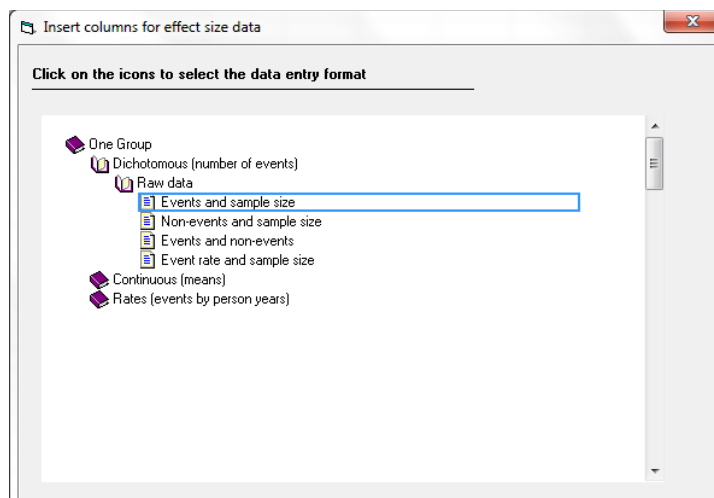


Select [Estimate of means ...]
Click [Next]

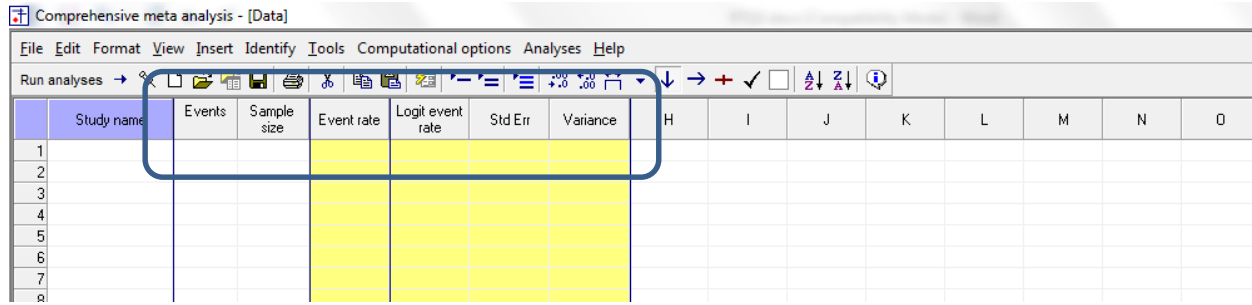


Drill down to

Dichotomous (number of events)
Raw data
Events and sample size



The screen should look like this



There are three options at this point

- Enter the data directly into CMA
- – or – Open the CMA data file
- – or – Copy the data from Excel

Here, we'll show how to copy the data from Excel

- Switch to Excel and open the file "PTSD Prevalence Mothers.xls"
- Highlight the rows and columns as shown (Columns A to C only), and press CTRL-C to copy to clipboard

The screenshot shows the Microsoft Excel interface for the file 'PTSD Prevalence mothers.xlsx'. The ribbon includes 'FILE', 'HOME', 'INSERT', 'PAGE LAYOUT', 'FORMULAS', 'DATA', 'REVIEW', 'VIEW', and 'ACROBAT'. The active cell is A1. The following table is displayed in the spreadsheet:

	A	B	C	D	E	F	G	H	I	J
1	Study	Events	N							
2	Pelcovitz, 1996	8	37							
3	Barakat, 1997	36	400							
4	Manne, 1998	5	100							
5	Fuemmeler, 2001	12	30							
6	Libov, 2002	15	80							
7	Brown, 2003	20	85							
8	Kazak, 2004	26	200							
9	Manne, 2004	13	120							
10	Kazak, 2005	48	200							
11	Landolt, 2005	15	70							
12	Glover	31	100							

- Switch to CMA
- Click in cell Study-name 1
- Press [CTRL-V] to paste the data

Click here

Comprehensive meta analysis - [Data]

File Edit Format View Insert Identify Tools Computational options Analyses Help

Run analyses → [Icons]

	Study name	Events	Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
1	Study	Events	N												
2	Pelcovitz, 1996	8	37	0.216	-1.288	0.399	0.159								
3	Barakat, 1997	36	400	0.090	-2.314	0.175	0.031								
4	Manne, 1998	5	100	0.050	-2.944	0.459	0.211								
5	Fuemmeler, 2001	12	30	0.400	-0.405	0.373	0.139								
6	Libov, 2002	15	80	0.188	-1.466	0.286	0.082								
7	Brown, 2003	20	85	0.235	-1.179	0.256	0.065								
8	Kazak, 2004	26	200	0.130	-1.901	0.210	0.044								
9	Manne, 2004	13	120	0.108	-2.108	0.294	0.086								
10	Kazak, 2005	48	200	0.240	-1.153	0.166	0.027								
11	Landolt, 2005	15	70	0.214	-1.299	0.291	0.085								
12	Glover	31	100	0.310	-0.800	0.216	0.047								
13															
14															
15															

At this point we should check that the data has been copied correctly

- Click anywhere in Row 1
- Select Edit > Delete row, and confirm

Click here

Comprehensive meta analysis - [Data]

File Edit Format View Insert Identify Tools Computational options Analyses Help

Run: [Icons]

	Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
1													
2	37	0.216	-1.288	0.399	0.159								
3	400	0.090	-2.314	0.175	0.031								
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5	30	0.400	-0.405	0.373	0.139								
6	80	0.188	-1.466	0.286	0.082								
7	85	0.235	-1.179	0.256	0.065								
8	200	0.130	-1.901	0.210	0.044								
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11	70	0.214	-1.299	0.291	0.085								
12	100	0.310	-0.800	0.216	0.047								
13													
14													
15													
16													

The screen should look like this

Study name	Events	Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
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8 Manne, 2004	13	120	0.108	-2.108	0.294	0.086								
9 Kazak, 2005	48	200	0.240	-1.153	0.166	0.027								
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11 Glover	31	100	0.310	-0.800	0.216	0.047								
12														
13														

By default, the program is displaying the event rate (prevalence) as the effect size

Click File > Save As and save the file

Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
37	0.216	-1.288	0.399	0.159								
400	0.090	-2.314	0.175	0.031								
100	0.050	-2.944	0.459	0.211								
30	0.400	-0.405	0.373	0.139								
80	0.188	-1.466	0.286	0.082								
85	0.235	-1.179	0.256	0.065								
200	0.130	-1.901	0.210	0.044								
120	0.108	-2.108	0.294	0.086								
200	0.240	-1.153	0.166	0.027								
10 Landolt, 2005	15	70	0.214	-1.299	0.291	0.085						
11 Glover	31	100	0.310	-0.800	0.216	0.047						
12												
13												
14												
15												

Note that the file name is now in the header.

- [Save] will over-write the prior version of this file without warning
- [Save As...] will allow you to save the file with a new name

Comprehensive meta analysis - [C:\Users\Bicostat\Dropbox\Workshops Three-Day\PTSD\PTSD Prevalence mothers.cma]

File Edit Format View Insert Identify Tools Computational options Analyses Help

Run analyses → [Icons]

	Study name	Events	Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
1	Pelcovitz, 1996	8	37	0.216	-1.288	0.399	0.159								
2	Barakat, 1997	36	400	0.090	-2.314	0.175	0.031								
3	Manne, 1998	5	100	0.050	-2.944	0.459	0.211								
4	Fuemmeler, 2001	12	30	0.400	-0.405	0.373	0.139								
5	Libov, 2002	15	80	0.188	-1.466	0.286	0.082								
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11	Glover	31	100	0.310	-0.800	0.216	0.047								
12															
13															

To run the analysis, click [Run analysis]

Comprehensive meta analysis - [C:\Users\Bicostat\Dropbox\Workshops Three-Day\PTSD\PTSD Prevalence mothers.cma]

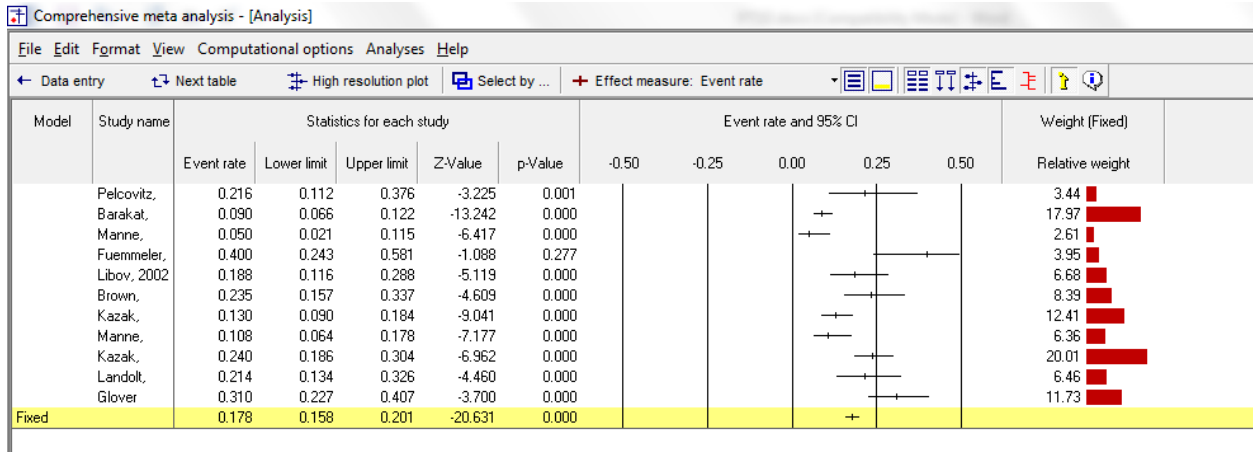
File Edit Format View Insert Identify Tools Computational options Analyses Help

Run analyses → [Icons]

	Study name	Events	Sample size	Event rate	Logit event rate	Std Err	Variance	H	I	J	K	L	M	N	O
1	Pelcovitz, 1996	8	37	0.216	-1.288	0.399	0.159								
2	Barakat, 1997	36	400	0.090	-2.314	0.175	0.031								
3	Manne, 1998	5	100	0.050	-2.944	0.459	0.211								
4	Fuemmeler, 2001	12	30	0.400	-0.405	0.373	0.139								
5	Libov, 2002	15	80	0.188	-1.466	0.286	0.082								
6	Brown, 2003	20	85	0.235	-1.179	0.256	0.065								
7	Kazak, 2004	26	200	0.130	-1.901	0.210	0.044								
8	Manne, 2004	13	120	0.108	-2.108	0.294	0.086								
9	Kazak, 2005	48	200	0.240	-1.153	0.166	0.027								
10	Landolt, 2005	15	70	0.214	-1.299	0.291	0.085								
11	Glover	31	100	0.310	-0.800	0.216	0.047								
12															
13															

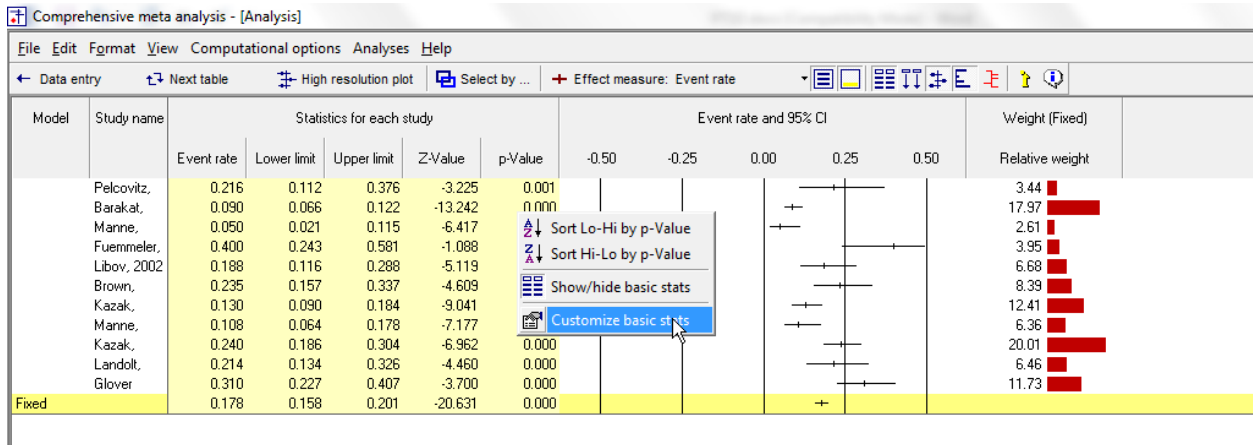
This is the basic analysis screen

Initially, the program displays the fixed-effect analysis. This is indicated by the tab at the bottom and the label in the plot.



The p-value tests the null that the true effect size is 0.50. This is of no interest to us, so we'll hide the z-value and the p-value.

Right-click on the statistics.



- Remove check-marks for Z-value and p-value
- Click Ok

Comprehensive meta analysis - [Analysis]

File Edit Format View Computational options Analyses Help

Data entry Next table High resolution plot Select by ... Effect measure: Event rate

Model	Study name	Statistics for each study					Event rate and 95% CI					Weight (Fixed)	
		Event rate	Lower limit	Upper limit	Z-Value	p-Value	-0.50	-0.25	0.00	0.25	0.50	Relative weight	
	Pelcovitz,	0.216	0.112	0.376	-3.225	0.001						3.44	
	Barakat,	0.090	0.066	0.122	-13.242	0.000						17.97	
	Manne,	0.050	0.021	0.115	-6.417	0.000							
	Fuenmeler,	0.400	0.243	0.581	-1.088	0.277							
	Libov, 2002	0.188	0.116	0.288	-5.119	0.000							
	Brown,	0.235	0.157	0.337	-4.609	0.000							
	Kazak,	0.130	0.090	0.184	-9.041	0.000							
	Manne,	0.108	0.064	0.178	-7.177	0.000							
	Kazak,	0.240	0.186	0.304	-6.962	0.000							
	Landolt,	0.214	0.134	0.326	-4.460	0.000							
	Glover	0.310	0.227	0.407	-3.700	0.000							
Fixed		0.178	0.158	0.201	-20.631	0.000							

Customize display

Show Decimals Alignment

All columns in this block

Event rate Auto Auto

Standard error Auto Auto

Variance Auto Auto

Lower limit Auto Auto

Upper limit Auto Auto

Z-Value Auto Auto

p-Value Auto Auto

Cancel Apply Ok

Comprehensive meta analysis - [Analysis]

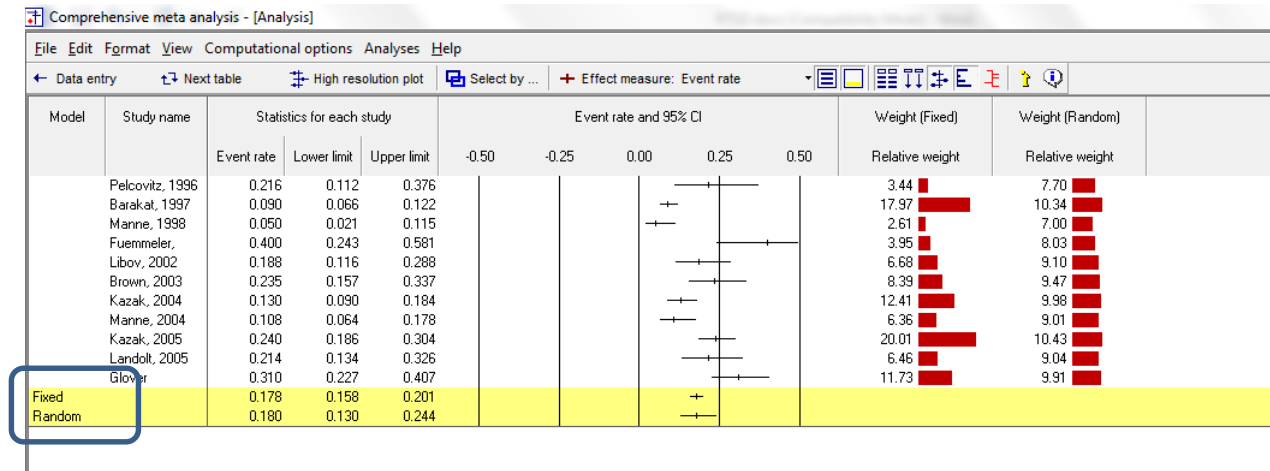
File Edit Format View Computational options Analyses Help

Data entry Next table High resolution plot Select by ... Effect measure: Event rate

Model	Study name	Statistics for each study			Event rate and 95% CI					Weight (Fixed)	
		Event rate	Lower limit	Upper limit	-0.50	-0.25	0.00	0.25	0.50	Relative weight	
	Pelcovitz, 1996	0.216	0.112	0.376						3.44	
	Barakat, 1997	0.090	0.066	0.122						17.97	
	Manne, 1998	0.050	0.021	0.115						2.61	
	Fuenmeler,	0.400	0.243	0.581						3.95	
	Libov, 2002	0.188	0.116	0.288						6.68	
	Brown, 2003	0.235	0.157	0.337						8.39	
	Kazak, 2004	0.130	0.090	0.184						12.41	
	Manne, 2004	0.108	0.064	0.178						6.36	
	Kazak, 2005	0.240	0.186	0.304						20.01	
	Landolt, 2005	0.214	0.134	0.326						6.46	
	Glover	0.310	0.227	0.407						11.73	
Fixed		0.178	0.158	0.201							

Click [Both models]

The program displays results for both the fixed-effect and the random-effects analysis.

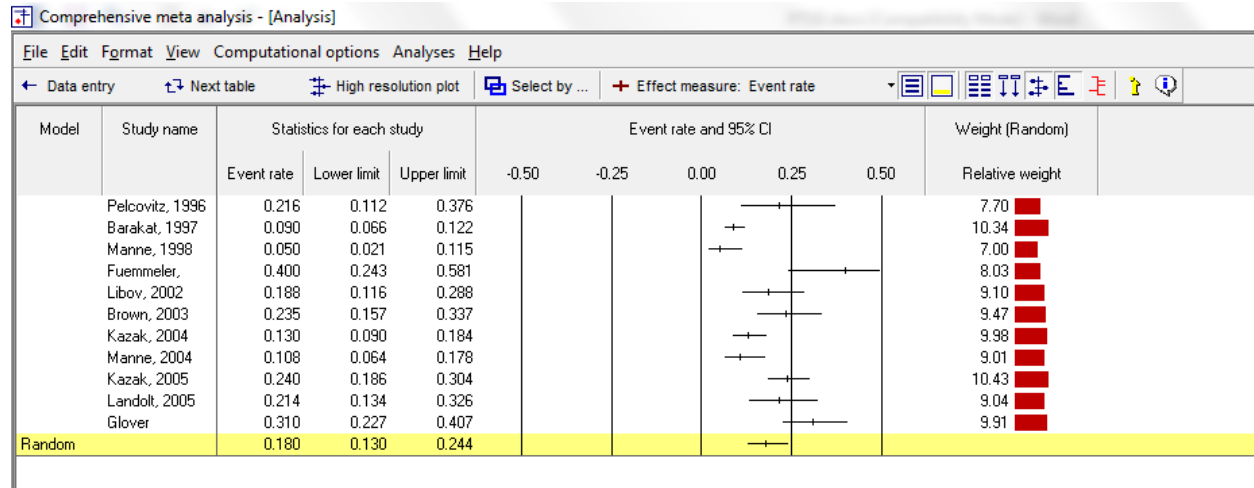


Under the fixed-effect model the pooled estimate is 0.178, while under the random-effects model the pooled estimate is 0.180. While the estimate of prevalence happens to be almost identical under the two models, the precision of the estimate is very different.

- The fixed-effect model would be appropriate if all the studies were virtual replicates of each other. This is not the case here since the patients varied in important ways from study to study.
- The random-effects model would be appropriate if the studies vary in ways that may impact the effect size (such as those mentioned immediately above). Therefore, we will use the random-effects model.

- Click Random on the tab at the bottom

The plot now displays the random-effects analysis alone.



A quick view of the plot suggests the following

- The risk of PTSD varied substantially from study to study.
- The risks vary from a low of 5.0% to a high of 40.0%
- It seems that much of this variation reflects differences in real proportions
- The mean prevalence is 0.180 with a CI of 0.130 to 0.244

Click [Next table]

Click here

Model	Effect size and 95% interval				Test of null (2-Tail)		Heterogeneity				Tau-squared			
	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	11	0.178	0.158	0.201	-20.631	0.000	65.229	10	0.000	84.669	0.346	0.204	0.041	0.588
Random	11	0.180	0.130	0.244	-7.695	0.000								

Figure 1

The statistics at the left duplicate those we saw on the prior screen.

- Under the random-effects model the mean prevalence is 0.180 with a 95% confidence interval of 0.130 to 0.244.
- The statistics at the upper right relate to the dispersion of effect sizes across studies.
- The Q-value is 65.229 with $df=10$ and $p < 0.001$. Q reflects the distance of each study from the mean effect (weighted, squared, and summed over all studies). Q is always computed using FE weights (which is the reason it is displayed on the “Fixed” row, but applies to both FE and RE analyses).
- If all studies actually shared the same true effect size, the expected value of Q would be equal to df (which is 10). Here, Q is greater than that value, and so there is some evidence of variance in true effects. This excess variance falls outside the range that could be attributed to random variation in effects (it is statistically significant).
- We had planned to use the random-effects model, since this matches the sampling frame for the studies, and would do so whether or not the Q -value was statistically significant.
- T^2 is the estimate of the between-study variance in true effects. This estimate is 0.346. T is the estimate of the between-study standard deviation in true effects. This estimate is 0.588. These value are both in logit units.
- I^2 reflects the proportion of true variance to observed variance. This is 84.669, which tells us that about 85% of the observed variance in effects is real. Put another way, if we were looking at a plot of the true effects rather than the observed effects, the variance in effects would be decreased by $(1 \text{ minus } .85)$ some 15%.
- This high value of I^2 tells us that if we could plot the *true* prevalence for each study, the dispersion would be only a little smaller than the dispersion we see in the plot of observed effects.

We can use the spreadsheet [Prediction intervals] as follows

- Open the spreadsheet [Prediction Intervals.xls]
- Select the tab for [Prevalence]
- In CMA select **Logit event rate** as the index
- Copy the A|B|C|D values as shown from CMA to Excel

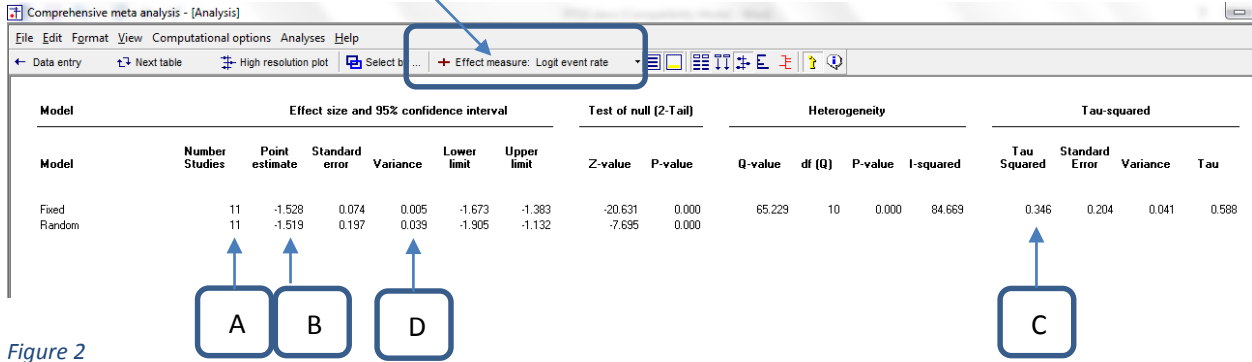
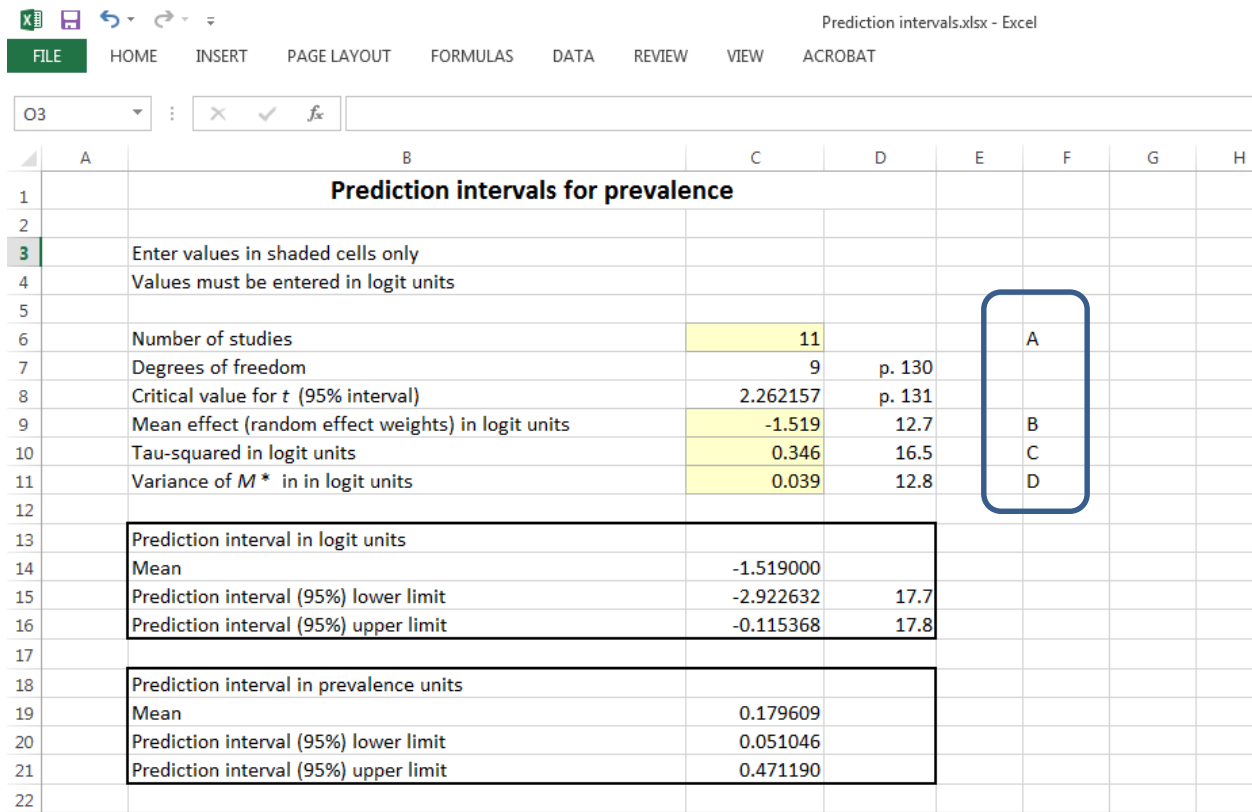


Figure 2

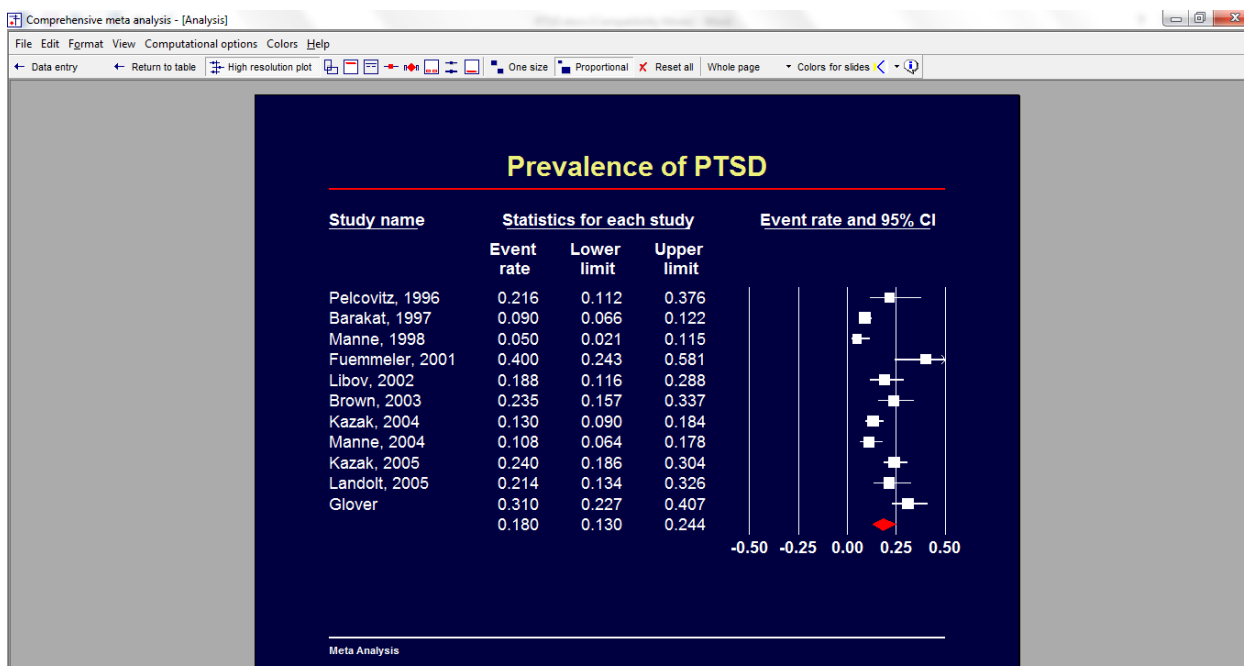
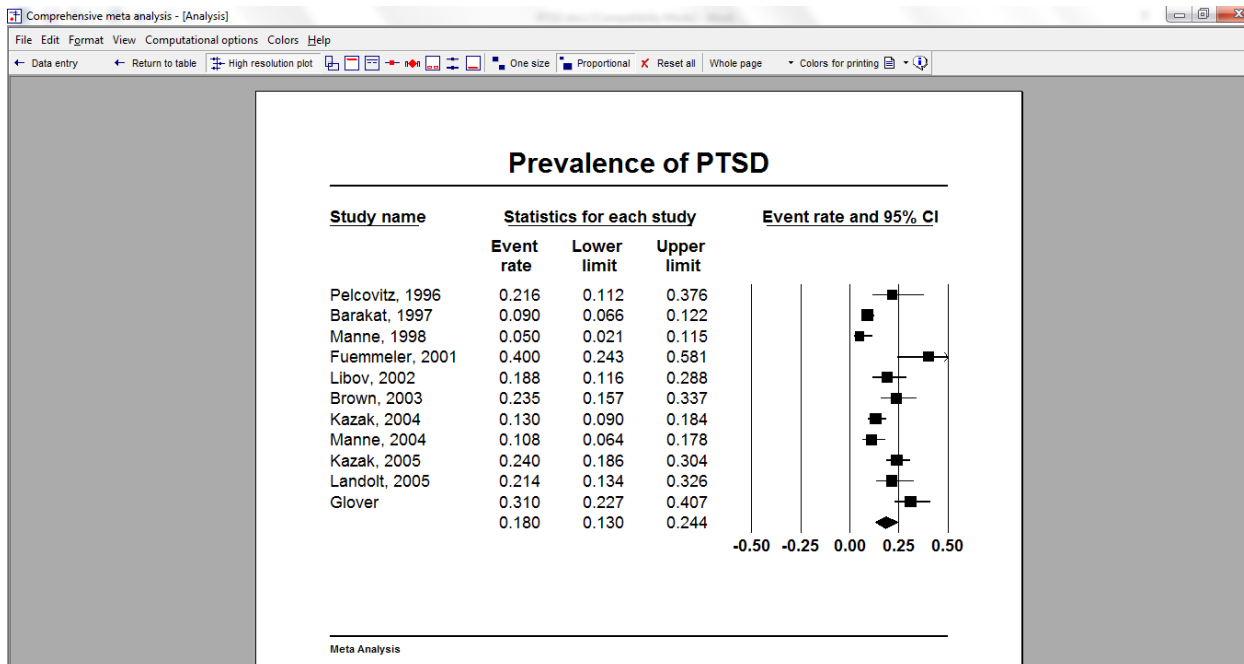


The confidence interval is 0.130 to 0.244 (read this from Figure 1, where the index is the event rate rather than the logit). The prediction interval (from Excel) is 0.051 to 0.471.

The true prevalence size varies from study to study. The mean prevalence probably falls in the range of 0.130 to 0.244. The true effect size for any single study will usually fall in the range of 0.051 to 0.471.

In 95% of all possible meta-analyses, the true mean will fall in the range indicated by the CI. In 95% of all meta-analyses, 95% of all studies will fall inside the range indicated by the PI. This assumes that the true effect sizes are normally distributed.

- Click [Next table] to return to the main analysis screen
- Click Hi-Resolution plot



Summary

This analysis includes eleven studies where mothers whose children suffered with chronic illnesses were evaluated for PRSD. Outcome was the proportion of mothers who showed symptoms of PTSD. The effect size is the prevalence of PTSD.

What is the pooled estimate of prevalence?

The pooled estimate of prevalence is 0.180, which means that about 18% of the mothers showed symptoms of PTSD.

These studies were sampled from a universe of possible studies defined by certain inclusion/exclusion rules as outlined in the full paper. The confidence interval for the prevalence is 0.130 to 0.244, which tell us that the mean prevalence in the universe of studies could fall anywhere in this range.

The Z-value tests the null hypothesis that the mean prevalence is 0.500, which is not of interest here.

Does the effect size vary across studies?

The *observed* effect size varies somewhat from study to study, but a certain amount of variation is expected due to sampling error. We need to determine if the observed variation falls within the range that can be attributed to sampling error (in which case there is no evidence of variation in true effects), or if it exceeds that range.

The *Q*-statistic provides a test of the null hypothesis that all studies in the analysis share a common effect size. If all studies shared the same effect size, the expected value of *Q* would be equal to the degrees of freedom (the number of studies minus 1).

The *Q*-value is 65.229 with 10 degrees of freedom and $p < 0.001$. We can reject the null hypothesis that the true effect size is the same in all these studies.

The I^2 statistic tells us what proportion of the observed variance reflects differences in true effect sizes rather than sampling error. Here, I^2 is 84.669. This tells us that about 85% of the variance in observed rates reflects variance in true rates rather than sampling error.

T^2 is the variance of true effect sizes (in logit units). Here, T^2 is 0.346. T is the standard deviation of true effects (in logit units). Here, T is 0.588.

If we assume that the rates are normally distributed (in logit units) we can estimate that the prediction interval. The true effect size for any single study will usually fall in the range of 0.051 to 0.471.