



# Stata 統計軟體教育訓練課程

## 統合分析 Meta-analysis

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授課日期：112年3月30日

# 為什麼要進行Meta-analysis?

統合多個臨床研究的樣本數和結果，證據力高  
花費研究經費和人力相對低

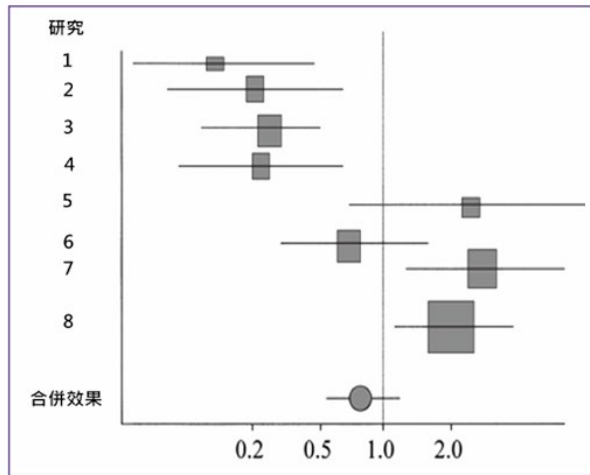
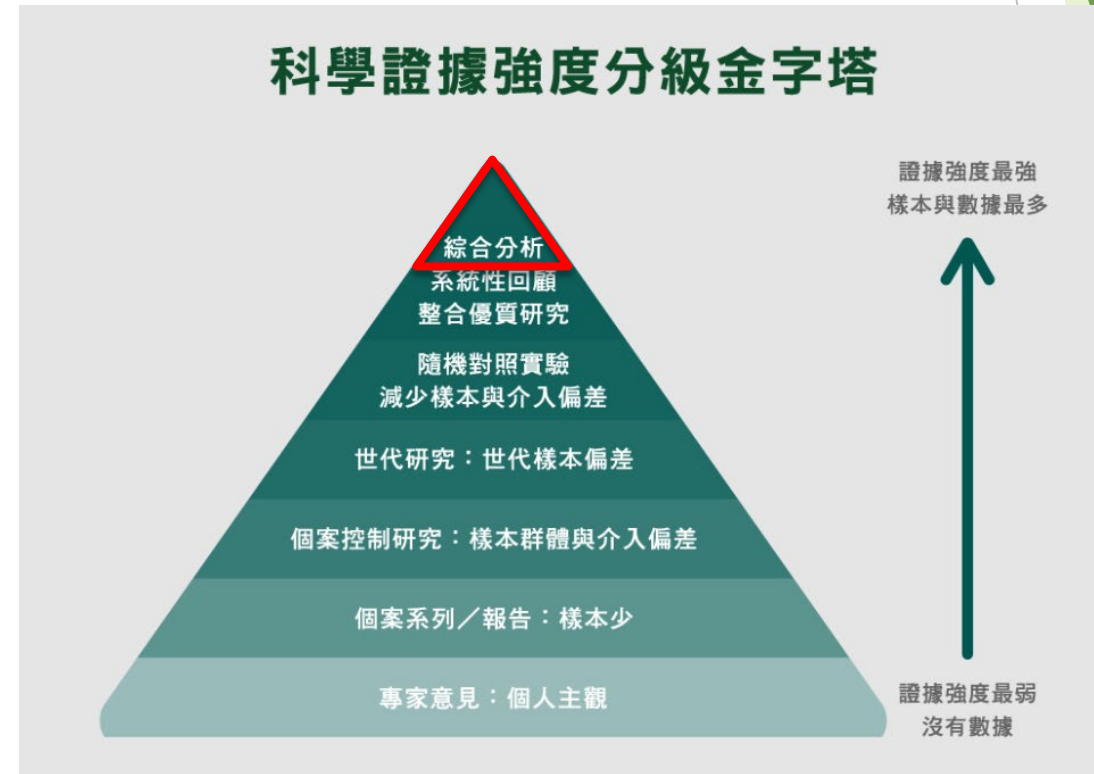


圖2 統合分析中呈現不同研究結果的明顯差異性





# Introduction to the “metan” Module

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\bcg.csv", clear

For binary (count) data:  
**4 variables (2\*2 data)**

1. the number of **events** in the **treatment** group (**tcases**)
2. the number of **non-events** in the **treatment** group (**tnoncases**)
3. the number of **events** in the **control** group (**ccases**)
4. the number of **non-events** in the **control** group (**cnoncases**)

1            2            3            4

In the command window type: **metan tcases tnoncases ccases cnoncases**

(1~4 順序不可以變動，名稱可隨意更改)

trial	trialnam	authors	pubyr	startyr	latitude	alloc	tcases	tnoncases	ccases	cnoncases	ttotal	ctotal	
1	2	Canada	Ferguson & Simes	1949	1933	55	1	6	300	29	274	306	303
2	1	Northern USA	Aronson	1948	1935	52	1	4	119	11	128	123	139
3	8	Chicago	Rosenthal et al	1961	1941	42	0	17	1699	65	1600	1716	1665
4	10	Georgia (Sch)	Comstock & Webster	1969	1947	33	0	5	2493	3	2338	2498	2341
5	9	Puerto Rico	Comstock et al	1974	1949	18	0	186	50448	141	27197	50634	27338
6	11	Georgia (Comm)	Comstock et al.	1976	1950	33	0	27	16886	29	17825	16913	17854
7	4	Madanapalle	Frimont-Moller et al	1973	1950	13	0	33	5036	47	5761	5069	5808
8	3	UK	Hart & Sutherland	1977	1950	53	1	62	13536	248	12619	13598	12867
9	7	South Africa	Coetzee & Berjak	1968	1965	27	1	29	7470	45	7232	7499	7277
10	5	Haiti	Vandeviere et al	1973	1965	18	1	8	2537	10	619	2545	629
11	6	Madras	TB Prevention Trial	1980	1968	13	1	505	87886	499	87892	88391	88391
12	12	Unknown	Rosenthal et al	1960	1945	42	1	3	228	11	209	231	220
13	13	Unknown	Stein and Aronson	1953	1940	52	0	180	1361	372	1079	1541	1451

# Introduction to the “metan” Module

For binary (count) data:  
4 variables (2\*2 data)

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年  
第4季\20221228-初探Meta-analysis\bcg.csv", clear

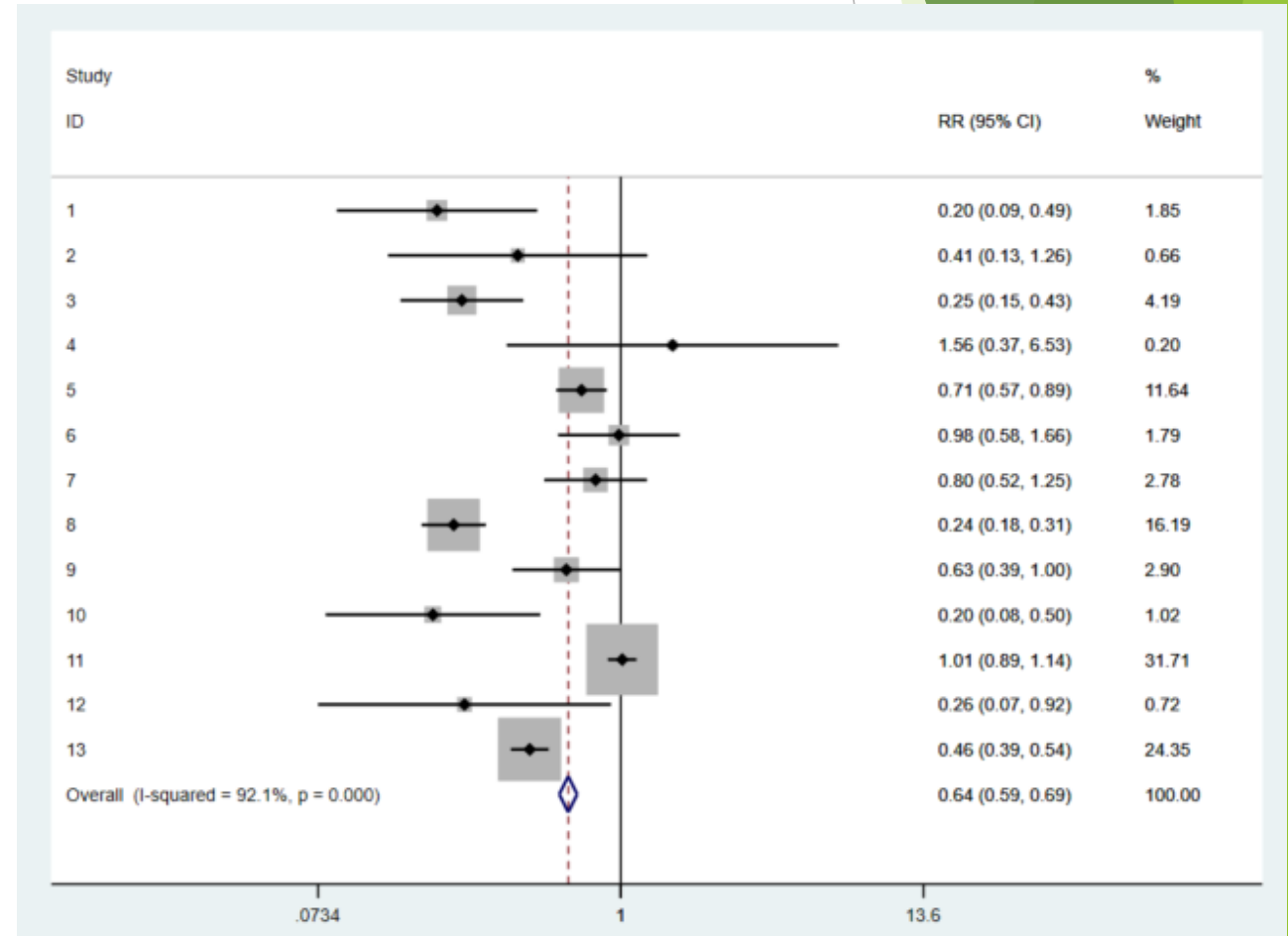
metan tcases tnoncases ccases cnoncases

```
. metan tcases tnoncases ccases cnoncases
```

Study	RR	[95% Conf. Interval]		% Weight
1	0.205	0.086	0.486	1.85
2	0.411	0.134	1.257	0.66
3	0.254	0.149	0.431	4.19
4	1.562	0.374	6.528	0.20
5	0.712	0.573	0.886	11.64
6	0.983	0.582	1.659	1.79
7	0.804	0.516	1.254	2.78
8	0.237	0.179	0.312	16.19
9	0.625	0.393	0.996	2.90
10	0.198	0.078	0.499	1.02
11	1.012	0.895	1.145	31.71
12	0.260	0.073	0.919	0.72
13	0.456	0.387	0.536	24.35
M-H pooled RR	0.635	0.588	0.686	100.00

Heterogeneity chi-squared = 152.57 (d.f. = 12) p = 0.000  
I-squared (variation in RR attributable to heterogeneity) = 92.1%

Test of RR=1 : z= 11.53 p = 0.000



# Introduction to the “metan” Module

For binary (count) data:  
**4 variables (2\*2 data)**

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年  
第4季\20221228-初探Meta-analysis\bcg.csv", clear

**metan tcases tnoncases ccases cnoncases**

若需要指令的協助：[help \(metan\)](#)

**rr** pools risk ratios (**the default**).

**or** pools odds ratios.

**rd** pools risk differences.

**fixed** specifies a fixed effect model using the method of Mantel and Haenszel (**the default**). For 4-variable data

**fixedi** specifies a fixed effect model using the inverse variance method. For 4- or 2-variable data

**peto** specifies that Peto's method is used to pool odds ratios. (For 4-variable data, zero cells)

**random** specifies a random effects model using the method of DerSimonian & Laird, with the estimate of heterogeneity being taken from the from the Mantel-Haenszel model. For 4-variable data

**randomi** specifies a random effects model using the method of DerSimonian & Laird, with the estimate of heterogeneity being taken from the inverse-variance fixed-effect model. For 4- or 2-variable data

# Introduction to the “metan” Module

For binary (count) data:  
**4 variables (2\*2 data)**

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\bcg.csv", clear

metan tcases tnoncases ccases cnoncases, or **random**

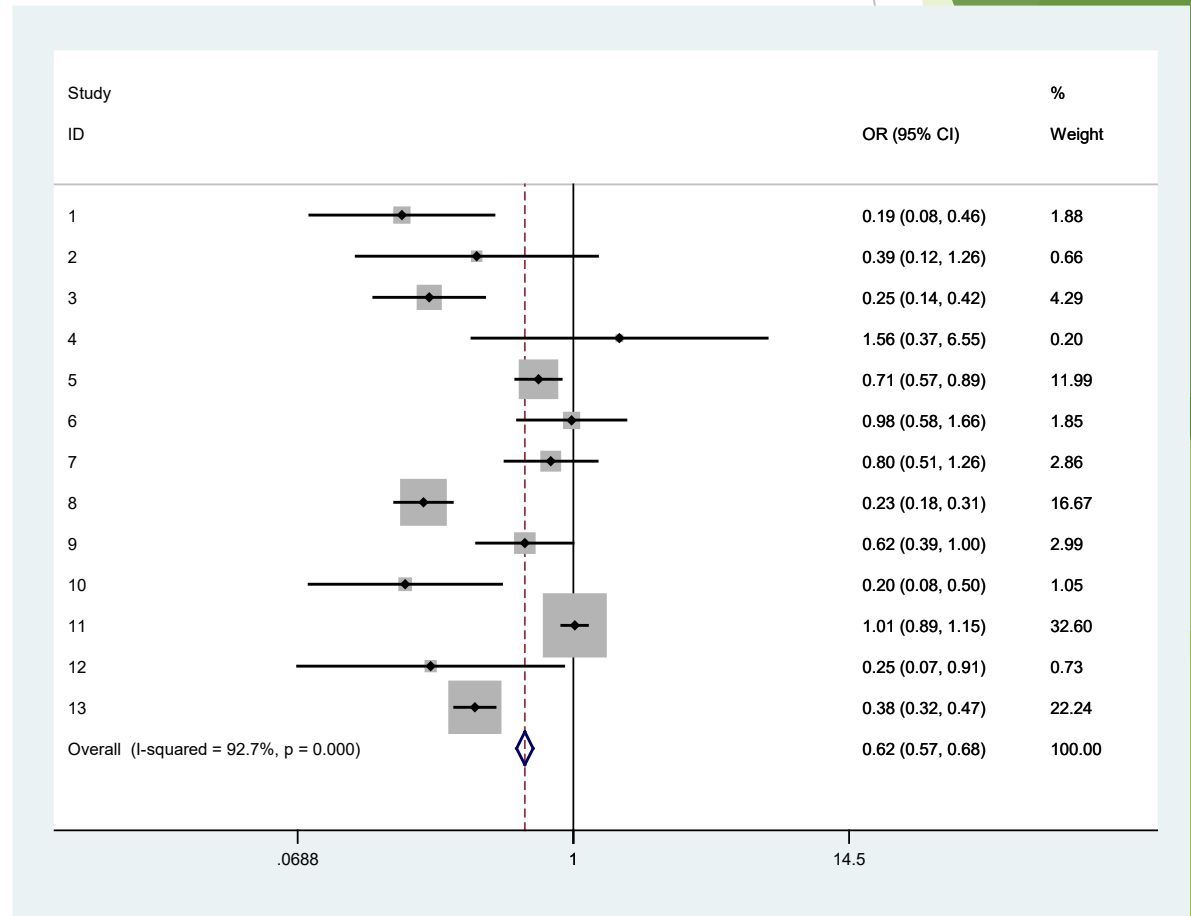
**Random effect**

```
. metan tcases tnoncases ccases cnoncases, or random
```

Study	OR	[95% Conf. Interval]		% Weight
1	0.189	0.077	0.462	6.44
2	0.391	0.121	1.262	5.12
3	0.246	0.144	0.422	8.37
4	1.563	0.373	6.548	4.11
5	0.711	0.571	0.886	9.75
6	0.983	0.582	1.661	8.44
7	0.803	0.514	1.256	8.83
8	0.233	0.176	0.308	9.55
9	0.624	0.391	0.996	8.73
10	0.195	0.077	0.497	6.24
11	1.012	0.894	1.146	9.97
12	0.250	0.069	0.908	4.63
13	0.384	0.316	0.466	9.82
D+L pooled OR	0.474	0.325	0.691	100.00

Heterogeneity chi-squared = 163.94 (d.f. = 12) p = 0.000  
 I-squared (variation in OR attributable to heterogeneity) = 92.7%  
 Estimate of between-study variance Tau-squared = 0.3682

Test of OR=1 : z= 3.88 p = 0.000



# Introduction to the “metan” Module

For binary (count) data:

**4 variables (2\*2 data)**

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年  
第4季\20221228-初探Meta-analysis\bcg.csv", clear

**四組數字： tcases tnoncases ccases cnoncases**

**metan tcases tnoncases ccases cnoncases**

**兩組數字： logRR, selogRR**

gen logRR = ln( (tcases/ttotal) / (ccases/ctotal) )

gen selogRR = sqrt( 1/tcases +1/ccases -1/ttotal -1/ctotal )

--Two variables: **metan loges seloges**

**metan logRR selogRR**

(log, effect sizes)(standard error, log, effect sizes)

**三組數字: RR, UL, LL**

**3組數字轉2組數字**

gen logrr=ln(rr)

gen selogrr=(ln(ul)-ln(ll))/3.92

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年  
第4季\20221228-初探Meta-analysis\nodm.csv", clear

--Three variables: **metan loges logll logul**

**metan rr ll ul**

(log, effect sizes)(log, lower and upper limits)



# Introduction to the “metan” Module

For binary (count) data:  
**3 variables**

insheet using "D:\助理研究員\中藥醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\nodm.csv", clear

metan rr ll ul

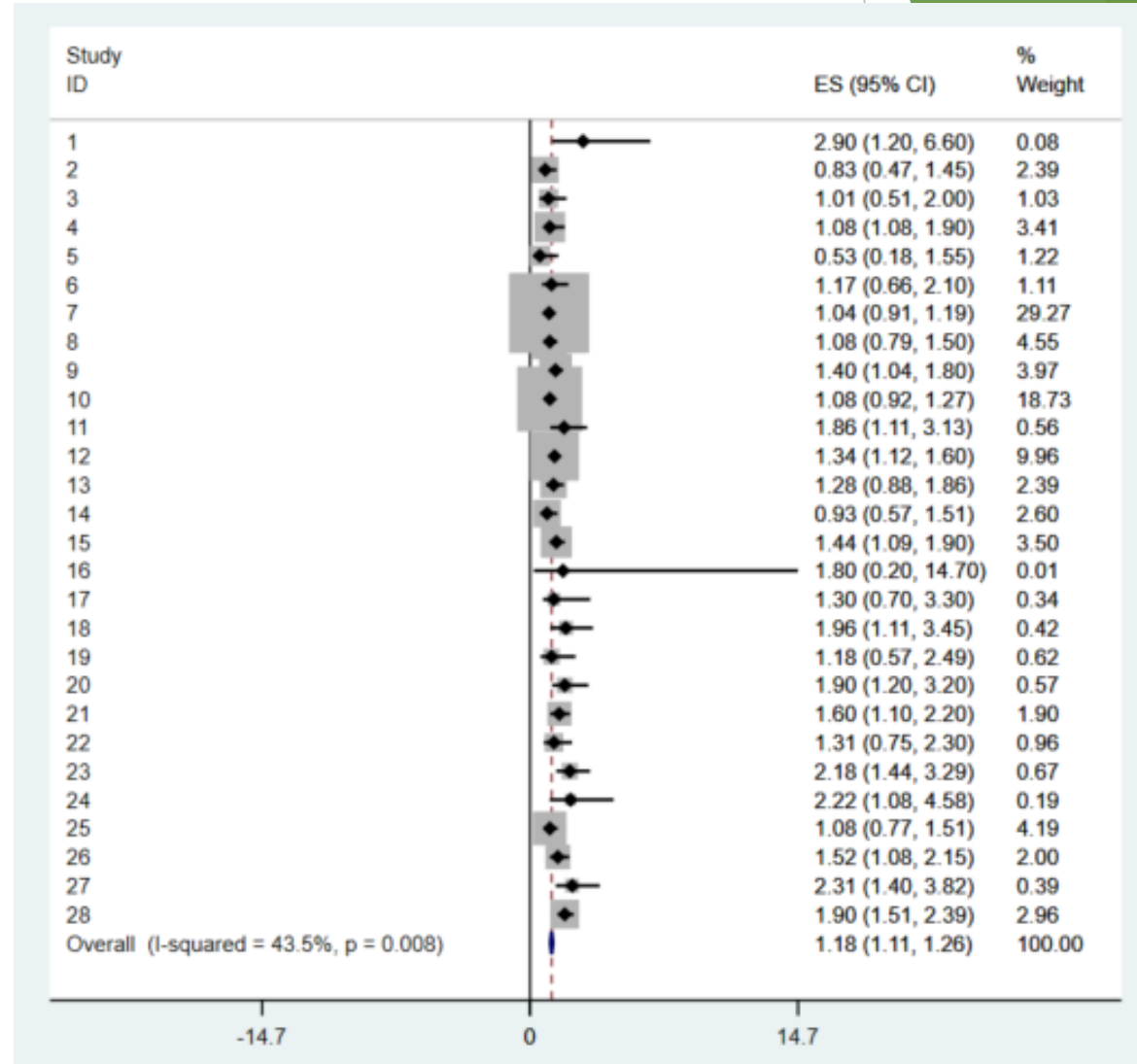
```
. metan rr ll ul
```

Study	ES	[95% Conf. Interval]		% Weight
1	2.900	1.200	6.600	0.08
2	0.830	0.470	1.450	2.39
3	1.010	0.510	2.000	1.03
4	1.080	1.080	1.900	3.41
5	0.530	0.180	1.550	1.22
6	1.170	0.660	2.100	1.11
7	1.040	0.910	1.190	29.27
8	1.080	0.790	1.500	4.55
9	1.400	1.040	1.800	3.97
10	1.080	0.920	1.270	18.73
11	1.860	1.110	3.130	0.56
12	1.340	1.120	1.600	9.96
13	1.280	0.880	1.860	2.39
14	0.930	0.570	1.510	2.60
15	1.440	1.090	1.900	3.50
16	1.800	0.200	14.700	0.01
17	1.300	0.700	3.300	0.34
18	1.960	1.110	3.450	0.42
19	1.180	0.570	2.490	0.62
20	1.900	1.200	3.200	0.57
21	1.600	1.100	2.200	1.90
22	1.310	0.750	2.300	0.96
23	2.180	1.440	3.290	0.67
24	2.220	1.080	4.580	0.19
25	1.080	0.770	1.510	4.19
26	1.520	1.080	2.150	2.00
27	2.310	1.400	3.820	0.39
28	1.900	1.510	2.390	2.96
-----				
I-V pooled ES	1.183	1.107	1.259	100.00
-----				

Heterogeneity calculated by formula  
 $Q = \text{SIGMA}_i \{ (1/\text{variance}_i) * (\text{effect}_i - \text{effect\_pooled})^2 \}$   
 where  $\text{variance}_i = ((\text{upper limit} - \text{lower limit}) / (2 * z))^2$

Heterogeneity chi-squared = 47.79 (d.f. = 27) p = 0.008  
 I-squared (variation in ES attributable to heterogeneity) = 43.5%

Test of ES=0 : z = 30.62 p = 0.000



# Introduction to the “metan” Module

For binary (count) data:

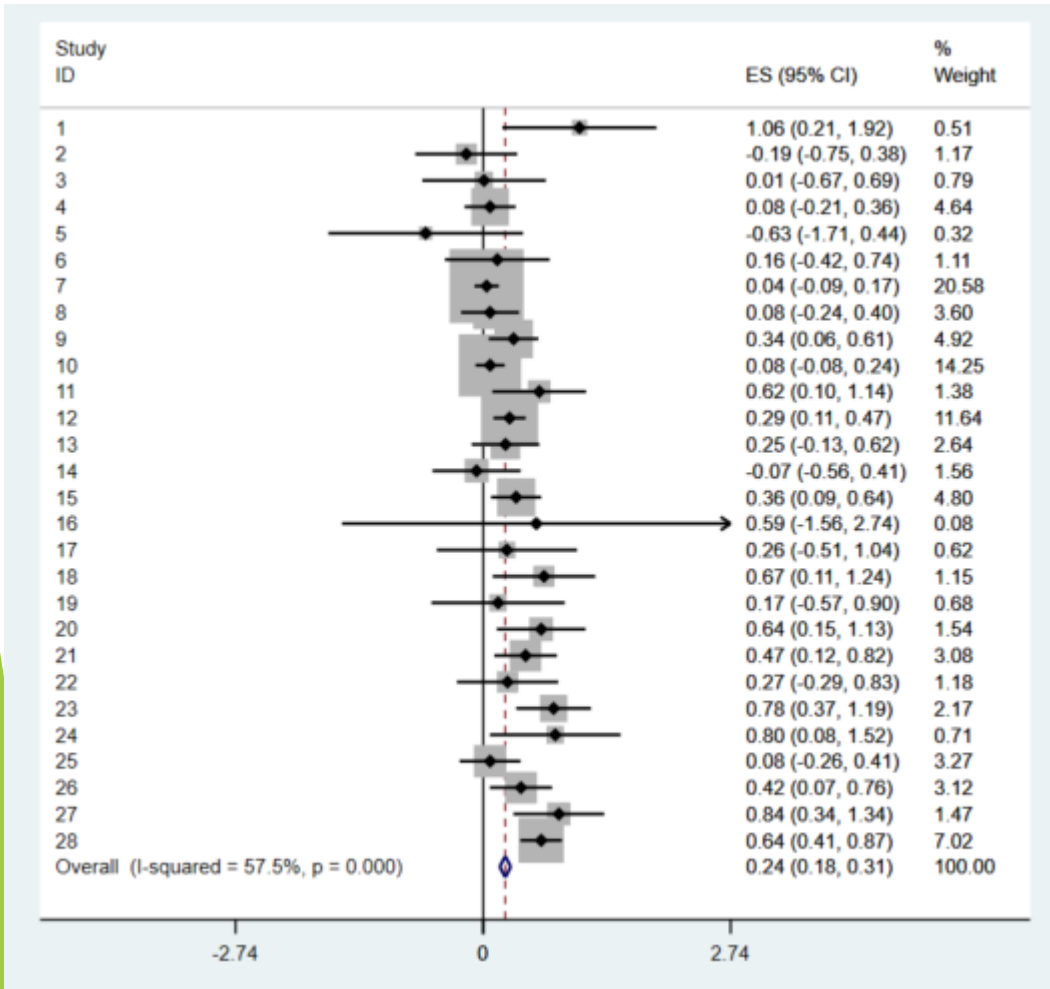
3組數字轉2組數字

gen logrr=ln(rr)

gen selogrr=(ln(ul)-ln(ll))/3.92

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\nodm.csv", clear

metan logrr selogrr



```

.gen logrr=ln(rr)
.
.gen selogrr=(ln(ul)-ln(ll))/3.92
.metan logrr selogrr

```

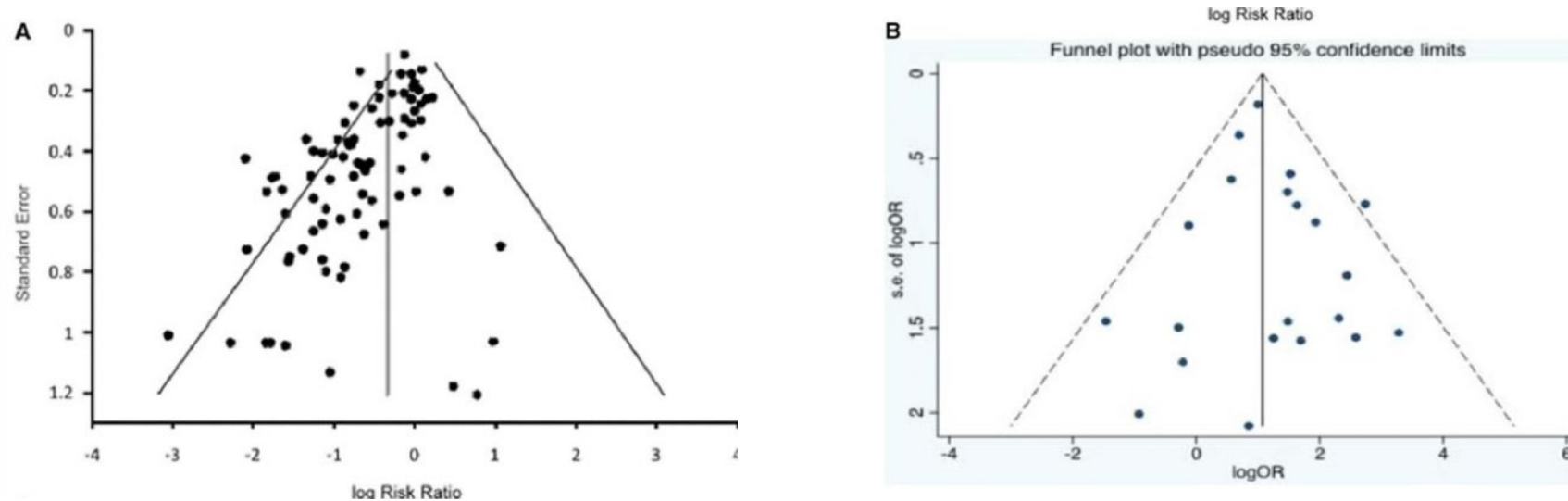
Study	ES	[95% Conf. Interval]	% Weight
1	1.065	0.212 1.917	0.51
2	-0.186	-0.750 0.377	1.17
3	0.010	-0.673 0.693	0.79
4	0.077	-0.205 0.359	4.64
5	-0.635	-1.711 0.442	0.32
6	0.157	-0.422 0.736	1.11
7	0.039	-0.095 0.173	20.58
8	0.077	-0.244 0.398	3.60
9	0.336	0.062 0.611	4.92
10	0.077	-0.084 0.238	14.25
11	0.621	0.102 1.139	1.38
12	0.293	0.114 0.471	11.64
13	0.247	-0.127 0.621	2.64
14	-0.073	-0.560 0.415	1.56
15	0.365	0.087 0.642	4.80
16	0.588	-1.561 2.736	0.08
17	0.262	-0.513 1.038	0.62
18	0.673	0.106 1.240	1.15
19	0.166	-0.572 0.903	0.68
20	0.642	0.151 1.132	1.54
21	0.470	0.123 0.817	3.08
22	0.270	-0.290 0.830	1.18
23	0.779	0.366 1.192	2.17
24	0.798	0.075 1.520	0.71
25	0.077	-0.260 0.414	3.27
26	0.419	0.074 0.763	3.12
27	0.837	0.335 1.339	1.47
28	0.642	0.412 0.871	7.02
I-V pooled ES	0.245	0.184 0.305	100.00

Heterogeneity chi-squared = 63.52 (d.f. = 27) p = 0.000  
I-squared (variation in ES attributable to heterogeneity) = 57.5%  
Test of ES=0 : z = 7.88 p = 0.000

# 圖像化評估 Publication Bias: Funnel Plot

「出版性偏差」 (publication bias)：研究的質素相若，但報告較大效應值的大型研究，相比於報告較小、或沒有效應的小型研究更常被發表出版的情況。

「出版性偏差」的風險：會令綜合性的研究並不能準確地代表某主題的所有研究，而只偏重於較極端的結果。



漏斗圖：(A) 有出版性偏差、(B) 無出版性偏差

# Introduction to the “metafunnel” Module

## 圖像化評估Publication Bias: Funnel Plot

search(metafunnel)  
search(metabias)

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探  
Meta-analysis\afreg.csv", clear

	year	study	rotor_n	rotor_t	pvi_n	pvi_t	logor	selogor	logrr	selogrr	weight	or	gp	af_duratio~h	age	male	htn	dm	lad
1	2012	Narayan S., 2012	10	34	42	69	-1.3173	.45	-.7273	.2827	14.30%	0.27 [0.11, 0.65]	0	45	61	95.77465	70	31	43
2	2014	Haissaguerre M., 2014	11	82	22	82	-.8615	.4088	-.6931	.3346	13.90%	0.42 [0.19, 0.94]	0	4.890244	57.5	80.5	.	.	.
3	2014	Atienza F., 2014 (Persistent)	27	58	31	58	-.2763	.3723	-.1382	.1866	12.10%	0.76 [0.37, 1.57]	0	15.84	54	81	34	9	45
4	2014	Atienza F., 2014 (Paxoxysmal)	23	55	26	58	-.1226	.3801	-.0695	.2157	10.70%	0.88 [0.42, 1.86]	0	49.56	53	84	29	3	40
5	2016	Lin Y.J., 2016	11	34	19	34	-.974	.5037	-.5465	.2911	9.40%	0.38 [0.14, 1.01]	0	5.3	54	76.5	50	5.9	39
6	2016	Jadidi A.S., 2016	17	85	35	66	-1.5077	.3666	-.9751	.2459	23.00%	0.22 [0.11, 0.45]	0	.	59	49	38	.	46
7	2017	Seitz J., 2017	47	105	30	47	-.7783	.3615	-.3549	.1543	16.70%	0.46 [0.23, 0.93]	0	19.4	58	74	42.5	10.6	42.4
8	2016	Sommer P.J., 2016	.	.	.	.	.	.	.	.	.	.	0	18.4	64.1	68	.	.	42.2
9	2012	Narayan S., 2012	10	34	42	69	-1.3173	.45	-.7273	.2827	14.30%	0.27 [0.11, 0.65]	1	52	63	94.44444	86	33	48
10	2014	Haissaguerre M., 2014	11	82	22	82	-.8615	.4088	-.6931	.3346	13.90%	0.42 [0.19, 0.94]	1	4.890244	60.1	80.5	.	.	.
11	2014	Atienza F., 2014 (Persistent)	27	58	31	58	-.2763	.3723	-.1382	.1866	12.10%	0.76 [0.37, 1.57]	1	18	55	81	39	14	45
12	2014	Atienza F., 2014 (Paxoxysmal)	23	55	26	58	-.1226	.3801	-.0695	.2157	10.70%	0.88 [0.42, 1.86]	1	43.92	54	73	44	5	40
13	2016	Lin Y.J., 2016	11	34	19	34	-.974	.5037	-.5465	.2911	9.40%	0.38 [0.14, 1.01]	1	7.06	56	79.4	47.1	17.6	39.9
14	2016	Jadidi A.S., 2016	17	85	35	66	-1.5077	.3666	-.9751	.2459	23.00%	0.22 [0.11, 0.45]	1	.	63	55	52	.	44
15	2017	Seitz J., 2017	47	105	30	47	-.7783	.3615	-.3549	.1543	16.70%	0.46 [0.23, 0.93]	1	12.2	63	76.2	45.7	12.4	45.6
16	2016	Sommer P.J., 2016	.	.	.	.	.	.	.	.	.	.	1	68.5	60.9	70	.	.	45.9

gen logRR = ln( (tcases/ttotal) / (ccases/ctotal) )

gen selogRR = sqrt( 1/tcases +1/ccases -1/ttotal -1/ctotal )

gen logrr=ln(rr)

gen selogrr=(ln(ul)-ln(ll))/3.92

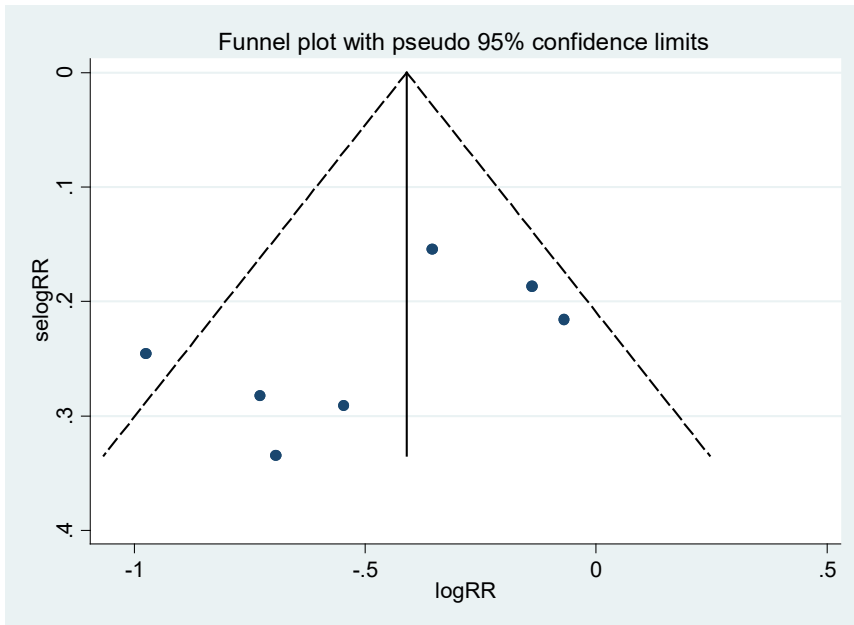
# Introduction to the “metafunnel” Module

## 圖像化評估Publication Bias: Funnel Plot

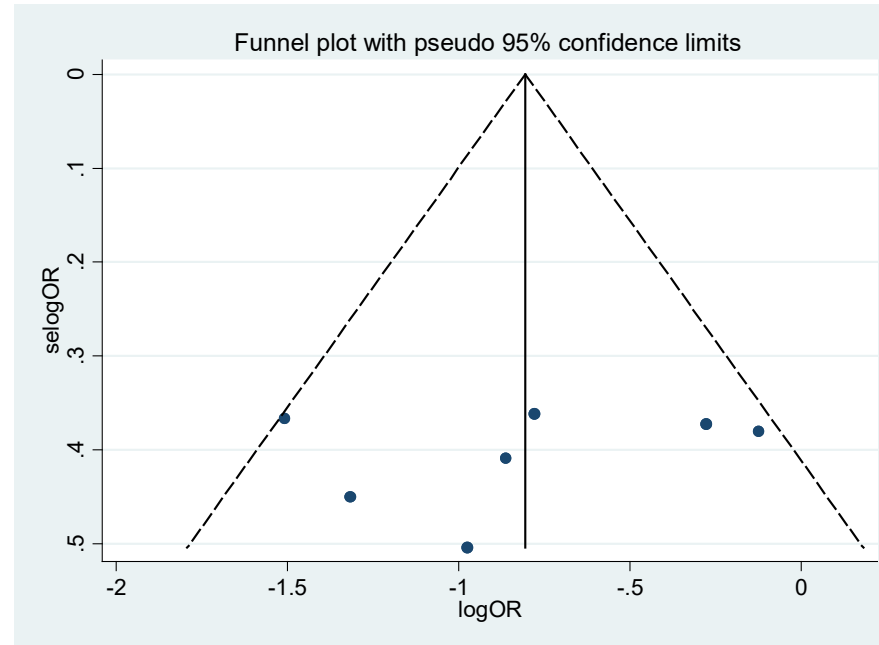
```
search(metafunnel)  
search(metabias)
```

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\afreg.csv", clear

```
metafunnel logrr selogrr
```



```
metafunnel logor selogor
```



# Introduction to the “metafunnel” Module

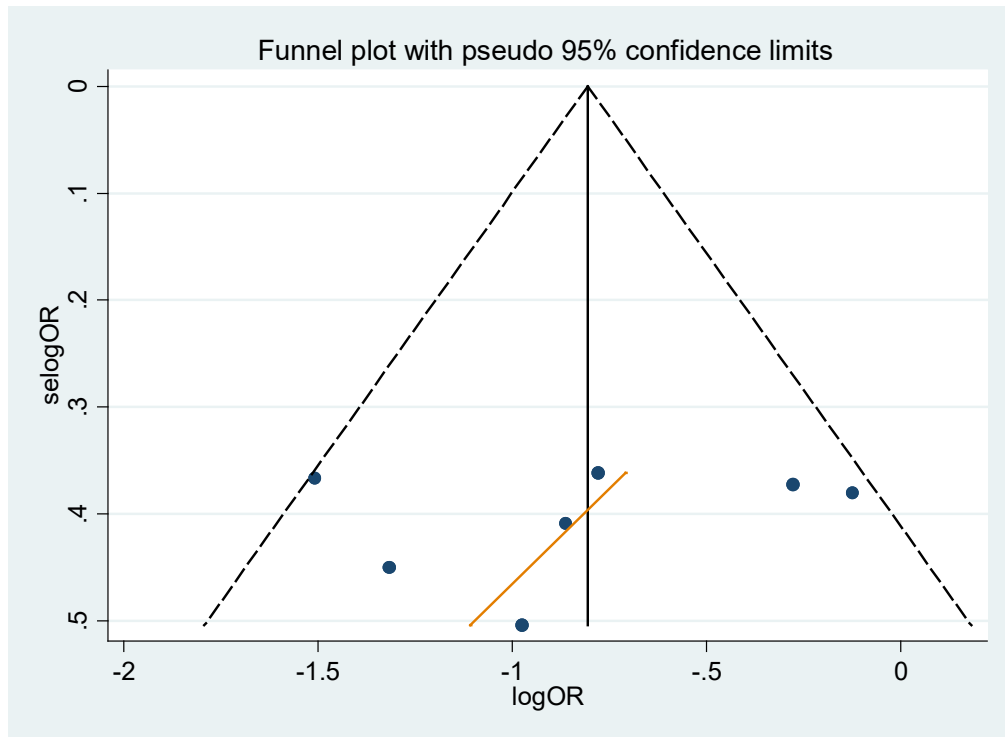
圖像化評估Publication Bias: Funnel Plot  
→ Small size effect: Egger's test

```
search(metafunnel)  
search(metabias)
```

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\afreg.csv", clear

```
metafunnel logor selogor, egger
```

```
metabias logor selogor, egger
```



```
. metabias logor selogor, egger graph
```

Note: default data input format (theta, se\_theta) assumed.

Tests for Publication Bias

Begg's Test

```
adj. Kendall's Score (P-Q) = -12  
Std. Dev. of Score = 18.27 (corrected for ties)  
Number of Studies = 14  
Z = -0.66  
Pr > |z| = 0.511  
Z = 0.60 (continuity corrected)  
Pr > |z| = 0.547 (continuity corrected)
```

Egger's test

	Std_Eff	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
slope		.3068297	1.247459	0.25	0.810	-2.41115 3.024809
bias		-2.8082	3.130834	-0.90	0.387	-9.629702 4.013302

# 研究出現高異質性怎麼辦？

- 不要先急著作統合分析

- 統合性迴歸分析 (meta-regression)

- 次群組分析 (subgroup-analysis)：找出具有明顯的 category 差別的變項

- 總論文數小於10篇以下，盡量不要作統合性迴歸分析 → **Egger' s test**

- 敏感度分析 (sensitivity analysis)：

- 將某些不合適的論文（例如壁報或品質差的論文）刪除

- 使用 **Random effect model**

若有 Publication Bias，則做 Meta-regression 去看是否有差異？

search (metareg)

metareg logrr af\_duration\_month age male lad htn dm, wsse(selogrr)

```
. metareg logrr af_duration_month age male lad htn dm, wsse(selogrr)
Iteration 1: tau^2 = 0

Meta-analysis regression                               No of studies = 10
tau^2 method                                           reml
tau^2 estimate = 0

Successive values of tau^2 differ by less than 10^-4 :convergence achieved
```

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
af_duratio~h	.0069913	.0062484	1.12	0.263	-.0052554	.019238
age	-.0232773	.030965	-0.75	0.452	-.0839677	.037413
male	-.0134777	.0225799	-0.60	0.551	-.0577334	.0307781
lad	.0429541	.0383832	1.12	0.263	-.0322756	.1181838
htn	-.0103658	.0129599	-0.80	0.424	-.0357666	.0150351
dm	-.0009762	.02803	-0.03	0.972	-.055914	.0539615
_cons	.5510243	2.597312	0.21	0.832	-4.539614	5.641663

metareg logor af\_duration\_month age male lad htn dm, wsse(selogor)

```
. metareg logor af_duration_month age male lad htn dm, wsse(selogor)
Iteration 1: tau^2 = 0

Meta-analysis regression                               No of studies = 10
tau^2 method                                           reml
tau^2 estimate = 0

Successive values of tau^2 differ by less than 10^-4 :convergence achieved
```

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
af_duratio~h	.0129666	.0111359	1.16	0.244	-.0088593	.0347926
age	-.0597687	.0633236	-0.94	0.345	-.1838807	.0643433
male	-.0238221	.0421582	-0.57	0.572	-.1064507	.0588065
lad	.0711115	.0677096	1.05	0.294	-.0615969	.2038198
htn	-.0169151	.0224828	-0.75	0.452	-.0609806	.0271505
dm	.0013636	.0515917	0.03	0.979	-.0997543	.1024815
_cons	2.073794	5.095346	0.41	0.684	-7.912901	12.06049

insheet using "D:\助理研究員\中榮醫研部-生統小組\全院教育課程規劃-2022oct\111年第4季\20221228-初探Meta-analysis\afreg.csv", clear



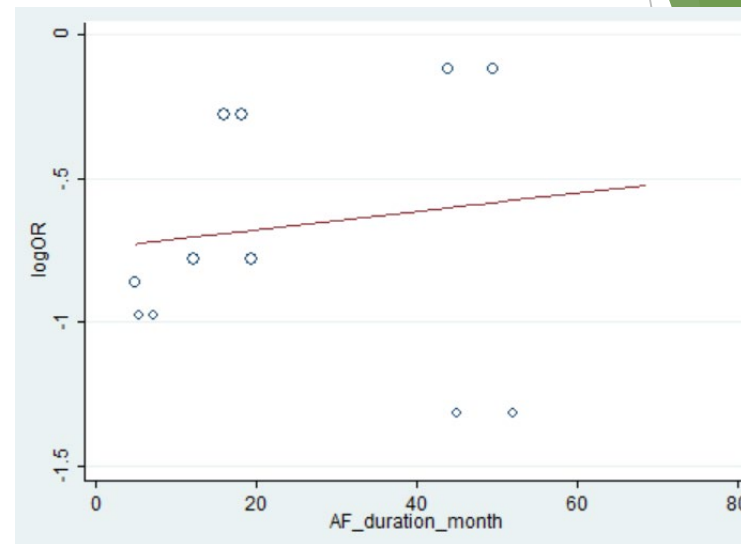
若有 Publication Bias，則做 Meta-regression 去看是否有差異？

search (metareg)

#單看特定變數會不會影響結局 (只能放一個變數)

AF duration 會不會影響復發

metareg logor af\_duration\_month , wsse(selogor) graph



```
. metareg logor af_duration_month , wsse(selogor) graph
```

```
Meta-regression
REML estimate of between-study variance      Number of obs = 12
% residual variation due to heterogeneity    tau2 = .02237
Proportion of between-study variance explained I-squared_res = 13.84%
with Knapp-Hartung modification              Adj R-squared = -82.67%
```

logor	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
af_duratio~h	.0032216	.0072379	0.45	0.666	-.0129054	.0193486
_cons	-.7446471	.2116059	-3.52	0.006	-1.216134	-.2731598

# Introduction to the “metareg” Module

search (metareg)

For risk ratio (RR) → Log RR:

```
#三組資料 (RR, LL, UL)
metan rr ll ul, random
```

```
#轉兩組資料 (logrr seloges)
gen logrr=ln(rr)
gen selogrr=(ln(ul)-ln(ll))/3.92
```

```
metareg logrr sex adjust, wsse(selogrr)
```

successive values of tau<sup>2</sup> differ by less than 10<sup>-4</sup> :convergence achieved

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
sex	-.1259708	.1030285	-1.22	0.221	-.3279031	.0759614
adjust	-.2823985	.0972248	-2.90	0.004	-.4729556	-.0918414
_cons	.5611827	.0802269	6.99	0.000	.4039409	.7184244

Random-effects model

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	source	year	adjust	sex	assess	rr	ll	ul	logrr	selogrr
1	Yarnell	1994	1	1	fasting	2.9	1.2	6.6	1.064711	.4348847
2	Park_M	1996	1	1	postchallenge	.83	.47	1.45	-.1863296	.2873944
3	Park_W	1996	1	0	postchallenge	1.01	.51	2	.0099503	.3485948
4	Folsom_M	1997	1	1	fasting	1.08	1.08	1.9	.0769611	.1441053
5	FolsomW	1997	1	0	fasting	.53	.18	1.55	-.6348783	.5492483
6	Lowe_BI	1997	1	1	postchallenge	1.17	.66	2.1	.1570037	.2952685
7	Lowe_Wh	1997	1	1	postchallenge	1.04	.91	1.19	.0392207	.0684347
8	Balkau	1998	1	1	postchallenge	1.08	.79	1.5	.0769611	.1635682
9	Bjornholt	1999	1	1	fasting	1.4	1.04	1.8	.3364722	.1399403
10	Rodriguez	1999	1	1	postchallenge	1.08	.92	1.27	.0769611	.0822445
11	Wannamethee	1999	1	1	casual	1.86	1.11	3.13	.6205765	.2644574
12	DECODE Study Group_M	2001	1	1	postchallenge	1.34	1.12	1.6	.2926696	.0909885
13	DECODE Study Group_W	2001	1	0	postchallenge	1.28	.88	1.86	.2468601	.1909209
0	postchallenge				postchallenge	.93	.57	1.51	-.0725707	.2485277
1	fasting				fasting	1.44	1.09	1.9	.3646432	.1417541
0	fasting				fasting	1.8	.2	14.7	.5877866	1.096246
1	fasting				fasting	1.3	.7	3.3	.2623642	.3955606
1	postchallenge				postchallenge	1.96	1.11	3.45	.6729445	.2892894
1	casual				casual	1.18	.57	2.49	.1655144	.3761229
0	postchallenge				postchallenge	1.9	1.2	3.2	.6418539	.2502115
1	fasting				fasting	1.6	1.1	2.2	.4700036	.1768233
22	Cremer	1997	0	0	casual	1.31	.75	2.3	.2700271	.2858651
23	Hart_M	1999	0	1	casual	2.18	1.44	3.29	.7793249	.2107766
24	Hart_W	1999	0	0	casual	2.18	1.44	3.29	.7793249	.2107766
25	Tominaga	1999	0	0	postchallenge	2.22	1.08	4.58	.7975072	.3685556
26	Simons_M	2000	0	1	fasting	1.08	.77	1.51	.0769611	.1718047
27	Simons_W	2000	0	0	fasting	1.52	1.08	2.15	.4187103	.1756395
28	Klein	2002	0	0	casual	2.31	1.4	3.82	.8372475	.2560659
28	Smith	2002	0	0	postchallenge	1.9	1.51	2.39	.6418539	.1171387

# Introduction to the “metareg” Module

search (metareg)

若Meta-regression有差異 → 把有差異的那群分層去比較 (Sub-group analysis)

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年第4季\20221228-初探Meta-analysis\nodm.csv ", clear

```
metareg logrr sex adjust, wsse(selogrr)
```

successive values of tau^2 differ by less than 10^-4 :convergence achieved

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
sex	-.1259708	.1030285	-1.22	0.221	-.3279031	.0759614
adjust	-.2823985	.0972248	-2.90	0.004	-.4729556	-.0918414
_cons	.5611827	.0802269	6.99	0.000	.4039409	.7184244

Random-effects model

#Sub-group analysis (依adjust與否分層): Fixed-effect model  
metan logrr selogrr, fixed eform by(adjust)

#Sub-group analysis (依adjust與否分層): Random-effects model  
metan logrr selogrr, random eform by(sex)

若Meta-regression有差異 →  
把有差異的那群分層去比較 (Sub-group analysis)

insheet using "D:\助理研究員\中榮醫研部-  
生統小組\全院教育課程規劃-2022oct\111年  
第4季\20221228-初探Meta-  
analysis\nodm.csv ", clear

#Sub-group analysis (依adjust與否分層):  
Random-effects model  
metan logrr selogrr, random eform by(sex)

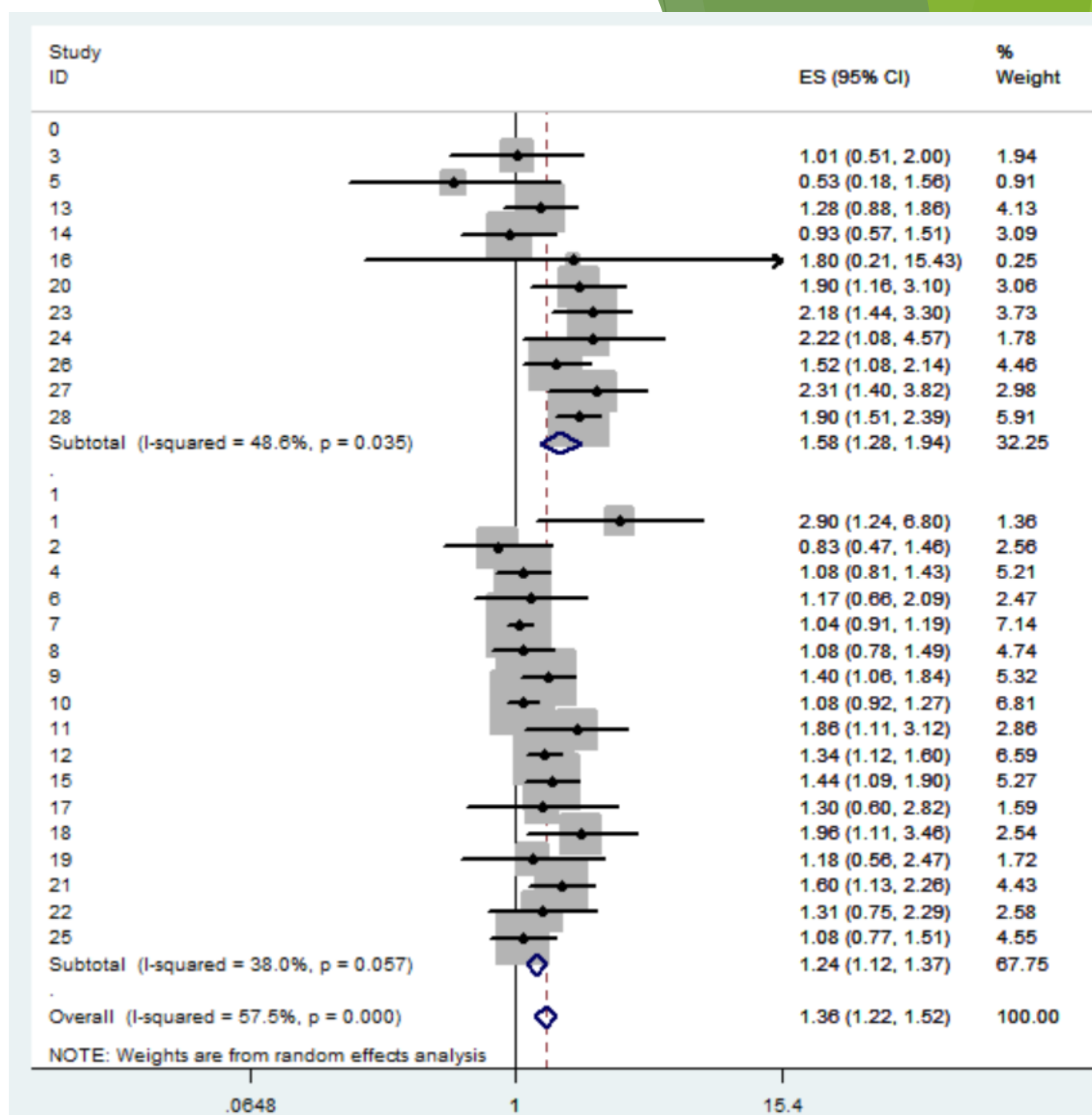
Test(s) of heterogeneity:					
	Heterogeneity statistic	degrees of freedom	P	I-squared**	Tau-squared
0	19.46	10	0.035	48.6%	0.0514
1	25.81	16	0.057	38.0%	0.0140
Overall	63.52	27	0.000	57.5%	0.0389

\*\* I-squared: the variation in ES attributable to heterogeneity)

Note: between group heterogeneity not calculated;  
only valid with inverse variance method

Significance test(s) of ES=1

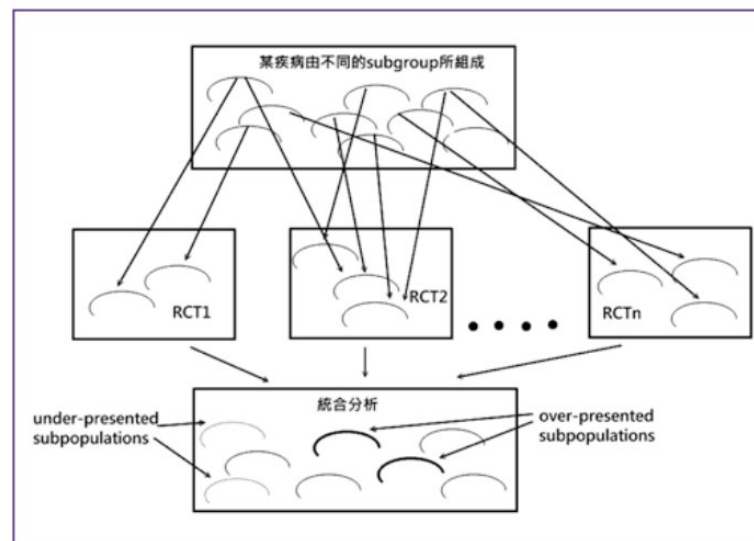
0	z= 4.32	p = 0.000
1	z= 4.16	p = 0.000
Overall	z= 5.51	p = 0.000



# 總結

- ▶ 僅由單一個隨機分派研究的結果來下結論是一種比較危險的行為，萬一這個結果有隨機錯誤時（error by chance），我們就有可能對某個醫學議題造成誤判。
- ▶ 統合分析可以提供較客觀的整合分析結果，對於不合適的研究我們也可藉由敏感性分析將其剔除，而使分析結果更正確。
- ▶ 隨機分派研究與觀察性研究的證據強度（level of evidence）是不同的，我們在看一篇統合分析的論文時一定要注意所選取論文的研究種類、品質、和訊息強度。

統合分析和隨機分派研究論文結果牴觸的可能原因：  
某些特定族群被過度呈現



## 生統小組：統計方法教育訓練



# Thank you for listening