# Interpretation of graphs and effect estimates in meta-analysis

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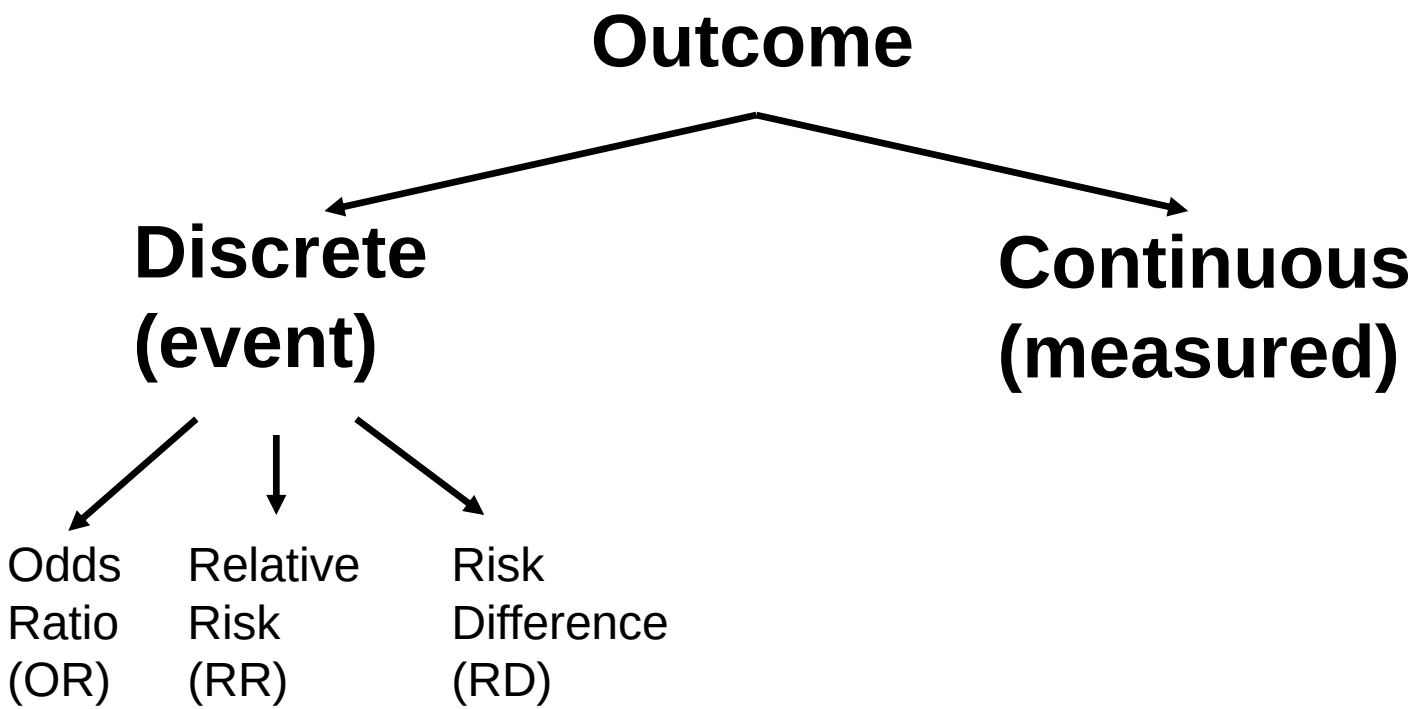
# Forest Plot

- For each trial or study
  - estimate (square)
  - 95% confidence interval (CI) (line)
  - size (square) indicates weight allocated
- Solid vertical line of ‘no effect’
  - if CI crosses line then effect not significant (p>0.05)
- Horizontal axis
  - arithmetic: RD, MD, SMD
  - logarithmic: OR, RR
- Diamond represents combined estimate and 95% CI
- Dashed line plotted vertically through combined estimate

# Effect Size Measures



# What are dichotomous outcomes?

- when the outcome for every participant is one of two possibilities or events
  - alive or dead
  - healed or not healed
  - pregnant or not pregnant

# What were the chances of that?

- **Risk** and **odds**
  - express chance in numbers
  - for dichotomous outcomes, express the chance within a group of being in one of two states
  - particular statistical meanings, calculated differently

# Risk

- 24 people drank coffee
  6 developed a headache
- risk of a headache

  = 6 headaches / 24 people who could have had one

  = 6/24 = ¼ = 0.25 = 25%

**risk = $\frac{\text{no. participants with event of interest}}{\text{total no. participants}}$**

# Odds

- 24 people drank coffee
  6 developed a headache
- odds of a headache
  = 6 headaches/18 without headaches
  = 6/18 = 1/3 = 0.33 = 1:3 (not usually as %)

**odds = $\frac{\text{no. participants with event of interest}}{\text{no. participants without event of interest}}$**

# Do risks and odds differ much?

- Two examples from caffeine trials

- 5 people with ‘headaches’ out of 65
- chance of having a headache

  **risk = 5/65 = 0.077** **odds = 5/60 = 0.083**

- 130 people ‘still awake’ out of 165
- chance of still being awake

  **risk = 130/165 = 0.79** **odds = 130/35 = 3.71**

# Comparing two groups

| | Headache | No headache | Total |
|---|---|---|---|
| **Caffeine** | 17 | 51 | **68** |
| **Decaf** | 9 | 55 | **64** |
| **Total** | **26** | **106** | **132** |

# Comparing two groups

- effect measures
  - risk ratio (RR) (relative risk)
  - odds ratio (OR)
  - risk difference (RD) (absolute risk reduction)
- all estimates are uncertain, and should be presented with a confidence interval

# Risk ratio

- risk of event with intervention = **17/68=0.25**
- risk of event with control = **9/64=0.14**

risk ratio = intervention risk / control risk

$$= \frac{17/68}{9/64} = \frac{0.25}{0.14} = 1.79$$

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| Caffeine | **17** | 51 | **68** |
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**Where risk ratio = 1, there is no difference between the groups**

# Expressing it in words

- Risk ratio 1.79
  - the risk of having a headache with treatment was 179% of the risk in the control group
  - intervention increased the risk of headache by 79%

- **or for a reduction in risk:**
  - Risk ratio 0.56
    - the risk of having a headache with Decaf was 56% of the risk in the caffein group
    - intervention reduced the risk of headache by 44%

# Odds ratio

- odds of event with intervention = **17/51**
- odds of event with control = **9/55**
- odds ratio = $\frac{\text{intervention odds}}{\text{control odds}}$
- $= \frac{17/51}{9/55} = \frac{0.33}{0.16} = 2.06$

| | Headache | No headache | Total |
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**Where odds ratio = 1, there, is no difference between the groups**

# Expressing it in words

- Odds ratio 2.06
  - intervention doubled the odds of headache
  - intervention increased the odds to 206% of the odds in the control group
  - intervention increased the odds of headache by 106%

- **or for a reduction in odds:**
  - Odds ratio 0.48
    - Decaff reduced the odds of headache to 48% of the odds in the caffein group
    - Decaf reduced the odds of headache by 52%

# Risk difference

| | Headache | No headache | Total |
|---|---|---|---|
| Caffeine | 17 | 51 | 68 |
| Decaf | 9 | 55 | 64 |
| Total | 26 | 106 | 132 |

- risk of event with intervention = **17/68=0.25**
- risk of event with control

  = 9/64=0.14

- risk difference = risk with intervention – risk with control

- =**17/68 – 9/64**
- = 0.25 – 0.14 = 0.11

- **Where risk difference = 0, there is no difference between the groups**

# Expressing it in words

- Risk difference 0.11
  - intervention increased the risk of headache by 11 percentage points
  - 14 out of 100 people experienced a headache in the control group. 11 more people experienced a headache with caffeine.

- **or for a reduction in risk:**
  - Risk difference -0.11
    - intervention reduced the risk of headache by 11 percentage points
    - 14 out of 100 people experienced a headache in the control group. 11 fewer people experienced a headache with caffeine.

# Now it’s your turn!

| | Event | No Event | Total |
|---|---|---|---|
| **Intervention** | 2 | 8 | 10 |
| **Control** | 5 | 5 | 10 |
| **Total** | **7** | **13** | **20** |

1. calculate:
   - risk ratio for the effect of treatment on chance of event
   - odds ratio for the effect of treatment on chance of event
2. express the results in words

# The answers

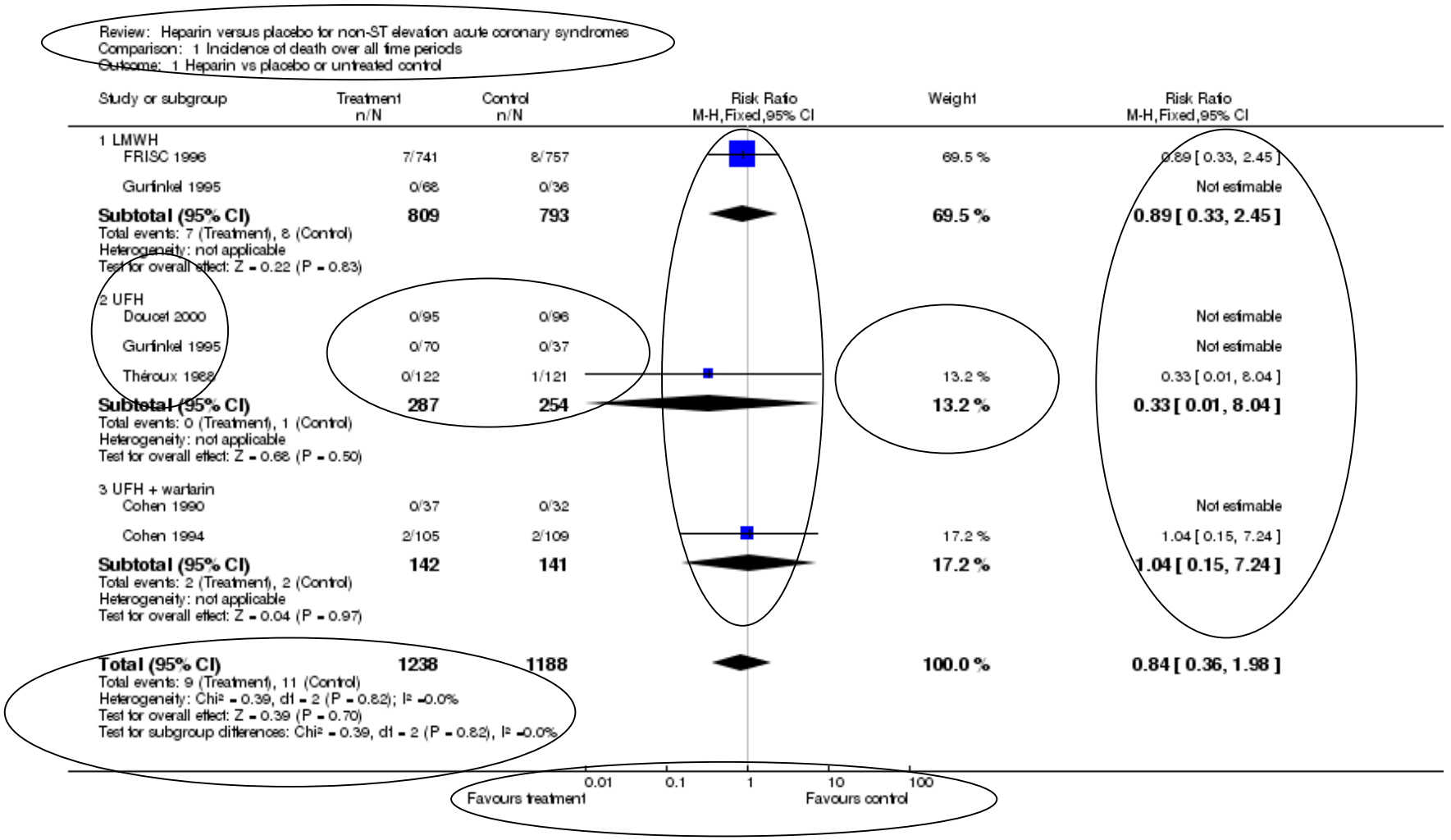
- Risk ratio $= \frac{2/10}{5/10} = \frac{0.2}{0.5} = 0.4$

$$= \frac{2/8}{5/5} = \frac{0.25}{1} = 0.25$$

- Odds ratio

# Communication

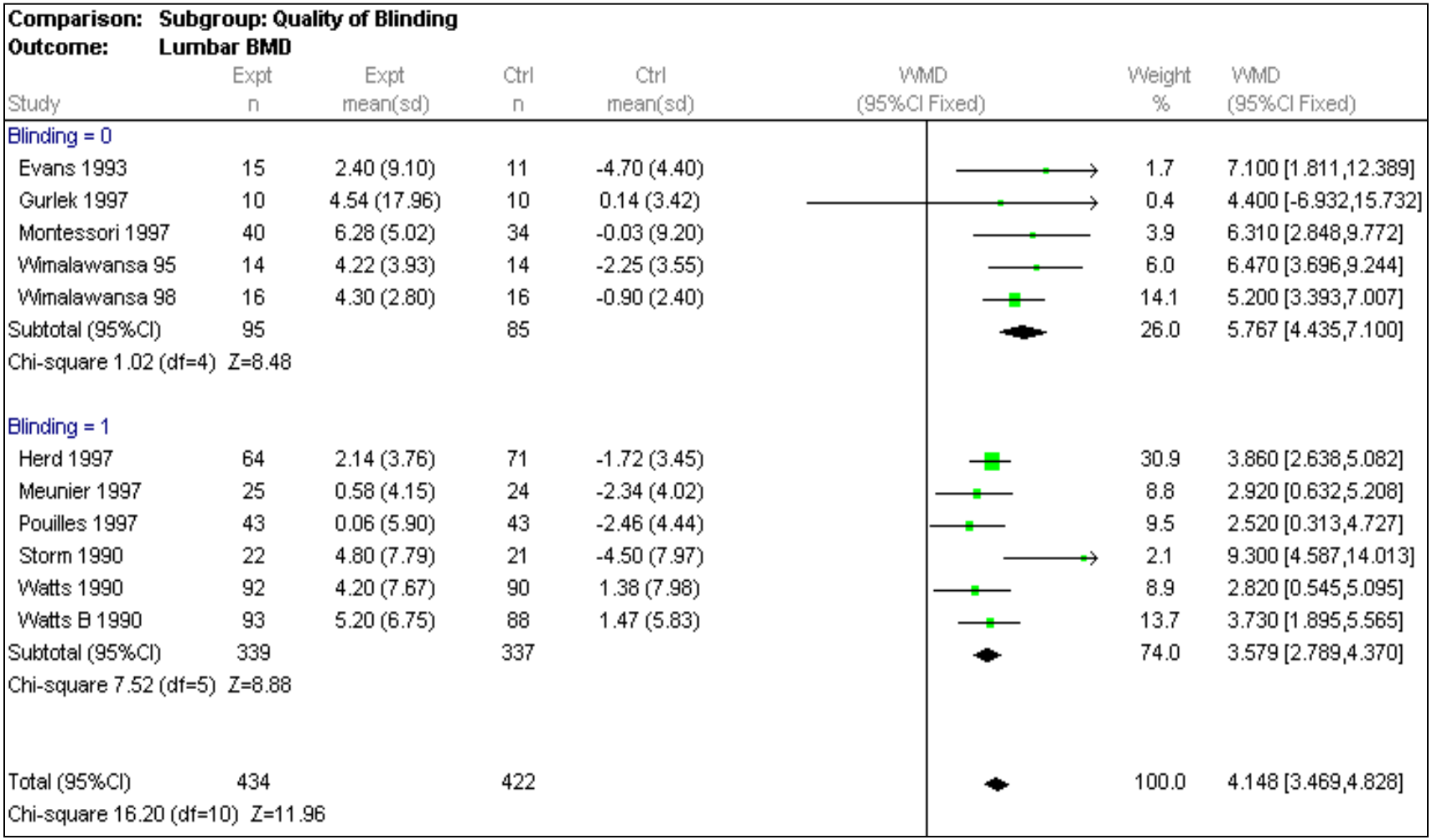
- OR is hard to understand, often misinterpreted
- RR is easier, but relative
  - can mean a very big or very small change
- RD is easiest
  - absolute measure of actual change in risk
  - easily converted to natural frequencies or NNT




1.1. Comparison 1 Incidence of death over all time periods, Outcome 1 Heparin vs placebo or untreated control.

Andrade-Castellanos CA, Colunga-Lozano LE, Delgado-Figueroa N, Magee K. Heparin versus placebo for non-ST elevation acute coronary syndromes. Cochrane Database of Systematic Reviews 2014, 6. Art. No.: CD003462. DOI: http://dx.doi.org/10.1002/14651858.CD003462.pub3

# Forest plot


Comparison: Subgroup: Quality of Blinding
Outcome: Lumbar BMD
Study
Expt n
Expt mean(sd)
Ctrl n
Ctrl mean(sd)
WMD (95%CI Fixed)
Weight %
WMD (95%CI Fixed)
Blinding = 0
Evans 1993 15 2.40 (9.10) 11 -4.70 (4.40) 1.7 7.100 [1.811,12.389]
Gurlek 1997 10 4.54 (17.96) 10 0.14 (3.42) 0.4 4.400 [-6.932,15.732]
Montessori 1997 40 6.28 (5.02) 34 -0.03 (9.20) 3.9 6.310 [2.848,9.772]
Wimalawansa 95 14 4.22 (3.93) 14 -2.25 (3.55) 6.0 6.470 [3.696,9.244]
Wimalawansa 98 16 4.30 (2.80) 16 -0.90 (2.40) 14.1 5.200 [3.393,7.007]
Subtotal (95%CI) 95 85 26.0 5.767 [4.435,7.100]
Chi-square 1.02 (df=4) Z=8.48
Blinding = 1
Herd 1997 64 2.14 (3.76) 71 -1.72 (3.45) 30.9 3.860 [2.638,5.082]
Meunier 1997 25 0.58 (4.15) 24 -2.34 (4.02) 8.8 2.920 [0.632,5.208]
Pouilles 1997 43 0.06 (5.90) 43 -2.46 (4.44) 9.5 2.520 [0.313,4.727]
Storm 1990 22 4.80 (7.79) 21 -4.50 (7.97) 2.1 9.300 [4.587,14.013]
Watts 1990 92 4.20 (7.67) 90 1.38 (7.98) 8.9 2.820 [0.545,5.095]
Watts B 1990 93 5.20 (6.75) 88 1.47 (5.83) 13.7 3.730 [1.895,5.565]
Subtotal (95%CI) 339 337 74.0 3.579 [2.789,4.370]
Chi-square 7.52 (df=5) Z=8.88
Total (95%CI) 434 422 100.0 4.148 [3.469,4.828]
Chi-square 16.20 (df=10) Z=11.96

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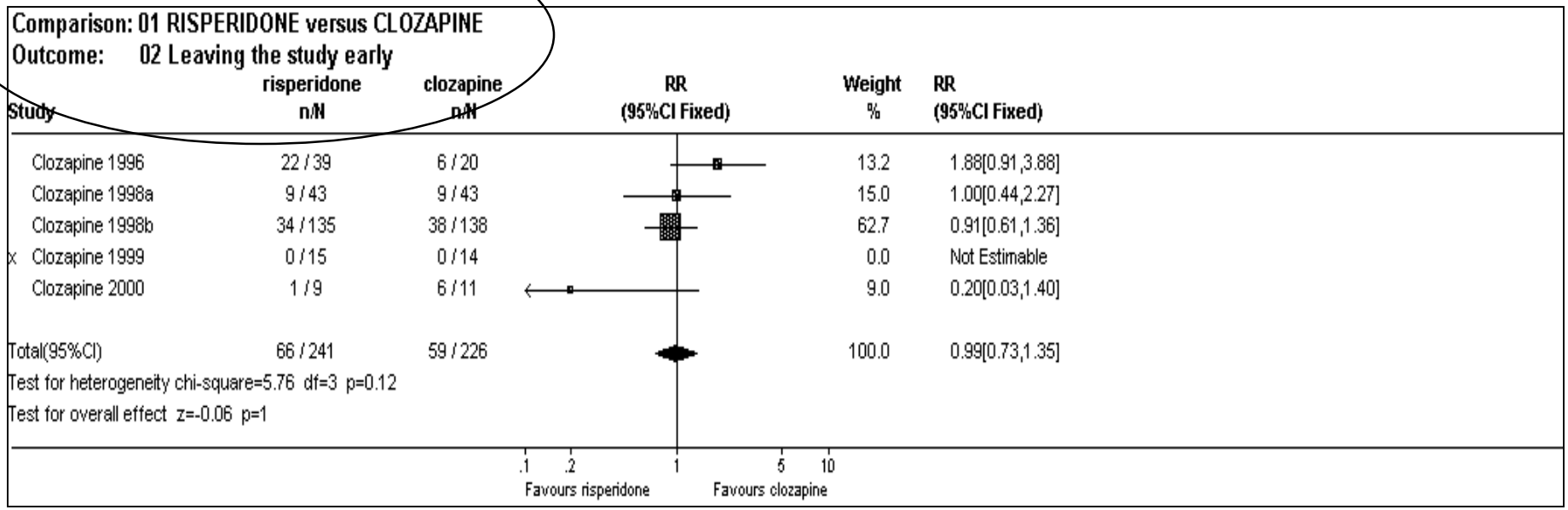
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Outcome: 02 Leaving the study early
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Weight %
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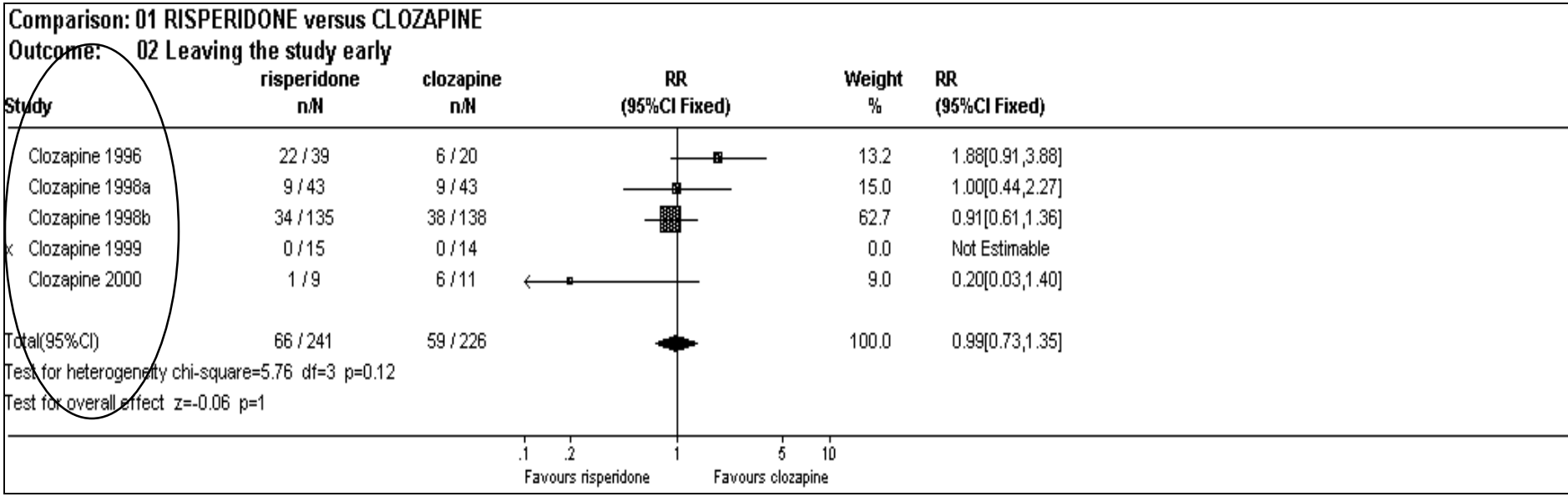
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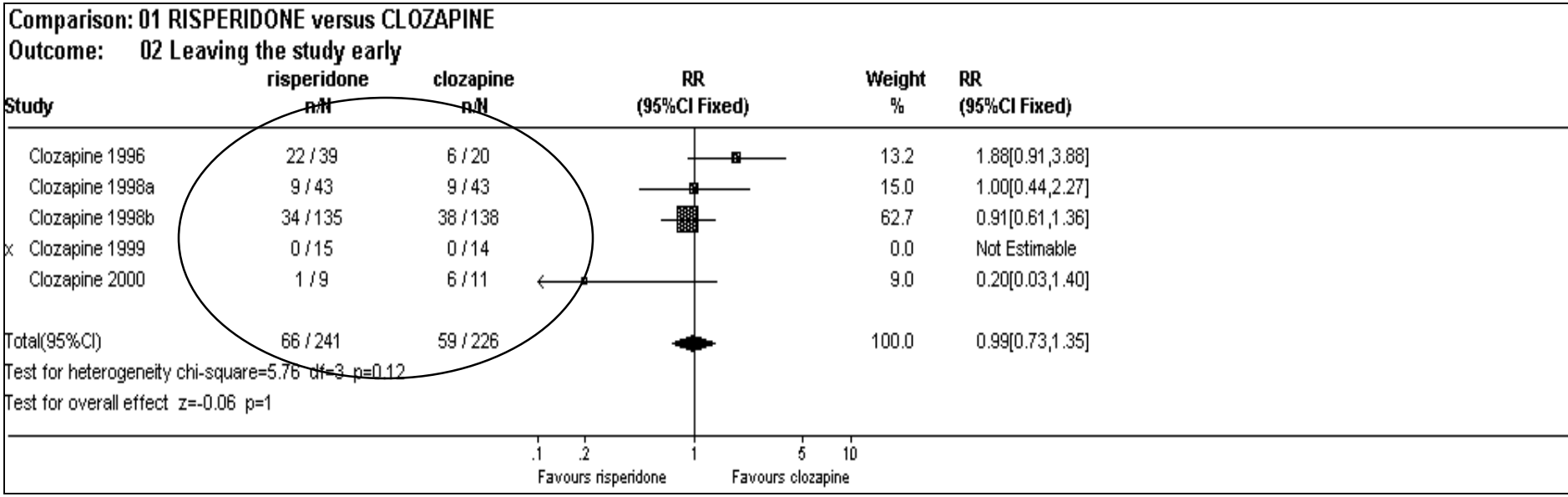
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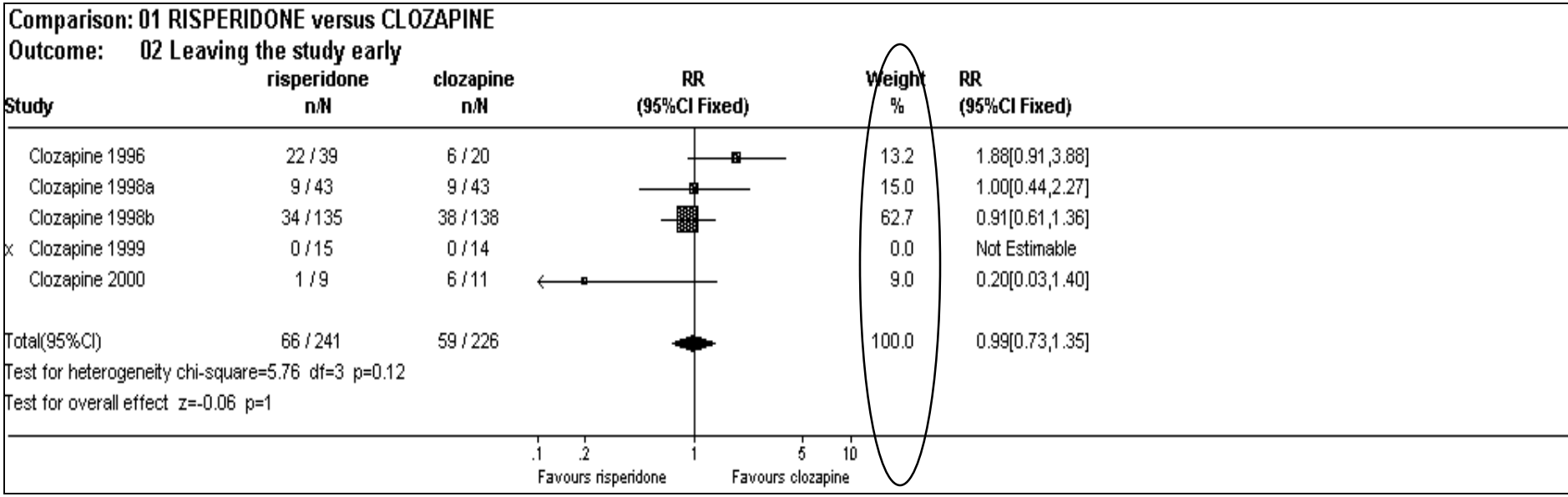
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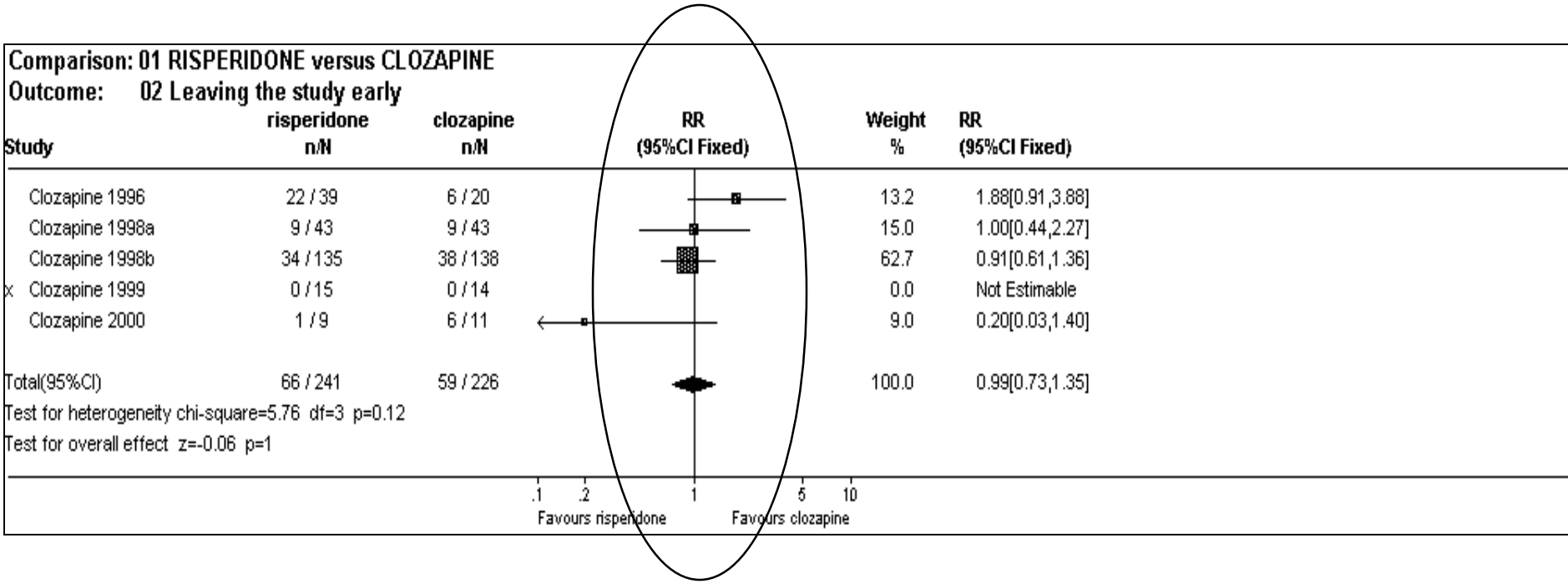
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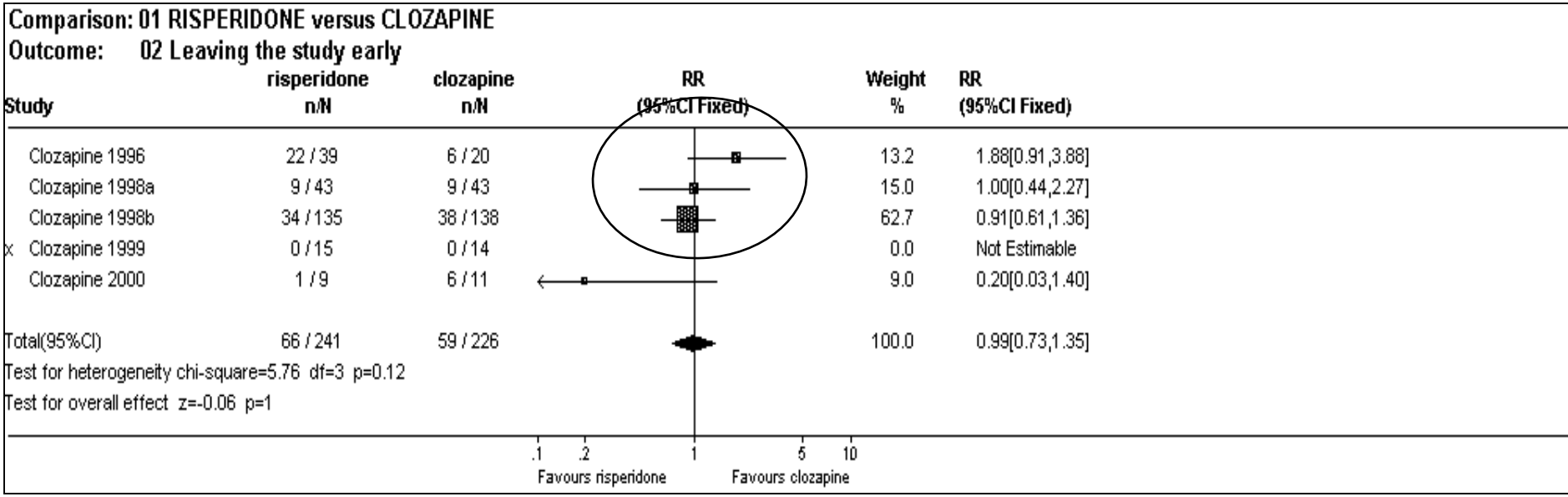
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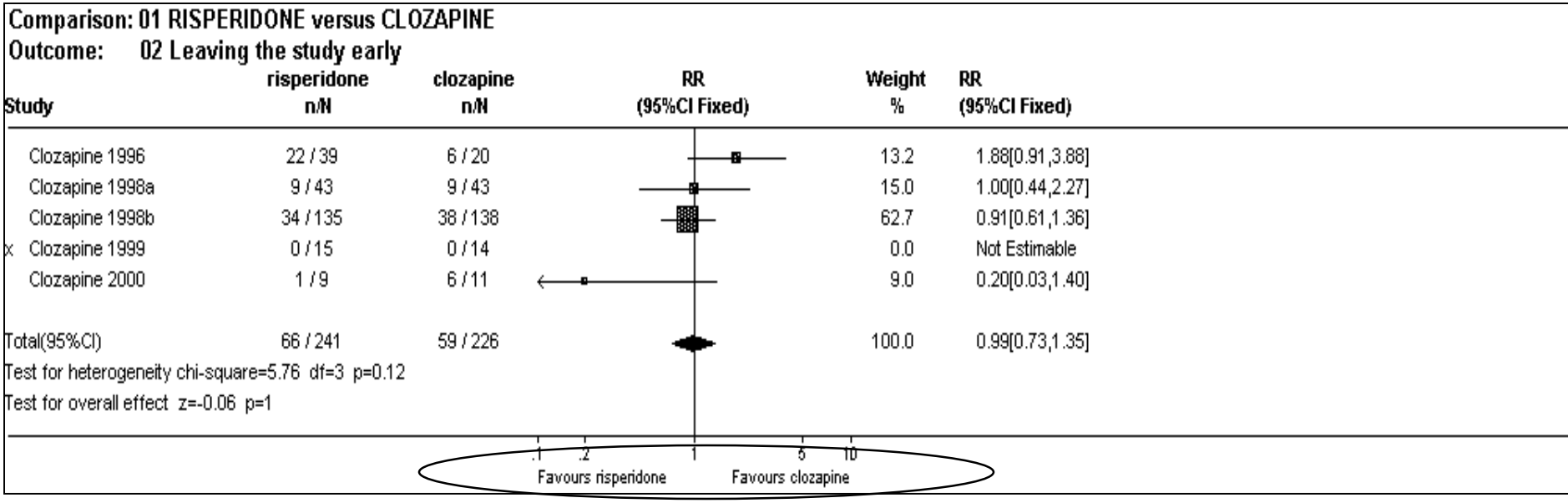
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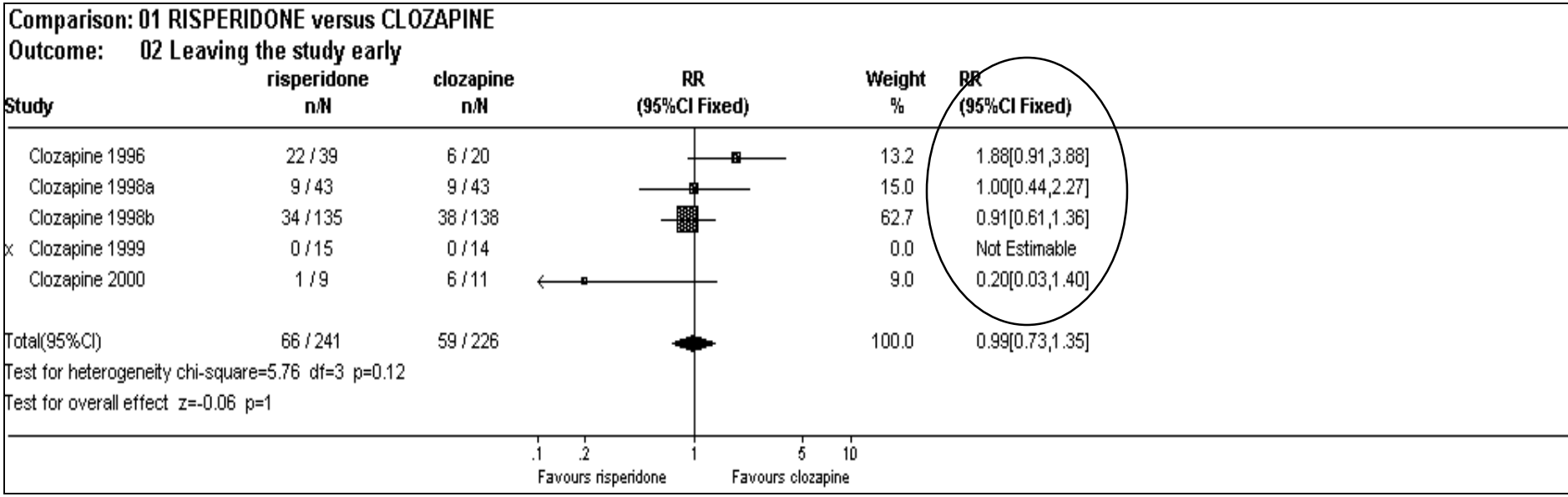
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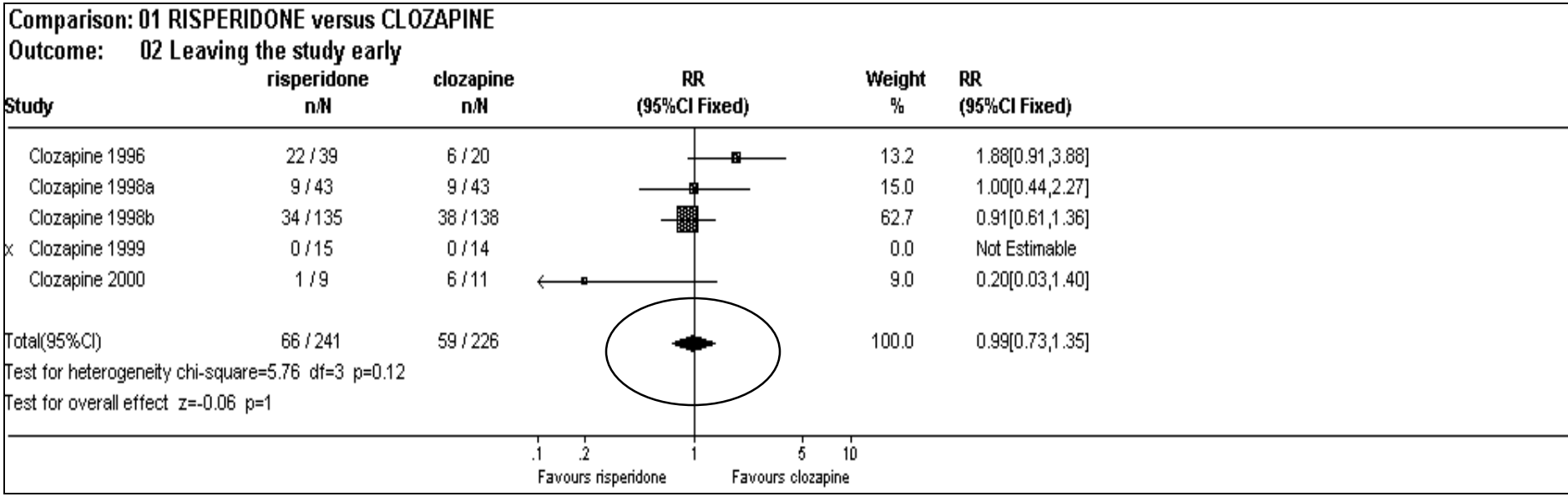
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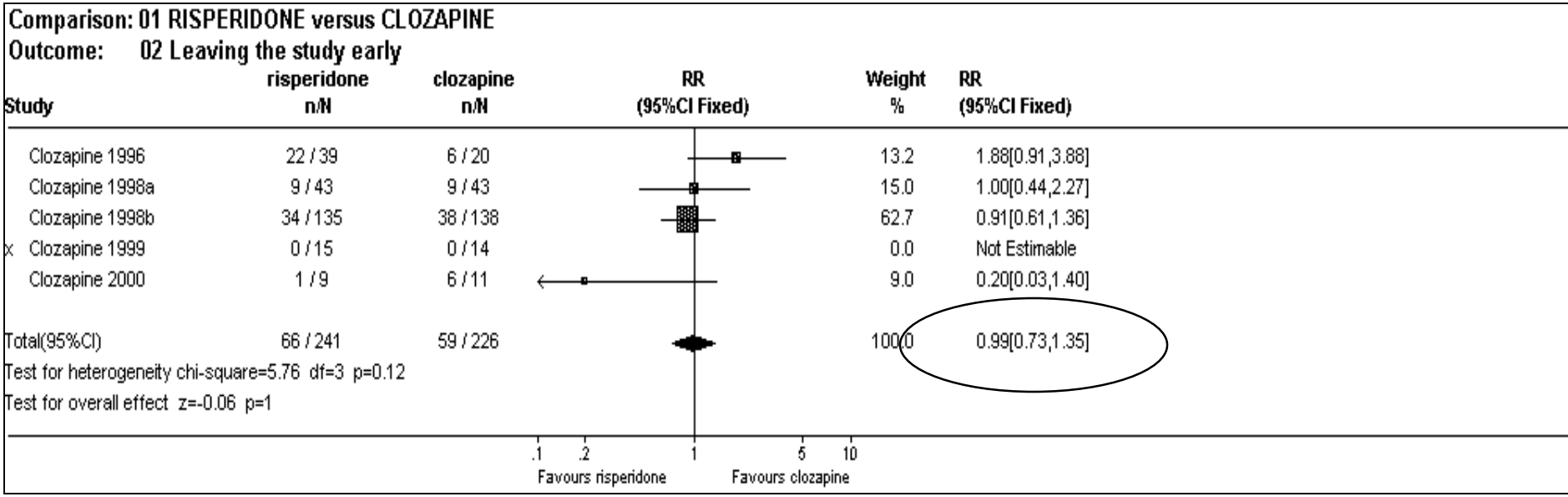
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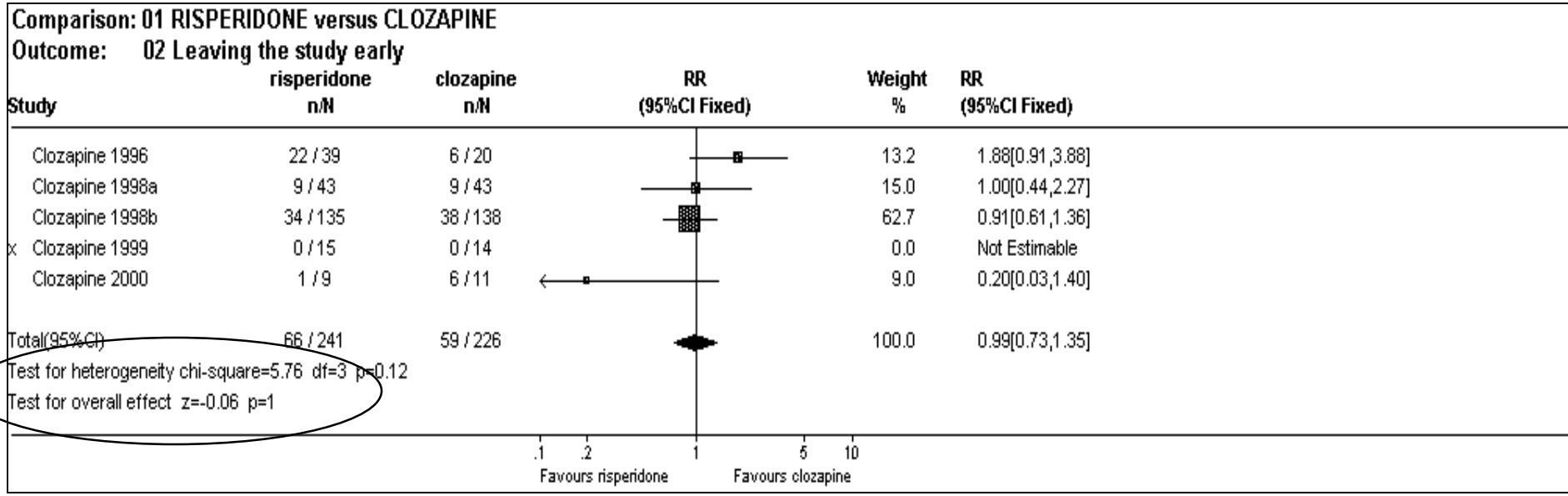
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# اگر میل داشتید Email بزنید !

Farid_n32@yahoo.com
fnajafi@kums.ac.ir