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# Using STATA® for Meta-analysis

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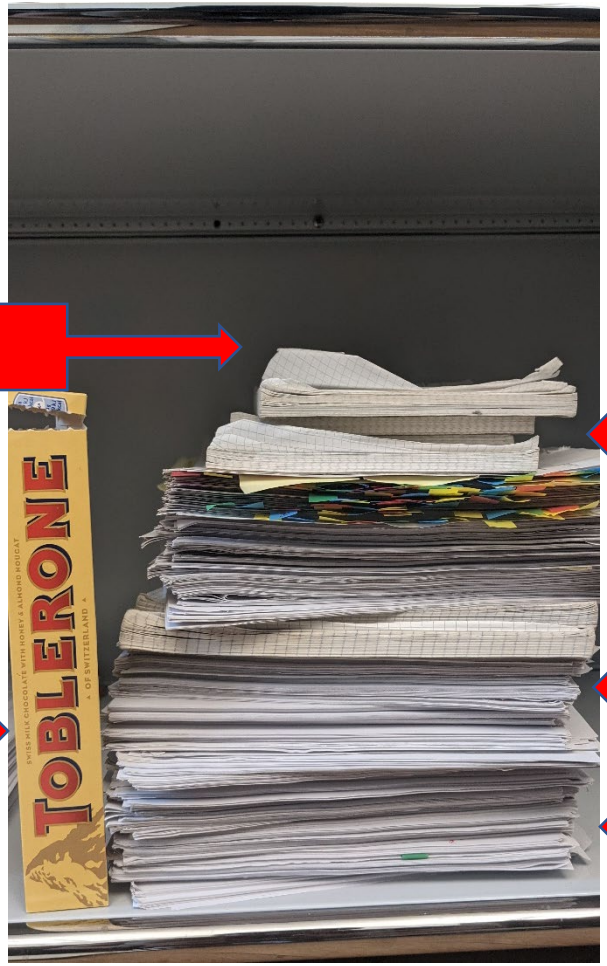
https://stata.ispm.ch/statainstallation/

# Lessons learned

- Extremely challenging
- Process oriented
- Organization is key

- Helps develop your future research ideas




Meeting notes

Tabbed articles for data extraction

Toblerone regular bar to scale

STATA outputs

Manuscript drafts and revisions

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# Meta-analysis

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*A statistical analysis which combines the results of several independent studies considered by the analyst to be "combinable"*

*Stat Methods Med Res. 2012 Aug;21(4):409-26*

- You will learn how to run meta-analysis on STATA (basic)
  - To structure your dataset
  - To install meta-analysis packages
  - To import and describe dataset
  - To compute for pooled estimates
- You will interpret the results and apply basic concepts of fixed-effect and random effect

# STATA ®

| Features | SPSS | SAS | Stata | JMP (SAS) | R | Python (Pandas) |
|---|---|---|---|---|---|---|
| Learning curve | Gradual | Pretty steep | Gradual | Gradual | Pretty steep | Steep |
| User interface | Point-and-click | Programming | Programming/ point-and-click | Point-and-click | Programming | Programming |
| Data manipulation | Strong | Very strong | Strong | Strong | Very strong | Strong |
| Data analysis | Very strong | Very strong | Very strong | Strong | Very strong | Strong |
| Graphics | Good | Good | Very good | Very good | Excellent | Good |
| Cost | Expensive (perpetual, cost only with new version).<br><br>Student disc. | Expensive (yearly renewal)<br><br>Free student version, 2014 | Affordable (perpetual, cost only with new version).<br><br>Student disc. | Expensive (yearly renewal)<br><br>Student disc. | Open source (free) | Open source (free) |
| Released | 1968 | 1972 | 1985 | 1989 | 1995 | 2008 |

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# STATA ®

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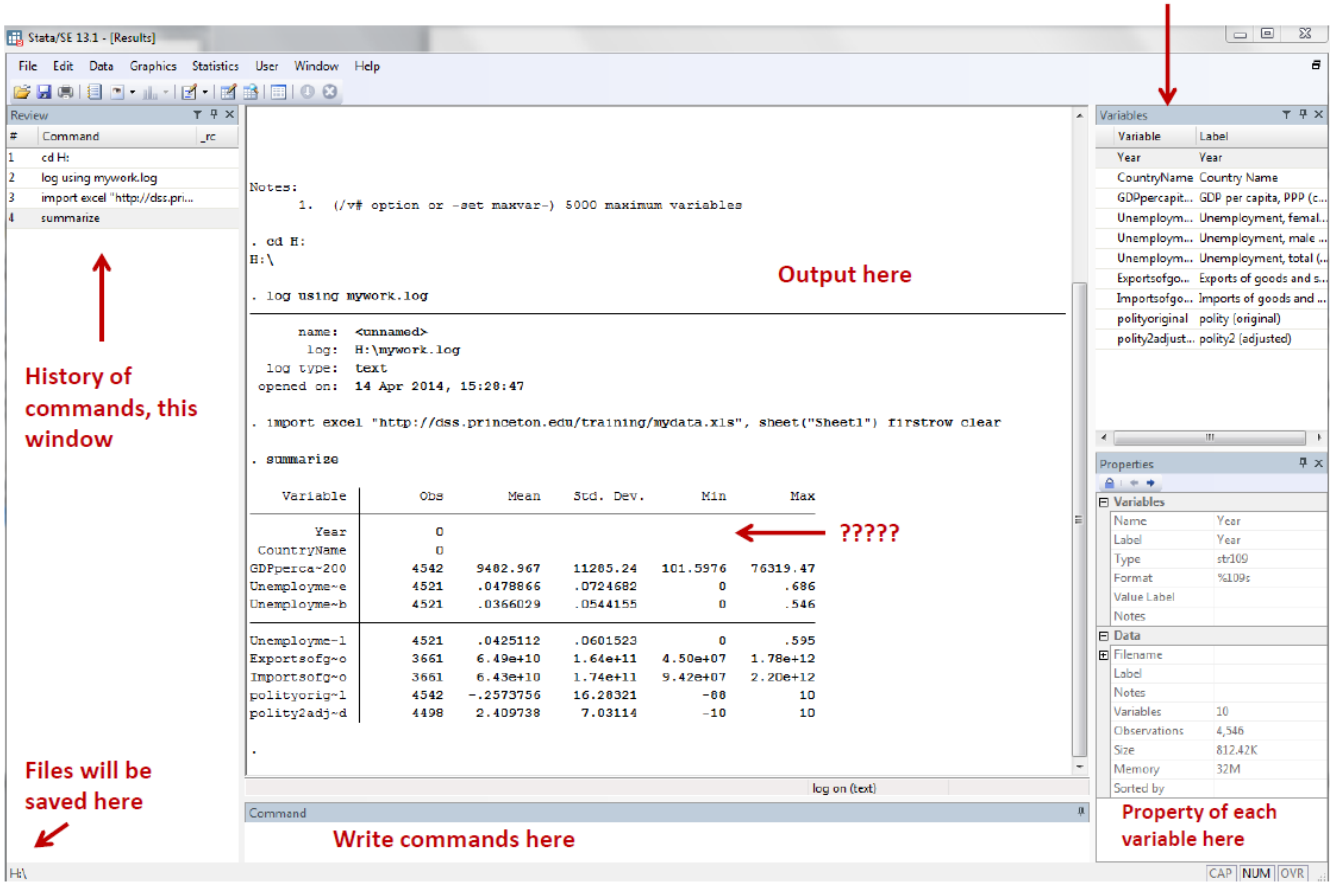
## Stata 15/16+ screen



# STATA ®

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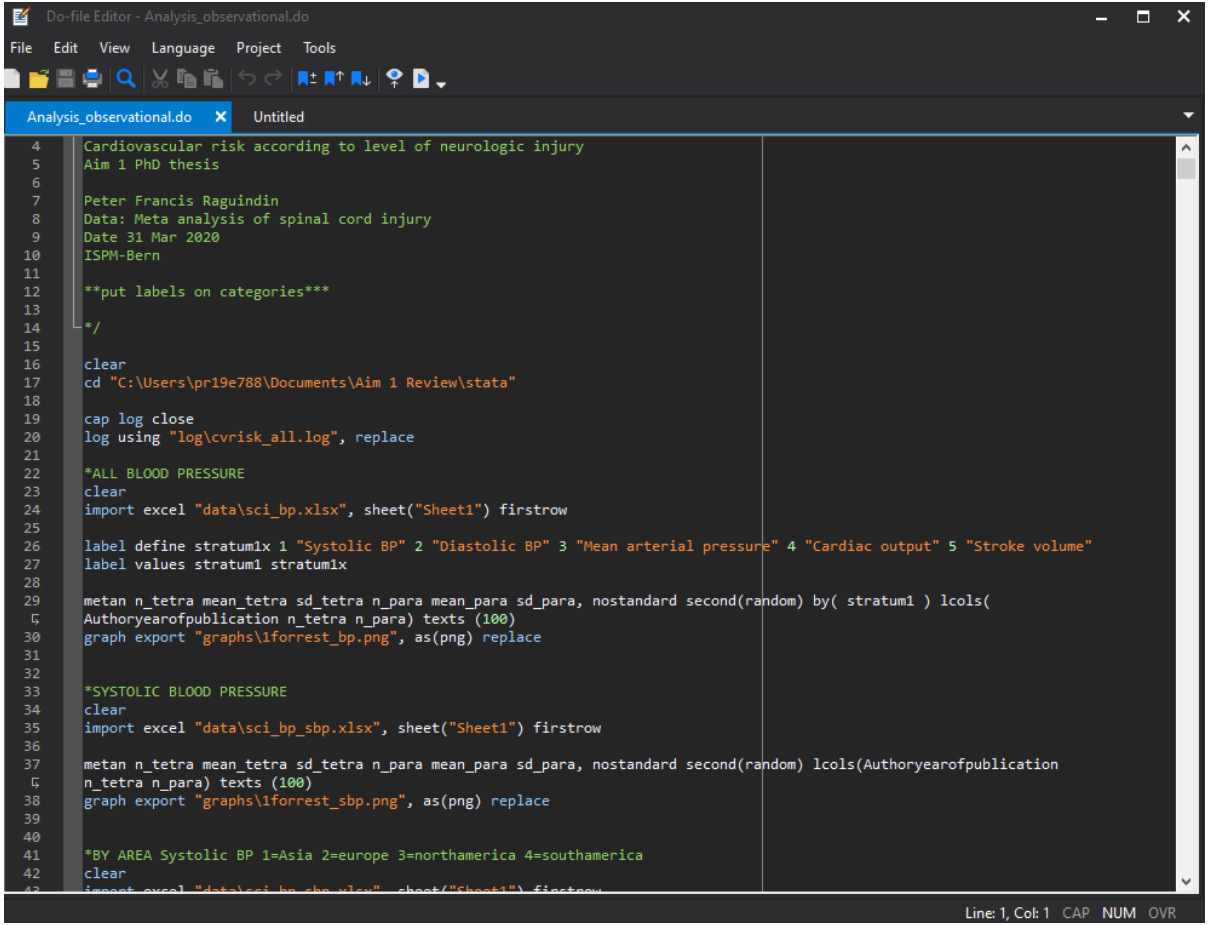
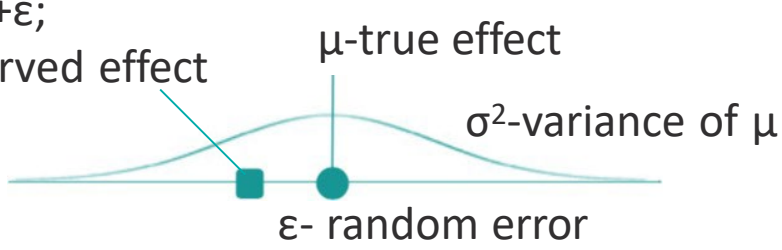


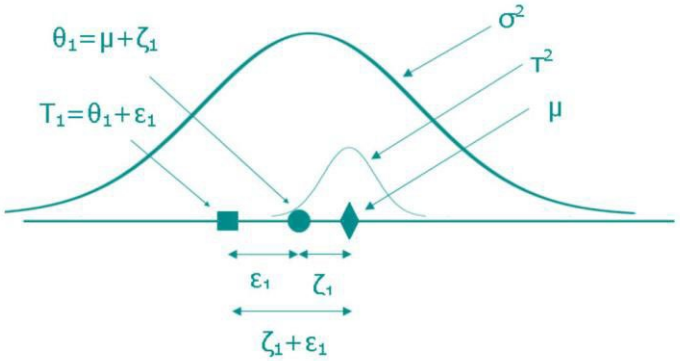

```
Cardiovascular risk according to level of neurologic injury
Aim 1 PhD thesis

Peter Francis Raguindin
Data: Meta analysis of spinal cord injury
Date 31 Mar 2020
ISPM-Bern

**put labels on categories***

*/

clear
cd "C:\Users\pr19e788\Documents\Aim 1 Review\stata"

cap log close
log using "log\cvrisk_all.log", replace

*ALL BLOOD PRESSURE
clear
import excel "data\sci_bp.xlsx", sheet("Sheet1") firstrow

label define stratum1x 1 "Systolic BP" 2 "Diastolic BP" 3 "Mean arterial pressure" 4 "Cardiac output" 5 "Stroke volume"
label values stratum1 stratum1x

metan n_tetra mean_tetra sd_tetra n_para mean_para sd_para, nostandard second(random) by( stratum1 ) lcols(
Authoryearofpublication n_tetra n_para) texts (100)
graph export "graphs\1forrest_bp.png", as(png) replace


*SYSTOLIC BLOOD PRESSURE
clear
import excel "data\sci_bp_sbp.xlsx", sheet("Sheet1") firstrow

metan n_tetra mean_tetra sd_tetra n_para mean_para sd_para, nostandard second(random) lcols(Authoryearofpublication
n_tetra n_para) texts (100)
graph export "graphs\1forrest_sbp.png", as(png) replace


*BY AREA Systolic BP 1=Asia 2=europe 3=northamerica 4=southamerica
clear
```

# Fixed vs. random effect



T =μ+ε;
observed effect



# Fixed effects vs Random effects

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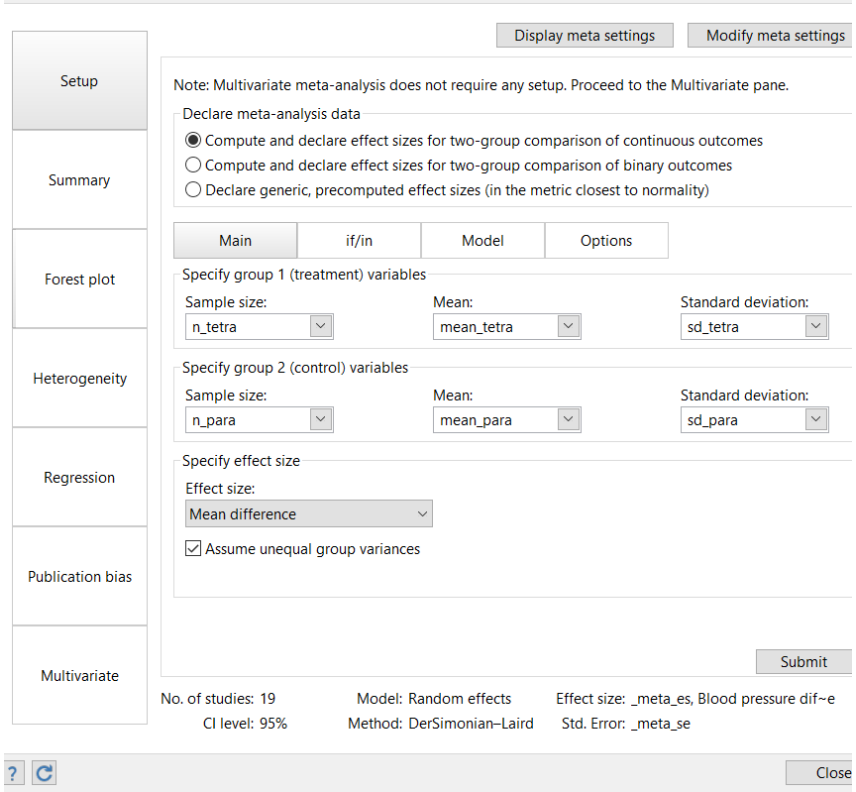
$$W = \frac{1}{V_i}$$

Fixed effect

$$W = \frac{1}{V_i + \tau}$$

Random effects

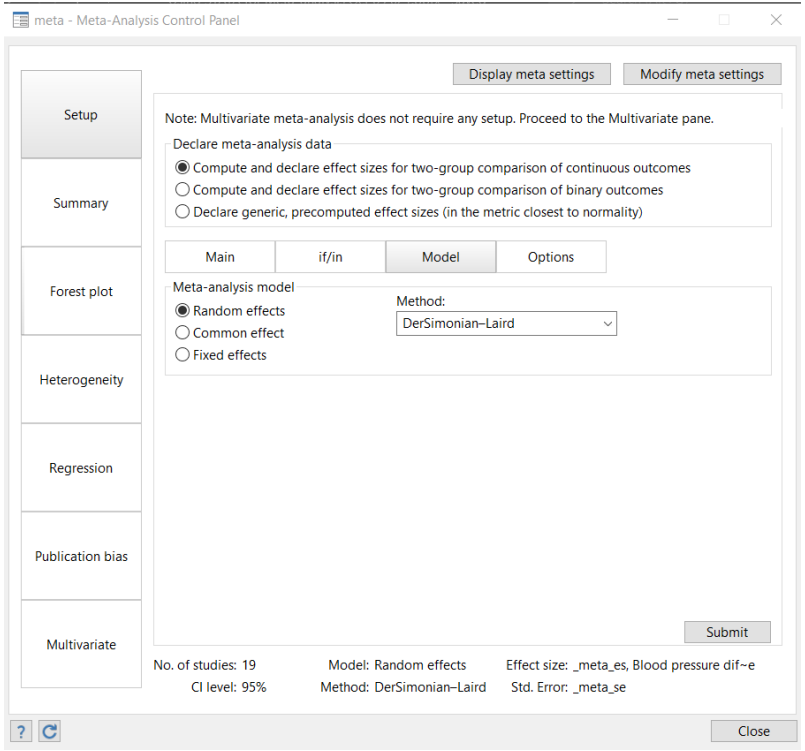
# New Meta-analysis Interface




- Set-up
- Adjust the setting of your data
- Sets the type of analysis

- Cohen and Hedges (standardized)
- Glass delta (standardized with unequal variance)

# New Meta-analysis Interface




- Choosing your model

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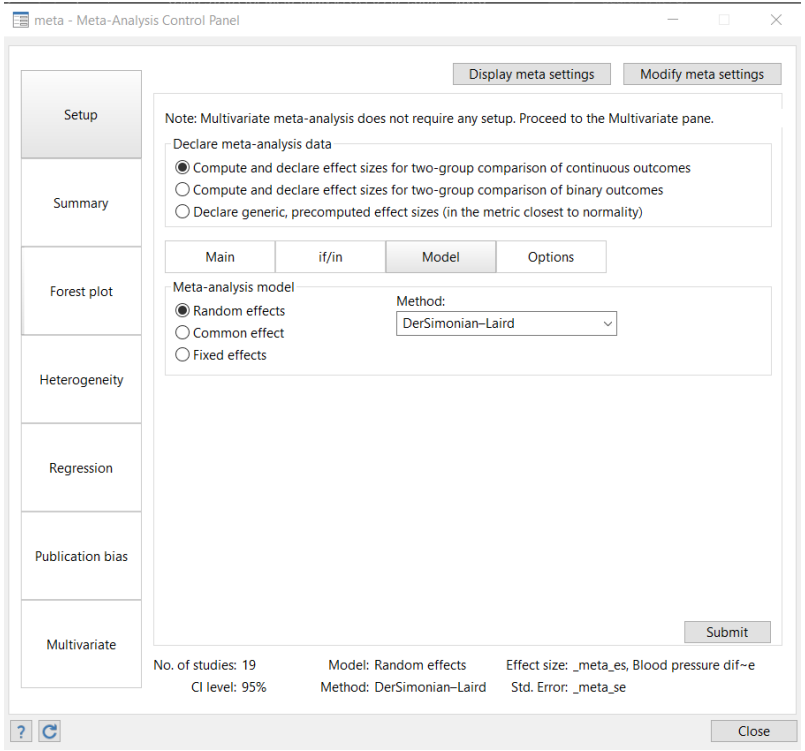
# New Meta-analysis Interface




- Choosing your model

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# Sample Study

ISCoS The International Spinal Cord Society

www.nature.com/sc



REVIEW ARTICLE OPEN

Check for updates

## The neurological level of spinal cord injury and cardiovascular risk factors: a systematic review and meta-analysis

Peter Francis Raguindin[1,2,3], Gion Fränkl[1,4,6], Oche Adam Itodo[1,2,3,6], Alessandro Bertolo[1], Ramona Maria Zeh[1], Simona Capossela[1], Beatrice Minder[5], Jivko Stoyanov[1], Gerold Stucki[1], Oscar H. Franco[2], Taulant Muka[2] and Marija Glisic[1,2]✉



**STUDY DESIGN:** Systematic review and meta-analysis.
**OBJECTIVE:** To determine the difference in cardiovascular risk factors (blood pressure, lipid profile, and markers of glucose metabolism and inflammation) according to the neurological level of spinal cord injury (SCI).
**METHODS:** We searched 5 electronic databases from inception until July 4, 2020. Data were extracted by two independent reviewers using a pre-defined data collection form. The pooled effect estimate was computed using random-effects models, and heterogeneity was calculated using $I^2$ statistic and chi-squared test (CRD42020166162).
**RESULTS:** We screened 4863 abstracts, of which 47 studies with 3878 participants (3280 males, 526 females, 72 sex unknown) were included in the meta-analysis. Compared to paraplegia, individuals with tetraplegia had lower systolic and diastolic blood pressure (unadjusted weighted mean difference, −14.5 mmHg, 95% CI −19.2, −9.9; −7.0 mmHg 95% CI −9.2, −4.8, respectively), lower triglycerides (−10.9 mg/dL, 95% CI −19.7, −2.1), total cholesterol (−9.9 mg/dL, 95% CI −14.5, −5.4), high-density lipoprotein (−1.7 mg/dL, 95% CI −3.3, −0.2) and low-density lipoprotein (−5.8 mg/dL, 95% CI −9.0, −2.5). Comparing individuals with high- vs. low-thoracic SCI, persons with higher injury had lower systolic and diastolic blood pressure (−10.3 mmHg, 95% CI −13.4, −7.1; −5.3 mmHg 95% CI −7.5, −3.2, respectively), while no differences were found for low-density lipoprotein, serum glucose, insulin, and inflammation markers. High heterogeneity was partially explained by age, prevalent cardiovascular diseases and medication use, body mass index, sample size, and quality of studies.
**CONCLUSION:** In SCI individuals, the level of injury may be an additional non-modifiable cardiovascular risk factor. Future well-designed longitudinal studies with sufficient follow-up and providing sex-stratified analyses should confirm our findings and explore the role of SCI level in cardiovascular health and overall prognosis and survival.

*Spinal Cord*; https://doi.org/10.1038/s41393-021-00678-6

# Sample Study

| Author, year of publicatic | n_tetra | mean_tetr | sd_tetra | n_para | mean_par | sd_para | outcome | stratum1 | location | stratum2 | no_part | stratum3 | sex | stratum4 | bmi | stratum5 | lesiondura | stratum6 | injurycom | stratum7 | a |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aadriansen 2016 | 124 | 119.9 | 23.5 | 158 | 136.4 | 20.2 | sbp, mmhg | 1 | europe | 2 | 282 | 2 | 74.1 | 1 | 24.8 | 1 | 22 | 2 | 68.7 | 1 | |
| Akbal 2013 | 13 | 112.8 | 9.1 | 43 | 110.7 | 8.9 | sbp, mmhg | 1 | asia | 1 | 56 | 2 | 0 | 0 | 25 | 1 | 3.05 | 1 | 13 | 1 | |
| Buchholz 2009 | 26 | 102.69 | 18.15 | 30 | 124.2 | 22.84 | sbp, mmhg | 1 | northamer | 3 | 56 | 2 | 78.5 | 1 | 25.2 | 2 | 14.55 | 2 | 0 | 0 | |
| Farkas 2018 | 12 | 105.42 | 16.5 | 35 | 117.43 | 12.4 | sbp, mmhg | 1 | northamer | 3 | 47 | 2 | 80.1 | 1 | 27.3 | 2 | 14.44 | 2 | 100 | 2 | |
| Grimm 1997 | 10 | 109 | 3.77 | 10 | 115 | 4.18 | sbp, mmhg | 1 | northamer | 3 | 30 | 1 | 100 | 2 | 25 | 1 | 10.6 | 1 | 33.3 | 1 | |
| Heidebreder 1982 | 10 | 101 | 5 | 10 | 123 | 5 | sbp, mmhg | 1 | europe | 2 | 20 | 1 | 70 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Janssen 1997 | 8 | 109.3 | 15.9 | 29 | 133.4 | 11.5 | sbp, mmhg | 1 | europe | 2 | 37 | 1 | 100 | 2 | 24.9 | 1 | 14.7 | 2 | 62 | 1 | |
| Katzelnick 2019 | 72 | 110 | 17 | 41 | 121.3 | 13.9 | sbp, mmhg | 1 | northamer | 3 | 46 | 2 | 82.6 | 1 | 26.9 | 2 | 16.9 | 2 | 40.7 | 1 | |
| Kim 2016 | 9 | 117 | 13 | 35 | 126.6 | 13.2 | sbp, mmhg | 1 | northamer | 3 | 44 | 2 | 68 | 1 | 20.3 | 1 | 0 | 0 | 0 | 0 | |
| King 1994 | 4 | 96.5 | 15.3 | 16 | 114.6 | 16.8 | sbp, mmhg | 1 | northamer | 3 | 20 | 1 | 90 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Legramante 2001 | 8 | 100.1 | 4.3 | 8 | 131.2 | 6 | sbp, mmhg | 1 | europe | 2 | 16 | 1 | 100 | 2 | 0 | 0 | 0 | 0 | 100 | 2 | |
| Matos Souza 2010 | 18 | 98.1 | 3.8 | 16 | 120.2 | 4.4 | sbp, mmhg | 1 | southamer | 4 | 34 | 1 | 100 | 2 | 23.6 | 1 | 6.7 | 1 | 0 | 0 | |
| Miyatani 2014 | 37 | 116.7 | 21.8 | 50 | 121.9 | 17.6 | sbp, mmhg | 1 | northamer | 3 | 87 | 2 | 74.7 | 1 | 26.4 | 2 | 13 | 1 | 63.2 | 1 | |
| Raymond 2010 | 11 | 99.1 | 15.9 | 14 | 121.6 | 12.8 | sbp, mmhg | 1 | asia | 1 | 25 | 1 | 80 | 1 | 23.5 | 1 | 11 | 1 | 28 | 1 | |
| Sabour 2013 | 94 | 112.35 | 8.9 | 68 | 114.06 | 10.24 | sbp, mmhg | 1 | asia | 1 | 162 | 2 | 80.9 | 1 | 23.3 | 1 | 8.03 | 1 | 29.6 | 1 | |
| Wecht 2001 | 12 | 91 | 14 | 12 | 131 | 15 | sbp, mmhg | 1 | northamer | 3 | 24 | 1 | 100 | 2 | 25.35 | 2 | 13.5 | 1 | 30 | 1 | |
| Wecht 2006 | 7 | 118 | 21 | 7 | 121 | 16 | sbp, mmhg | 1 | northamer | 3 | 14 | 1 | 100 | 2 | 24.8 | 1 | 13.5 | 1 | 50 | 1 | |
| Zhou 1997 | 15 | 117 | 12 | 15 | 124 | 10 | sbp, mmhg | 1 | asia | 1 | 30 | 1 | 83.3 | 1 | 0 | 0 | 0 | 0 | 100 | 2 | |
| Zhu 2013 | 151 | 119.75 | 10.1047 | 126 | 128.8 | 9.33 | sbp, mmhg | 1 | northamer | 3 | 277 | 2 | 98 | 1 | 26.6 | 2 | 18 | 2 | 0 | 0 | |

# Exercise 1: Blood pressure study

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Is there difference in the blood pressure of individuals with spinal cord injury according to the different levels of injury?

- Meta-analysis of observational studies
- *Population:* Individuals with Spinal cord injury
- *Exposure:* Spinal cord injury levels (tetraplegia and paraplegia)
- *Outcome:* Blood pressure

- Data type: CONTINUOUS
- Data: `sci_bp_sbp.xlsx`

# Guide Questions

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- Do preliminary dataset check
- Is there any difference between the blood pressure of tetraplegia and paraplegia?
  - Compute for mean difference using fixed effect and random effects model
  - Compute for standardized mean difference fixed effect and random effects model
  - Export your forest plot

  - Who has higher systolic blood pressure?

- Bonus question: What are the mean difference according to the location of the study
  - Do a subgroup analysis according to the area
- Bonus question: Is there publication bias?
  - Do a funnel plot

# Solution

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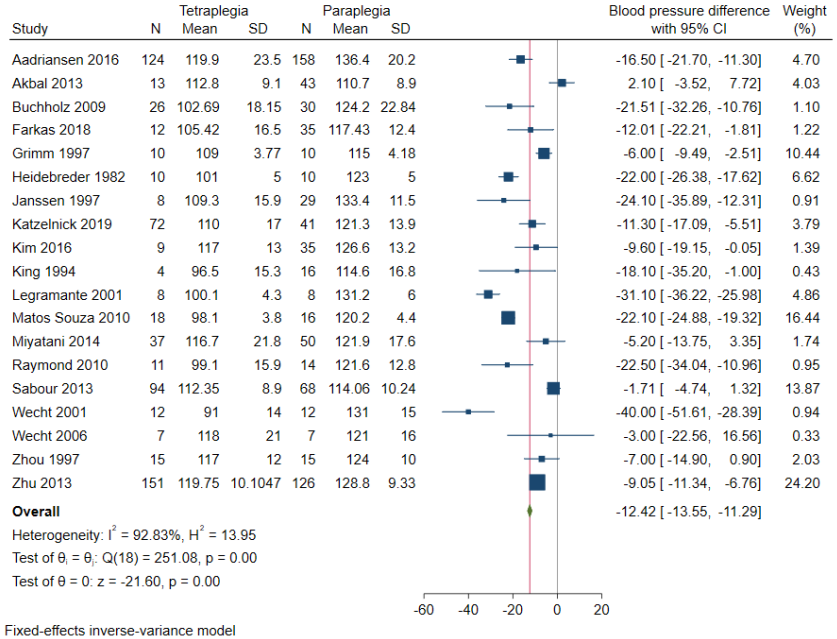
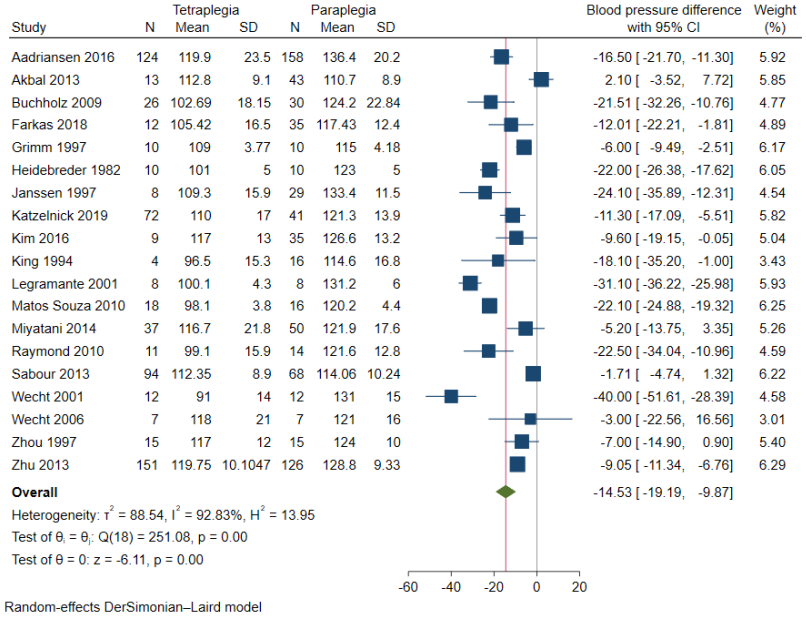


| Study | Tetraplegia N | Tetraplegia Mean | Tetraplegia SD | Paraplegia N | Paraplegia Mean | Paraplegia SD | Blood pressure difference with 95% CI | Weight (%) |
|---|---|---|---|---|---|---|---|---|
| Aadriansen 2016 | 124 | 119.9 | 23.5 | 158 | 136.4 | 20.2 | -16.50 [-21.70, -11.30] | 4.70 |
| Akbal 2013 | 13 | 112.8 | 9.1 | 43 | 110.7 | 8.9 | 2.10 [ -3.52, 7.72] | 4.03 |
| Buchholz 2009 | 26 | 102.69 | 18.15 | 30 | 124.2 | 22.84 | -21.51 [-32.26, -10.76] | 1.10 |
| Farkas 2018 | 12 | 105.42 | 16.5 | 35 | 117.43 | 12.4 | -12.01 [-22.21, -1.81] | 1.22 |
| Grimm 1997 | 10 | 109 | 3.77 | 10 | 115 | 4.18 | -6.00 [ -9.49, -2.51] | 10.44 |
| Heidebreder 1982 | 10 | 101 | 5 | 10 | 123 | 5 | -22.00 [-26.38, -17.62] | 6.62 |
| Janssen 1997 | 8 | 109.3 | 15.9 | 29 | 133.4 | 11.5 | -24.10 [-35.89, -12.31] | 0.91 |
| Katzelnick 2019 | 72 | 110 | 17 | 41 | 121.3 | 13.9 | -11.30 [-17.09, -5.51] | 3.79 |
| Kim 2016 | 9 | 117 | 13 | 35 | 126.6 | 13.2 | -9.60 [-19.15, -0.05] | 1.39 |
| King 1994 | 4 | 96.5 | 15.3 | 16 | 114.6 | 16.8 | -18.10 [-35.20, -1.00] | 0.43 |
| Legramante 2001 | 8 | 100.1 | 4.3 | 8 | 131.2 | 6 | -31.10 [-36.22, -25.98] | 4.86 |
| Matos Souza 2010 | 18 | 98.1 | 3.8 | 16 | 120.2 | 4.4 | -22.10 [-24.88, -19.32] | 16.44 |
| Miyatani 2014 | 37 | 116.7 | 21.8 | 50 | 121.9 | 17.6 | -5.20 [-13.75, 3.35] | 1.74 |
| Raymond 2010 | 11 | 99.1 | 15.9 | 14 | 121.6 | 12.8 | -22.50 [-34.04, -10.96] | 0.95 |
| Sabour 2013 | 94 | 112.35 | 8.9 | 68 | 114.06 | 10.24 | -1.71 [ -4.74, 1.32] | 13.87 |
| Wecht 2001 | 12 | 91 | 14 | 12 | 131 | 15 | -40.00 [-51.61, -28.39] | 0.94 |
| Wecht 2006 | 7 | 118 | 21 | 7 | 121 | 16 | -3.00 [-22.56, 16.56] | 0.33 |
| Zhou 1997 | 15 | 117 | 12 | 15 | 124 | 10 | -7.00 [-14.90, 0.90] | 2.03 |
| Zhu 2013 | 151 | 119.75 | 10.1047 | 126 | 128.8 | 9.33 | -9.05 [-11.34, -6.76] | 24.20 |
| **Overall** | | | | | | | -12.42 [-13.55, -11.29] | |

Heterogeneity: $I^2$ = 92.83%, $H^2$ = 13.95
Test of $\theta_i = \theta_j$: Q(18) = 251.08, p = 0.00
Test of $\theta$ = 0: z = -21.60, p = 0.00

-60 -40 -20 0 20

Fixed-effects inverse-variance model



| Study | Tetraplegia N | Tetraplegia Mean | Tetraplegia SD | Paraplegia N | Paraplegia Mean | Paraplegia SD | Blood pressure difference with 95% CI | Weight (%) |
|---|---|---|---|---|---|---|---|---|
| Aadriansen 2016 | 124 | 119.9 | 23.5 | 158 | 136.4 | 20.2 | -16.50 [-21.70, -11.30] | 5.92 |
| Akbal 2013 | 13 | 112.8 | 9.1 | 43 | 110.7 | 8.9 | 2.10 [ -3.52, 7.72] | 5.85 |
| Buchholz 2009 | 26 | 102.69 | 18.15 | 30 | 124.2 | 22.84 | -21.51 [-32.26, -10.76] | 4.77 |
| Farkas 2018 | 12 | 105.42 | 16.5 | 35 | 117.43 | 12.4 | -12.01 [-22.21, -1.81] | 4.89 |
| Grimm 1997 | 10 | 109 | 3.77 | 10 | 115 | 4.18 | -6.00 [ -9.49, -2.51] | 6.17 |
| Heidebreder 1982 | 10 | 101 | 5 | 10 | 123 | 5 | -22.00 [-26.38, -17.62] | 6.05 |
| Janssen 1997 | 8 | 109.3 | 15.9 | 29 | 133.4 | 11.5 | -24.10 [-35.89, -12.31] | 4.54 |
| Katzelnick 2019 | 72 | 110 | 17 | 41 | 121.3 | 13.9 | -11.30 [-17.09, -5.51] | 5.82 |
| Kim 2016 | 9 | 117 | 13 | 35 | 126.6 | 13.2 | -9.60 [-19.15, -0.05] | 5.04 |
| King 1994 | 4 | 96.5 | 15.3 | 16 | 114.6 | 16.8 | -18.10 [-35.20, -1.00] | 3.43 |
| Legramante 2001 | 8 | 100.1 | 4.3 | 8 | 131.2 | 6 | -31.10 [-36.22, -25.98] | 5.93 |
| Matos Souza 2010 | 18 | 98.1 | 3.8 | 16 | 120.2 | 4.4 | -22.10 [-24.88, -19.32] | 6.25 |
| Miyatani 2014 | 37 | 116.7 | 21.8 | 50 | 121.9 | 17.6 | -5.20 [-13.75, 3.35] | 5.26 |
| Raymond 2010 | 11 | 99.1 | 15.9 | 14 | 121.6 | 12.8 | -22.50 [-34.04, -10.96] | 4.59 |
| Sabour 2013 | 94 | 112.35 | 8.9 | 68 | 114.06 | 10.24 | -1.71 [ -4.74, 1.32] | 6.22 |
| Wecht 2001 | 12 | 91 | 14 | 12 | 131 | 15 | -40.00 [-51.61, -28.39] | 4.58 |
| Wecht 2006 | 7 | 118 | 21 | 7 | 121 | 16 | -3.00 [-22.56, 16.56] | 3.01 |
| Zhou 1997 | 15 | 117 | 12 | 15 | 124 | 10 | -7.00 [-14.90, 0.90] | 5.40 |
| Zhu 2013 | 151 | 119.75 | 10.1047 | 126 | 128.8 | 9.33 | -9.05 [-11.34, -6.76] | 6.29 |
| **Overall** | | | | | | | -14.53 [-19.19, -9.87] | |

Heterogeneity: $\tau^2$ = 88.54, $I^2$ = 92.83%, $H^2$ = 13.95
Test of $\theta_i = \theta_j$: Q(18) = 251.08, p = 0.00
Test of $\theta$ = 0: z = -6.11, p = 0.00

-60 -40 -20 0 20

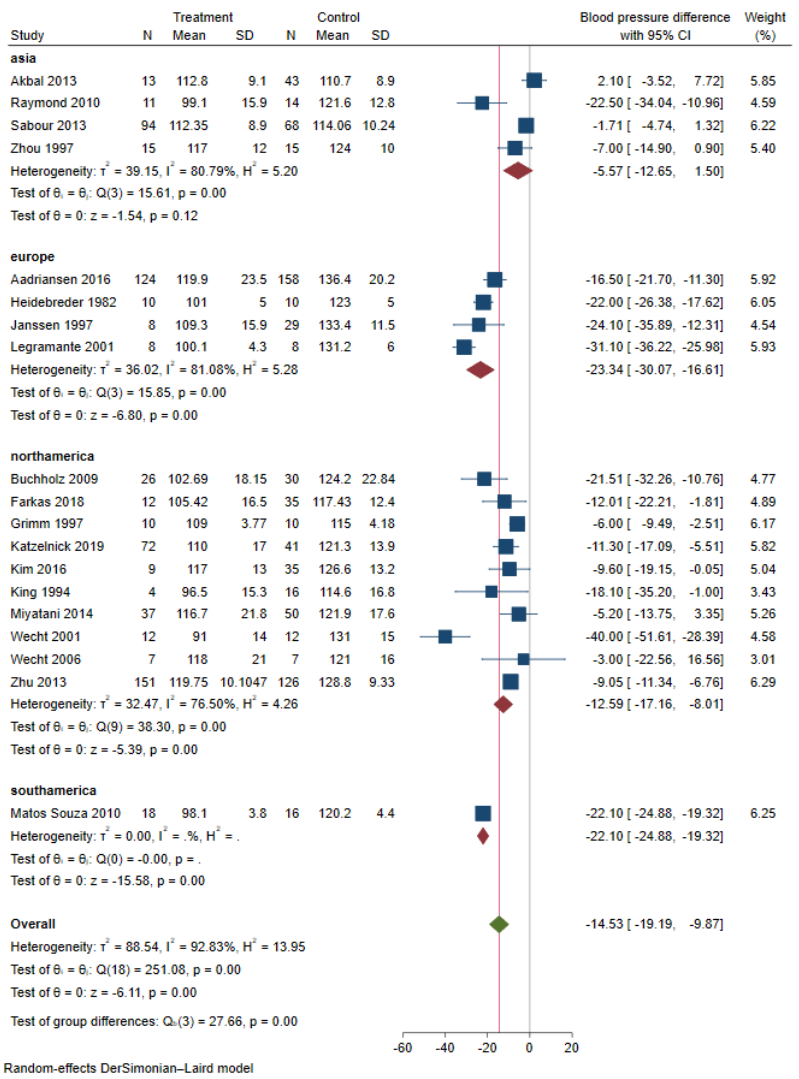
Random-effects DerSimonian–Laird model

Fixed-effects (WMD)

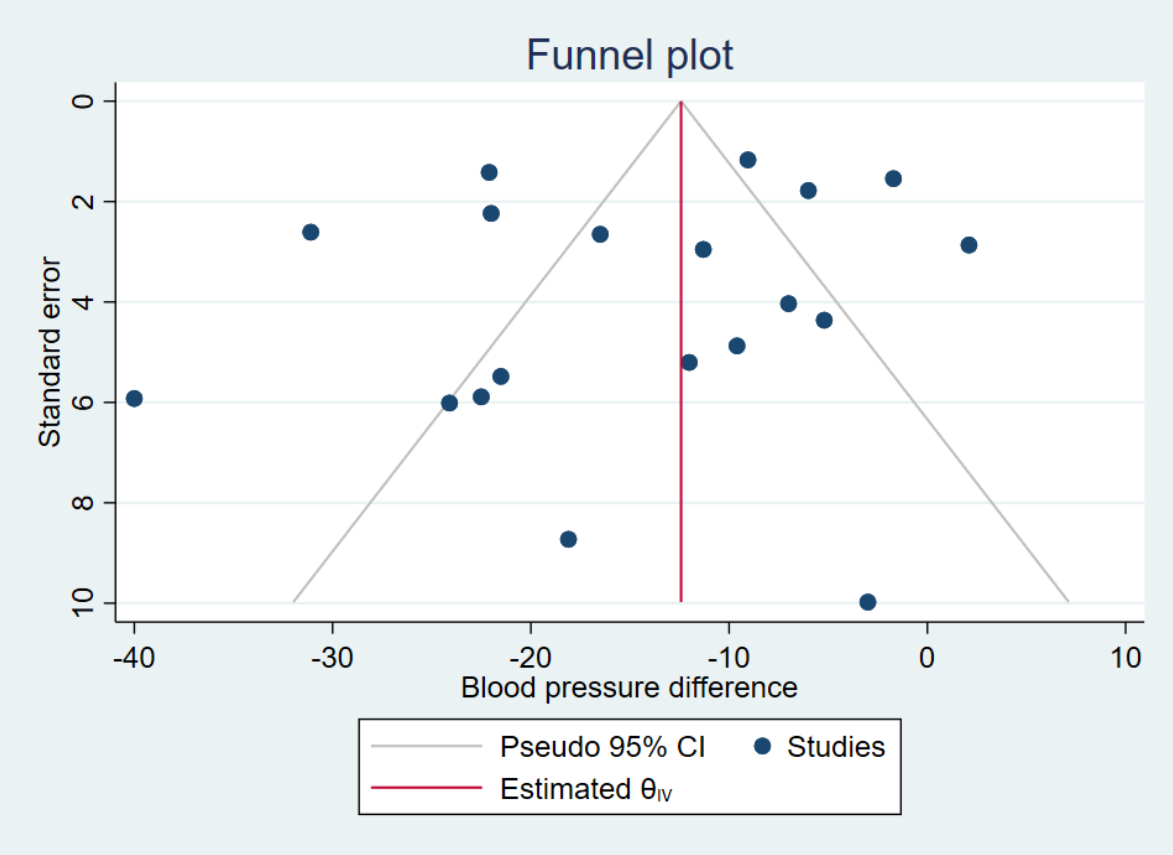
Random effects (WMD)

| Test | Results | Interpretation |
|---|---|---|
| Test for heterogeneity | | |
| Cochran's Q | $p < 0.05$ | There is heterogeneity |
| I2 | 75% to 100% | Considerable heterogeneity |
| Tau and Tau2 | - | Describes the spread of between study effects |
| H2 | >1 | Ratio (multiplicative factor)<br>There is heterogeneity |
| Publication bias (small study effects) | | |
| Funnel plot | Assymetrical | There is publication bias (small studies do not mimic large studies) |
| Egger's test | $p < 0.05$ | There is publication bias (small studies do not mimic large studies) |

# Solution


Study | Treatment N Mean SD | Control N Mean SD | Blood pressure difference with 95% CI | Weight (%)
asia
Akbal 2013 13 112.8 9.1 43 110.7 8.9 2.10 [ -3.52, 7.72] 5.85
Raymond 2010 11 99.1 15.9 14 121.6 12.8 -22.50 [ -34.04, -10.96] 4.59
Sabour 2013 94 112.35 8.9 68 114.06 10.24 -1.71 [ -4.74, 1.32] 6.22
Zhou 1997 15 117 12 15 124 10 -7.00 [ -14.90, 0.90] 5.40
Heterogeneity: τ² = 39.15, I² = 80.79%, H² = 5.20 -5.57 [ -12.65, 1.50]
Test of θi = θj: Q(3) = 15.61, p = 0.00
Test of θ = 0: z = -1.54, p = 0.12
europe
Aadriansen 2016 124 119.9 23.5 158 136.4 20.2 -16.50 [ -21.70, -11.30] 5.92
Heidebreder 1982 10 101 5 10 123 5 -22.00 [ -26.38, -17.62] 6.05
Janssen 1997 8 109.3 15.9 29 133.4 11.5 -24.10 [ -35.89, -12.31] 4.54
Legramante 2001 8 100.1 4.3 8 131.2 6 -31.10 [ -36.22, -25.98] 5.93
Heterogeneity: τ² = 36.02, I² = 81.08%, H² = 5.28 -23.34 [ -30.07, -16.61]
Test of θi = θj: Q(3) = 15.85, p = 0.00
Test of θ = 0: z = -6.80, p = 0.00
northamerica
Buchholz 2009 26 102.69 18.15 30 124.2 22.84 -21.51 [ -32.26, -10.76] 4.77
Farkas 2018 12 105.42 16.5 35 117.43 12.4 -12.01 [ -22.21, -1.81] 4.89
Grimm 1997 10 109 3.77 10 115 4.18 -6.00 [ -9.49, -2.51] 6.17
Katzelnick 2019 72 110 17 41 121.3 13.9 -11.30 [ -17.09, -5.51] 5.82
Kim 2016 9 117 13 35 126.6 13.2 -9.60 [ -19.15, -0.05] 5.04
King 1994 4 96.5 15.3 16 114.6 16.8 -18.10 [ -35.20, -1.00] 3.43
Miyatani 2014 37 116.7 21.8 50 121.9 17.6 -5.20 [ -13.75, 3.35] 5.26
Wecht 2001 12 91 14 12 131 15 -40.00 [ -51.61, -28.39] 4.58
Wecht 2006 7 118 21 7 121 16 -3.00 [ -22.56, 16.56] 3.01
Zhu 2013 151 119.75 10.1047 126 128.8 9.33 -9.05 [ -11.34, -6.76] 6.29
Heterogeneity: τ² = 32.47, I² = 76.50%, H² = 4.26 -12.59 [ -17.16, -8.01]
Test of θi = θj: Q(9) = 38.30, p = 0.00
Test of θ = 0: z = -5.39, p = 0.00
southamerica
Matos Souza 2010 18 98.1 3.8 16 120.2 4.4 -22.10 [ -24.88, -19.32] 6.25
Heterogeneity: τ² = 0.00, I² = .%, H² = . -22.10 [ -24.88, -19.32]
Test of θi = θj: Q(0) = -0.00, p = .
Test of θ = 0: z = -15.58, p = 0.00
Overall -14.53 [ -19.19, -9.87]
Heterogeneity: τ² = 88.54, I² = 92.83%, H² = 13.95
Test of θi = θj: Q(18) = 251.08, p = 0.00
Test of θ = 0: z = -6.11, p = 0.00
Test of group differences: Qb(3) = 27.66, p = 0.00
-60 -40 -20 0 20
Random-effects DerSimonian–Laird model

# Solution


Funnel plot
Standard error
0
2
4
6
8
10
-40
-30
-20
-10
0
10
Blood pressure difference
Pseudo 95% CI
Studies
Estimated θIV

# Exercise 2: Streptokinase study

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What is the effect of intravenous streptokinase on early mortality in patients with acute myocardial infarction?

- Meta-analysis of randomized controlled trials
- *Population:* Adults diagnosed with acute myocardial infarction
- *Intervention:* intravenous streptokinase
- *Control:* no streptokinase
- *Outcome:* mortality

- Data type: BINARY or DICHOTOMOUS
- Data: `strepto.dta`

# Questions

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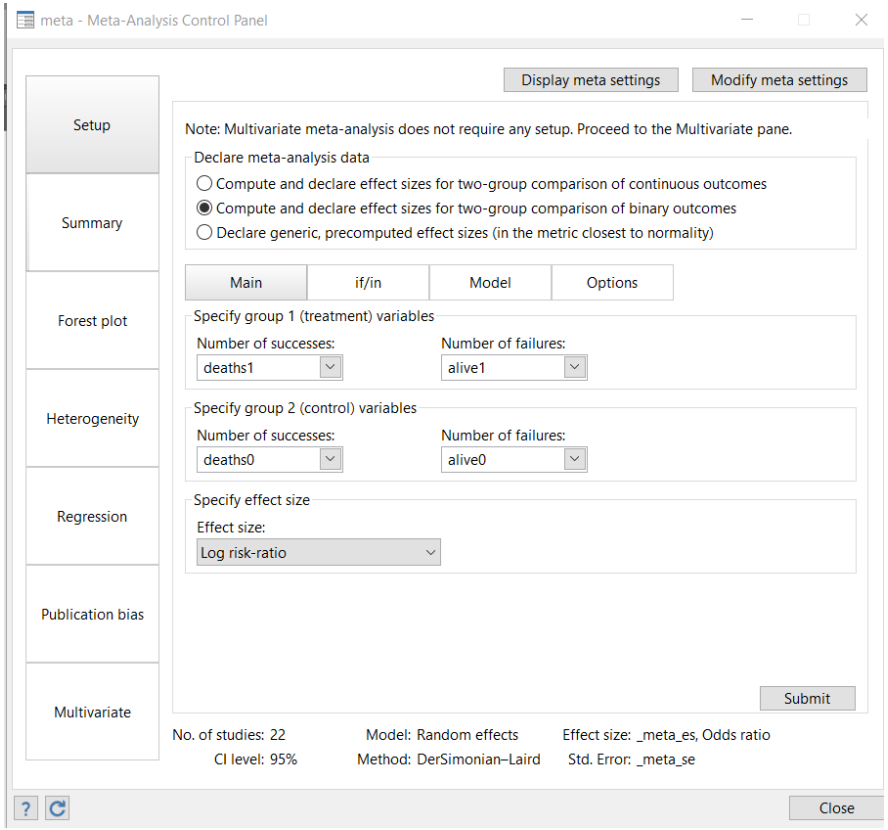
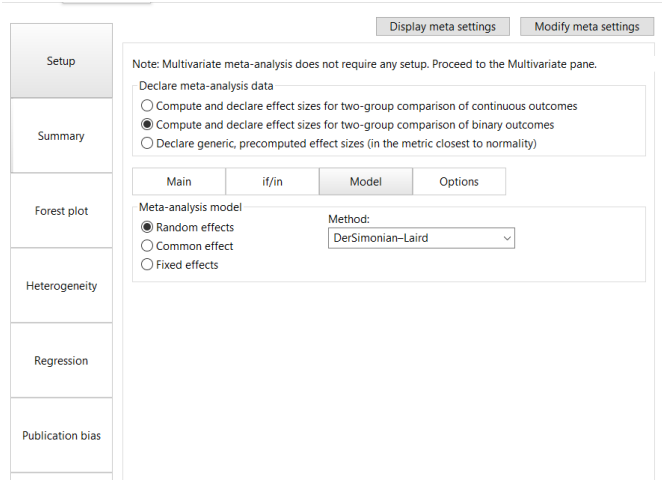
- Do preliminary dataset check
- Using risk ratio, what is the risk difference between streptokinase and control?
    - WARNING! The command requires to put individuals with and without the outcome.
  - Compute for the risk ratio for each study and pooled effect
    - Compute using fixed effect model using Inverse variance
    - Random effects model using Inverse variance
  - Is streptokinase beneficial?

- Bonus questions
  - Does year of conduct of trials change our results?
  - Does one study influence the whole results?

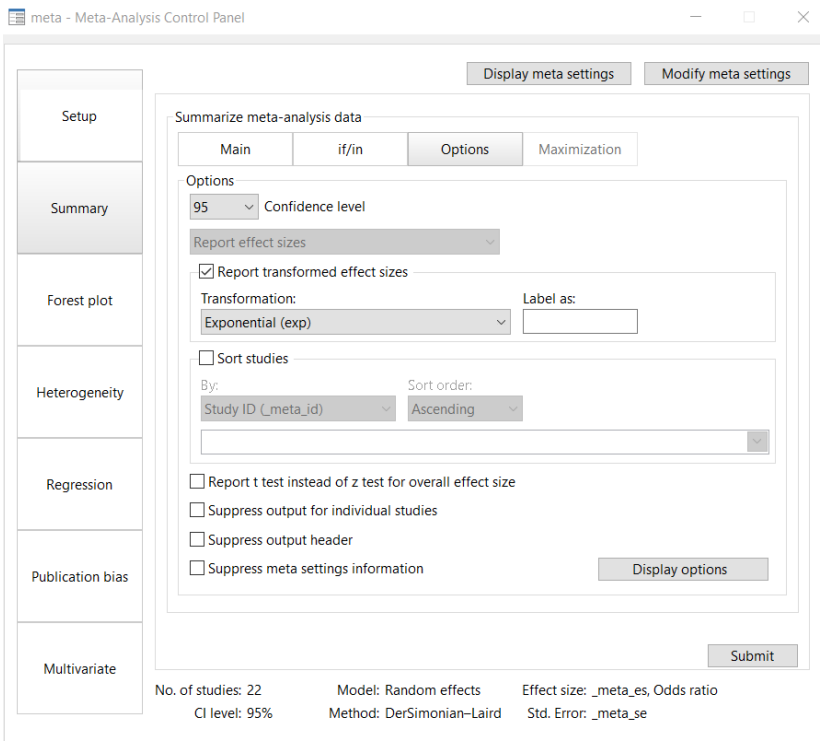
# Solution



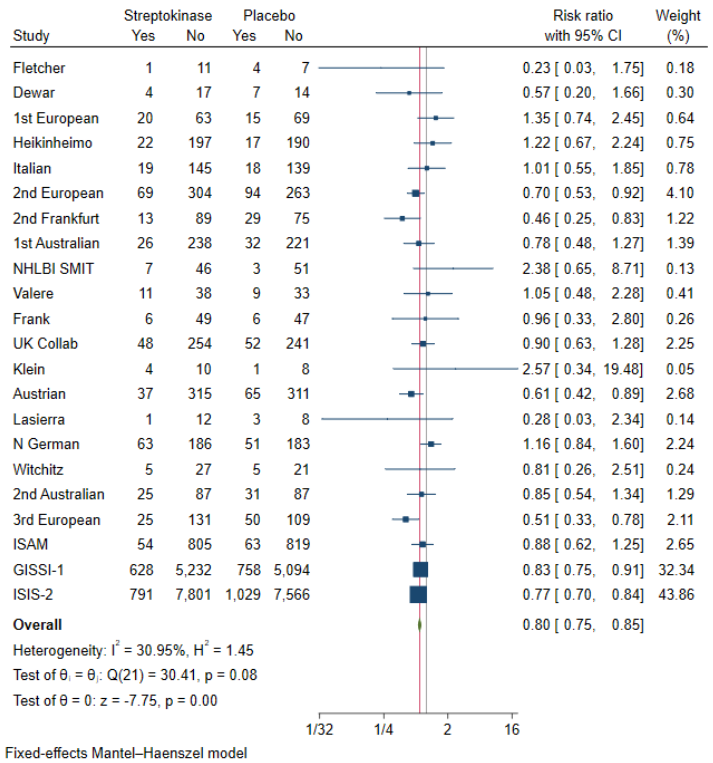

```
generate alive1=pop1-deaths1
generate alive0=pop0-deaths0
```



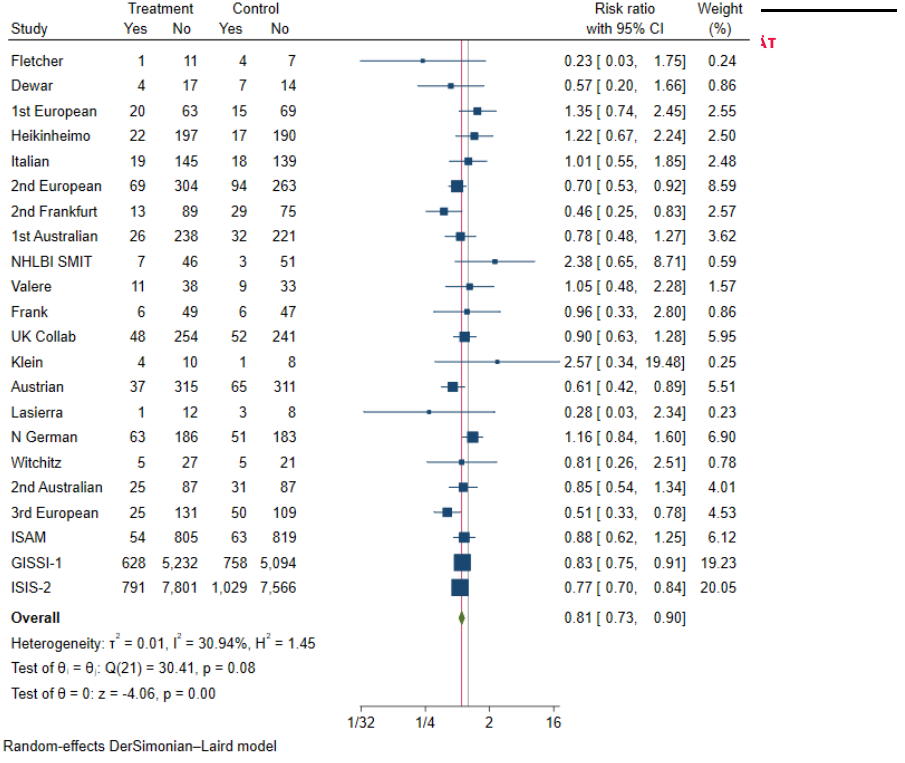
# Solution


meta - Meta-Analysis Control Panel
Display meta settings
Modify meta settings
Setup
Summary
Forest plot
Heterogeneity
Regression
Publication bias
Multivariate
Summarize meta-analysis data
Main
if/in
Options
Maximization
Options
95
Confidence level
Report effect sizes
Report transformed effect sizes
Transformation:
Exponential (exp)
Label as:
Sort studies
By:
Study ID (_meta_id)
Sort order:
Ascending
Report t test instead of z test for overall effect size
Suppress output for individual studies
Suppress output header
Suppress meta settings information
Display options
Submit
No. of studies: 22
CI level: 95%
Model: Random effects
Method: DerSimonian–Laird
Effect size: _meta_es, Odds ratio
Std. Error: _meta_se

# Solution

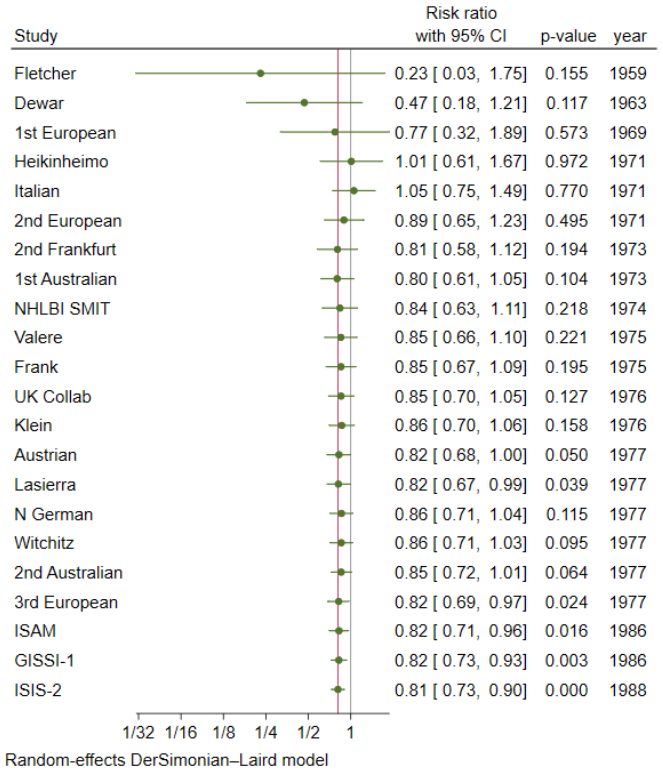



Fixed-effect (RR)




Random-effects (RR)

# Solution




Cumulative meta-analysis according to trial year


Leave-one-out analysis (Influence analysis)