Tracy Meta Analysis
— Statistical Analysis —

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Contents

List of Tables

List of Figures

Contents

1 Notes

1.1 For meeting 7.8.2014

1. In order to conduct the meta analysis to aggregate the odds ratios similar to section 3: "Meta analysis for gender and all type chronic pain", we will need the frequency/percentages for both variable of interest (in this example should be gender and all type pain) and their odds ratio (gender and all type pain) for each single study. Let's see if we can get more information to conduct such studies. For example, if we want to aggregate the ORs of having depression among population w/o a specific pain, we will need the percentage of depression, pecentage of this specific pain and the original odds ratio in every single study..

2. Some studies seem duplicate (maybe one author conducted several studies using the same study cohort, we need to decide if should only keep one of those "duplicate" studies.)

3. Not sure whether pulled odds ratios are marginal or adjusted odds ratios for some records, this could bias the meta analysis results. In addtion, from the name of odds ratio columns (Column BJ to CA), we can only tell one of the two variables that have been used to calculate the Odds Ratio, for example, "asso with gender" column, we can not tell which variable to be associated with gender for many cells. For now, I assume they are assoiated with all type pain if not indicated in the text

4. Tried to clean the "all type pain" column to "all type chronic pain", in order to make studies more consistent with each other, may worth PIs to double check

5. Once study goal is narrowed down or primary aim is clear, may worth for PIs to check each article to confirm the numbers that I pulled is correct.

1.2 For future meeting

Please refer http://biostat.mc.vanderbilt.edu/wiki/Main/JacksonPainMeta

Some explanation for the belowing statistic estimated:
$\hat{tau2}$: estimated amount of total heterogeneity (between study variance), in this study $\hat{tau2}$=0.6874
tau : square root of estimated $\hat{tau2}$ value
$\hat{I2}$: total heterogeneity \total variability (percentage of unexplained variance)
$\hat{H2}$: total variability \sampling variability (H greatr than 1 suggests there is unexplained heterogeneity), in this study H=4.46
Q : weighted deviations about the summary effect size, larger values of Q reflect greater between-study heterogenerity

Please note that, if there are few studies in the meta-analysis (as is usually the case), the Q test is likely underpowered for detecting true heterogeneity.

2 Descriptive of pain

2.1 Initial look at the data

datasub
14 Variables 49 Observations

author

n	missing	unique
49	0	47

```
lowest : Allain et al.     Almeida et al.    Altinel et al.    Asghari et al.    Bahouq et al.
highest: Tavafian et al.   Tezel et al.      Van Vuuren et al. Vieira et al.     Zarei et al.
```

pub.year

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
49	0	13	2009	2003	2004	2007	2009	2012	2013	2013

	1997	2002	2003	2004	2005	2007	2008	2009	2010	2011	2012	2013	2014
Frequency	1	1	2	2	3	5	8	3	2	5	5	11	1
%	2	2	4	4	6	10	16	6	4	10	10	22	2

country

n	missing	unique
49	0	22

```
lowest : 18 countries         Brail               Brazil              China               Ethiopia
highest: Thailand and Myanmar Togo                Tunisia             Turkey              Zimbabwe
```

study.design

n	missing	unique
49	0	6

```
Case control study (1, 2%), Cohort study (1, 2%), Descriptive (1, 2%)
Retrospective Chart Review (1, 2%), Survey (44, 90%)
Survey with follow up (1, 2%)
```

setting

n	missing	unique
49	0	13

```
Clinic (2, 4%), Door to door (23, 47%), Door to door  (1, 2%)
Door to door survey, hospital exam (1, 2%), Hospital (2, 4%)
Hospital clinic (1, 2%), Hospital wards and clinics (1, 2%)
Mail and professional meeting (1, 2%), NR (3, 6%), Phone (3, 6%)
Public hospital (1, 2%), School (1, 2%), Work (9, 18%)
```

urban.rural

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
30	19	11	69.61	0.00	0.00	49.85	100.00	100.00	100.00	100.00

	0	35	37	49.8	50	50.2	51	66	74.4	75	100
Frequency	5	1	1	1	1	1	1	1	1	1	16
%	17	3	3	3	3	3	3	3	3	3	53

tool

n	missing	unique
49	0	4

```
 (2, 4%), Descriptive (1, 2%), Q (41, 84%), Q.E (5, 10%)
```

number.subjects

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
49	0	46	3938	103.6	122.4	311.0	1271.0	2449.0	5411.2	12603.8

```
lowest :    24    60   100   109   120
highest:  7040 11234 13517 16479 85088
```

response.rate

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
34	15	27	85.2	55.87	71.09	75.48	90.60	98.30	100.00	100.00

```
lowest :  15.40  32.96  68.20  71.00  71.30
highest:  98.40  98.50  98.60  99.00 100.00
```

---

population

n	missing	unique
49	0	12

```
Elderly general population (6, 12%), Female workers (2, 4%)
General elderly population (3, 6%), General population (18, 37%)
Institutioinalized elderly (1, 2%), Pain clinic outpatients (3, 6%)
Rheumatology clinic outpatients (1, 2%), Schizophrenic adults (1, 2%)
Students  (1, 2%), Urban Females (1, 2%), Women (2, 4%)
Workers (10, 20%)
```

---

gender.f

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
42	7	32	58.37	16.19	40.50	50.00	56.80	66.30	98.49	100.00

```
lowest :   0.0  12.3  15.2  35.0  40.0
highest:  66.9  72.7  74.0  84.9 100.0
```

---

pain.prevelance

n	missing	unique	Mean	.05	.10	.25	.50	.75	.90	.95
41	8	38	29.3	7.6	9.6	15.5	23.5	36.0	59.0	69.0

```
lowest :  4.20  7.54  7.60  9.60 10.42
highest: 51.96 59.00 69.00 71.60 80.00
```

---

pain.prevalence

n	missing	unique
49	0	47

```
lowest :
highest: 91% LBP (57.1% of which was chronic)
```

---

population2

n	missing	unique
37	12	3

```
elderly (9, 24%), genpop (18, 49%), workers (10, 27%)
```

2.2 Low back pain (all patients)

Table 1: pain.prevelance N=41, 8 Missing

	N	pain.prevelance
population2		
elderly	7	31.54
genpop	16	20.25
workers	8	49.80
Missing	10	25.82
study.design		
Case control study	0	
Cohort study	0	
Descriptive	0	
Retrospective Chart Review	1	17.20
Survey	39	29.18
Survey with follow up	1	46.00
urban.rural		
0	5	25.90
37	1	59.00
49.8	1	12.66
50	1	29.90
51	1	22.60
66	1	50.60
74.4	1	23.50
75	1	51.00
100	13	30.46
Missing	16	26.67
number.subjects		
[60, 350)	11	44.35
[350, 1597)	10	22.62
[1597, 3182)	10	30.84
[3182,85088]	10	17.89
gender.f		
[0.0, 51.0)	12	32.07
[51.0, 56.8)	7	29.00
[56.8, 66.4)	9	19.64
[66.4,100.0]	9	31.47
Missing	4	38.38
Overall		
	41	29.30

3 Meta Proportion analysis

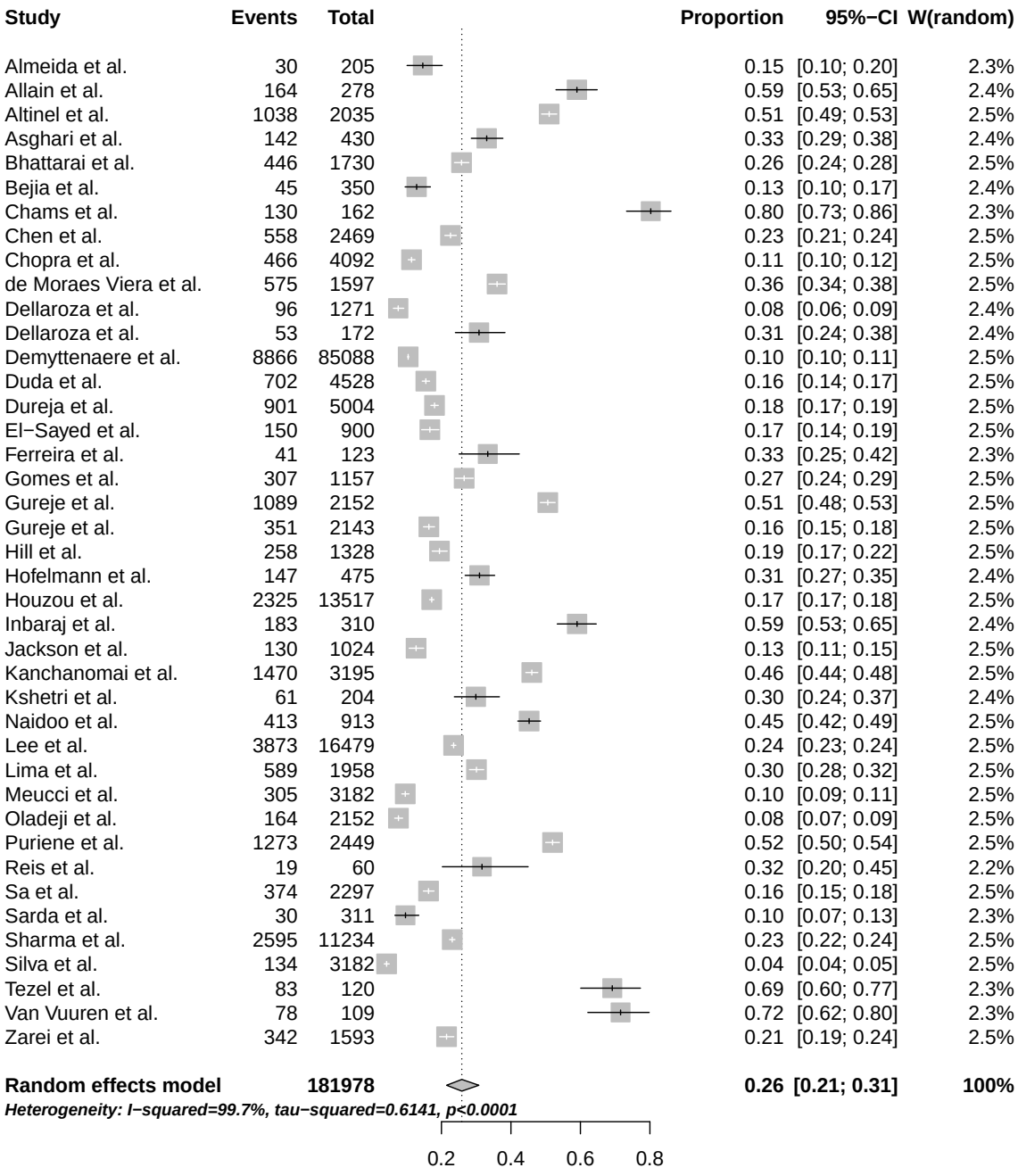
The below section presents the pain (LBP) prevalence meta-analysis, section 3.1 is for all studies, sectoin 3.2 is for general population, section 3.3 is for elderly patients, section 3.4 is for workers.

3.1 LBP:All studies

3.1.1 PAIN.PREVELANCE

```
[[1]]
   proportion           95%-CI %W(random)
1      0.1463 [0.1010; 0.2023]        2.34
2      0.5899 [0.5296; 0.6483]        2.43
3      0.5101 [0.4881; 0.5320]        2.48
4      0.3302 [0.2859; 0.3769]        2.45
5      0.2578 [0.2373; 0.2791]        2.48
6      0.1286 [0.0953; 0.1682]        2.39
7      0.8025 [0.7327; 0.8608]        2.34
8      0.2260 [0.2096; 0.2430]        2.48
9      0.1139 [0.1043; 0.1240]        2.48
10     0.3601 [0.3365; 0.3841]        2.48
11     0.0755 [0.0616; 0.0915]        2.44
12     0.3081 [0.2401; 0.3829]        2.38
13     0.1042 [0.1022; 0.1063]        2.49
14     0.1550 [0.1446; 0.1659]        2.48
15     0.1801 [0.1695; 0.1910]        2.48
16     0.1667 [0.1429; 0.1927]        2.46
17     0.3333 [0.2509; 0.4240]        2.35
18     0.2653 [0.2401; 0.2918]        2.47
19     0.5060 [0.4847; 0.5274]        2.48
20     0.1638 [0.1484; 0.1801]        2.48
21     0.1943 [0.1733; 0.2166]        2.47
22     0.3095 [0.2681; 0.3532]        2.45
23     0.1720 [0.1657; 0.1785]        2.49
24     0.5903 [0.5333; 0.6456]        2.44
25     0.1270 [0.1072; 0.1489]        2.45
26     0.4601 [0.4427; 0.4776]        2.48
27     0.2990 [0.2371; 0.3669]        2.40
28     0.4524 [0.4197; 0.4853]        2.47
29     0.2350 [0.2286; 0.2416]        2.49
30     0.3008 [0.2806; 0.3217]        2.48
31     0.0959 [0.0858; 0.1066]        2.47
32     0.0762 [0.0653; 0.0882]        2.46
33     0.5198 [0.4998; 0.5398]        2.48
34     0.3167 [0.2026; 0.4496]        2.21
35     0.1628 [0.1479; 0.1786]        2.48
36     0.0965 [0.0660; 0.1348]        2.35
37     0.2310 [0.2232; 0.2389]        2.49
38     0.0421 [0.0354; 0.0497]        2.46
39     0.6917 [0.6009; 0.7727]        2.34
40     0.7156 [0.6212; 0.7979]        2.32
41     0.2147 [0.1948; 0.2357]        2.47

Number of studies combined: k=41

                         proportion           95%-CI  z  p.value
Random effects model     0.2586 [0.2149; 0.3077] NA       --

Quantifying heterogeneity:
tau^2 = 0.6141; H = 17.58 [16.93; 18.26]; I^2 = 99.7% [99.7%; 99.7%]
```

```
Test of heterogeneity:
       Q d.f.  p.value
 12367.95   40 < 0.0001

Details on meta-analytical method:
- Inverse variance method
- DerSimonian-Laird estimator for tau^2
- Logit transformation
- Clopper-Pearson confidence interval for individual studies
```

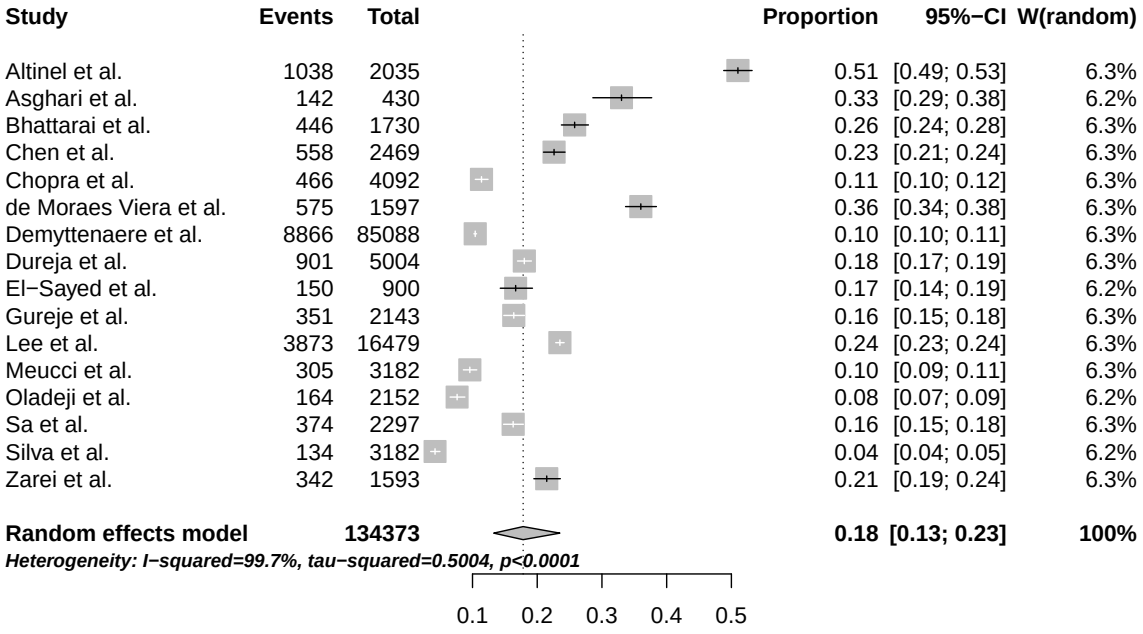

Study Events Total Proportion 95%−CI W(random)
Almeida et al. 30 205 0.15 [0.10; 0.20] 2.3%
Allain et al. 164 278 0.59 [0.53; 0.65] 2.4%
Altinel et al. 1038 2035 0.51 [0.49; 0.53] 2.5%
Asghari et al. 142 430 0.33 [0.29; 0.38] 2.4%
Bhattarai et al. 446 1730 0.26 [0.24; 0.28] 2.5%
Bejia et al. 45 350 0.13 [0.10; 0.17] 2.4%
Chams et al. 130 162 0.80 [0.73; 0.86] 2.3%
Chen et al. 558 2469 0.23 [0.21; 0.24] 2.5%
Chopra et al. 466 4092 0.11 [0.10; 0.12] 2.5%
de Moraes Viera et al. 575 1597 0.36 [0.34; 0.38] 2.5%
Dellaroza et al. 96 1271 0.08 [0.06; 0.09] 2.4%
Dellaroza et al. 53 172 0.31 [0.24; 0.38] 2.4%
Demyttenaere et al. 8866 85088 0.10 [0.10; 0.11] 2.5%
Duda et al. 702 4528 0.16 [0.14; 0.17] 2.5%
Dureja et al. 901 5004 0.18 [0.17; 0.19] 2.5%
El−Sayed et al. 150 900 0.17 [0.14; 0.19] 2.5%
Ferreira et al. 41 123 0.33 [0.25; 0.42] 2.3%
Gomes et al. 307 1157 0.27 [0.24; 0.29] 2.5%
Gureje et al. 1089 2152 0.51 [0.48; 0.53] 2.5%
Gureje et al. 351 2143 0.16 [0.15; 0.18] 2.5%
Hill et al. 258 1328 0.19 [0.17; 0.22] 2.5%
Hofelmann et al. 147 475 0.31 [0.27; 0.35] 2.4%
Houzou et al. 2325 13517 0.17 [0.17; 0.18] 2.5%
Inbaraj et al. 183 310 0.59 [0.53; 0.65] 2.4%
Jackson et al. 130 1024 0.13 [0.11; 0.15] 2.5%
Kanchanomai et al. 1470 3195 0.46 [0.44; 0.48] 2.5%
Kshetri et al. 61 204 0.30 [0.24; 0.37] 2.4%
Naidoo et al. 413 913 0.45 [0.42; 0.49] 2.5%
Lee et al. 3873 16479 0.24 [0.23; 0.24] 2.5%
Lima et al. 589 1958 0.30 [0.28; 0.32] 2.5%
Meucci et al. 305 3182 0.10 [0.09; 0.11] 2.5%
Oladeji et al. 164 2152 0.08 [0.07; 0.09] 2.5%
Puriene et al. 1273 2449 0.52 [0.50; 0.54] 2.5%
Reis et al. 19 60 0.32 [0.20; 0.45] 2.2%
Sa et al. 374 2297 0.16 [0.15; 0.18] 2.5%
Sarda et al. 30 311 0.10 [0.07; 0.13] 2.3%
Sharma et al. 2595 11234 0.23 [0.22; 0.24] 2.5%
Silva et al. 134 3182 0.04 [0.04; 0.05] 2.5%
Tezel et al. 83 120 0.69 [0.60; 0.77] 2.3%
Van Vuuren et al. 78 109 0.72 [0.62; 0.80] 2.3%
Zarei et al. 342 1593 0.21 [0.19; 0.24] 2.5%
Random effects model 181978 0.26 [0.21; 0.31] 100%
Heterogeneity: I−squared=99.7%, tau−squared=0.6141, p<0.0001
0.2
0.4
0.6
0.8

From this pain prevalence meta analysis, the prevalence of LBP across all studies is 0.2586 and the 95% CI is [0.2149, 0.3077]. there is significant heterogeneity among examined studies (H=17.58, P value for Q statistic is <0.0001)

3.2 LBP:Gen population

3.2.1 PAIN.PREVELANCE Among genneral population

```
[[1]]
   proportion           95%-CI %W(random)
1      0.5101 [0.4881; 0.5320]        6.27
2      0.3302 [0.2859; 0.3769]        6.17
3      0.2578 [0.2373; 0.2791]        6.26
4      0.2260 [0.2096; 0.2430]        6.27
5      0.1139 [0.1043; 0.1240]        6.27
6      0.3601 [0.3365; 0.3841]        6.26
7      0.1042 [0.1022; 0.1063]        6.30
8      0.1801 [0.1695; 0.1910]        6.28
9      0.1667 [0.1429; 0.1927]        6.20
10     0.1638 [0.1484; 0.1801]        6.25
11     0.2350 [0.2286; 0.2416]        6.29
12     0.0959 [0.0858; 0.1066]        6.25
13     0.0762 [0.0653; 0.0882]        6.22
14     0.1628 [0.1479; 0.1786]        6.26
15     0.0421 [0.0354; 0.0497]        6.20
16     0.2147 [0.1948; 0.2357]        6.25

Number of studies combined: k=16

                        proportion           95%-CI  z  p.value
Random effects model     0.1782 [0.1328; 0.235] NA       --

Quantifying heterogeneity:
tau^2 = 0.5004; H = 18.78 [17.71; 19.93]; I^2 = 99.7% [99.7%; 99.7%]

Test of heterogeneity:
      Q d.f.  p.value
 5292.71   15 < 0.0001

Details on meta-analytical method:
- Inverse variance method
- DerSimonian-Laird estimator for tau^2
- Logit transformation
- Clopper-Pearson confidence interval for individual studies
```

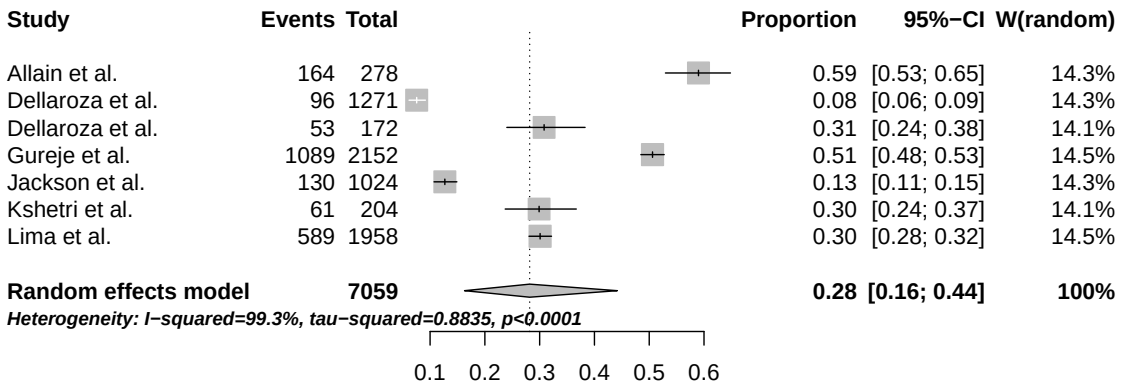

Study
Events
Total
Proportion
95%−CI
W(random)
Altinel et al. 1038 2035 0.51 [0.49; 0.53] 6.3%
Asghari et al. 142 430 0.33 [0.29; 0.38] 6.2%
Bhattarai et al. 446 1730 0.26 [0.24; 0.28] 6.3%
Chen et al. 558 2469 0.23 [0.21; 0.24] 6.3%
Chopra et al. 466 4092 0.11 [0.10; 0.12] 6.3%
de Moraes Viera et al. 575 1597 0.36 [0.34; 0.38] 6.3%
Demyttenaere et al. 8866 85088 0.10 [0.10; 0.11] 6.3%
Dureja et al. 901 5004 0.18 [0.17; 0.19] 6.3%
El−Sayed et al. 150 900 0.17 [0.14; 0.19] 6.2%
Gureje et al. 351 2143 0.16 [0.15; 0.18] 6.3%
Lee et al. 3873 16479 0.24 [0.23; 0.24] 6.3%
Meucci et al. 305 3182 0.10 [0.09; 0.11] 6.3%
Oladeji et al. 164 2152 0.08 [0.07; 0.09] 6.2%
Sa et al. 374 2297 0.16 [0.15; 0.18] 6.3%
Silva et al. 134 3182 0.04 [0.04; 0.05] 6.2%
Zarei et al. 342 1593 0.21 [0.19; 0.24] 6.3%
Random effects model 134373 0.18 [0.13; 0.23] 100%
Heterogeneity: I−squared=99.7%, tau−squared=0.5004, p<0.0001
0.1
0.2
0.3
0.4
0.5

From this pain prevalence meta analysis, the prevalence of LBP among general population studies is 0.1782 and the 95% CI is [0.1328, 0.2350]. there is significant heterogeneity among examined studies (H=18.78, P value for Q statistic is <0.0001)

3.3 LBP:Elderly patients

3.3.1 PAIN.PREVELANCE Among elderly population

```
[[1]]
  proportion             95%-CI %W(random)
1     0.5899 [0.5296; 0.6483]       14.25
2     0.0755 [0.0616; 0.0915]       14.31
3     0.3081 [0.2401; 0.3829]       14.06
4     0.5060 [0.4847; 0.5274]       14.46
5     0.1270 [0.1072; 0.1489]       14.35
6     0.2990 [0.2371; 0.3669]       14.12
7     0.3008 [0.2806; 0.3217]       14.45

Number of studies combined: k=7

                        proportion           95%-CI  z  p.value
Random effects model     0.2818 [0.1629; 0.4417] NA       --

Quantifying heterogeneity:
tau^2 = 0.8835; H = 11.7 [10.28; 13.32]; I^2 = 99.3% [99.1%; 99.4%]

Test of heterogeneity:
     Q d.f.  p.value
 821.8    6 < 0.0001

Details on meta-analytical method:
- Inverse variance method
- DerSimonian-Laird estimator for tau^2
- Logit transformation
- Clopper-Pearson confidence interval for individual studies
```

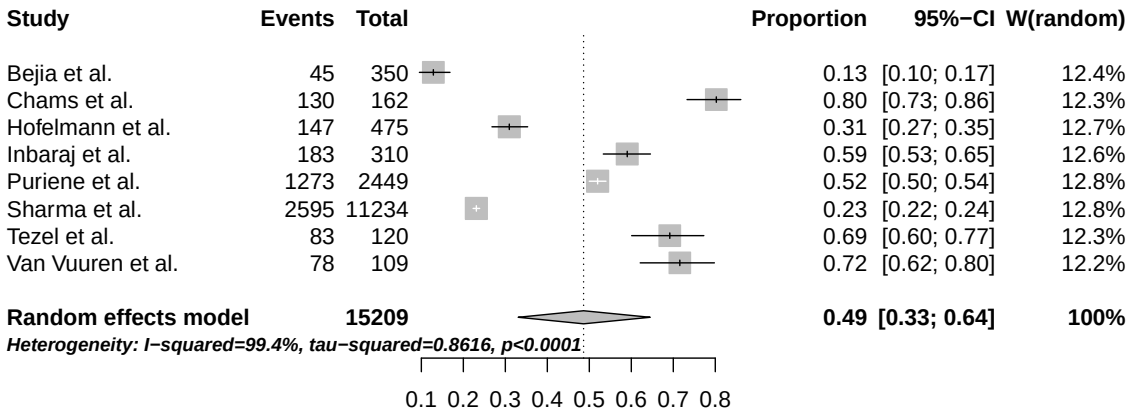


From this pain prevalence meta analysis, the prevalence of LBP among elderly population studies is 0.2818 and the 95% CI is [0.1629, 0.4417]. there is significant heterogeneity among examined studies (H=11.7, P value for Q statistic is <0.0001)

3.4 LBP:Worker patients

3.4.1 PAIN.PREVELANCE Among Workers

```
[[1]]
  proportion           95%-CI %W(random)
1     0.1286 [0.0953; 0.1682]       12.44
2     0.8025 [0.7327; 0.8608]       12.26
3     0.3095 [0.2681; 0.3532]       12.67
4     0.5903 [0.5333; 0.6456]       12.62
5     0.5198 [0.4998; 0.5398]       12.79
6     0.2310 [0.2232; 0.2389]       12.80
7     0.6917 [0.6009; 0.7727]       12.26
8     0.7156 [0.6212; 0.7979]       12.17

Number of studies combined: k=8

                      proportion           95%-CI  z  p.value
Random effects model      0.4864 [0.3306; 0.6449] NA       --

Quantifying heterogeneity:
tau^2 = 0.8616; H = 13.1 [11.72; 14.63]; I^2 = 99.4% [99.3%; 99.5%]

Test of heterogeneity:
       Q d.f.  p.value
 1200.53    7 < 0.0001

Details on meta-analytical method:
- Inverse variance method
- DerSimonian-Laird estimator for tau^2
- Logit transformation
- Clopper-Pearson confidence interval for individual studies
```



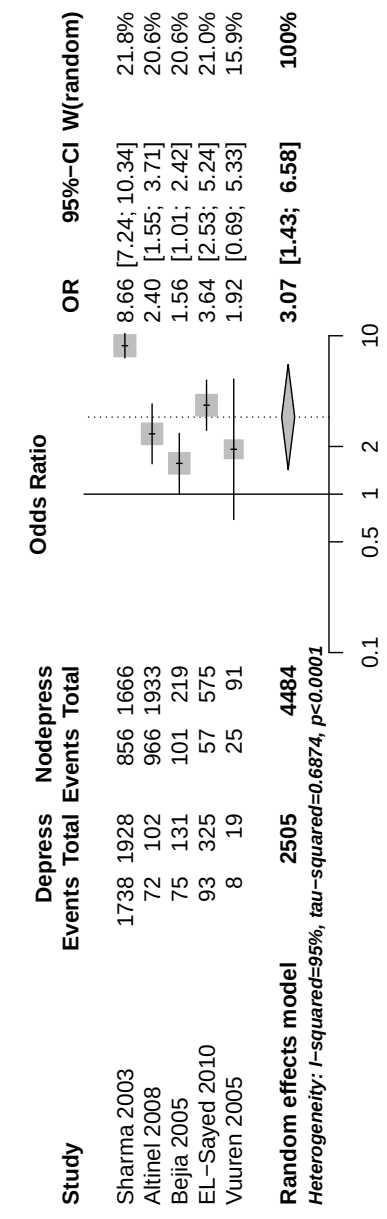
From this pain prevalence meta analysis, the prevalence of LBP among worker population studies is 0.4864 and the 95% CI is [0.3306, 0.6449]. there is significant heterogeneity among examined studies (H=13.1, P value for Q statistic is <0.0001)

3.5 LBP association with depression

Based on our discussion in the last meeting, a total of six studies were pulled for examining the association between LBP and mental disorder, among them, one study is a focus group study in which the information to do the meta analysis was not available. So five studies were examined.

```
                    OR            95%-CI %W(random)
Sharma 2003    8.6558 [7.2449; 10.3414]       21.85
Altinel 2008   2.4025 [1.5548;  3.7123]       20.63
Bejia 2005     1.5647 [1.0114;  2.4207]       20.62
EL-Sayed 2010  3.6429 [2.5308;  5.2437]       21.05
Vuuren 2005    1.9200 [0.6920;  5.3268]       15.86

Number of studies combined: k=5

                         OR           95%-CI      z  p.value
Random effects model 3.0654 [1.4278; 6.5812] 2.8735   0.0041

Quantifying heterogeneity:
tau^2 = 0.6874; H = 4.46 [3.33; 5.99]; I^2 = 95% [91%; 97.2%]

Test of heterogeneity:
     Q d.f.  p.value
 79.71    4 < 0.0001

Details on meta-analytical method:
- Inverse variance method
- DerSimonian-Laird estimator for tau^2
```

So, from this study, the weighted OR between LBP and mental disorder (mainly depression) was 3.065 and 95% CI is [1.4278, 6.5812], indicating there is significant association between LBP and mental disorder. Test of heterogeneity is significant, indicating there is significant heterogeneity between examined studies. The forest plot is a plot of effect sizes and their precisions.


Study
Depress Events Total
Nodepress Events Total
Odds Ratio
OR 95%−CI W(random)
Sharma 2003 1738 1928 856 1666 8.66 [7.24; 10.34] 21.8%
Altinel 2008 72 102 966 1933 2.40 [1.55; 3.71] 20.6%
Bejia 2005 75 131 101 219 1.56 [1.01; 2.42] 20.6%
EL−Sayed 2010 93 325 57 575 3.64 [2.53; 5.24] 21.0%
Vuuren 2005 8 19 25 91 1.92 [0.69; 5.33] 15.9%
Random effects model 2505 4484 3.07 [1.43; 6.58] 100%
Heterogeneity: I−squared=95%, tau−squared=0.6874, p<0.0001
0.1
0.5
1
2
10