Appendix A: Sample Search Strategy (EMBASE)

1. exp Human immunodeficiency virus/
2. HIV.tw.
3. human immunodeficiency virus.tw.
4. exp acquired immune deficiency syndrome/
5. AIDS.tw.
6. acquired immune deficiency syndrome.tw.
7. Or/1-6
8. exp pain/
9. (chronic* adj5 pain*).tw.
10. (chronic* adj5 myalgia).tw.
11. (chronic* adj5 headache*).tw.
12. (chronic* adj5 neuropath*).tw.
13. (chronic* adj5 discomfort).tw.
14. (chronic* adj5 neuralgia).tw.
15. (chronic* adj5 arthralgia).tw.
16. (chronic* adj5 fibromyalgia).tw.
17. Or/8-16
18. psychosocial.mp.
19. psycholog*.mp.
20. exp social adaptation/
21. social support*.mp.
22. adjustment.mp
23. mood*.mp.
24. mental disorder*.mp.
25. depressi*.mp.
26. anxiety.mp.
27. post?trauma*.mp.
28. personality.mp
29. stress.mp
30. substance abuse.mp
31. coping.mp.
32. cogniti*.mp.
33. belief*.mp.
34. self-management.mp.
35. stigma.mp.
36. catastrophi?ing.mp.
37. (pain adj2 acceptance).mp.
38. mindful*.mp.
39. Or/18-38
40. 7 and 17 and 39
41. limit 40 to (human and yr=”1981–Current”)

Appendix B: Quality Assessment

Scoring: Positive (=1), negative/not present (=0), uncertain (=?). Scores were classified as low (<50%), medium (50–80%), and high quality (>80%).

1) Study Rationale: Positive (1) if the hypothesis/objective of the study is clearly described.

2) Target population and sampling frame: Positive if the target population is described and adequate inclusion/exclusion criteria are provided.

3) Recruitment: Positive if recruitment sources reported. For case-control/between-group comparison studies, positive if groups recruited from the same population with a clear definition of cases and controls.

4) Response Rate: Positive if the rate of eligible persons who participate in the study at baseline is reported and is at least 80%.

5) Response Rate (prospective only): Positive if response rate at follow-up is at least 80%, or if differences between follow-up responders and non-responders are not significant.

6) Sample Size: Positive if sample size was justified by the authors a priori.

7) Demographic and HIV clinical factors: Positive if all of the following sample characteristics are reported: age; gender; HIV/AIDS stages or CD4+ count and viral load; HIV duration; use of antiretroviral therapy (ART); and, ART type.

8) Pain characteristics: Positive if all of the following are described: location and character of pain; average pain duration is reported and is at least 3 months; and pain intensity is, on average, moderate (e.g., $\geq$4/10 on a numerical rating scale).

9) Assessment: Positive if there was a standardized method of data collection across all participants and data were collected directly from participants.

10) Assessment: Positive if assessment instruments were previously validated, or if the psychometrics of a new measure are reported and support reliability and validity. Where diagnostic data are extracted from the medical file, diagnoses are based on standardized and validated criteria.

11) Assessment (prospective): Positive if the independent variable (IV) was measured before the dependent variable (DV) and there was no presence of the DV at that time. Or, positive if the analysis controls for baseline scores of the outcome variable.

12) Assessment (prospective): Positive if there was a minimum of 3 months between baseline and follow-up assessments.

13) Statistical Analyses: Positive if appropriate statistical analyses were conducted, the assumptions underlying these were met, and the measures of association with *p*-values or

confidence intervals are reported.

14) Confounding/matching: Positive if ≥4 of the following were controlled for/matched: age, gender, ethnicity, income, education, CD4+ count/viral load, and ART use.

Total for cross-sectional/case-control: 11
Total for prospective cohort studies: 14

Supplementary Table 1**.** Demographic characteristics and pain assessment of included studies.

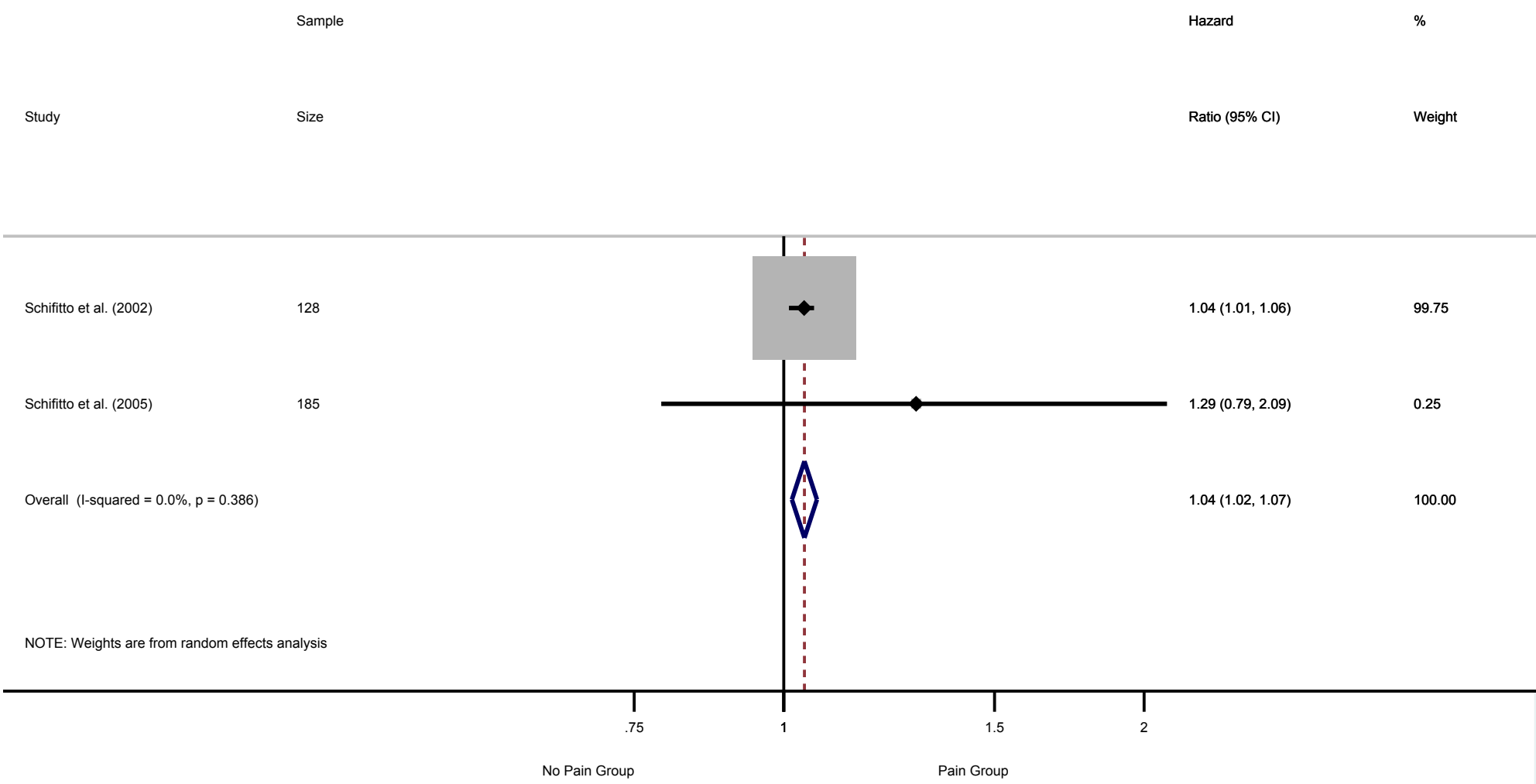
Study	Age (years) Mean (SD)	Sex (% men)	Race/Ethnicity (%) (Pain/No Pain)	HIV Duration (y) Mean (SD)	Pain/Function /QoL
Aouizerat et al. (2010)[2]	Pain: 45.7 (8.1) No Pain: 44.4 (8.6)	Pain: 72.6 No Pain: 78.2	White: 43.0/38.0 Black: 33.0/47.0 Hispanic: 11.0/9.0	Pain: 12.5 (7.0) No Pain: 11.5 (6.9)	MSAS
Bakka (Thesis, 1995)[5]	Men: 40 (6.23) Women: 37 (7.10)	84.1	White: 48.4; Black: 31.0; Hispanic: 19.0	Not Reported	BPI; KPS; MSAS
Banerjee et al. (2011)[6]	Pain: 51.6 (9.9) No Pain: 45.2 (9.8)	Pain: 85.70 No Pain: 72.9	Not Reported	Not Reported	Neurological exam
Berg et al. (2009)[8]	46.0	46.0	Hispanic: 50.0 Black: 43.0	Not Reported	BPI
Breitbart et al. (1996[1]; 1997; 1998); Rosenfeld et al. (1996)[11-13,91]	Pain: 39.0[1] No Pain: 38.6	Pain: 60.9[1] No Pain: 68.9	Black: 39.0/35.9[1] White: 37.6/41.5 Hispanic: 23.4/22.6	Pain: 4.25[1] No Pain: 4.71	BPI; FLIC; MSAS
Ellis et al. (2010)[1] [27] Keltner (2012)[2] [48]	Pain: 46 (7.5)[1] No Pain: 45 (8.0)	Pain: 74.9[1] No Pain: 78.0	White: 45.0[2]; Black: 43.0; Hispanic: 10.0	Not Reported	Neurological exam; MOS-HIV
Evans et al. (1998)[28]	Pain: 42 No Pain: 40	100.0	White: 59.0; Black: 19.0; Hispanic: 19.0	Not Reported	VAS; EQOLESQ
Evans et al. (2003a[1]b[2]); Davis et al. (2004); Griswold et al. (2005) [22,29,30,38]	46.0 (7.9)[2]	70.6[2]	Black: 49.4[1] Hispanic: 18.8 White: 30.6	Not Reported	BPI; KPS
Hansen et al. (2011)[1] Miaskowski et al. (2011) Jeevanjee et al. (2014) [39,46,70]	49.5 (7.5)[1]	Pain: 61.3[1] No Pain: 95.5	Black: 43.1/27.3[1] White: 37.5/45.5	Not Reported	BPI
Jiao et al. (2016) [47]	Pain: 50.0 (10.2) No Pain: 46.6 (11.5)	Pain: 50.0 No Pain: 62.0	Black: 45.0/50.0 Hispanic: 44.0/36.0 White: 6.0/9.0	Not Reported	ICD-9 diagnoses; NRS
Kirkland (Thesis; 2012)[50]	Pain: 43.28 (11.7) No Pain: 43.2 (13.3)	Pain: 52.4 No Pain: 49.5	Black: 74.8/73.1	Pain: 8.6 (6.0) No Pain: 8.0 (5.4)	Interview (IHS criteria); BHS; MIDAS; HIT-6
Knowlton et al. (2015)[1] Mitchell et al. (2016; 2017ab[2]) [52,72-74]	48.15 (6.27)[1]	61.4[1]	Black: 85.9[2] White: 6.5	Not Reported	Past 6 month pain
Koeppe et al. (2010) [53]	Pain: 45.61 No Pain: 42.2	Pain: 81.5 No Pain: 85.1	White: 71.2/64.6	Pain: 10.53 No Pain: 7.9	Medical file; NRS
Koeppe et al. (2012)[54]	41.8	76.4	White: 72.2	8.3 (5.3-12.3)†	Medical file; NRS
Lagana et al. (2002)[55]	40.0 (7.5)	57.5	White: 57.5; Black: 31.7; Hispanic: 10.8	6.2 (3.5)	Past 6 month pain
Lopez et al. (2004)[56]	No AIDS: 36.8 (8.1) AIDS: 39.5 (8.0)	83.9	White: 76.4 Non-White: 23.6	Not Reported	Neurological exam
Lucey et al. (2011)[57]	48 (7.4)	85.0	White: 50.0 Black: 48.0	5-10 years: 26.1% >10 years: 65.2%	NPS; BPI; PDI
Malvar et al. (2015)[60]	Pain: 44.0 (7.7) No Pain: 41.8 (8.8)	Pain: 76.0 No Pain: 83.0	Black: 43.0/44.4 White: 47.0/41.0 Hispanic: 8.0/11.0	Not Reported	Neurological exam
Mann et al. (2015)[61]	50.3 (9.6)	79.6	Black: 34.3	≤2 years: 15.7%	BPI; EQ-5D-3L;

			White: 44.1	>2 years: 84.3%	SF-12
Merlin, Cen, et al. (2012)[65]	47.5 (21-71)	72.3	Black: 58.4	11 (0-25)†	BPI; MSAS
Merlin, Westfall, et al. (2012) [68]	43.7 (36.0–50.0)	77.5	Non-white: 52.3 White: 47.7	Not Reported	EuroQoL
Merlin et al. (2015; 2017[1])[66,67]	>50: 52.9%[1]	Pain: 68.6[1] No Pain: 74.3	Black: 57.1/54.3[1] White: 41.4/44.3	Not Reported	BCPQ; PEG
Morgello et al. (2004)[76] Fellows et al. (2012)[1] [31]	Pain: 46.6 (7.1)[1] No Pain: 43.7 (7.5)	Pain: 70.0[1] No Pain: 58.6	Black: 51.3/49.6[1] Hispanic: 21.3/31.3 White: 27.3/18.6	Pain: 11.9 (5.2) [1] No Pain: 11.2 (5.2)	Neurological exam
Nakamoto et al. (2010)[77]	44.2 (10.2)	84.0	White: 51.0	10.4 (6.3)	Neurological exam
Parker et al. (2017) [79]	30.7 (4.8)	Women: 100.0	amaXhosa: 100.0	Pain: 4.3 (3.3) No Pain: 3.8 (3.2)	BPI; EQ-5D
Passik et al. (2006)[81]	39.71 (6.59)	86.0	White: 45.0 Black: 52.0	Not Reported	BPI; MSAS
Phillips et al. (2014)[84]	Pain: 51.3 (8.4) No Pain: 47.7 (8.9)	Pain: 89.3 No Pain: 84.2	White: 85.7/86.8 African: 10.7/10.5 Asian: 0/2.6	Pain: 17.8 (7.0) No Pain:14.7 (7.8)	BPNS, TCSS, UENS; NPSI; BPI; SF-36;
Pierson (Thesis; 2009)[1] [86] Cucciare et al. (2009)[21] Huggins et al. (2012)[44] Trafton et al. (2012)[113]	49 (8)[1]	62.9[1]	Black: 43.5[1] White: 33.9 Hispanic: 11.3 Asian/Native: 4.8	Not Reported	POQ
Pillay et al. (2017)[88]	Pain: 42.4 (11.3) No Pain: 44.6 (13.4)	Pain: 25.0 No Pain: 24.0	Black: 100.0	Pain: 9 (5–12) No Pain: 12 (10–15)†	BPNS; NRS; WBPQ; EQ5D
Robbins et al. (2013[1]; 2016) [89,90]	Pain: 43.5 (1.2) [1] No Pain: 41.4 (0.6)	Pain: 32.1[1] No Pain: 48.5	Thai: 95.7[1]	Pain: 10.5 (0.8) [1] No Pain: 9.1 (0.4)	BPI; S-LANNS
Safo et al. (2017)[92]	42 (32–49)	Women: 100.0	Hispanic: 34.6/23.9 Black: 60.0/69.1	Not Reported	CDC Healthy Days
Sandoval et al. (2014)[94]	48.42 (8.13)	58.0	Black: 53.0; White: 33.0; Hispanic: 11.0	10.8 (6.8)	NPS; Physical performance
Saylor et al. (2017)[95]	35 (8)	53.0	Black: 100.0	Not Reported	TNS; PAOFI, KPS;
Schifitto et al. (2002)[96]	Pain: 40.8 (7.3) No Pain: 40.4 (7.6)	Pain: 80.0 No Pain: 81.5	White: 52.7/44.4	Not Reported	Neurological exam; MOS; KPS
Schifitto et al. (2005)[97]	Pain: 43.6 (6.9) No Pain: 42.7 (7.0)	Pain: 70.7 No Pain: 75.7	White: 32.6/11.7 Black: 61.0/77.5 Hispanic: 4.3/9.0	Pain: 8.2 (4.0) No Pain: 7.2 (4.5)	Neurological exam; NPS; MOS; KPS
Shacham et al. (2015)[98]	43.06 (11.05)	68.7	'Minority': 72.6 White: 27.4	Not Reported	DIS-IV
Simmonds et al. (2005)[101]	40.70 (7.49)	78	White: 29.0; Black: 54.0; Hispanic: 13.0	6.77 (4.2)	NRS; MOS-HIV; Performance
Simms et al. (1992)[102]	Pain: 37.5 (7.6) No Pain: 37.0 (6.5)	Pain: 46.0 No Pain: 77.0	Not Reported	Pain: 2.81 (1.2) No Pain: 1.8 (1.2)	Medical exam
Singer et al. (1993; 1996[1])[104,105]	Pain: 38.1 (9.7) [1] No Pain: 39.9 (10.6)	100.0[1]	'Predominantly Caucasian'[1]	Not Reported	IHS criteria; KPS
Smith et al. (2002)[107]	PTSD: 41.47 (6.8) No PTSD: 42.9 (7.8)	PTSD: 59.7 No PTSD:	PTSD/No PTSD: Black: 37.1/62.9	Not Reported	BPI; SF-12

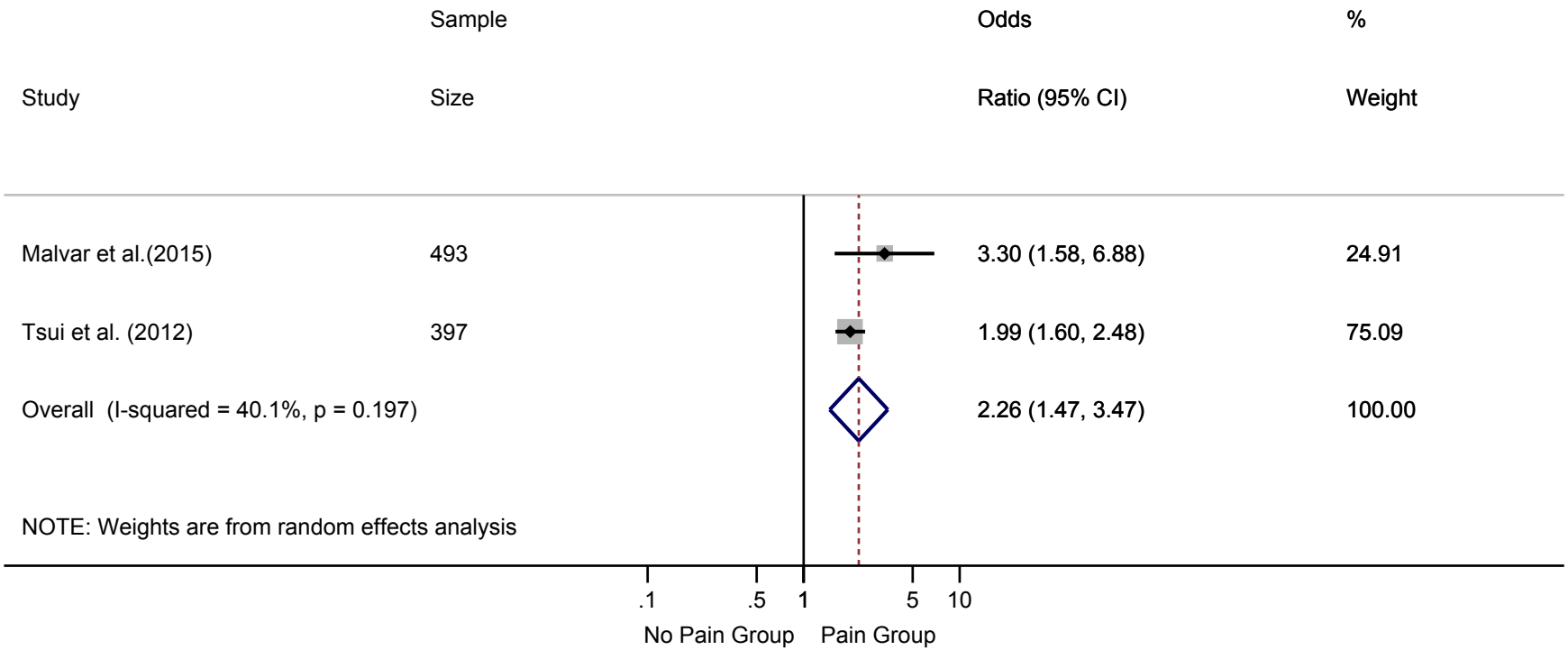
		57.8	Hispanic: 67.5/32.5		
Surratt et al. (2015)[110]	Pain: 46.9 (7.7) No Pain : 45.3 (7.9)	Pain: 55.4 No pain: 63.7	Black: 66.7/69.0	Pain:13.6 (7.3) No pain:12.9 (7.2)	GAIN Health Distress
Tsui et al. (2012; 2016[1])[116,117]	Pain: 43.5(7.3)[1] No Pain: 41.9 (7.5)	Pain: 73.4[1] No Pain: 75.6	Black: 39.2/43.0[1] White: 36.1/30.6 Hispanic: 17.7/19.4	Not Reported	SF-12; HIV Symptom Index
Tsui et al. (2013; 2014)[114,115]	Pain : 30.4 (5.5) No Pain : 29.8 (5)	Pain: 53.0 No Pain: 65.0	Not Reported	Pain: 4.6 (3.6) No Pain: 4.2 (3.5)	SF-12 pain interference
Uebelacker et al. (2015)[119]	Pain: 51.0 (8.4) No Pain: 51.0 (10.3)	Pain: 58.0 No Pain: 68.0	White: 68.0/62.0 Black: 28.0/31.0	Pain:17.9 (9.5) No Pain:16.0 (7.9)	Past 6 month pain; NRS; BPI
Wadley et al. (2016)[121]	Pain: 44 (10) No Pain: 40 (10)	Pain: 34.0 No Pain: 22.0	Black: 100.0	Pain: 6 (1–25)† No Pain: 6 (1–20)	BPI; EQ5D3L
Wadley et al. (Unpublished)[122]	45 (10)	22.0	Not Reported	8 (5)	NRS

Note: BCPQ, Brief Chronic Pain Questionnaire; BHS, Brief Headache Screen; BPI, Brief Pain Inventory; BPNS, Brief Peripheral Neuropathy Screen; CDC, Centre for Disease Control; DIS-IV, Diagnostic Interview Schedule for DSM-IV; EQOLESQ, Endicott Quality of Life Enjoyment and Satisfaction Questionnaire; FLIC, Functional Living Index; GAIN, Global Appraisal of Individual Needs; HIT-6, Headache Impact Test; KPS, Karnofsky Performance Scale; IHS, International Headache Society; MIDAS, Migraine Disability Assessment; MOS-HIV**,** Medical Outcomes Study HIV Health Survey; MSAS, Memorial Symptom Assessment Scale**;** NPS, Neuropathic Pain Scale; NPSI, Neuropathic Pain Symptom Inventory; NRS, Pain Intensity Numerical Rating Scale; PAOFI, Patient Assessment of Own Functioning Inventory; PDI, Pain Disability Index; POQ, Pain Outcomes Questionnaire; PTSD, Post-traumatic stress disorder; SF-12/36, Short form Medical Outcome Survey; S-LANNS, Self-Administered Leeds Assessment of Neuropathic Symptoms and Signs; TCSS, Toronto Clinical Scoring System; TNS, Total Neuropathy Scale; UENS, Utah Early Neuropathy Scale; VAS, Pain intensity Visual Analogue Scale; WBPQ, Wisconsin Brief Pain Questionnaire

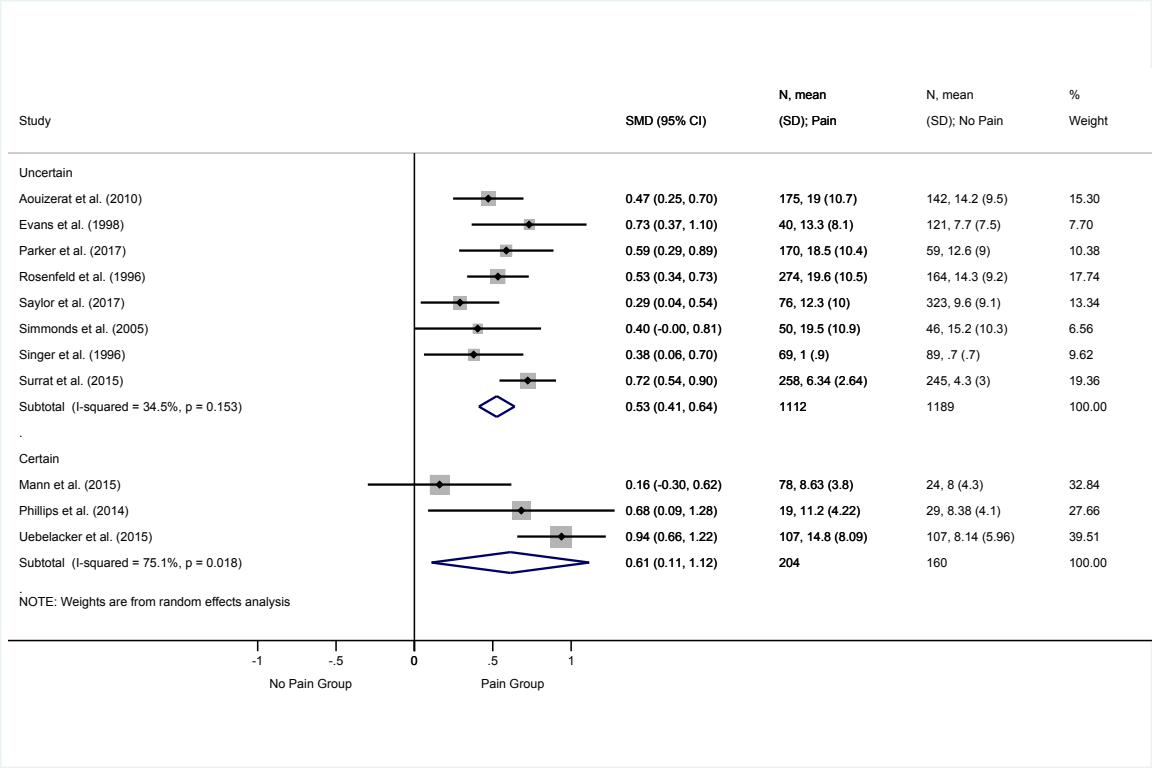
†Median and Range


Sample
Hazard
%
Study
Size
Ratio (95% CI)
Weight
Schifitto et al. (2002)
128
1.04 (1.01, 1.06)
99.75
Schifitto et al. (2005)
185
1.29 (0.79, 2.09)
0.25
Overall (I-squared = 0.0%, p = 0.386)
1.04 (1.02, 1.07)
100.00
NOTE: Weights are from random effects analysis
.75
1
1.5
2
No Pain Group
Pain Group

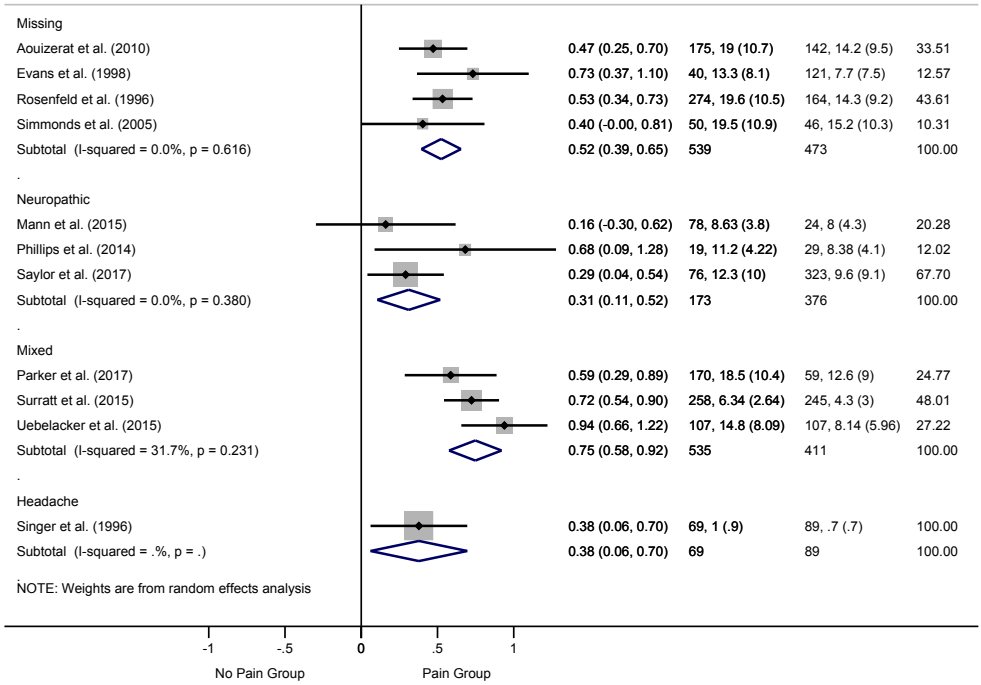
Supplemental Figure 1. Forest plot of hazard ratios from prospective studies reporting baseline depression as a predictor of follow-up symptomatic neuropathy. Baseline depression was more severe in participants who developed symptomatic neuropathy at follow-up, as reflected in the pooled hazard ratio (HR) of >1. Note: CI, Confidence Interval.


Sample
Odds
%
Study
Size
Ratio (95% CI)
Weight
Malvar et al.(2015)
493
3.30 (1.58, 6.88)
24.91
Tsui et al. (2012)
397
1.99 (1.60, 2.48)
75.09
Overall (I-squared = 40.1%, p = 0.197)
2.26 (1.47, 3.47)
100.00
NOTE: Weights are from random effects analysis
.1
.5
1
5
10
No Pain Group
Pain Group

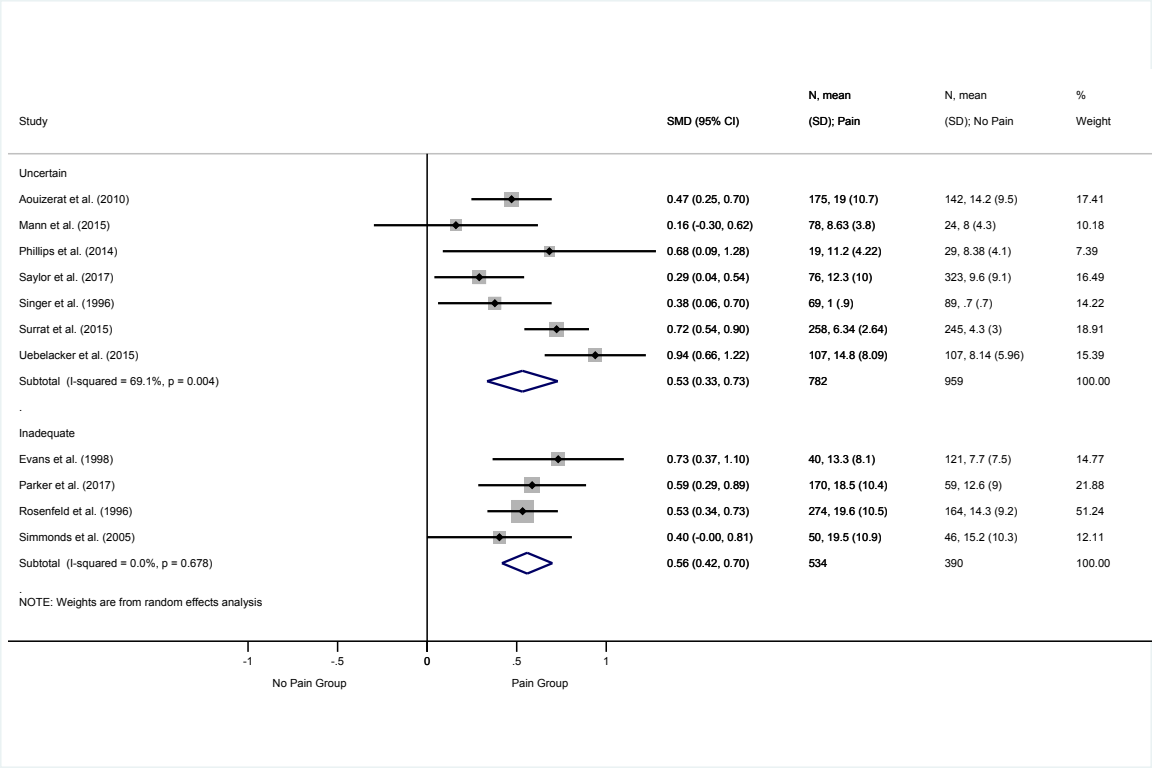
Supplemental Figure 2. Forest plot of odds ratios (OR) from prospective studies reporting baseline depression predicting follow-up presence of pain. Baseline depression was more severe in participants who had pain at follow-up, as reflected in the pooled odds ratio (OR) of >1. Note: CI, Confidence Interval.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Uncertain
Aouizerat et al. (2010) 0.47 (0.25, 0.70) 175, 19 (10.7) 142, 14.2 (9.5) 15.30
Evans et al. (1998) 0.73 (0.37, 1.10) 40, 13.3 (8.1) 121, 7.7 (7.5) 7.70
Parker et al. (2017) 0.59 (0.29, 0.89) 170, 18.5 (10.4) 59, 12.6 (9) 10.38
Rosenfeld et al. (1996) 0.53 (0.34, 0.73) 274, 19.6 (10.5) 164, 14.3 (9.2) 17.74
Saylor et al. (2017) 0.29 (0.04, 0.54) 76, 12.3 (10) 323, 9.6 (9.1) 13.34
Simmonds et al. (2005) 0.40 (-0.00, 0.81) 50, 19.5 (10.9) 46, 15.2 (10.3) 6.56
Singer et al. (1996) 0.38 (0.06, 0.70) 69, 1 (.9) 89, .7 (.7) 9.62
Surrat et al. (2015) 0.72 (0.54, 0.90) 258, 6.34 (2.64) 245, 4.3 (3) 19.36
Subtotal (I-squared = 34.5%, p = 0.153) 0.53 (0.41, 0.64) 1112 1189 100.00
Certain
Mann et al. (2015) 0.16 (-0.30, 0.62) 78, 8.63 (3.8) 24, 8 (4.3) 32.84
Phillips et al. (2014) 0.68 (0.09, 1.28) 19, 11.2 (4.22) 29, 8.38 (4.1) 27.66
Uebelacker et al. (2015) 0.94 (0.66, 1.22) 107, 14.8 (8.09) 107, 8.14 (5.96) 39.51
Subtotal (I-squared = 75.1%, p = 0.018) 0.61 (0.11, 1.12) 204 160 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
No Pain Group
Pain Group

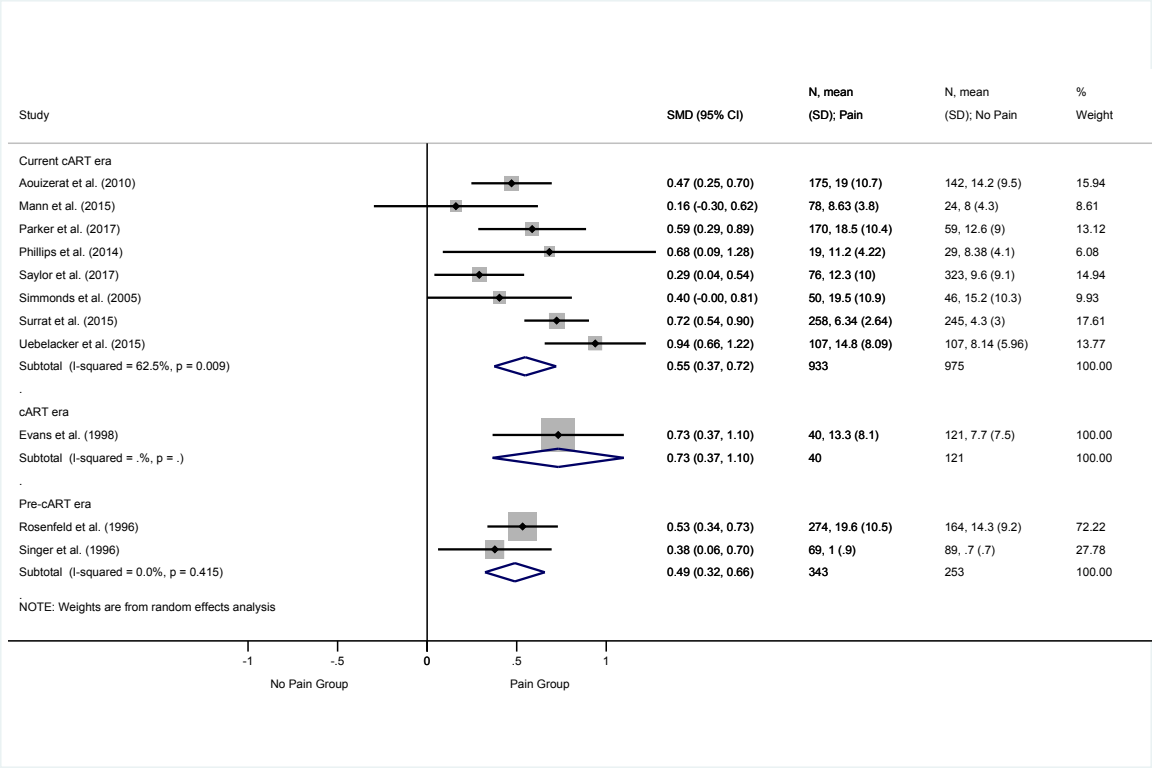
Supplemental Figure 3. Forest plot of subgroup analysis of cross-sectional SMDs for depression by certainty of pain chronicity. Note: Studies were coded as 'certain' chronic pain if they reported a subsample with average pain duration of ≥3 months. Studies that assessed pain/neuropathy without describing duration were categorized as 'uncertain pain chronicity'. SMD, standardized mean difference, CI, Confidence Interval; SD, standard deviation. A positive pooled SMD indicates that the group with pain had more severe depression symptoms.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Missing
Aouizerat et al. (2010) 0.47 (0.25, 0.70) 175, 19 (10.7) 142, 14.2 (9.5) 33.51
Evans et al. (1998) 0.73 (0.37, 1.10) 40, 13.3 (8.1) 121, 7.7 (7.5) 12.57
Rosenfeld et al. (1996) 0.53 (0.34, 0.73) 274, 19.6 (10.5) 164, 14.3 (9.2) 43.61
Simmonds et al. (2005) 0.40 (-0.00, 0.81) 50, 19.5 (10.9) 46, 15.2 (10.3) 10.31
Subtotal (I-squared = 0.0%, p = 0.616) 0.52 (0.39, 0.65) 539 473 100.00
Neuropathic
Mann et al. (2015) 0.16 (-0.30, 0.62) 78, 8.63 (3.8) 24, 8 (4.3) 20.28
Phillips et al. (2014) 0.68 (0.09, 1.28) 19, 11.2 (4.22) 29, 8.38 (4.1) 12.02
Saylor et al. (2017) 0.29 (0.04, 0.54) 76, 12.3 (10) 323, 9.6 (9.1) 67.70
Subtotal (I-squared = 0.0%, p = 0.380) 0.31 (0.11, 0.52) 173 376 100.00
Mixed
Parker et al. (2017) 0.59 (0.29, 0.89) 170, 18.5 (10.4) 59, 12.6 (9) 24.77
Surratt et al. (2015) 0.72 (0.54, 0.90) 258, 6.34 (2.64) 245, 4.3 (3) 48.01
Uebelacker et al. (2015) 0.94 (0.66, 1.22) 107, 14.8 (8.09) 107, 8.14 (5.96) 27.22
Subtotal (I-squared = 31.7%, p = 0.231) 0.75 (0.58, 0.92) 535 411 100.00
Headache
Singer et al. (1996) 0.38 (0.06, 0.70) 69, 1 (.9) 89, .7 (.7) 100.00
Subtotal (I-squared = .%, p = .) 0.38 (0.06, 0.70) 69 89 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
No Pain Group
Pain Group

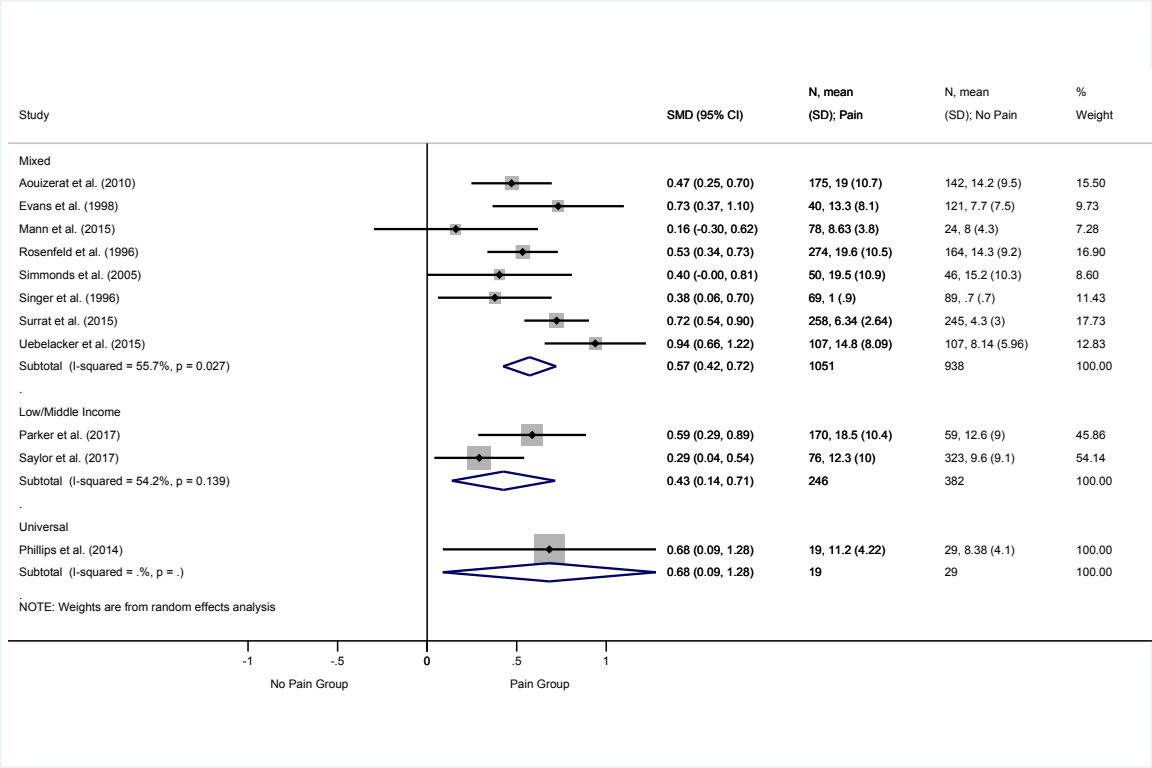
Supplemental Figure 4. Forest plot of subgroup analysis of cross-sectional SMDs for depression by pain type. Note: SMD, standardized mean difference, CI, Confidence Interval; SD, standard deviation. A positive pooled SMD indicates that the group with pain had more severe depression symptoms.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Uncertain
Aouizerat et al. (2010) 0.47 (0.25, 0.70) 175, 19 (10.7) 142, 14.2 (9.5) 17.41
Mann et al. (2015) 0.16 (-0.30, 0.62) 78, 8.63 (3.8) 24, 8 (4.3) 10.18
Phillips et al. (2014) 0.68 (0.09, 1.28) 19, 11.2 (4.22) 29, 8.38 (4.1) 7.39
Saylor et al. (2017) 0.29 (0.04, 0.54) 76, 12.3 (10) 323, 9.6 (9.1) 16.49
Singer et al. (1996) 0.38 (0.06, 0.70) 69, 1 (.9) 89, .7 (.7) 14.22
Surrat et al. (2015) 0.72 (0.54, 0.90) 258, 6.34 (2.64) 245, 4.3 (3) 18.91
Uebelacker et al. (2015) 0.94 (0.66, 1.22) 107, 14.8 (8.09) 107, 8.14 (5.96) 15.39
Subtotal (I-squared = 69.1%, p = 0.004) 0.53 (0.33, 0.73) 782 959 100.00
Inadequate
Evans et al. (1998) 0.73 (0.37, 1.10) 40, 13.3 (8.1) 121, 7.7 (7.5) 14.77
Parker et al. (2017) 0.59 (0.29, 0.89) 170, 18.5 (10.4) 59, 12.6 (9) 21.88
Rosenfeld et al. (1996) 0.53 (0.34, 0.73) 274, 19.6 (10.5) 164, 14.3 (9.2) 51.24
Simmonds et al. (2005) 0.40 (-0.00, 0.81) 50, 19.5 (10.9) 46, 15.2 (10.3) 12.11
Subtotal (I-squared = 0.0%, p = 0.678) 0.56 (0.42, 0.70) 534 390 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
No Pain Group
Pain Group

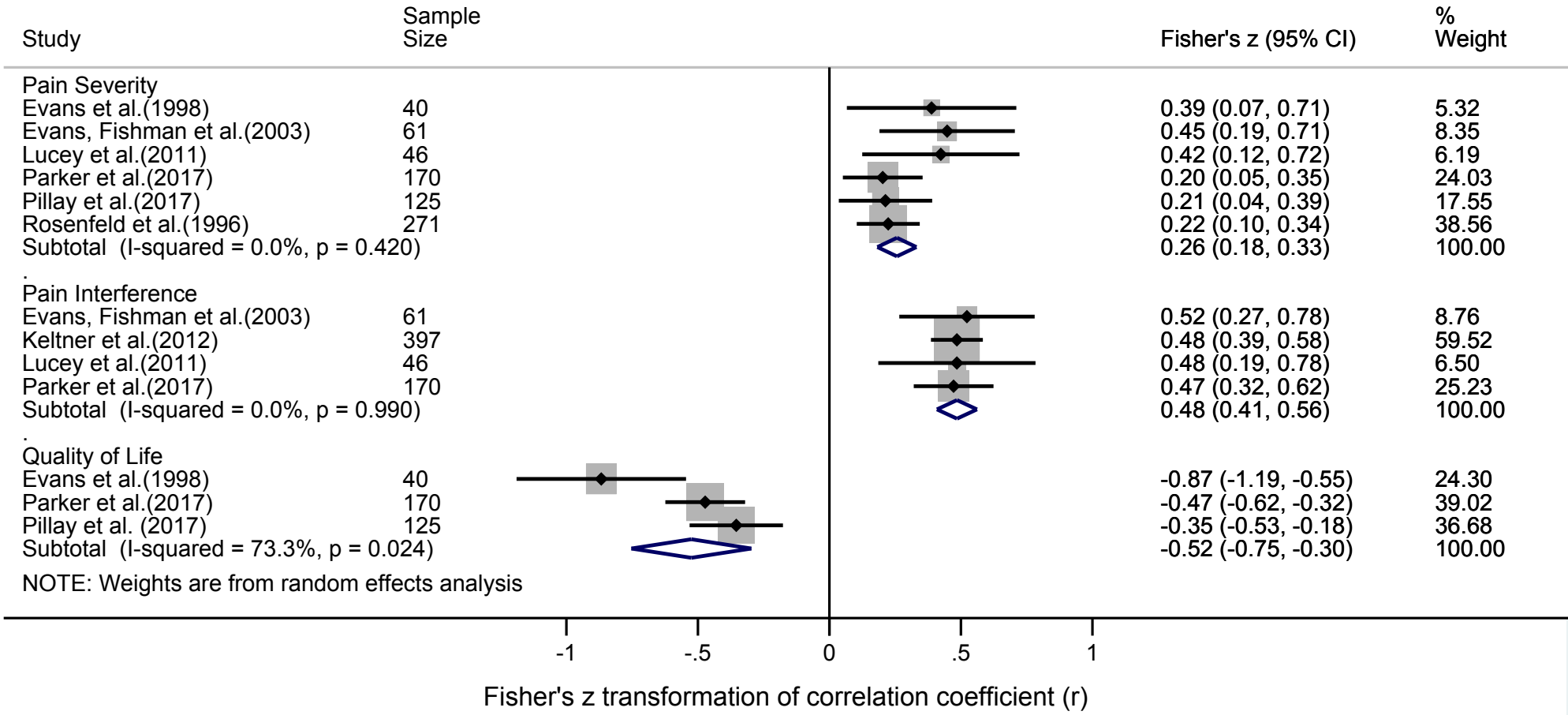
Supplemental Figure 5. Forest plot of subgroup analysis of cross-sectional SMDs for depression by indicators of immune functioning and viral suppression. Note: Studies were categorized as follows: 'adequate' immune functioning and viral suppression, mean/median CD4+ count >350 cells/mm^3 and viral load <50 log copies/ml; 'inadequate', CD4+ count $\leq$350 cells/mm^3 and viral load $\geq$ 50 log copies/ml (or, if these data were not reported, the majority of the sample had an AIDS diagnosis); and, uncertain where data were not reported sufficiently. SMD, standardized mean difference, CI, Confidence Interval; SD, standard deviation. A positive pooled SMD indicates that the group with pain had more severe depression symptoms.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Current cART era
Aouizerat et al. (2010) 0.47 (0.25, 0.70) 175, 19 (10.7) 142, 14.2 (9.5) 15.94
Mann et al. (2015) 0.16 (-0.30, 0.62) 78, 8.63 (3.8) 24, 8 (4.3) 8.61
Parker et al. (2017) 0.59 (0.29, 0.89) 170, 18.5 (10.4) 59, 12.6 (9) 13.12
Phillips et al. (2014) 0.68 (0.09, 1.28) 19, 11.2 (4.22) 29, 8.38 (4.1) 6.08
Saylor et al. (2017) 0.29 (0.04, 0.54) 76, 12.3 (10) 323, 9.6 (9.1) 14.94
Simmonds et al. (2005) 0.40 (-0.00, 0.81) 50, 19.5 (10.9) 46, 15.2 (10.3) 9.93
Surrat et al. (2015) 0.72 (0.54, 0.90) 258, 6.34 (2.64) 245, 4.3 (3) 17.61
Uebelacker et al. (2015) 0.94 (0.66, 1.22) 107, 14.8 (8.09) 107, 8.14 (5.96) 13.77
Subtotal (I-squared = 62.5%, p = 0.009) 0.55 (0.37, 0.72) 933 975 100.00
cART era
Evans et al. (1998) 0.73 (0.37, 1.10) 40, 13.3 (8.1) 121, 7.7 (7.5) 100.00
Subtotal (I-squared = .%, p = .) 0.73 (0.37, 1.10) 40 121 100.00
Pre-cART era
Rosenfeld et al. (1996) 0.53 (0.34, 0.73) 274, 19.6 (10.5) 164, 14.3 (9.2) 72.22
Singer et al. (1996) 0.38 (0.06, 0.70) 69, 1 (.9) 89, .7 (.7) 27.78
Subtotal (I-squared = 0.0%, p = 0.415) 0.49 (0.32, 0.66) 343 253 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
No Pain Group
Pain Group

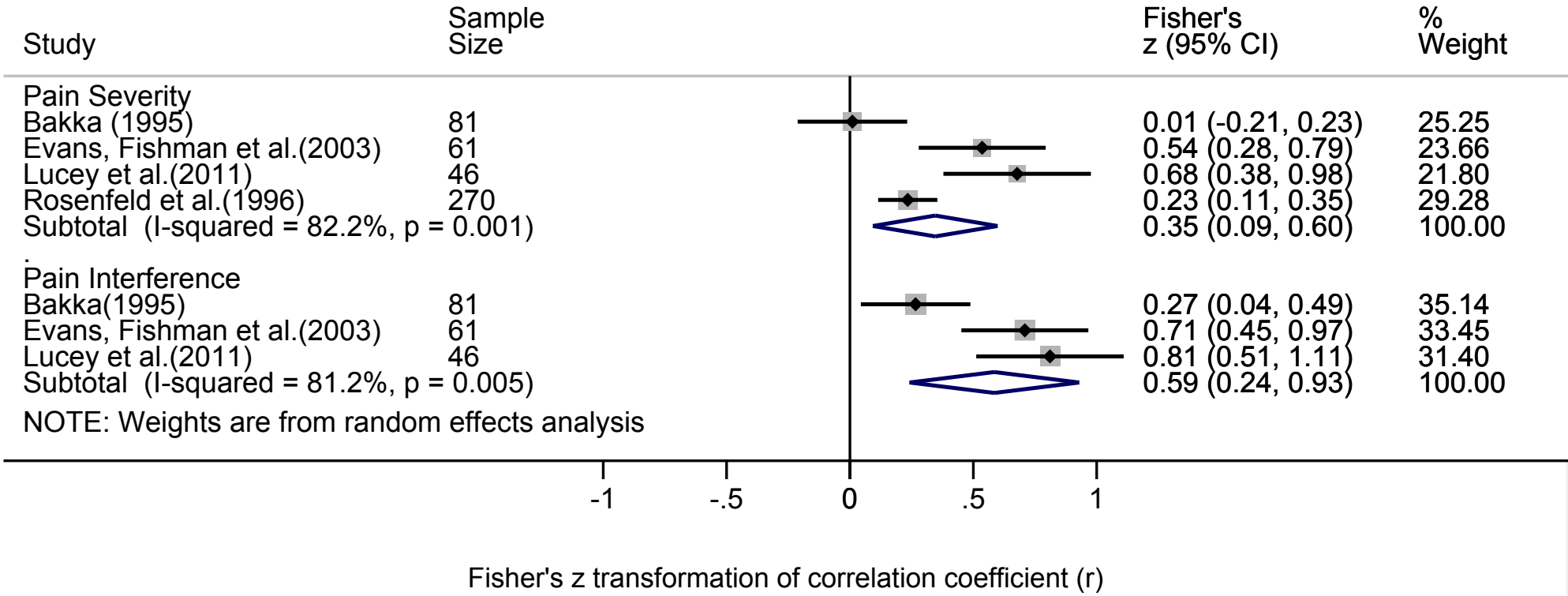
Supplemental Figure 6. Forest plot of subgroup analysis of cross-sectional SMDs for depression by cART treatment era. Note: cART treatment era was categorized as: 1981-1996, 'pre-cART' era; 1997-2003, 'cART era'; or, 2004-present, 'current cART' era. SMD, standardized mean difference, CI, Confidence Interval; SD, standard deviation. A positive pooled SMD indicates that the group with pain had more severe depression symptoms.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Mixed
Aouizerat et al. (2010) 0.47 (0.25, 0.70) 175, 19 (10.7) 142, 14.2 (9.5) 15.50
Evans et al. (1998) 0.73 (0.37, 1.10) 40, 13.3 (8.1) 121, 7.7 (7.5) 9.73
Mann et al. (2015) 0.16 (-0.30, 0.62) 78, 8.63 (3.8) 24, 8 (4.3) 7.28
Rosenfeld et al. (1996) 0.53 (0.34, 0.73) 274, 19.6 (10.5) 164, 14.3 (9.2) 16.90
Simmonds et al. (2005) 0.40 (-0.00, 0.81) 50, 19.5 (10.9) 46, 15.2 (10.3) 8.60
Singer et al. (1996) 0.38 (0.06, 0.70) 69, 1 (.9) 89, .7 (.7) 11.43
Surrat et al. (2015) 0.72 (0.54, 0.90) 258, 6.34 (2.64) 245, 4.3 (3) 17.73
Uebelacker et al. (2015) 0.94 (0.66, 1.22) 107, 14.8 (8.09) 107, 8.14 (5.96) 12.83
Subtotal (I-squared = 55.7%, p = 0.027) 0.57 (0.42, 0.72) 1051 938 100.00
Low/Middle Income
Parker et al. (2017) 0.59 (0.29, 0.89) 170, 18.5 (10.4) 59, 12.6 (9) 45.86
Saylor et al. (2017) 0.29 (0.04, 0.54) 76, 12.3 (10) 323, 9.6 (9.1) 54.14
Subtotal (I-squared = 54.2%, p = 0.139) 0.43 (0.14, 0.71) 246 382 100.00
Universal
Phillips et al. (2014) 0.68 (0.09, 1.28) 19, 11.2 (4.22) 29, 8.38 (4.1) 100.00
Subtotal (I-squared = .%, p = .) 0.68 (0.09, 1.28) 19 29 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
No Pain Group
Pain Group

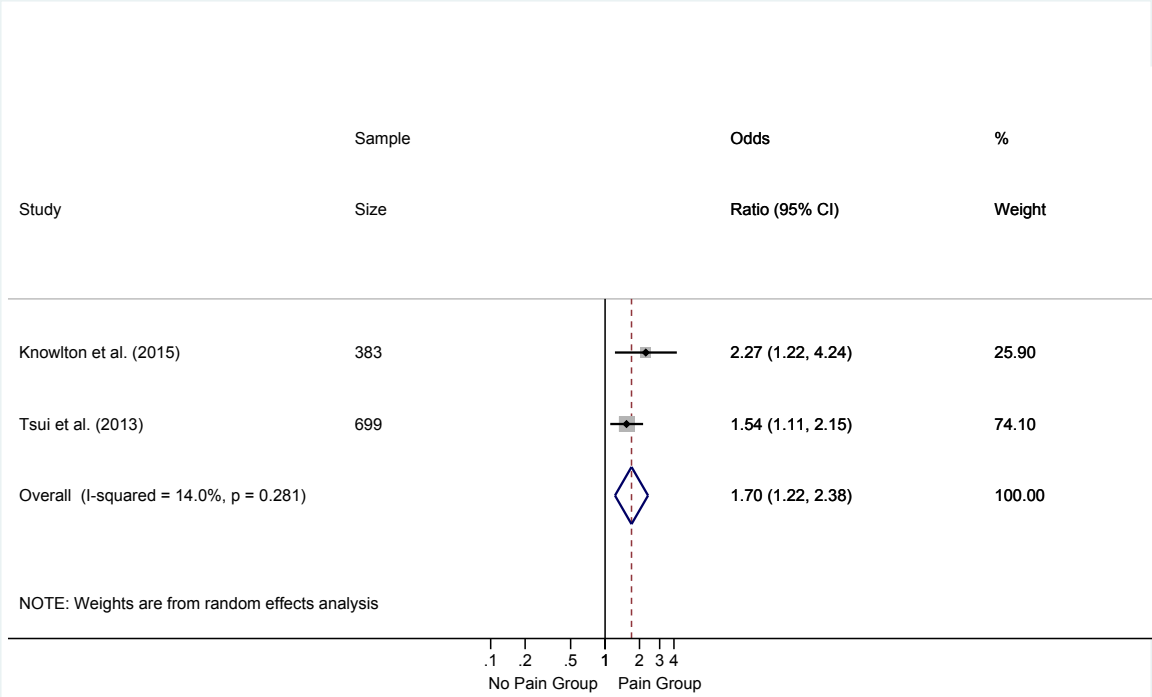
Supplemental Figure 7. Forest plot of subgroup analysis of cross-sectional SMDs for depression by healthcare system type. Note: SMD, standardized mean difference, CI, Confidence Interval; SD, standard deviation. A positive pooled SMD indicates that the group with pain had more severe depression symptoms.


Study
Sample Size
Fisher's z (95% CI)
% Weight
Pain Severity
Evans et al.(1998) 40 0.39 (0.07, 0.71) 5.32
Evans, Fishman et al.(2003) 61 0.45 (0.19, 0.71) 8.35
Lucey et al.(2011) 46 0.42 (0.12, 0.72) 6.19
Parker et al.(2017) 170 0.20 (0.05, 0.35) 24.03
Pillay et al.(2017) 125 0.21 (0.04, 0.39) 17.55
Rosenfeld et al.(1996) 271 0.22 (0.10, 0.34) 38.56
Subtotal (I-squared = 0.0%, p = 0.420) 0.26 (0.18, 0.33) 100.00
Pain Interference
Evans, Fishman et al.(2003) 61 0.52 (0.27, 0.78) 8.76
Keltner et al.(2012) 397 0.48 (0.39, 0.58) 59.52
Lucey et al.(2011) 46 0.48 (0.19, 0.78) 6.50
Parker et al.(2017) 170 0.47 (0.32, 0.62) 25.23
Subtotal (I-squared = 0.0%, p = 0.990) 0.48 (0.41, 0.56) 100.00
Quality of Life
Evans et al.(1998) 40 -0.87 (-1.19, -0.55) 24.30
Parker et al.(2017) 170 -0.47 (-0.62, -0.32) 39.02
Pillay et al. (2017) 125 -0.35 (-0.53, -0.18) 36.68
Subtotal (I-squared = 73.3%, p = 0.024) -0.52 (-0.75, -0.30) 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
Fisher's z transformation of correlation coefficient (r)

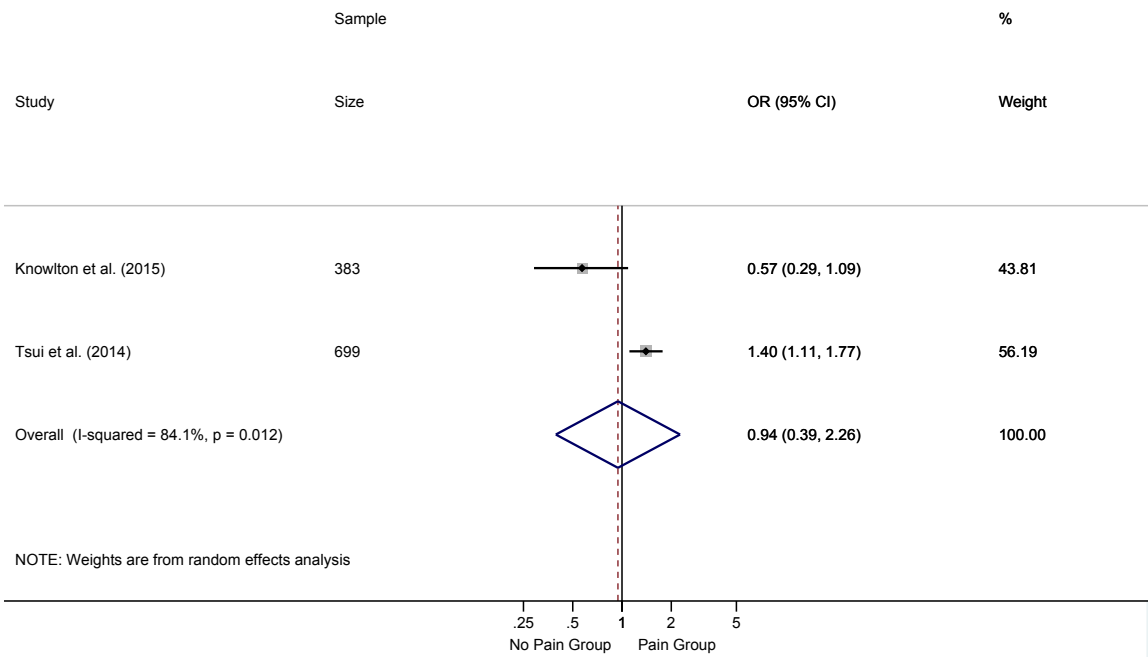
Supplemental Figure 8. Forest plot of cross-sectional correlations for depression. Pain severity and interference were positively associated with depression, as indicated by pooled correlations of >0. Quality of life was negatively associated with depression as indicated by a pooled correlation of <0. Note: CI, Confidence Interval.


Study
Sample Size
Fisher's z (95% CI)
% Weight
Pain Severity
Bakka (1995) 81 0.01 (-0.21, 0.23) 25.25
Evans, Fishman et al.(2003) 61 0.54 (0.28, 0.79) 23.66
Lucey et al.(2011) 46 0.68 (0.38, 0.98) 21.80
Rosenfeld et al.(1996) 270 0.23 (0.11, 0.35) 29.28
Subtotal (I-squared = 82.2%, p = 0.001) 0.35 (0.09, 0.60) 100.00
Pain Interference
Bakka(1995) 81 0.27 (0.04, 0.49) 35.14
Evans, Fishman et al.(2003) 61 0.71 (0.45, 0.97) 33.45
Lucey et al.(2011) 46 0.81 (0.51, 1.11) 31.40
Subtotal (I-squared = 81.2%, p = 0.005) 0.59 (0.24, 0.93) 100.00
NOTE: Weights are from random effects analysis
-1
-.5
0
.5
1
Fisher's z transformation of correlation coefficient (r)

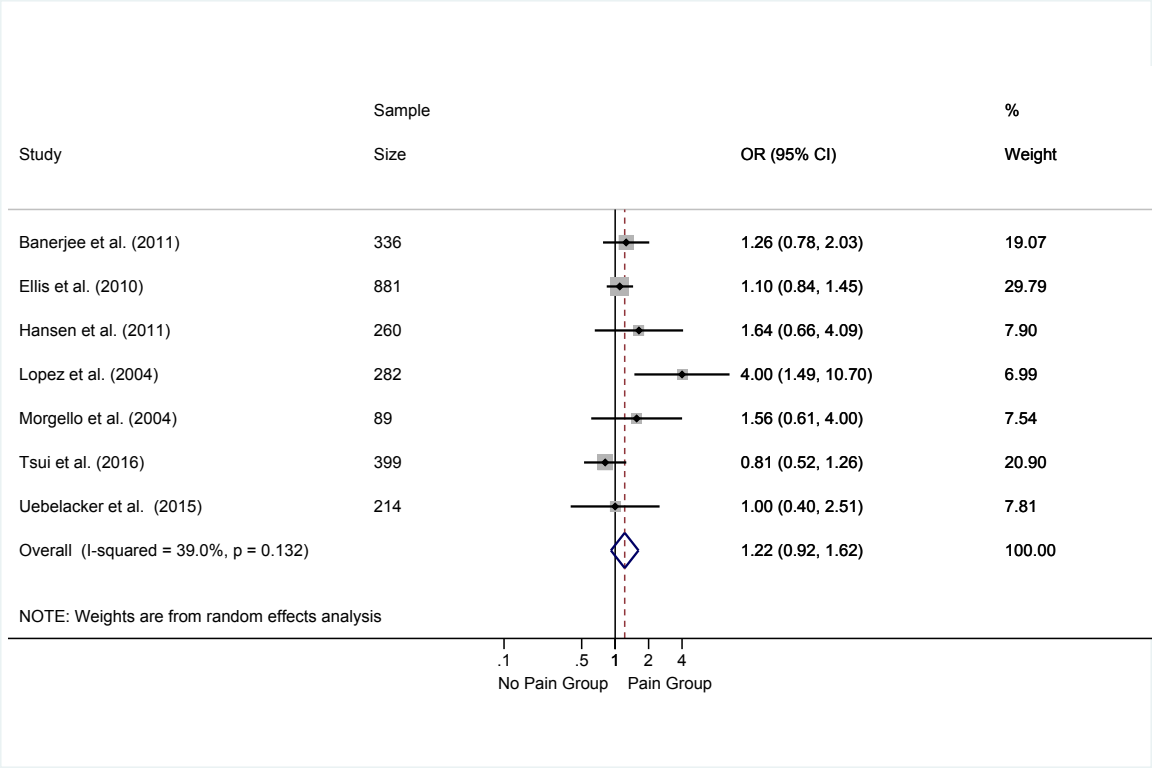
Supplemental Figure 9. Forest plot of cross-sectional correlations for psychological distress. Pain severity and interference were positively associated with distress, as indicated by pooled correlations of >0. Quality of life was negatively associated with distress as indicated by a pooled correlation of <0.


Study
Sample Size
Odds Ratio (95% CI)
% Weight
Knowlton et al. (2015)
383
2.27 (1.22, 4.24)
25.90
Tsui et al. (2013)
699
1.54 (1.11, 2.15)
74.10
Overall (I-squared = 14.0%, p = 0.281)
1.70 (1.22, 2.38)
100.00
NOTE: Weights are from random effects analysis
.1
.2
.5
1
2
3
4
No Pain Group
Pain Group

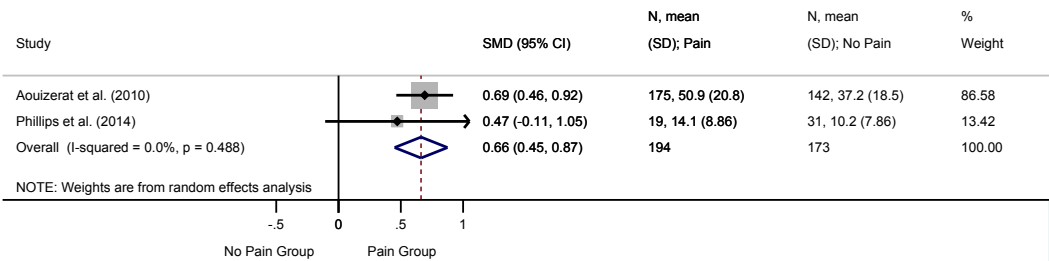
Supplemental Figure 10. Forest plot of odds ratios (OR) of baseline pain predicting follow-up heroin use. Higher pain at baseline predicted greater likelihood of heroin use at follow-up, as reflected in the pooled OR of >1. Note: CI, Confidence Interval.


Sample
%
Study
Size
OR (95% CI)
Weight
Knowlton et al. (2015)
383
0.57 (0.29, 1.09)
43.81
Tsui et al. (2014)
699
1.40 (1.11, 1.77)
56.19
Overall (I-squared = 84.1%, p = 0.012)
0.94 (0.39, 2.26)
100.00
NOTE: Weights are from random effects analysis
.25
.5
1
2
5
No Pain Group
Pain Group

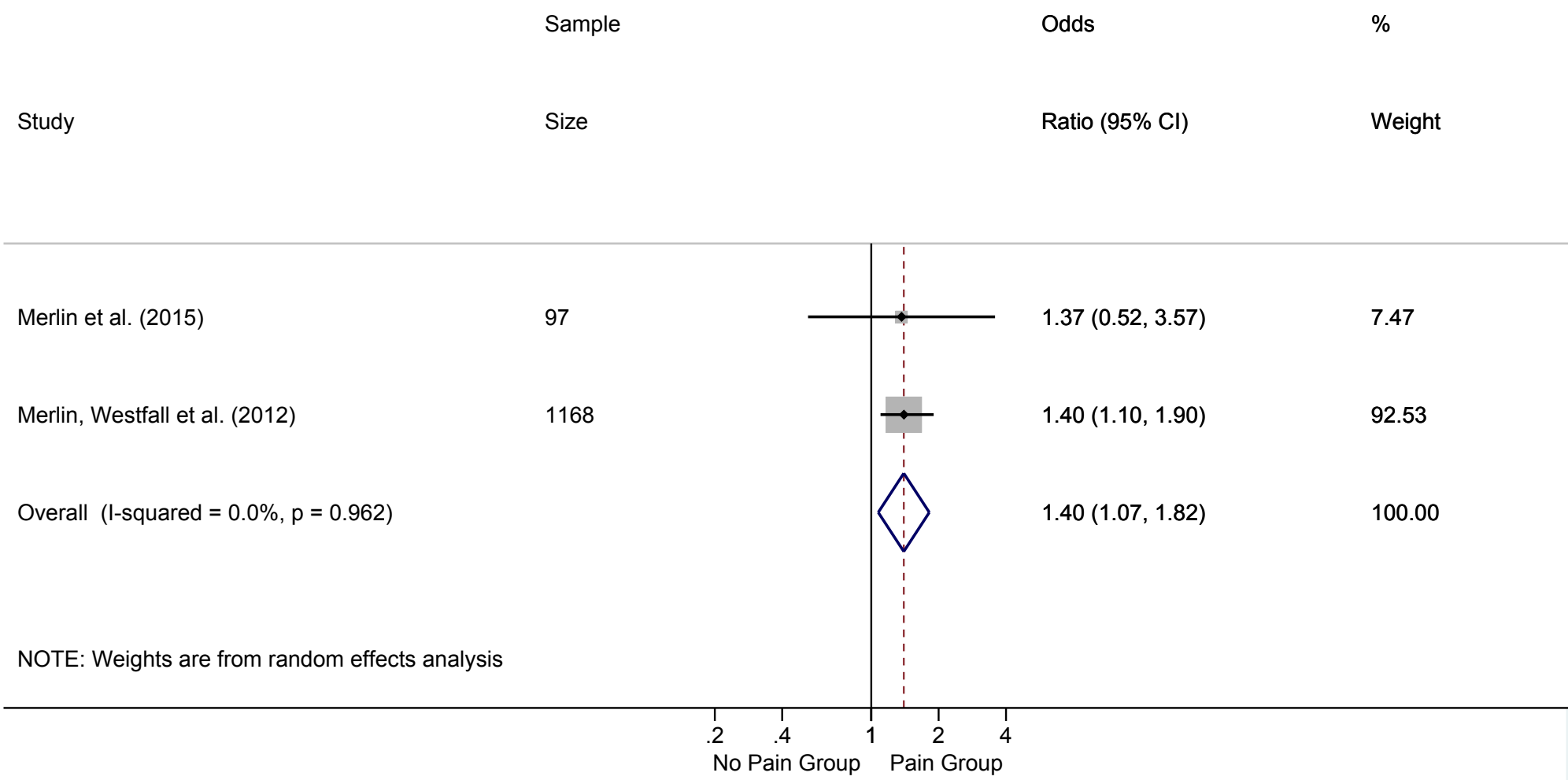
Supplemental Figure 11. Forest plot of odds ratios (OR) for baseline pain predicting follow-up alcohol abuse. Baseline pain did not predict follow-up alcohol abuse, as the confidence interval (CI) of the pooled odds ratio (OR) included 1.


Study
Sample Size
OR (95% CI)
% Weight
Banerjee et al. (2011) 336 1.26 (0.78, 2.03) 19.07
Ellis et al. (2010) 881 1.10 (0.84, 1.45) 29.79
Hansen et al. (2011) 260 1.64 (0.66, 4.09) 7.90
Lopez et al. (2004) 282 4.00 (1.49, 10.70) 6.99
Morgello et al. (2004) 89 1.56 (0.61, 4.00) 7.54
Tsui et al. (2016) 399 0.81 (0.52, 1.26) 20.90
Uebelacker et al. (2015) 214 1.00 (0.40, 2.51) 7.81
Overall (I-squared = 39.0%, p = 0.132) 1.22 (0.92, 1.62) 100.00
NOTE: Weights are from random effects analysis
.1
.5
1
2
4
No Pain Group
Pain Group

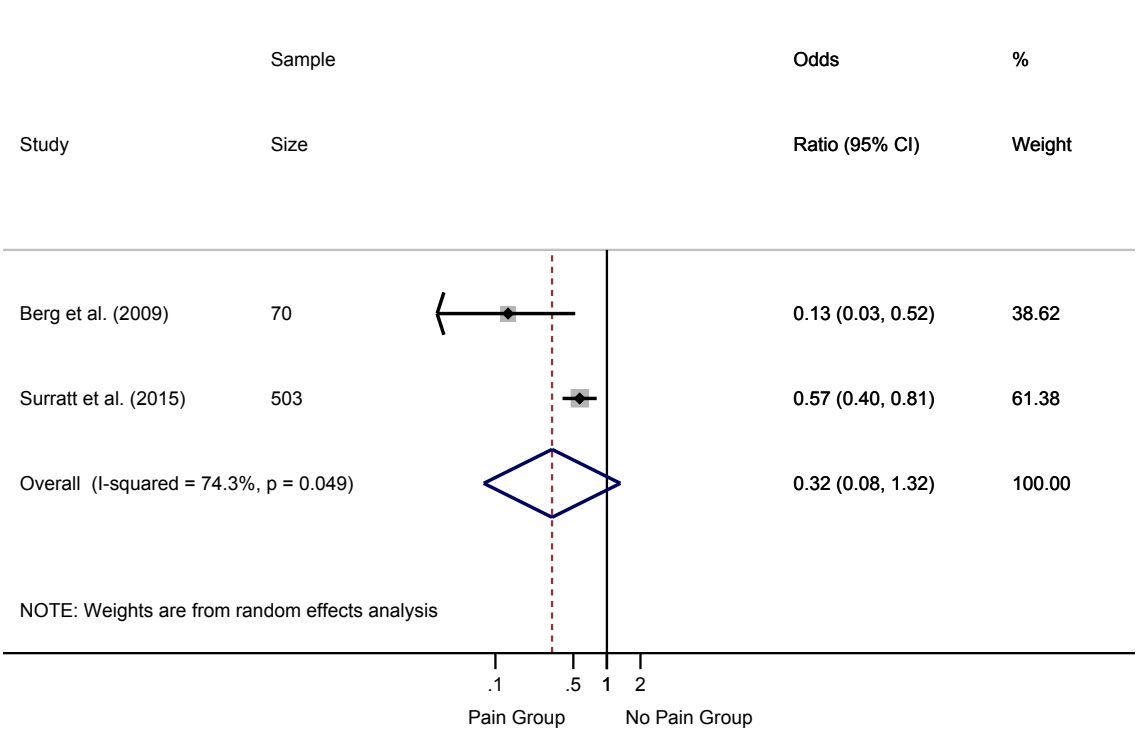
Supplemental Figure 12. Forest plot of cross-sectional odds ratios for alcohol abuse. Alcohol abuse did not differ between pain and no pain groups, as the confidence interval (CI) of the pooled odds ratio (OR) included 1.


Study
SMD (95% CI)
N, mean (SD); Pain
N, mean (SD); No Pain
% Weight
Aouizerat et al. (2010)
0.69 (0.46, 0.92)
175, 50.9 (20.8)
142, 37.2 (18.5)
86.58
Phillips et al. (2014)
0.47 (-0.11, 1.05)
19, 14.1 (8.86)
31, 10.2 (7.86)
13.42
Overall (I-squared = 0.0%, p = 0.488)
0.66 (0.45, 0.87)
194
173
100.00
NOTE: Weights are from random effects analysis
-.5
0
.5
1
No Pain Group
Pain Group

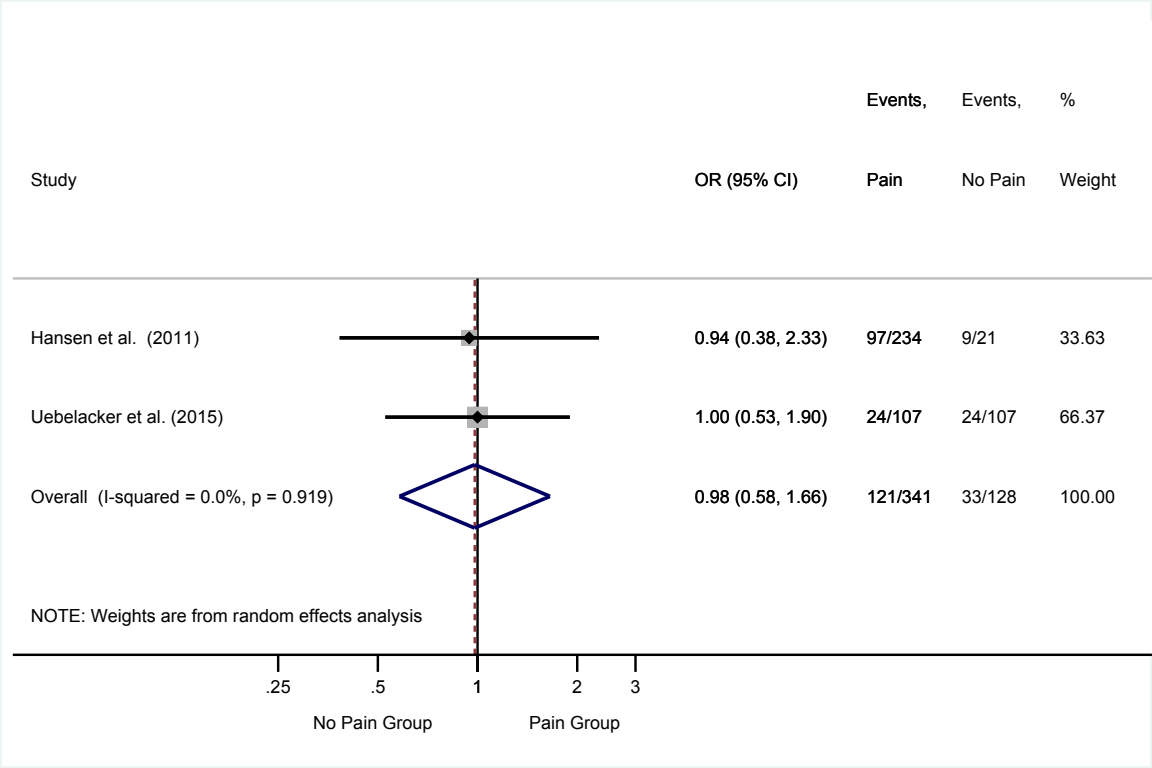
Supplemental Figure 13. Forest plot of cross-sectional standardized mean differences (SMD) for sleep disturbance. Sleep disturbance was more severe in participants with versus without pain, as indicated by a positive pooled SMD. Note: CI, Confidence Interval; SD, standard deviation.


Study
Sample Size
Odds Ratio (95% CI)
% Weight
Merlin et al. (2015)
97
1.37 (0.52, 3.57)
7.47
Merlin, Westfall et al. (2012)
1168
1.40 (1.10, 1.90)
92.53
Overall (I-squared = 0.0%, p = 0.962)
1.40 (1.07, 1.82)
100.00
NOTE: Weights are from random effects analysis
.2
.4
1
2
4
No Pain Group
Pain Group

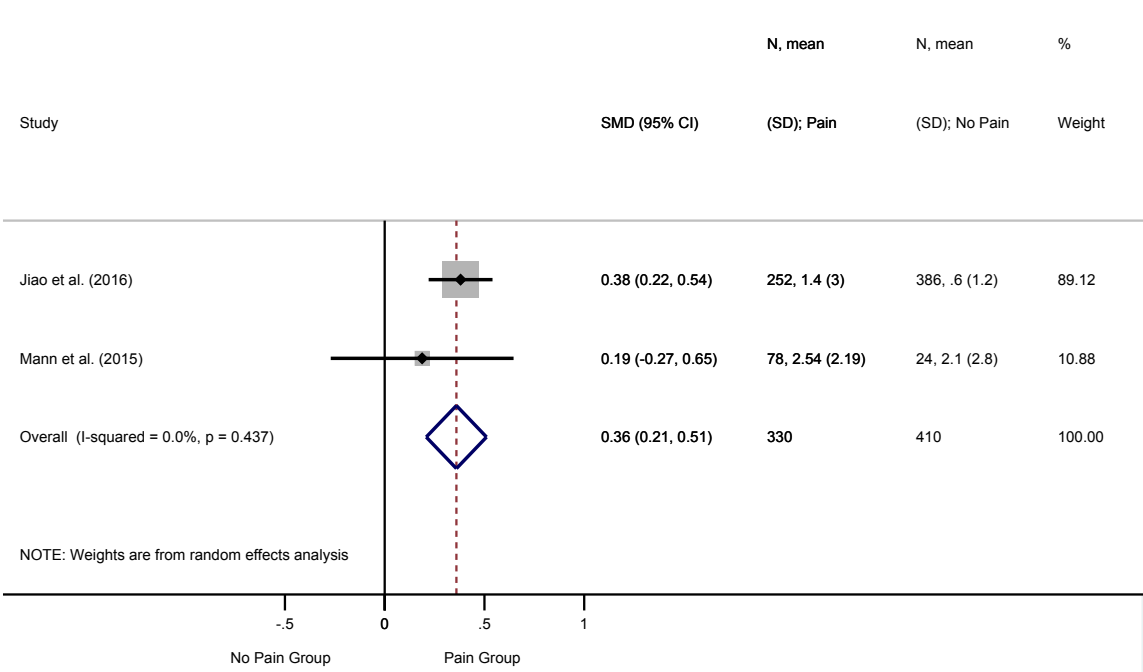
Supplemental Figure 14. Forest plot of cross-sectional odds ratios (OR) for ART non-adherence. Non-adherence was more likely in participants with versus without pain, as reflected in the pooled odds ratio (OR) of >1. Note: CI, Confidence Interval.


Sample
Odds
%
Study
Size
Ratio (95% CI)
Weight
Berg et al. (2009)
70
0.13 (0.03, 0.52)
38.62
Surratt et al. (2015)
503
0.57 (0.40, 0.81)
61.38
Overall (I-squared = 74.3%, p = 0.049)
0.32 (0.08, 1.32)
100.00
NOTE: Weights are from random effects analysis
.1
.5
1
2
Pain Group
No Pain Group

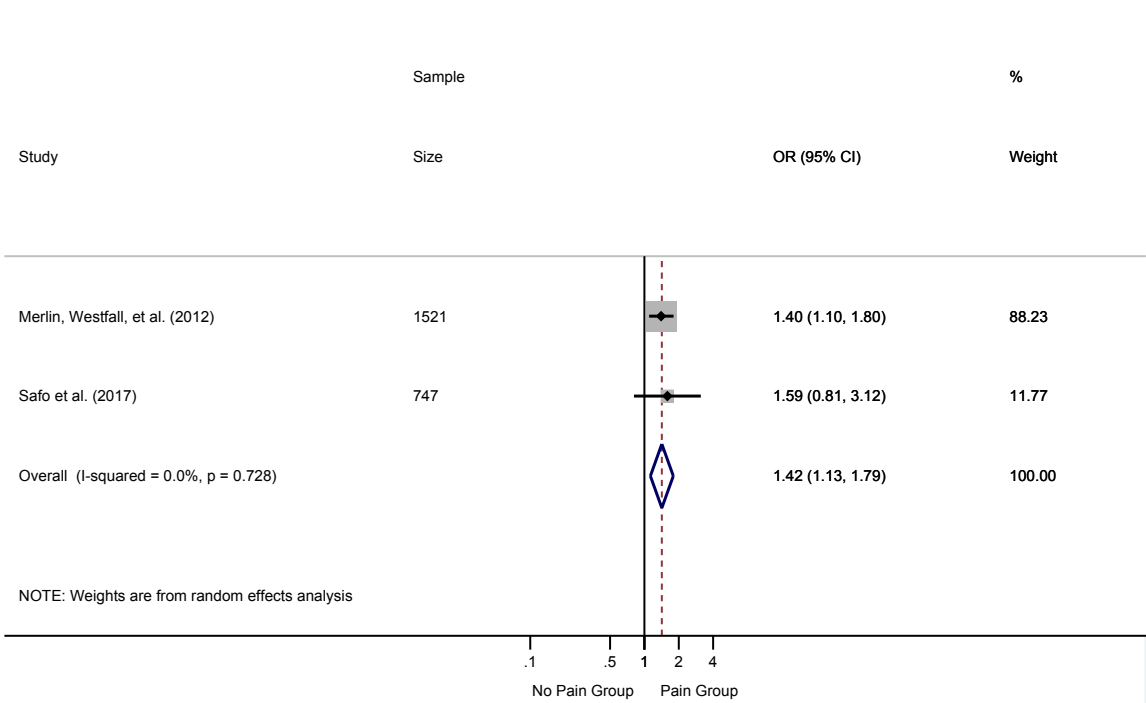
Supplemental Figure 15. Forest plot of cross-sectional odds ratios (OR) for ART adherence. Note: OR <1, pain group less likely to report optimal adherence. CI, Confidence Interval.


Study
OR (95% CI)
Events, Pain
Events, No Pain
% Weight
Hansen et al. (2011)
0.94 (0.38, 2.33)
97/234
9/21
33.63
Uebelacker et al. (2015)
1.00 (0.53, 1.90)
24/107
24/107
66.37
Overall (I-squared = 0.0%, p = 0.919)
0.98 (0.58, 1.66)
121/341
33/128
100.00
NOTE: Weights are from random effects analysis
.25
.5
1
2
3
No Pain Group
Pain Group

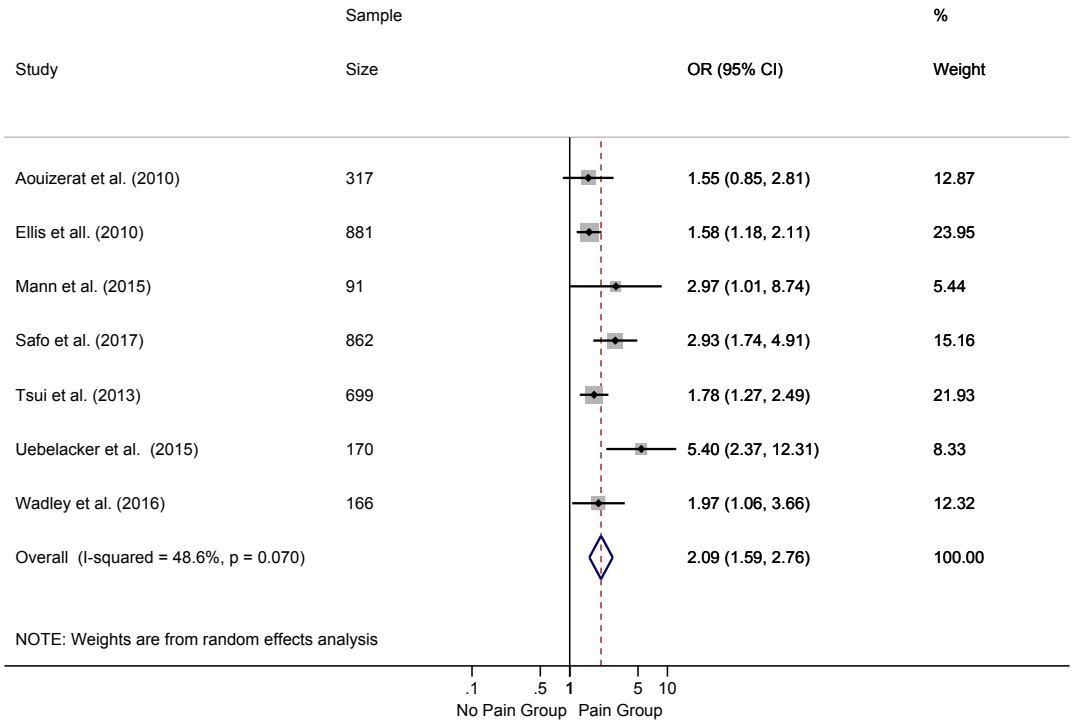
Supplemental Figure 16. Forest plot of cross-sectional events data for healthcare use. Health care use events did not differ between pain and no pain groups, as the confidence interval (CI) of the pooled odds ratio (OR) included 1.


N, mean
N, mean
%
Study
SMD (95% CI)
(SD); Pain
(SD); No Pain
Weight
Jiao et al. (2016)
0.38 (0.22, 0.54)
252, 1.4 (3)
386, .6 (1.2)
89.12
Mann et al. (2015)
0.19 (-0.27, 0.65)
78, 2.54 (2.19)
24, 2.1 (2.8)
10.88
Overall (I-squared = 0.0%, p = 0.437)
0.36 (0.21, 0.51)
330
410
100.00
NOTE: Weights are from random effects analysis
-.5
0
.5
1
No Pain Group
Pain Group

Supplemental Figure 17. Forest plot of cross-sectional standardized mean differences (SMD) for healthcare use. Mean healthcare use was greater in participants with versus without pain, as indicated by a positive pooled SMD. Note: CI, Confidence Interval; SD, standard deviation.


Study
Sample Size
OR (95% CI)
% Weight
Merlin, Westfall, et al. (2012)
1521
1.40 (1.10, 1.80)
88.23
Safo et al. (2017)
747
1.59 (0.81, 3.12)
11.77
Overall (I-squared = 0.0%, p = 0.728)
1.42 (1.13, 1.79)
100.00
NOTE: Weights are from random effects analysis
.1
.5
1
2
4
No Pain Group
Pain Group

Supplemental Figure 18. Forest plot of prospective odds ratios (OR) for pain predicting missed HIV clinic visits. Pain at baseline predicted greater likelihood of missed HIV clinic visits, as reflected in the pooled odds ratio (OR) of >1. Note: CI, Confidence Interval.


Sample
Size
%
Study
OR (95% CI)
Weight
Aouizerat et al. (2010) 317 1.55 (0.85, 2.81) 12.87
Ellis et all. (2010) 881 1.58 (1.18, 2.11) 23.95
Mann et al. (2015) 91 2.97 (1.01, 8.74) 5.44
Safo et al. (2017) 862 2.93 (1.74, 4.91) 15.16
Tsui et al. (2013) 699 1.78 (1.27, 2.49) 21.93
Uebelacker et al. (2015) 170 5.40 (2.37, 12.31) 8.33
Wadley et al. (2016) 166 1.97 (1.06, 3.66) 12.32
Overall (I-squared = 48.6%, p = 0.070) 2.09 (1.59, 2.76) 100.00
NOTE: Weights are from random effects analysis
.1
.5
1
5
10
No Pain Group
Pain Group

Supplemental Figure 19. Forest plot of cross-sectional odds ratios for unemployment. Unemployment was more likely in participants with versus without pain, as reflected in the pooled odds ratio (OR) of >1. Note: CI, Confidence Interval. Where there were separate categories for full and part-time employment, data from the 'employed full-time' category were extracted.