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Financial Incentives for Smoking Cessation – A Cochrane Review

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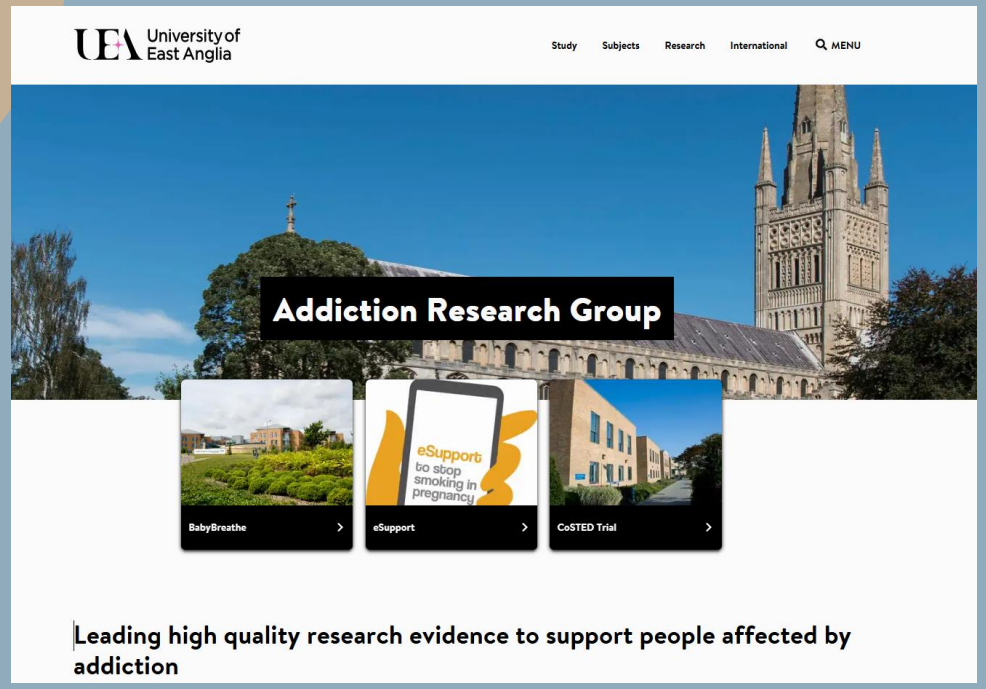
The views and opinions expressed are those of myself (and for the review results, my co-authors) and do not necessarily reflect those of the Cochrane Tobacco Addiction group, the NIHR, National Health Service (NHS) or the Department of Health.

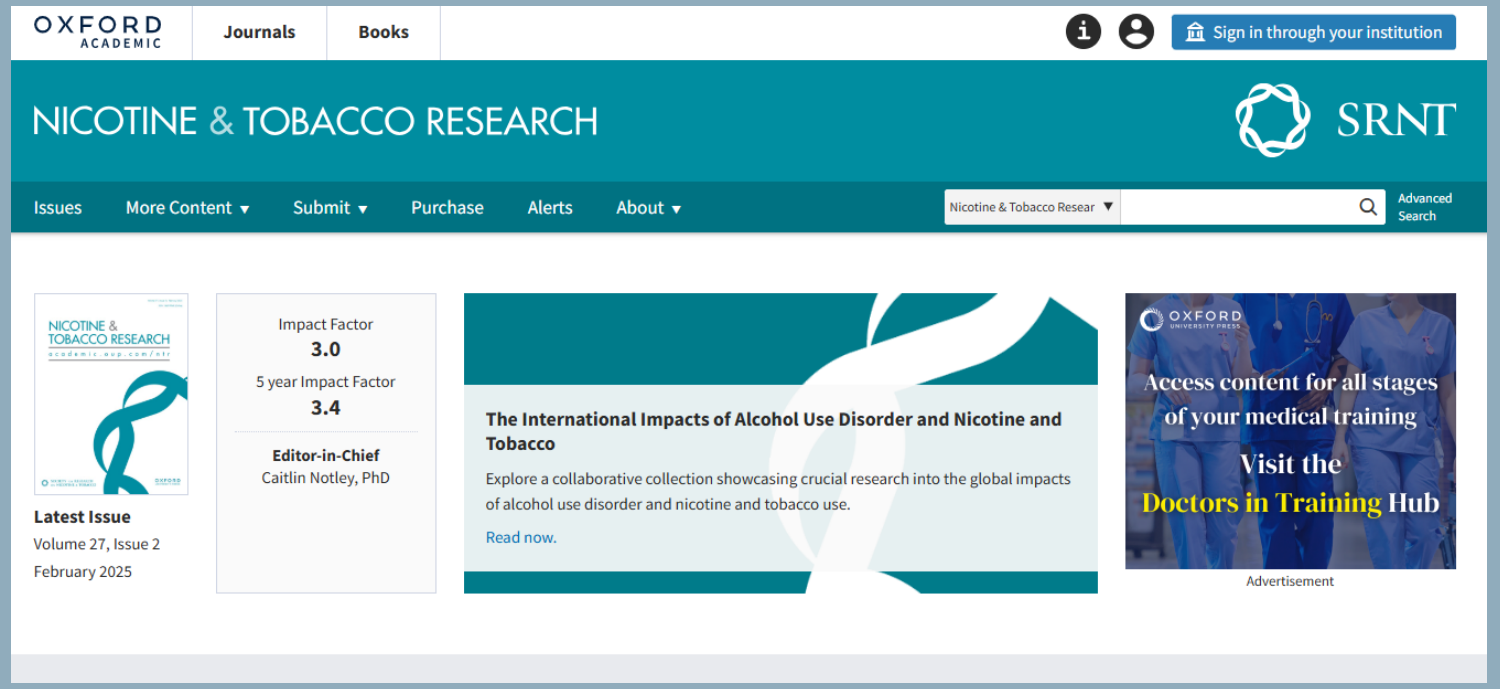
We have never received industry funding and have no conflicts of interest to declare

About the University of East Anglia

About me



[Addiction Research Group]



[Nicotine & Tobacco Research | Oxford Academic]

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About Cochrane

WHAT?

- Gathers and combines the best evidence from research to determine the benefits and risks of treatments/interventions

HOW?

- By systematically reviewing the available evidence, with strong emphasis on quality assessment
- Cochrane methods considered gold-standard

WHY?

- To help healthcare providers, patients, carers, researchers, funders, policy makers, guideline developers improve their knowledge and make decisions

Cochrane

Author team







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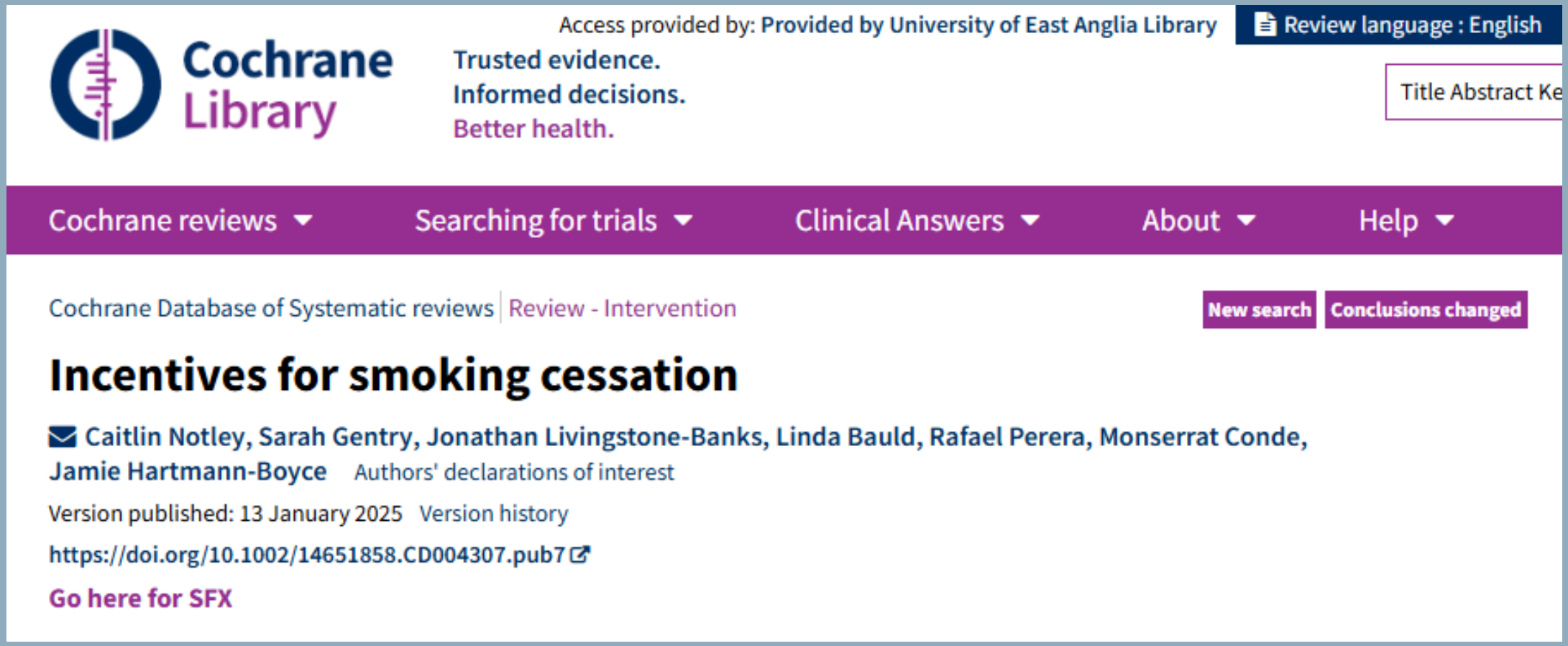


Notley C, Gentry S, Livingstone-Banks J, Bauld L, Perera R, Conde M, Hartmann-Boyce J. Incentives for smoking cessation. Cochrane Database of Systematic Reviews 2025, Issue 1. Art. No.: CD004307. DOI: 10.1002/14651858.CD004307.pub7. Accessed 03 February 2025.

Background: Incentives

- Smoking remains the leading preventable cause of death worldwide
- Incentive based programmes have been used to encourage positive health behaviour change, but are controversial:
- Public acceptability?
- Commissioning?
- Time limited effectiveness?

- Possible mechanisms of action (theory of behaviour change):
- Operant conditioning
- Delay discounting

Background: Incentives in pregnancy

- Pregnant women who smoke are a high risk priority group
- UK Government targets to reduce smoking in pregnancy rates to 5% or less have not been achieved
- Interest in trialling alternative, non-pharmacological, approaches to address smoking cessation in pregnancy

Background: The last Cochrane Incentives update

- Notley et al, **2019**
- Incentives found to be effective for smoking cessation in mixed populations, and in trials recruiting pregnant women
- Pooled relative risk (RR) for quitting with incentives at longest follow-up (six months or more) compared with controls was 1.49 (95% CI 1.28 to 1.73; 31 RCTs, adjusted N = 20,097; I^2 = 33%). **High certainty evidence.**
- Taken together, nine trials in pregnant smokers (eight conducted in the USA and one in the UK) delivered an RR at longest follow-up (up to 24 weeks post-partum) of 2.38, 95% CI 1.54 to 3.69; 9 RCTs; N = 2273; I2 = 41%) in favour of incentives. **Moderate certainty evidence**
- From 2015 update (Cahill et al): "Incentives appear to boost cessation rates while they are in place"
- From 2019 update: "Findings from our meta-analysis in mixed populations suggest that incentives continue to have a significant impact on sustained smoking cessation, even after they have finished."

Objectives

Primary

To assess the long-term effects of incentives and contingency management programmes for smoking cessation in mixed and pregnant populations.

Secondary

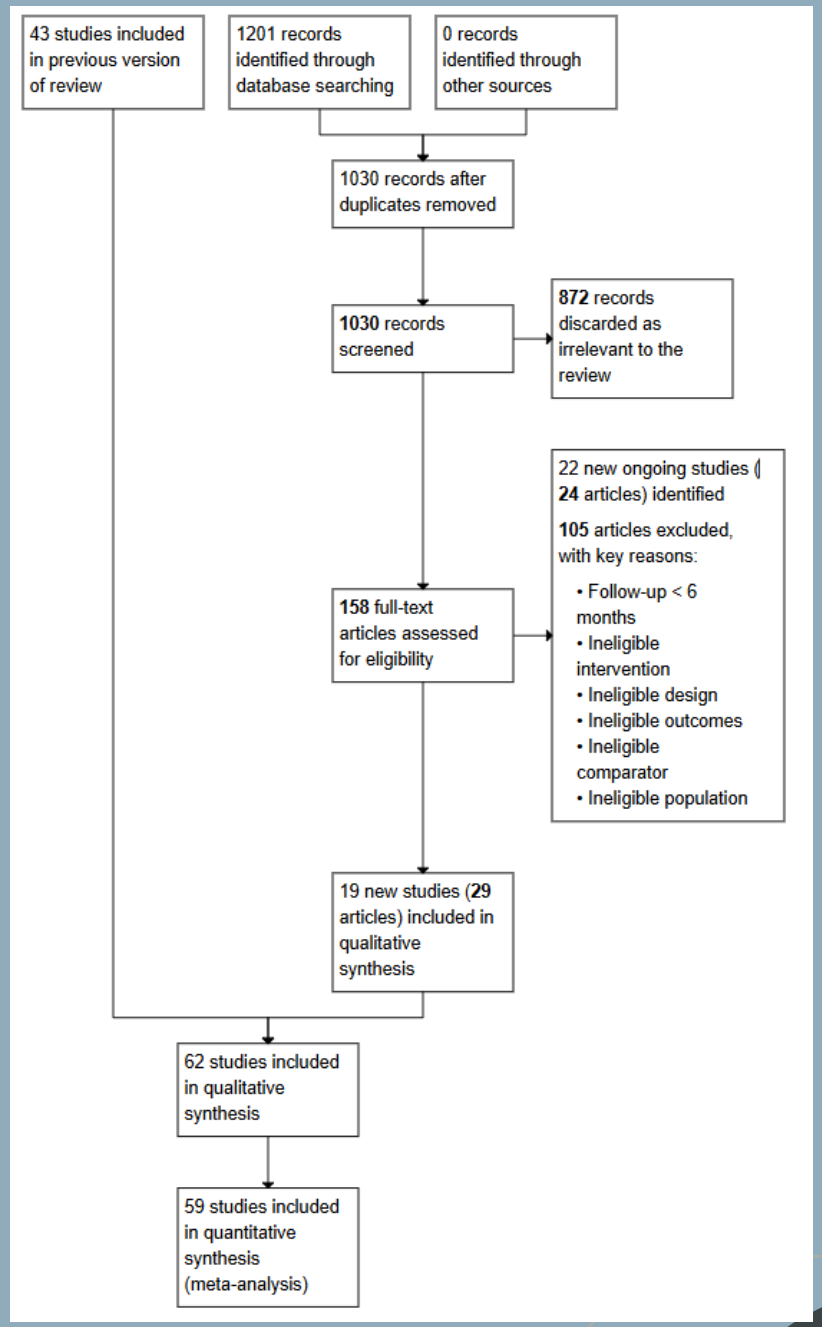
To assess the long-term effects of incentives and contingency management programmes for smoking cessation in mixed populations, considering whether incentives were offered at the final follow-up point.

To assess the difference in outcomes for pregnant populations, considering whether rewards were contingent on abstinence or guaranteed.

Selection criteria

- Studies: RCTs or cluster RCTs
- Participants: Adults who smoke
- Interventions: Incentive schemes to reward participants for validated cessation and abstinence
- Controls: Usual care or other smoking cessation interventions
- Outcomes: Long term smoking cessation (6 months or more), self-reported or biochemically validated (strictest available outcome)
- Pregnancy outcomes: long term smoking cessation to at least the end of pregnancy and at longest follow up postpartum

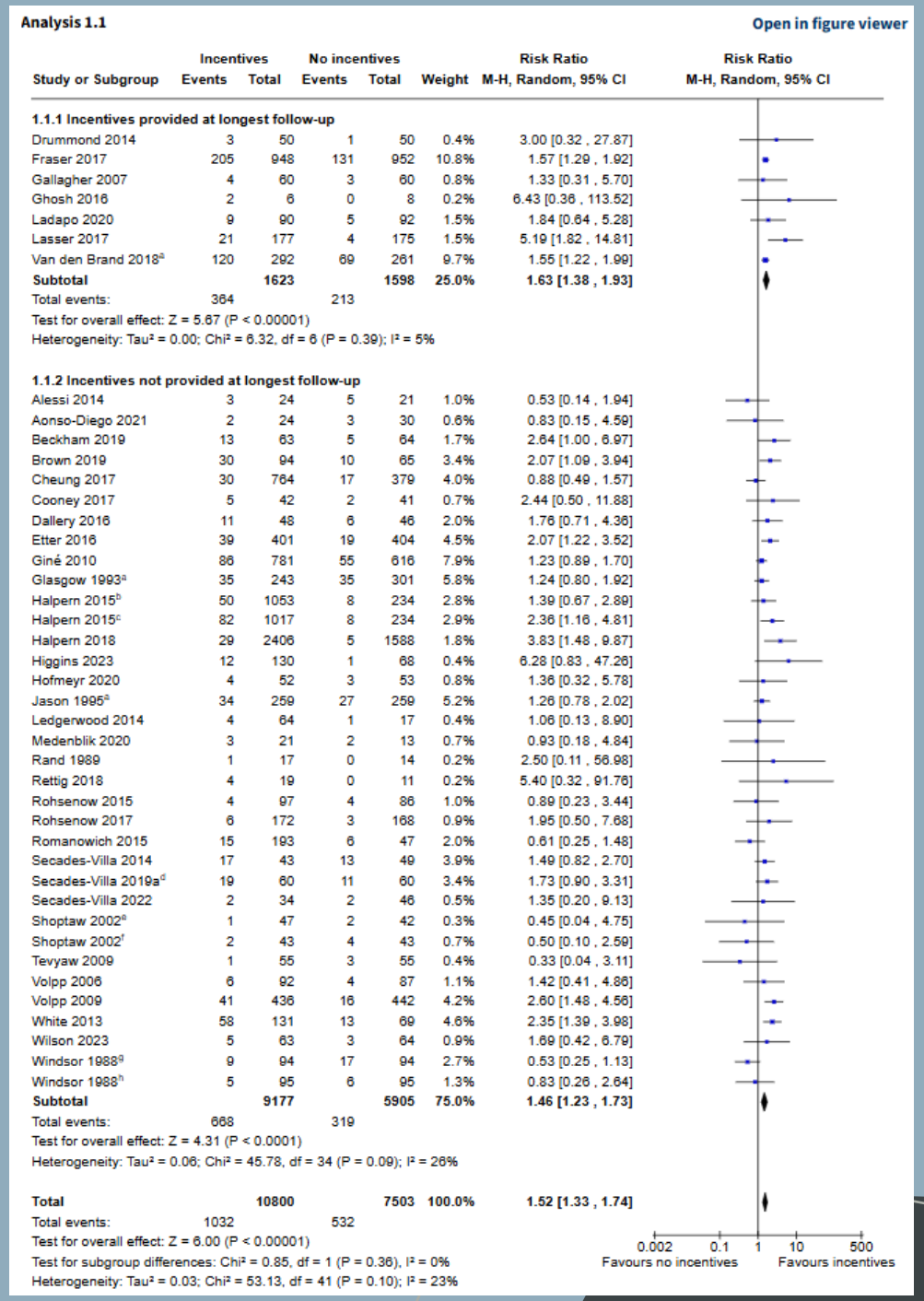
Main results: Included studies



Combined prisma flow diagram – mixed populations and pregnancy trials

Main results: Incentives vs. no incentives at 6+ months – Mixed population trials

GRADE certainty of evidence: HIGH



Analysis 1.1 — Open in figure viewer

Study or Subgroup	Incentives Events	Incentives Total	No incentives Events	No incentives Total	Weight	Risk Ratio M-H, Random, 95% CI
1.1.1 Incentives provided at longest follow-up						
Drummond 2014	3	50	1	50	0.4%	3.00 [0.32 , 27.87]
Fraser 2017	205	948	131	952	10.8%	1.57 [1.29 , 1.92]
Gallagher 2007	4	60	3	60	0.8%	1.33 [0.31 , 5.70]
Ghosh 2016	2	6	0	8	0.2%	6.43 [0.36 , 113.52]
Ladapo 2020	9	90	5	92	1.5%	1.84 [0.64 , 5.28]
Lasser 2017	21	177	4	175	1.5%	5.19 [1.82 , 14.81]
Van den Brand 2018[a]	120	292	69	261	9.7%	1.55 [1.22 , 1.99]
Subtotal		**1623**		**1598**	**25.0%**	**1.63 [1.38 , 1.93]**
Total events:	364		213			
Test for overall effect: Z = 5.67 (P < 0.00001)						
Heterogeneity: Tau² = 0.00; Chi² = 6.32, df = 6 (P = 0.39); I² = 5%						
1.1.2 Incentives not provided at longest follow-up						
Alessi 2014	3	24	5	21	1.0%	0.53 [0.14 , 1.94]
Aonso-Diego 2021	2	24	3	30	0.6%	0.83 [0.15 , 4.59]
Beckham 2019	13	63	5	64	1.7%	2.64 [1.00 , 6.97]
Brown 2019	30	94	10	65	3.4%	2.07 [1.09 , 3.94]
Cheung 2017	30	764	17	379	4.0%	0.88 [0.49 , 1.57]
Cooney 2017	5	42	2	41	0.7%	2.44 [0.50 , 11.88]
Dallery 2016	11	48	6	46	2.0%	1.76 [0.71 , 4.36]
Etter 2016	39	401	19	404	4.5%	2.07 [1.22 , 3.52]
Giné 2010	86	781	55	616	7.9%	1.23 [0.89 , 1.70]
Glasgow 1993[a]	35	243	35	301	5.8%	1.24 [0.80 , 1.92]
Halpern 2015[b]	50	1053	8	234	2.8%	1.39 [0.67 , 2.89]
Halpern 2015[c]	82	1017	8	234	2.9%	2.36 [1.16 , 4.81]
Halpern 2018	29	2406	5	1588	1.8%	3.83 [1.48 , 9.87]
Higgins 2023	12	130	1	68	0.4%	6.28 [0.83 , 47.26]
Hofmeyr 2020	4	52	3	53	0.8%	1.36 [0.32 , 5.78]
Jason 1995[a]	34	259	27	259	5.2%	1.26 [0.78 , 2.02]
Ledgerwood 2014	4	64	1	17	0.4%	1.06 [0.13 , 8.90]
Medenblik 2020	3	21	2	13	0.7%	0.93 [0.18 , 4.84]
Rand 1989	1	17	0	14	0.2%	2.50 [0.11 , 56.98]
Rettig 2018	4	19	0	11	0.2%	5.40 [0.32 , 91.76]
Rohsenow 2015	4	97	4	86	1.0%	0.89 [0.23 , 3.44]
Rohsenow 2017	6	172	3	168	0.9%	1.95 [0.50 , 7.68]
Romanowich 2015	15	193	6	47	2.0%	0.61 [0.25 , 1.48]
Secades-Villa 2014	17	43	13	49	3.9%	1.49 [0.82 , 2.70]
Secades-Villa 2019a[d]	19	60	11	60	3.4%	1.73 [0.90 , 3.31]
Secades-Villa 2022	2	34	2	46	0.5%	1.35 [0.20 , 9.13]
Shoptaw 2002[e]	1	47	2	42	0.3%	0.45 [0.04 , 4.75]
Shoptaw 2002[f]	2	43	4	43	0.7%	0.50 [0.10 , 2.59]
Tevyaw 2009	1	55	3	55	0.4%	0.33 [0.04 , 3.11]
Volpp 2006	6	92	4	87	1.1%	1.42 [0.41 , 4.86]
Volpp 2009	41	436	16	442	4.2%	2.60 [1.48 , 4.56]
White 2013	58	131	13	69	4.6%	2.35 [1.39 , 3.98]
Wilson 2023	5	63	3	64	0.9%	1.69 [0.42 , 6.79]
Windsor 1988[g]	9	94	17	94	2.7%	0.53 [0.25 , 1.13]
Windsor 1988[h]	5	95	6	95	1.3%	0.83 [0.26 , 2.64]
Subtotal		**9177**		**5905**	**75.0%**	**1.46 [1.23 , 1.73]**
Total events:	668		319			
Test for overall effect: Z = 4.31 (P < 0.0001)						
Heterogeneity: Tau² = 0.06; Chi² = 45.78, df = 34 (P = 0.09); I² = 26%						
Total		**10800**		**7503**	**100.0%**	**1.52 [1.33 , 1.74]**
Total events:	1032		532			
Test for overall effect: Z = 6.00 (P < 0.00001)						
Test for subgroup differences: Chi² = 0.85, df = 1 (P = 0.36), I² = 0%						
Heterogeneity: Tau² = 0.03; Chi² = 53.13, df = 41 (P = 0.10); I² = 23%						

Risk Ratio M-H, Random, 95% CI

0.002 0.1 1 10 500

Favours no incentives Favours incentives

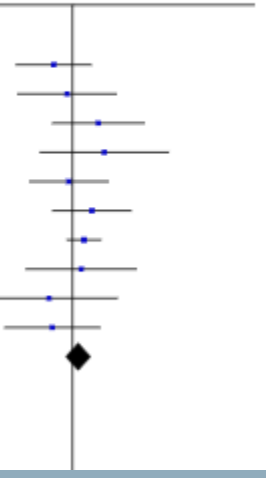
Incentives vs. no incentives at 6+ months – Substance misuse sub-group

Analysis 1.2 Open in figure viewer

Study or Subgroup	Incentives Events	Incentives Total	No incentives Events	No incentives Total	Weight	Risk Ratio M-H, Random, 95% CI
1.2.1 Substance misusers						
Alessi 2014	3	24	5	21	1.0%	0.53 [0.14 , 1.94]
Aonso-Diego 2021	2	24	3	30	0.6%	0.83 [0.15 , 4.59]
Cooney 2017	5	42	2	41	0.7%	2.44 [0.50 , 11.88]
Drummond 2014	3	50	1	50	0.4%	3.00 [0.32 , 27.87]
Rohsenow 2015	4	97	4	86	1.0%	0.89 [0.23 , 3.44]
Rohsenow 2017	6	172	3	168	0.9%	1.95 [0.50 , 7.68]
Secades-Villa 2014	17	43	13	49	3.9%	1.49 [0.82 , 2.70]
Secades-Villa 2022	2	34	2	46	0.5%	1.35 [0.20 , 9.13]
Shoptaw 2002[a]	1	47	2	42	0.3%	0.45 [0.04 , 4.75]
Shoptaw 2002[b]	2	43	4	43	0.7%	0.50 [0.10 , 2.59]
Subtotal		**576**		**576**	**10.0%**	**1.22 [0.82 , 1.82]**
Total events:	45		39			

Test for overall effect: Z = 0.97 (P = 0.33)

Heterogeneity: Tau² = 0.00; Chi² = 6.10, df = 9 (P = 0.73); I² = 0%



Incentives vs. no incentives at 6+ months – Adjusted analysis including cRCTS

Analysis 1.3 Open in figure viewer

Study or Subgroup	log[OR]	SE	Incentives Total	Control Total	Weight	Odds Ratio IV, Random, 95% CI
Alessi 2014	-0.776529	0.815424	24	21	0.7%	0.46 [0.09 , 2.27]
Anderson 2021	1.036737	0.779845	208	103	0.7%	2.82 [0.61 , 13.00]
Aonso-Diego 2021	-0.198451	0.947835	24	30	0.5%	0.82 [0.13 , 5.26]
Beckham 2019	1.121026	0.560243	64	63	1.3%	3.07 [1.02 , 9.20]
Brown 2019	0.947789	0.40837	94	65	2.2%	2.58 [1.16 , 5.74]
Cheung 2017	-0.139262	0.312512	764	379	3.2%	0.87 [0.47 , 1.61]
Cooney 2017	0.891998	0.808179	42	41	0.7%	2.44 [0.50 , 11.89]
Dallery 2016	0.565314	0.463009	48	46	1.8%	1.76 [0.71 , 4.36]
Drummond 2014	1.098612	1.139558	50	50	0.3%	3.00 [0.32 , 28.00]
Etter 2016	0.727549	0.270314	401	404	3.9%	2.07 [1.22 , 3.52]
Fraser 2017	0.451076	0.101452	948	952	8.2%	1.57 [1.29 , 1.92]
Gallagher 2007	0.285179	0.742781	60	60	0.8%	1.33 [0.31 , 5.70]
Ghosh 2016	1.860975	1.46779	6	8	0.2%	6.43 [0.36 , 114.18]
Giné 2010	0.207014	0.165095	781	616	6.3%	1.23 [0.89 , 1.70]
Glasgow 1993	0.215111	0.223338	243	301	4.8%	1.24 [0.80 , 1.92]
Halpern 2015[a]	0.329304	0.372898	1017	234	2.5%	1.39 [0.67 , 2.89]
Halpern 2015[b]	0.858662	0.362832	1053	234	2.6%	2.36 [1.16 , 4.81]
Halpern 2018	1.342865	0.484054	2406	1588	1.7%	3.83 [1.48 , 9.89]
Higgins 2023	-1	1.048433	63	42	0.4%	0.37 [0.05 , 2.87]
Hofmeyr 2020	0.307485	0.738238	52	53	0.8%	1.36 [0.32 , 5.78]
Jason 1995[c]	0.231112	0.242749	259	259	4.4%	1.26 [0.78 , 2.03]
Ladapo 2020	0.900161	0.362968	65	72	2.6%	2.46 [1.21 , 5.01]
Lasser 2017	1.646734	0.534823	177	175	1.4%	5.19 [1.82 , 14.81]
Ledgerwood 2014	0.058269	1.07815	64	17	0.4%	1.06 [0.13 , 8.77]
Medenblik 2020	0.076961	0.838076	13	21	0.6%	1.08 [0.21 , 5.58]
Pisinger 2022[d]	0.122218	0.226357	295	580	4.8%	1.13 [0.73 , 1.76]
Rand 1989	0.916291	1.594411	17	14	0.2%	2.50 [0.11 , 56.90]
Rettig 2018	1.686399	1.44355	19	11	0.2%	5.40 [0.32 , 91.44]
Rohsenow 2015	-0.116534	0.690101	97	86	0.9%	0.89 [0.23 , 3.44]
Rohsenow 2017	0.667829	0.696892	172	168	0.9%	1.95 [0.50 , 7.64]
Romanowich 2015	-0.494296	0.453666	193	47	1.8%	0.61 [0.25 , 1.48]
Secades-Villa 2014	0.398776	0.304011	43	49	3.3%	1.49 [0.82 , 2.70]
Secades-Villa 2019a[e]	0.548121	0.332228	60	60	3.0%	1.73 [0.90 , 3.32]
Secades-Villa 2022	0.300105	0.974764	34	46	0.5%	1.35 [0.20 , 9.12]
Shoptaw 2002[f]	-0.693147	0.830179	47	42	0.6%	0.50 [0.10 , 2.54]
Shoptaw 2002[g]	-0.798508	1.21865	43	43	0.3%	0.45 [0.04 , 4.90]
Tevyaw 2009	-1.108663	1.110607	55	55	0.4%	0.33 [0.04 , 2.91]
Van den Brand 2018	0.438255	0.12482	292	261	7.5%	1.55 [1.21 , 1.98]
Van Schayck 2018	0.947789	0.201274	320	320	5.3%	2.58 [1.74 , 3.83]
Volpp 2006	0.350657	0.630786	92	87	1.0%	1.42 [0.41 , 4.89]
Volpp 2009	0.955511	0.287067	436	442	3.6%	2.60 [1.48 , 4.56]
White 2013	0.854415	0.268367	131	69	3.9%	2.35 [1.39 , 3.98]
White 2020[c]	0.559616	0.237436	3746	223	4.5%	1.75 [1.10 , 2.79]
Wilson 2023	0.524729	0.70995	63	64	0.8%	1.69 [0.42 , 6.80]
Windsor 1988[h]	-0.18633	0.5913	95	95	1.2%	0.83 [0.26 , 2.64]
Windsor 1988[i]	-0.634878	0.384832	94	94	2.4%	0.53 [0.25 , 1.13]
Total			**15270**	**8690**	**100.0%**	**1.57 [1.37 , 1.79]**

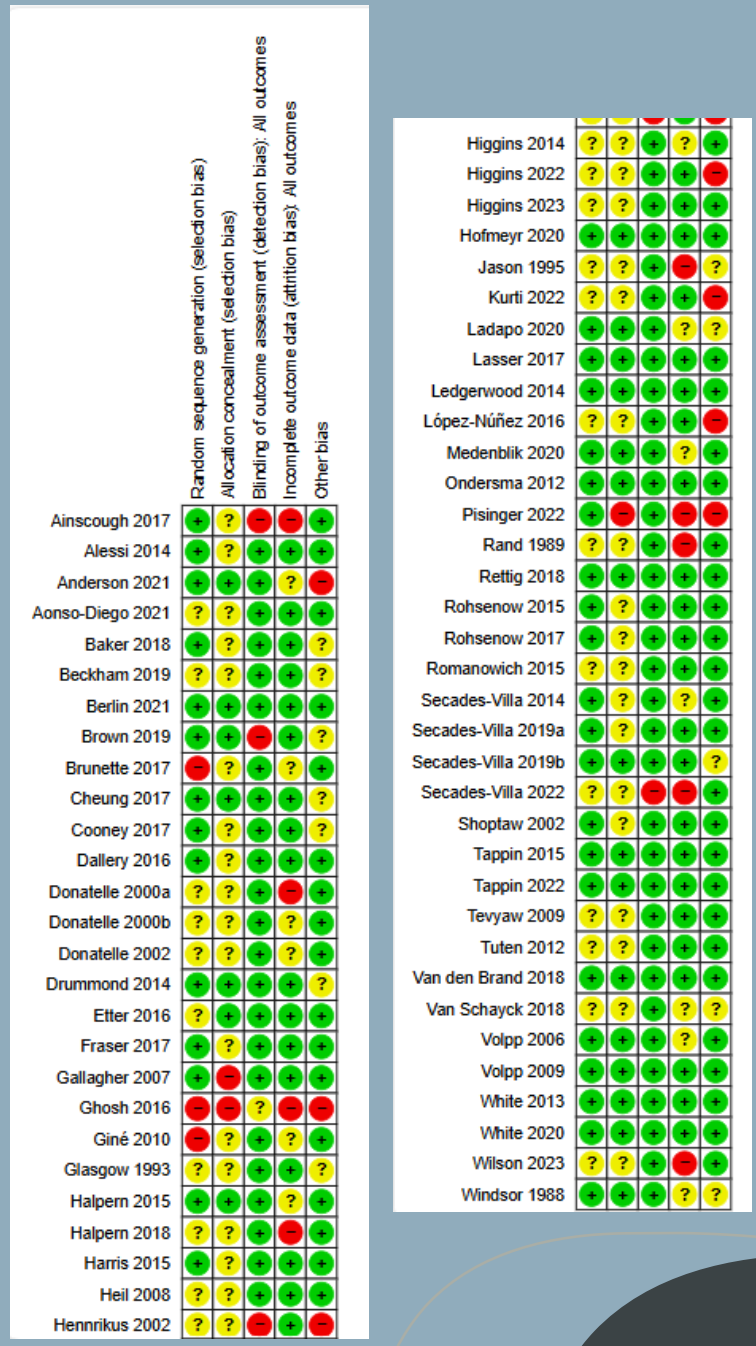
Odds Ratio IV, Random, 95% CI

0.01 0.1 1 10 100

Favours no incentives Favours incentives

Test for overall effect: Z = 6.60 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² = 0.05; Chi² = 64.09, df = 45 (P = 0.03); I² = 30%

Risk of bias


Random sequence generation (selection bias)
Allocation concealment (selection bias)
Blinding of outcome assessment (detection bias): All outcomes
Incomplete outcome data (attrition bias): All outcomes
Other bias
Ainscough 2017
Alessi 2014
Anderson 2021
Aonso-Diego 2021
Baker 2018
Beckham 2019
Berlin 2021
Brown 2019
Brunette 2017
Cheung 2017
Cooney 2017
Dallery 2016
Donatelle 2000a
Donatelle 2000b
Donatelle 2002
Drummond 2014
Etter 2016
Fraser 2017
Gallagher 2007
Ghosh 2016
Giné 2010
Glasgow 1993
Halpern 2015
Halpern 2018
Harris 2015
Heil 2008
Hennrikus 2002
Higgins 2014
Higgins 2022
Higgins 2023
Hofmeyr 2020
Jason 1995
Kurti 2022
Ladapo 2020
Lasser 2017
Ledgerwood 2014
López-Núñez 2016
Medenblik 2020
Ondersma 2012
Pisinger 2022
Rand 1989
Rettig 2018
Rohsenow 2015
Rohsenow 2017
Romanowich 2015
Secades-Villa 2014
Secades-Villa 2019a
Secades-Villa 2019b
Secades-Villa 2022
Shoptaw 2002
Tappin 2015
Tappin 2022
Tevyaw 2009
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Van den Brand 2018
Van Schayck 2018
Volpp 2006
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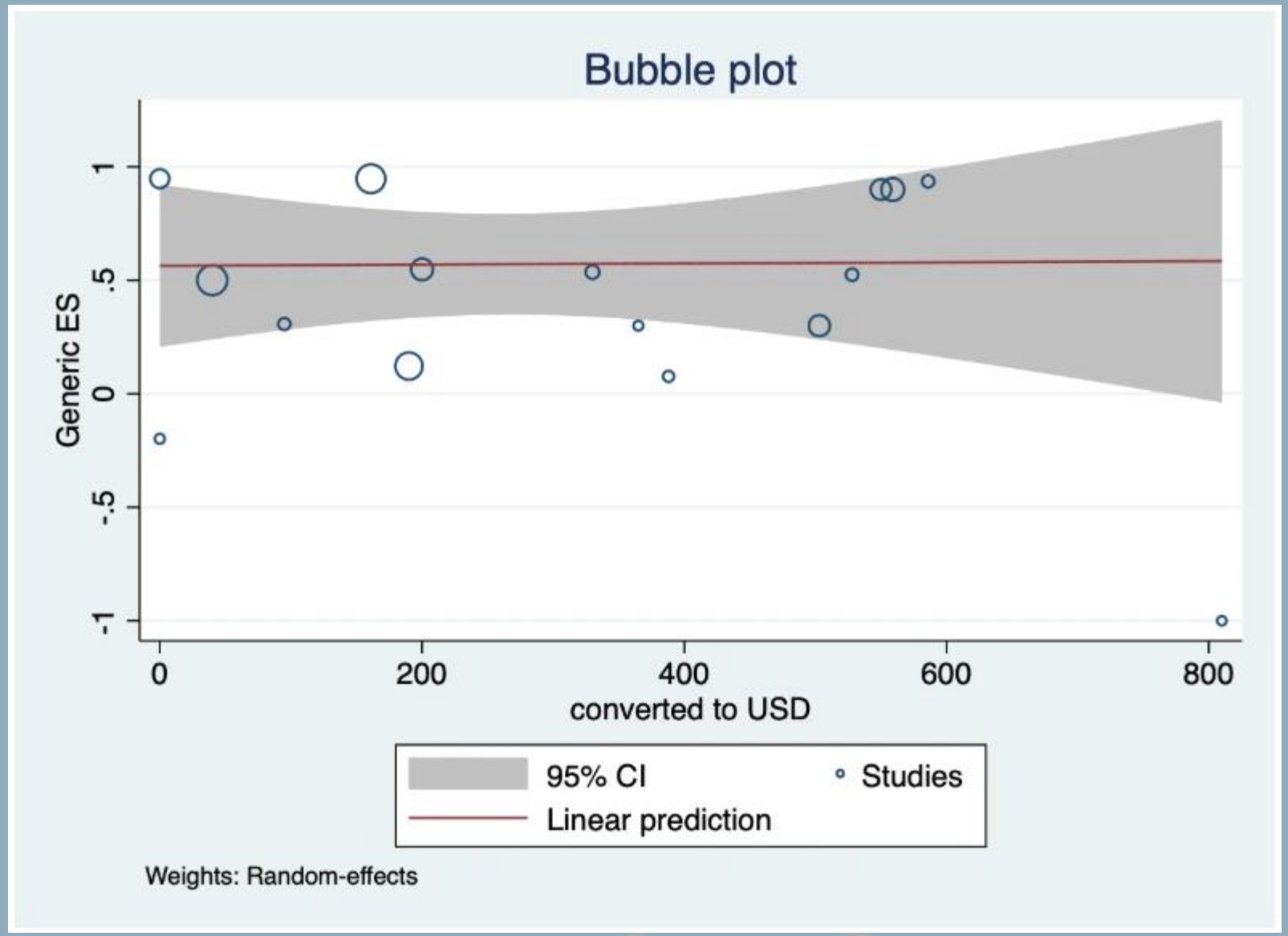
White 2013
White 2020
Wilson 2023
Windsor 1988

Amount of incentives



Pause for questions and discussion

Main results: Incentives vs. no incentives at Longest follow up – Pregnancy trials

GRADE certainty of evidence: HIGH

New

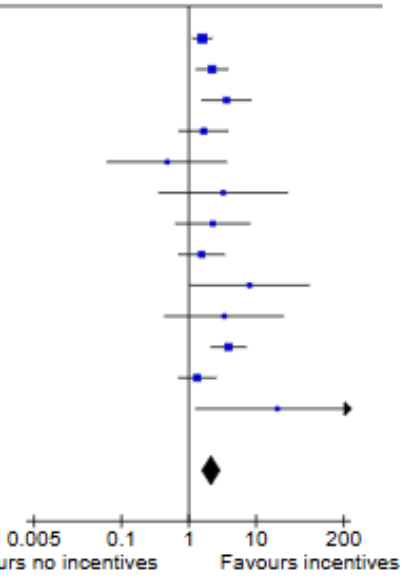
Analysis 2.1 Open in figure viewer

Study or Subgroup	Incentives Events	Incentives Total	No incentives Events	No incentives Total	Weight	Risk Ratio M-H, Random, 95% CI
Baker 2018	74	505	47	509	20.9%	1.59 [1.12 , 2.24]
Berlin 2021	38	231	17	229	14.7%	2.22 [1.29 , 3.81]
Donatelle 2000a	22	103	6	102	8.4%	3.63 [1.54 , 8.58]
Donatelle 2000b	13	67	7	60	8.5%	1.66 [0.71 , 3.89]
Harris 2015	1	7	3	10	1.9%	0.48 [0.06 , 3.69]
Heil 2008	3	37	1	40	1.7%	3.24 [0.35 , 29.82]
Higgins 2014	7	40	3	39	4.5%	2.27 [0.63 , 8.17]
Higgins 2022	13	85	9	91	9.4%	1.55 [0.70 , 3.43]
Kurti 2022[a]	7	43	1	49	1.9%	7.98 [1.02 , 62.27]
Ondersma 2012	7	48	1	23	2.0%	3.35 [0.44 , 25.68]
Tappin 2015[b]	47	306	12	303	12.9%	3.88 [2.10 , 7.16]
Tappin 2022	20	471	15	470	12.0%	1.33 [0.69 , 2.57]
Tuten 2012	13	42	0	32	1.1%	20.72 [1.28 , 336.01]
Total		**1985**		**1957**	**100.0%**	**2.13 [1.58 , 2.86]**
Total events:	265		122			

Test for overall effect: Z = 5.01 (P < 0.00001)

Test for subgroup differences: Not applicable

Heterogeneity: Tau² = 0.08; Chi² = 17.46, df = 12 (P = 0.13); I² = 31%



Footnotes

[a]Numbers interpreted from a figure, not reported in text

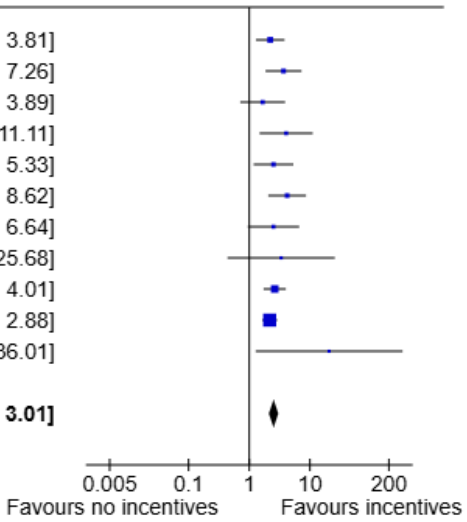
[b]12 months post-target quit date

Comparison 2: Incentives for smoking cessation: pregnant people, Outcome 1: Smoking cessation at longest follow-up

Main results: Incentives vs. no incentives at End of pregnancy

Study or Subgroup	Incentives Events	Incentives Total	No incentives Events	No incentives Total	Weight	Risk ratio M-H, Random, 95% CI
Berlin 2021	38	231	17	229	10.9%	2.22 [1.29 , 3.81]
Donatelle 2000a	34	105	9	102	6.9%	3.67 [1.85 , 7.26]
Donatelle 2000b[a]	13	67	7	60	4.4%	1.66 [0.71 , 3.89]
Heil 2008	15	37	4	40	3.2%	4.05 [1.48 , 11.11]
Higgins 2014[a]	18	40	7	39	5.7%	2.51 [1.18 , 5.33]
Higgins 2022[a]	31	81	8	88	6.3%	4.21 [2.06 , 8.62]
Kurti 2022[b]	11	43	5	49	3.4%	2.51 [0.95 , 6.64]
Ondersma 2012[c]	7	48	1	23	0.8%	3.35 [0.44 , 25.68]
Tappin 2015	69	306	26	303	18.0%	2.63 [1.72 , 4.01]
Tappin 2022	126	471	58	470	40.0%	2.17 [1.63 , 2.88]
Tuten 2012[d]	13	42	0	32	0.4%	20.72 [1.28 , 336.01]
Total (Wald[e])		**1471**		**1435**	**100.0%**	**2.52 [2.10 , 3.01]**
Total events:	375		142			

Test for overall effect: Z = 10.09 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[f]) = 0.00; Chi² = 8.65, df = 10 (P = 0.57); I² = 0%



Footnotes

[a]Extrapolated from %
[b]Numbers interpreted from a figure, not reported in text
[c]Results reported only to end of 10-week programme (end of pregnancy)
[d]Results reported only to end of 12-week programme (end of pregnancy)
[e]CI calculated by Wald-type method.
[f]Tau² calculated by DerSimonian and Laird method.

Conclusions

1. High-certainty evidence that incentives improve smoking cessation rates at long-term follow-up in mixed population studies
2. Effectiveness of incentives is sustained even when the last follow-up occurs after the withdrawal of incentives
3. High-certainty evidence that incentive schemes conducted amongst pregnant people who smoke improve smoking cessation rates, both at the end of pregnancy and postpartum – **This represents increased certainty in the evidence compared to the last review update in 2019**

Implications

This review includes a number of large new trials from diverse cultural settings, e.g:

- Brown (2019) – using self-incentives in a community-based trial, UK, N=159
- Secades-Villa 2019a – recruiting people who smoke in inpatient treatment for depression, Spain, N=120
- Van-Schayck 2018 – cRCT N=640 current smokers recruited from 61 companies in the Netherlands
- White 2020 – cRCT recruiting 4190 employees across 101 workplace clusters in Thailand
- Tappin 2022 – 944 pregnant people attending UK stop smoking services

….suggesting that the impact of incentives can be considered broadly generalisable
Incentives may particularly appeal to low-income populations, thus reducing health inequity

More evidence is needed from low- and middle-income countries

Current and future research might more precisely explore differences between trials offering low or high cash incentives and self-incentives (deposits)

Strong support for incentives based interventions in practice