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PRIMARY CARE
HEALTH SCIENCES

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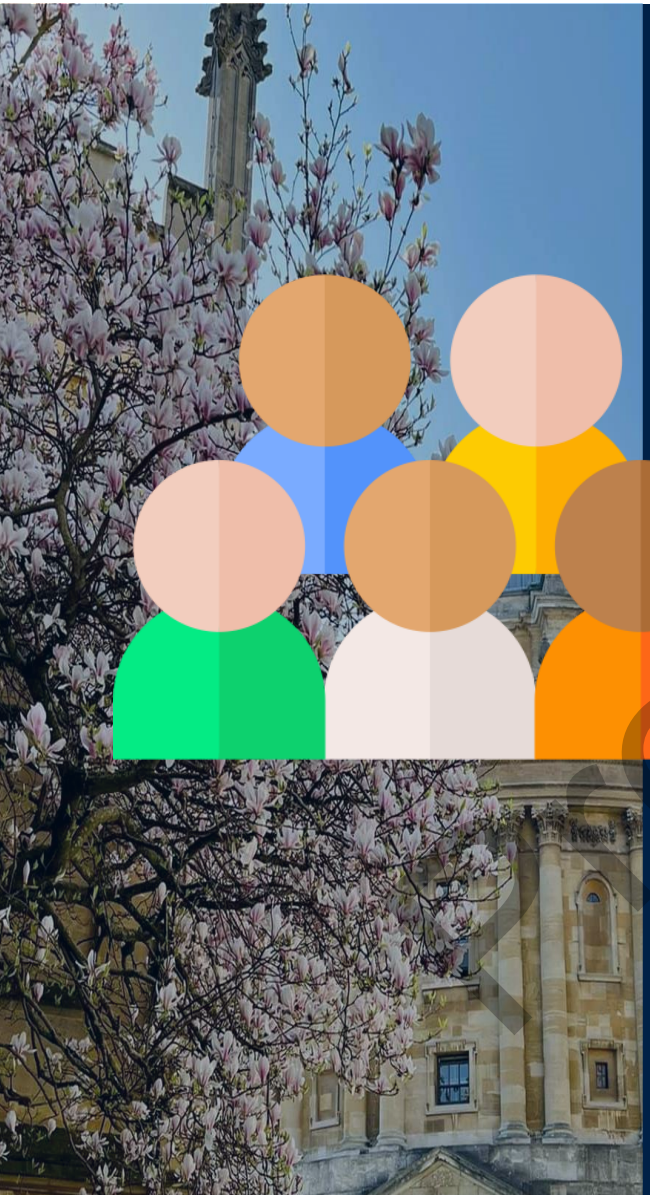

# The effect of individual-level smoking cessation interventions on socioeconomic inequalities in tobacco smoking: a Cochrane systematic review


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**Tobacco Online Policy Seminar (TOPS)**
**2024**

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## DISCLOSURES

- I have never received funding from tobacco, vaping or pharmaceutical industries and have no conflicts of interest to declare.
- Two of my co-authors (NN, JSA) have grants or connections to the pharmaceutical industry which is not related to the present work.

## UNDER PEER - REVIEW

- This work is subject to change as it is currently under peer review

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** Joint senior authors*



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# PROBLEM

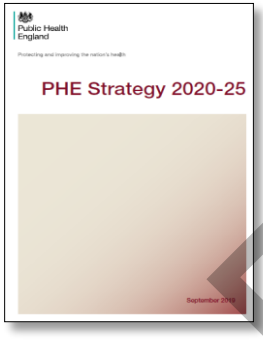
**Smoking prevalence:** UK: 6.4 million (13.3%)[1]; USA: 28.3 million (11.5%)[2]

**Unemployment**
**Low income**
**Less education**

**Higher smoking rates**

**Health inequalities**[3, 4]

## *Smokefree 2030*




***'…targeting vulnerable population groups and areas where people smoke at higher rates".***

***'reduced variation in smoking prevalence rates between socio-economic groups.'***

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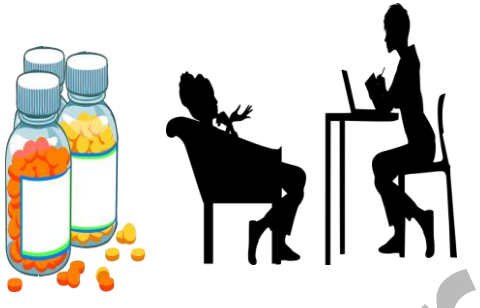
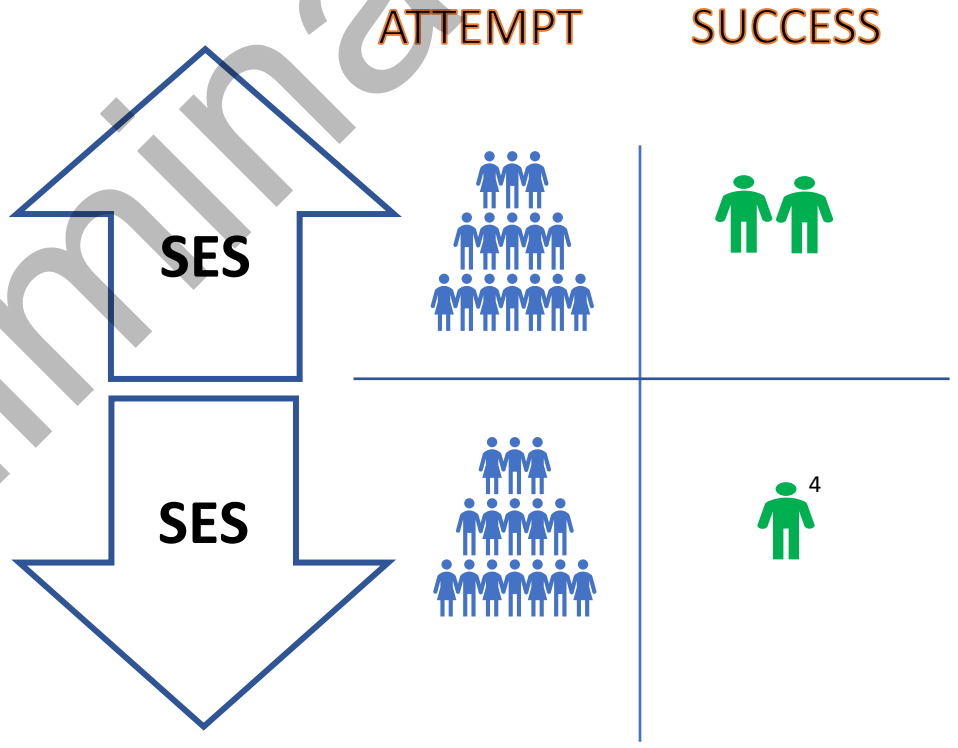
# ADVANCING HEALTH EQUALITY BY IMPROVING TREATMENT RESPONSE

**No safe level of tobacco smoking**



***Smoking cessation interventions***

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# Helping people quit smoking: smoking cessation interventions

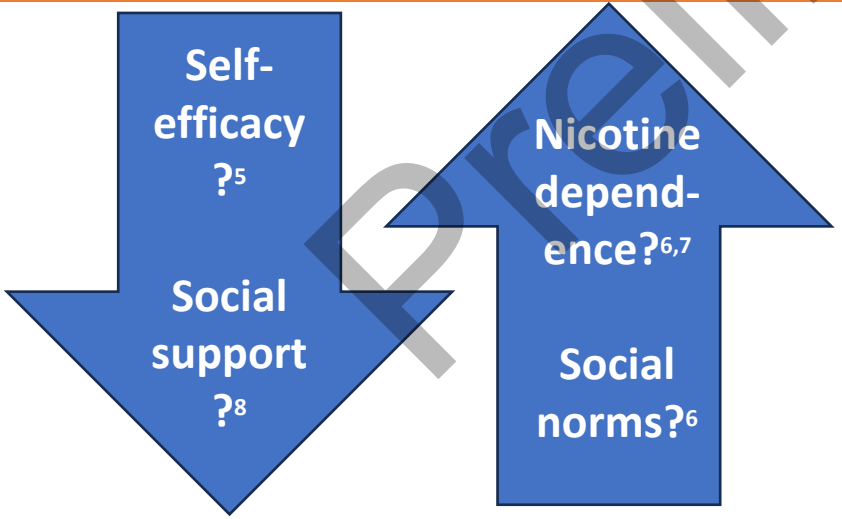
## Behavioural support

- Counselling, hypnotherapy, exercise
- Delivered in person-over the phone, online, in print
- By health professionals, nurse, physician, counsellor
- Varying intensity
- Financial incentives

## Medication

- NRT (patches, gum, lozenge)
- Antidepressants
- Nicotine partial receptor agonists
- Electronic cigarettes

# Why are there differences in quitting success by SES?




**Different SC interventions will vary in their ability to manage these factors**

**Same intervention may perform differently in different populations?**

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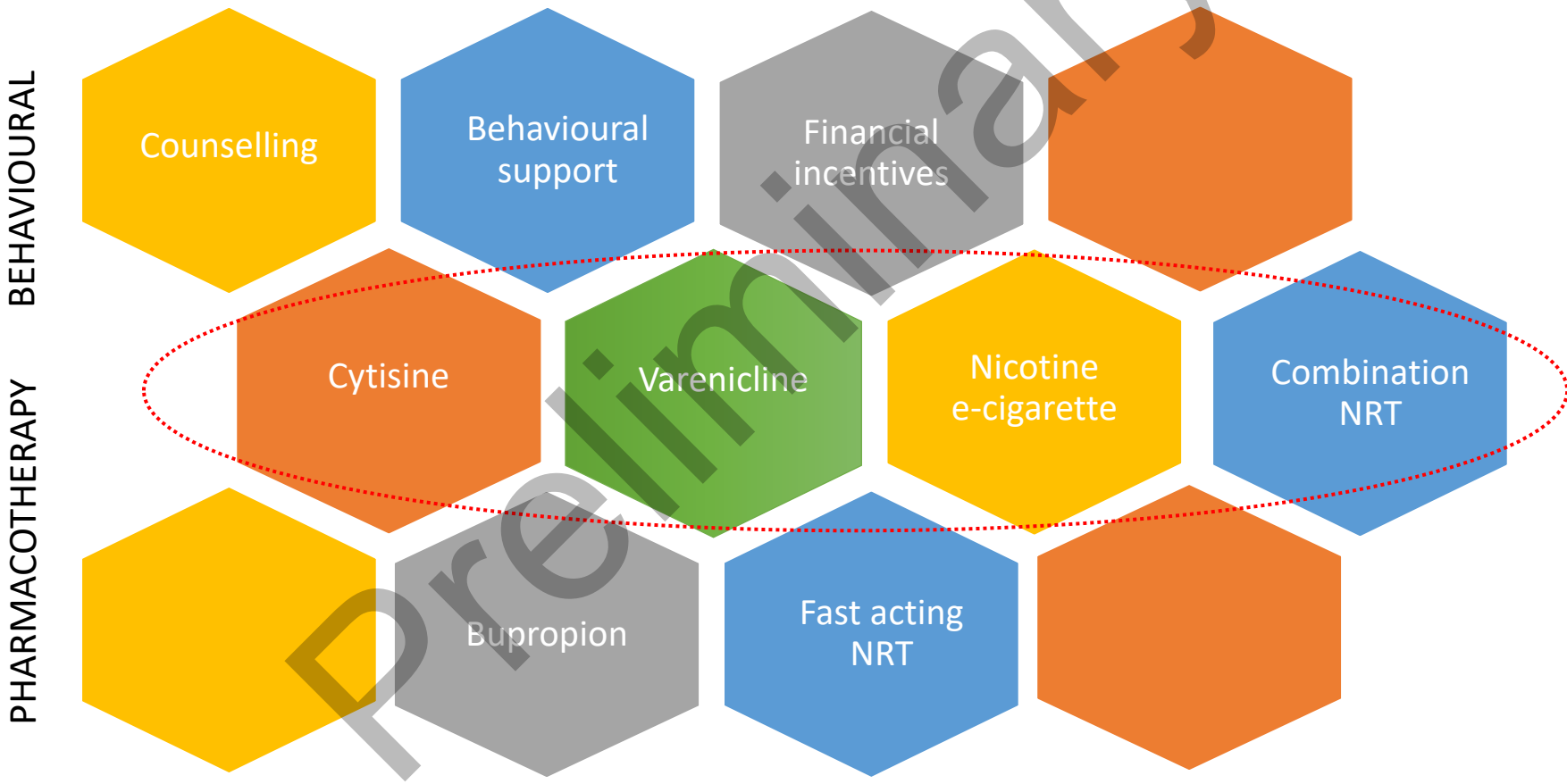
# Which interventions to recommend?

**High certainty evidence from Cochrane review**

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# Cochrane systematic review: objective

**To investigate differences in the effectiveness of individual-level smoking cessation interventions by socioeconomic groups, to estimate the potential that an intervention might positively or negatively impact health equalities due to tobacco use**


Cochrane Database of Systematic Reviews

**The effect of individual-level smoking cessation interventions on socioeconomic inequalities in tobacco smoking (Protocol)**

Theodoulou A, Lindson N, Fanshawe TR, Thomas J, Nollen N, Ahluwalia JS, Leavens E, Hartmann-Boyce J

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# METHODS

***Search:*** Cochrane Database of Systematic Reviews: ***1-May-2023***

## Study eligibility criteria

| | |
|---|---|
| **P**articipants | **Adults (≥18 years) who smoke, regardless of motivation to quit** |
| **I**ntervention | **Any individual-level smoking cessation intervention** |
| **C**omparator | **No treatment, placebo or any other smoking cessation intervention** |
| **O**utcome | **Abstinence rates (≥6m) by lower a categories** ***Education level; Income level; Occupation classifica Other deprivation indices.*** |
| **S**tudy design | **Randomised controlled trials (from 2000)** |

- **SES indicators most reflective in meaning across RCTs**
- **Avoid biases from greater likelihood of receiving unpublished data from more recent RCTs**
- **Limit screening of inappropriate interventions**

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# METHODS

## Risk of bias (RoB)

| Cochrane RoB 1 Domains |
| --- |
| Random sequence generation |
| Allocation concealment |
| Blinding of participants & personnel *(Pharma RCTs)* Blinding of outcome assessment |
| Incomplete outcome data |
| ~~Selective reporting~~ |
| Other sources of bias |

| Availability of abstinence data by SES |
| --- |
| the extent to which complete information on smoking abstinence by SES indicator is reported or available upon request |

**Overall RoB**

Low risk

Unclear risk

High risk

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# MEASURES OF TREATMENT EFFECT

## Smoking cessation rates by SES

RCT

OR in lower SES / OR in higher SES

Ratio of OR (ROR) (95% CI)

### ➢ Combined ROR by intervention type in random-effects MA

Relative odds of quitting in lower versus higher SES groups

ROR and CI **≥ 1.05**: clinically significant increase

ROR and CI **0.96 to 1.04**: clinically non-significant

ROR and CI **≤ 0.95:** clinically significant decrease

### ➢ Subgroup analysis

- Type of SES indicator
- Economic classification of the study country

### ➢ Sensitivity analysis

- Removing studies at overall high RoB
- Using additional SES indicators (studies with multiple SES indicators)
- Adjusted estimates

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# MEASURES OF TREATMENT EFFECT

## Intervention impact on health equality classification

| Positive (↑↑) | Possibly positive (↑) | Neutral (↔ ↔) | Possibly neutral (↔) | Possibly negative (↓) | Negative (↓↓) | Unclear (??) |
|---|---|---|---|---|---|---|
| Evidence relative effect of the intervention on quit rates is greater in lower SES groups *(point estimate favours lower SES, and 95% CI excludes no clinically significant difference (lower bound of 95% CI ≥ 1.05)).* | Some evidence that the relative effect of the intervention on quit rates is greater in lower SES *(point estimate ≥ 1.05, but 95% CI include no clinically significant difference (lower bound of 95% CI < 1.05)).* | Evidence suggests no difference in the relative effect of the intervention on quit rates between lower and higher SES groups *(point estimate and 95% CIs between 0.96 and 1.04).* | Some evidence of no difference in relative intervention effect on quit rates between higher and lower SES groups *(point estimate between 0.96 and 1.04, but 95% CIs include clinically significant difference (i.e. lower bound ≤ 0.95, higher bound ≥ 1.05, or both).* | Some evidence that the relative effect of the intervention on quit rates is greater in higher SES groups *(point estimate ≤ 0.95, but upper bound of 95% CI ≥ 0.95).* | Some evidence that the relative effect of the intervention on quit rates is greater in higher SES groups *(point estimate ≤ 0.95, but upper bound of 95% CI ≥ 0.95).* | Unable to assess intervention equality impact based on available evidence *(example: interaction between treatment type and SES reported as non-significant, but OR and CIs not reported).* |

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# MEASURES OF TREATMENT EFFECT

**GRADE: Certainty of the evidence**

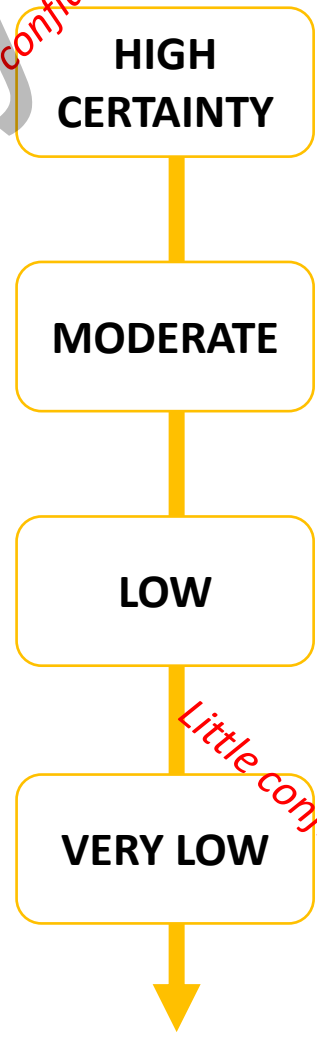
Judgements downgraded by:

***Risk of bias***
(incl. publication bias)
E.g. studies were rated at high or unclear RoB

***Inconsistency***

***Indirectness***
e.g. studies limited inclusion based on SES

***Imprecision***
e.g. due to wide confidence intervals

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# MEASURES OF TREATMENT EFFECT

## Smoking cessation rates by SES

- **Unit of analysis issues**
  - >2 eligible study arms?
    - Included the most and least intensive interventions
- **SES indicator with >2 categories** *(e.g.* ***high****-, med-,* ***low****)*
    - Compared categories at each end of the scale
- **Dealing with missing data**
  - Contacted study authors if they reported any measure of SES at baseline
- **All studies were presented in effect direction plots**

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Questions or comments before we go through key findings

?

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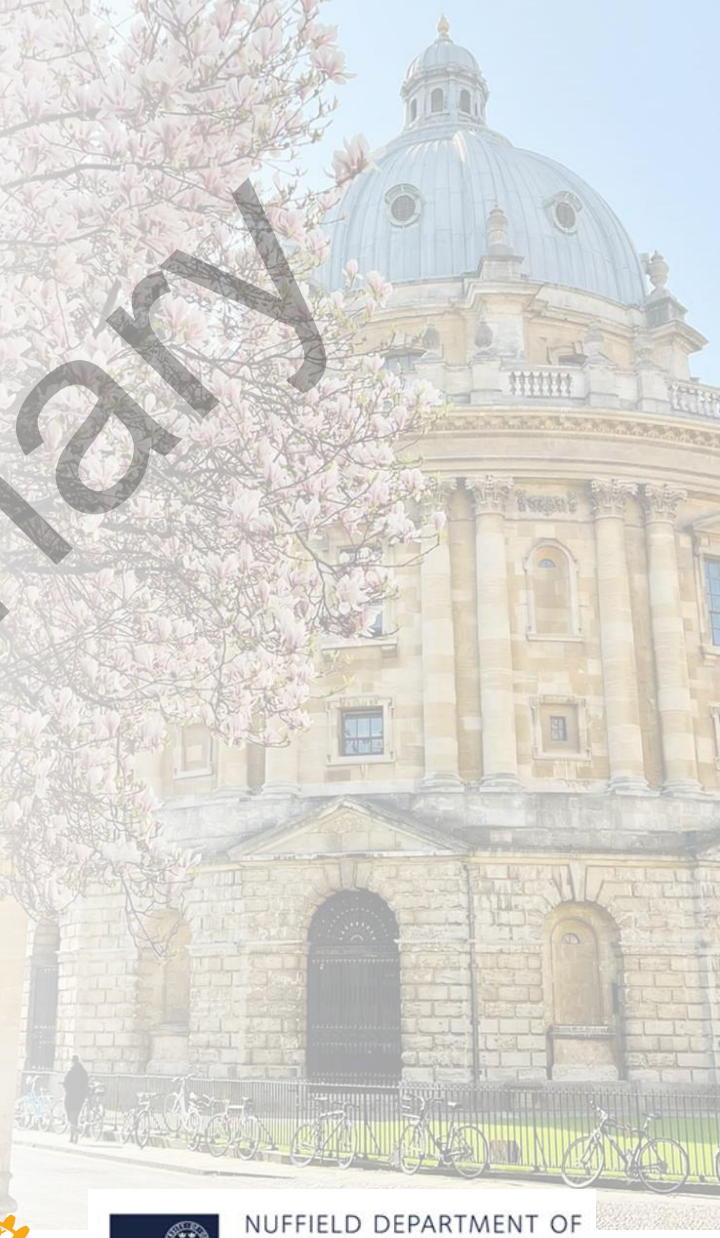

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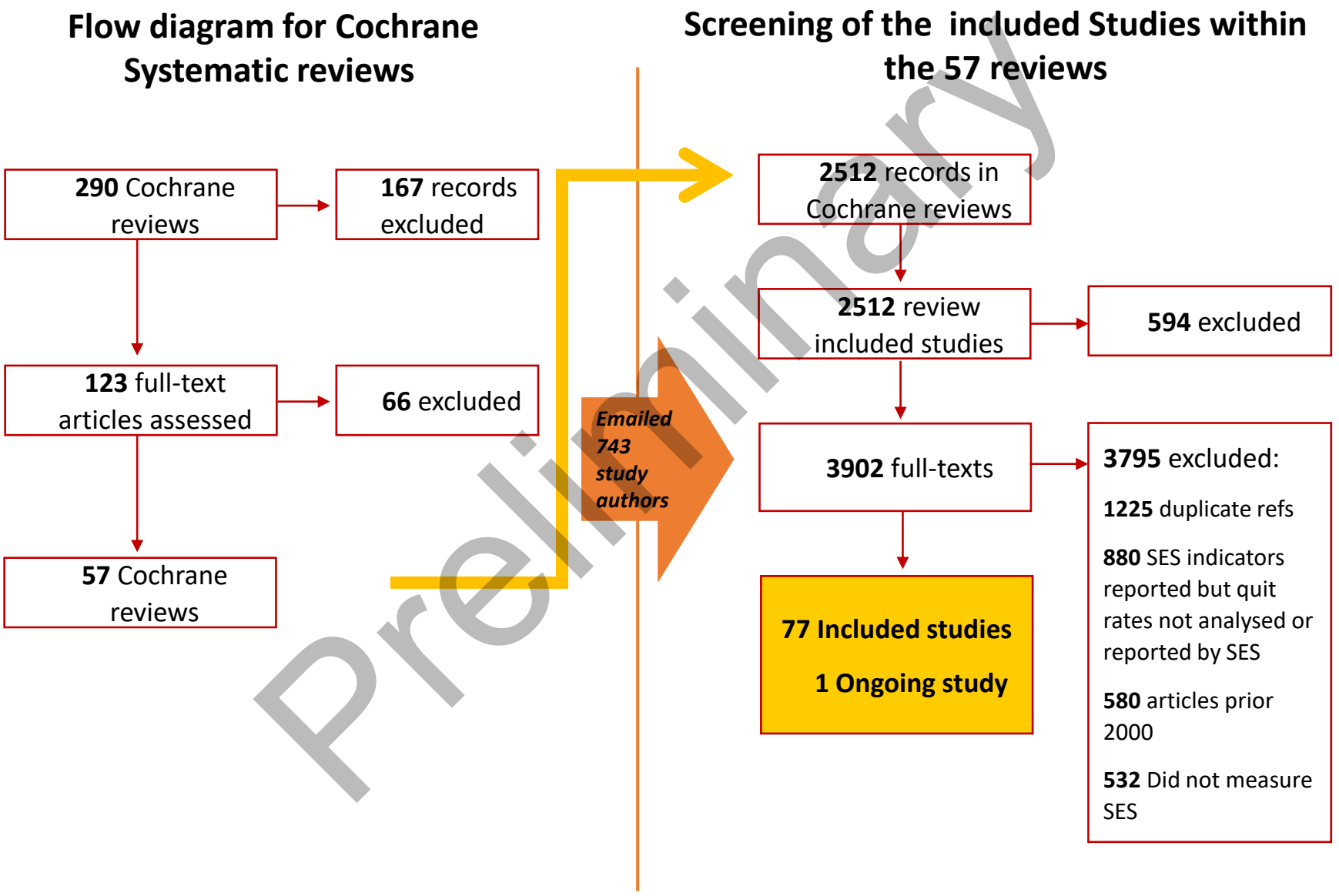
# RESULTS


Flow diagram for Cochrane Systematic reviews
290 Cochrane reviews
167 records excluded
123 full-text articles assessed
66 excluded
57 Cochrane reviews
Emailed 743 study authors
Screening of the included Studies within the 57 reviews
2512 records in Cochrane reviews
2512 review included studies
594 excluded
3902 full-texts
3795 excluded:
1225 duplicate refs
880 SES indicators reported but quit rates not analysed or reported by SES
580 articles prior 2000
532 Did not measure SES
77 Included studies
1 Ongoing study
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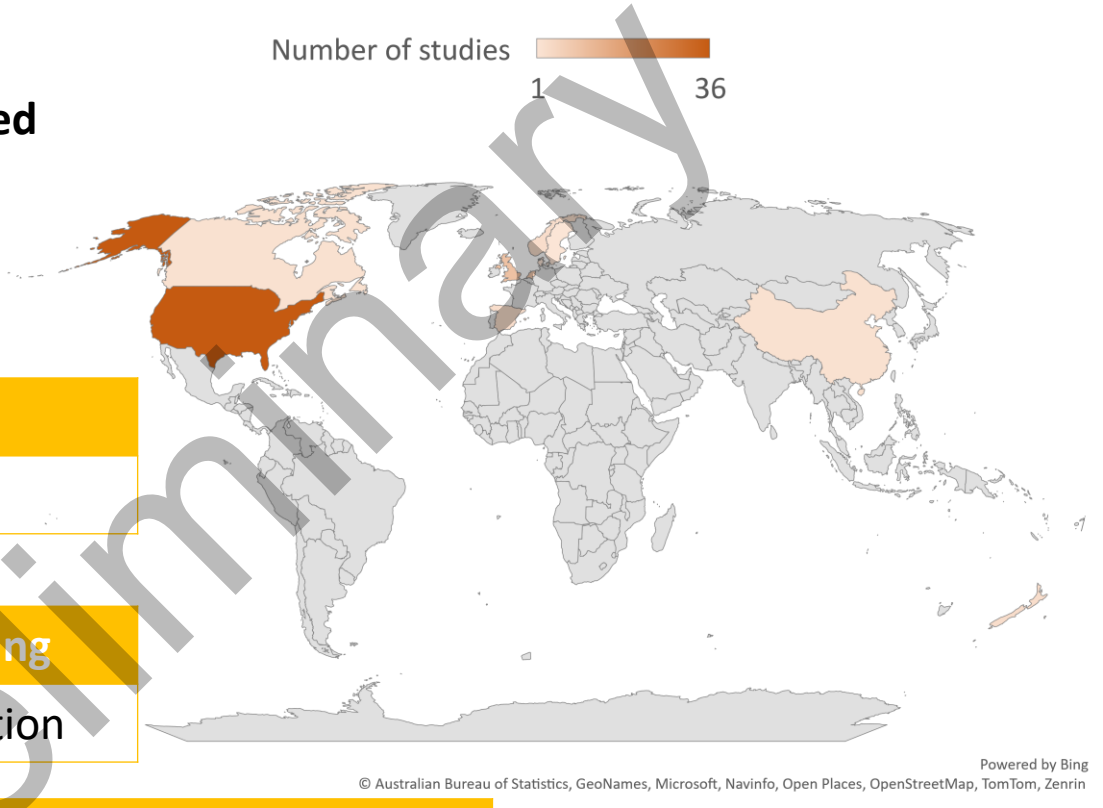
# 77 included studies - participants

**127,791 randomised participants**




| | |
|---|---|
| 35 RCTs | **Predominant ethnicity**<br>White' or 'Caucasian' |
| 46 RCTs | **Motivated to quit smoking**<br>Not selection on motivation |
| 16 RCTs | **Restricted inclusion based on a measure of SES**<br>living on a low-income, homeless, employee |
| 33 RCTs | **Other specific population characteristics**<br>young adults; veterans; people with chronic conditions, mothers etc. |

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# 77 included studies – interventions and comparators

| Pharmacotherapy interventions |
| --- |
| NRT:<br>▪ Single form NRT<br>▪ Combination NRT<br>▪ Preloading NRT<br>▪ Duration of NRT use<br>▪ Other (e.g. choice of NRT) |
| Antidepressants (Bupropion) |
| Nicotine receptor partial agonists (Cytisine) |
| Electronic cigarettes |
| Combinations of pharmacotherapies |

| Behavioural interventions |
| --- |
| Counselling:<br>▪ Telephone<br>▪ Face-to-face<br>▪ Tailored to the individual |
| Print-based self-help materials |
| Mobile phone text messaging |
| Mobile app-based interventions |
| Internet interventions |
| Financial incentives |

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# 77 included studies – Outcomes

**Smoking abstinence**

All studies: intended to analyse, analysed or presented quit rates at ≥ 6 months by an SES indicator.

**SES Indicators**

- Education level (66)
- Income level (26)
- Employment status (17)
- Health insurance (6)
- level of deprivation (5)
- Occupation classification (1)
- Place of residence (1)
- receiving state benefits (1)
- Free prescriptions (1)

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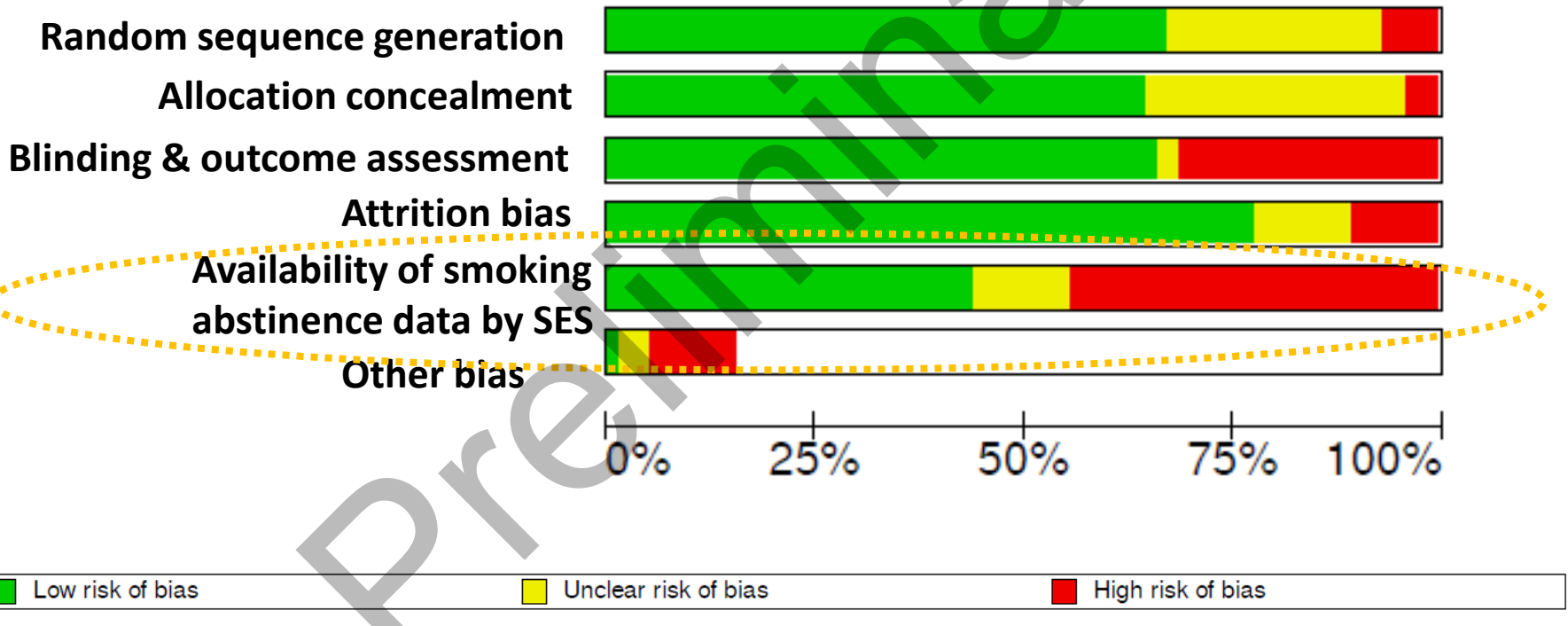
# Risk of Bias

**Overall RoB** **12** – Low risk; **13** – Unclear risk; **52** - High risk

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# Pharmacological & electronic cigarette intervention comparisons

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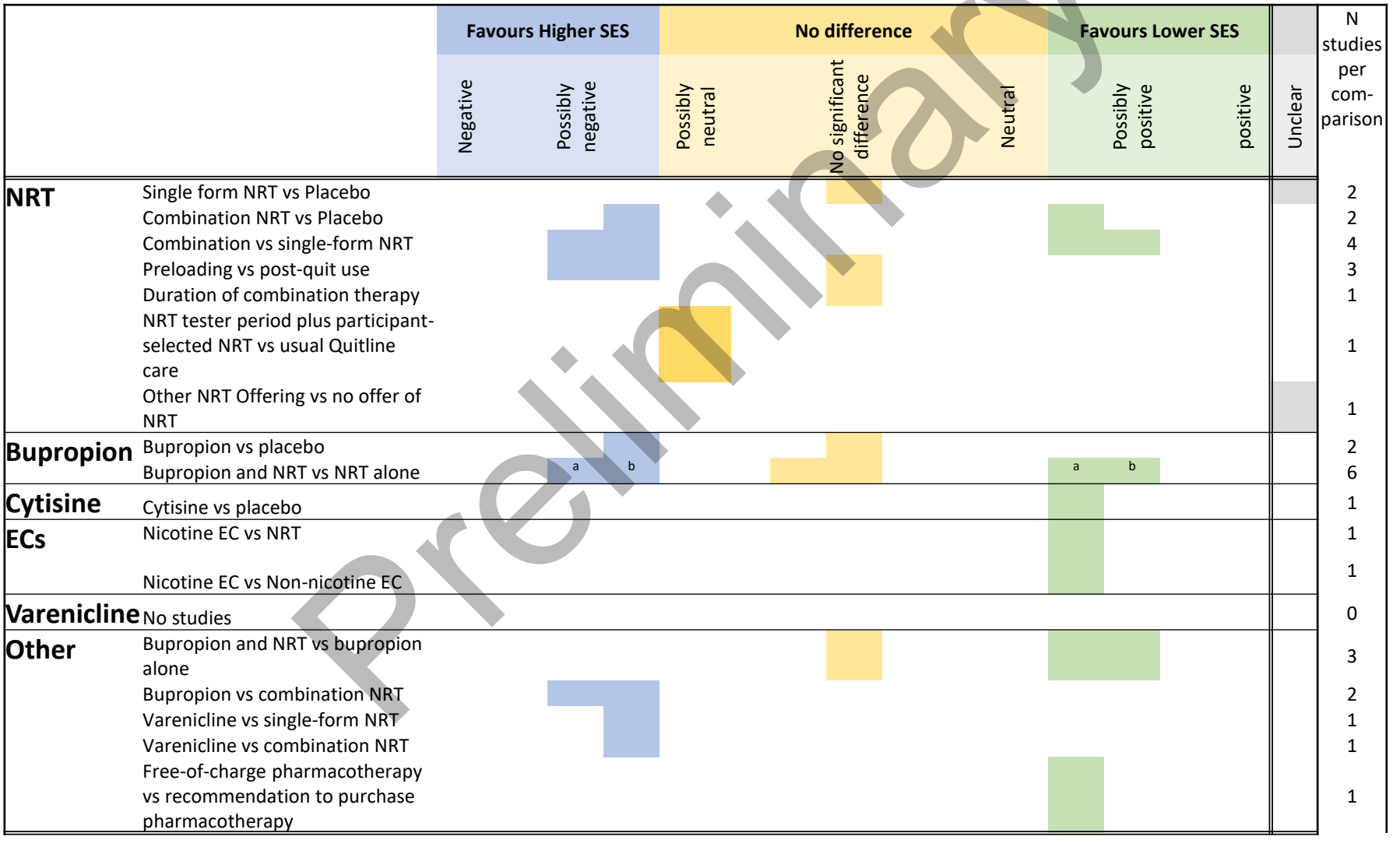
# EFFECTS OF INTERVENTIONS

## Pharmacological and EC intervention comparisons

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# Nicotine Replacement Therapy

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **NRT** | Single form NRT vs Placebo | | | | | | | | | 2 |
| | Combination NRT vs Placebo | | | | | | | | | 2 |
| | Combination vs single-form NRT | | | | | | | | | 4 |
| → | Preloading vs post-quit use | | | | | | | | | 3 |
| → | Duration of combination therapy | | | | | | | | | 1 |
| → | NRT tester period plus participant-selected NRT vs usual Quitline care | | | | | | | | | 1 |
| → | Other NRT Offering vs no offer of NRT | | | | | | | | | 1 |

## Preloading versus post-quit use

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Bullen 2010 | New Zealand | High | ↓ | Possibly negative | High | 0.51 [0.10, 2.63] |
| Etter 2009 | Switzerland | High | ↓ | Possibly negative | High | 0.88 [0.54, 1.43] |
| Piper 2017 | USA | High | ↔? | No sig. difference | High | *"The main and interaction effects of the six intervention components on 26-week abstinence rates were not moderated by gender, race, education, time to first cigarette, or living with a smoker."* |

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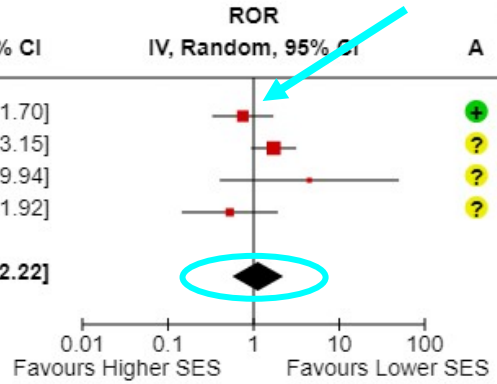
# Nicotine Replacement Therapy

| | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|
| | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **NRT** | | | | | | | | | |
| Single form NRT vs Placebo | | | | | | | | | 2 |
| Combination NRT vs Placebo | | | | | | | | | 2 |
| Combination vs single-form NRT | | | | | | | | | 4 |
| Preloading vs post-quit use | | | | | | | | | 3 |
| Duration of combination therapy | | | | | | | | | 1 |
| NRT tester period plus participant-selected NRT vs usual Quitline care | | | | | | | | | 1 |
| Other NRT Offering vs no offer of NRT | | | | | | | | | 1 |

## Combination versus single-form NRT

| Study or Subgroup | log[ROR] | SE | Lower SES Total | Higher SES Total | Weight | ROR IV, Random, 95% CI |
|---|---|---|---|---|---|---|
| Baker 2016 (1) | -0.29 | 0.42 | 214 | 413 | 32.4% | 0.75 [0.33 , 1.70] |
| Krupski 2016 (2) | 0.54 | 0.31 | 1031 | 1872 | 41.2% | 1.72 [0.93 , 3.15] |
| Piper 2010a (3) | 1.5 | 1.23 | 23 | 371 | 7.2% | 4.48 [0.40 , 49.94] |
| Piper 2010b (4) | -0.64 | 0.66 | 70 | 262 | 19.3% | 0.53 [0.14 , 1.92] |
| **Total (95% CI)** | | | **1338** | **2918** | **100.0%** | **1.12 [0.56 , 2.22]** |

Heterogeneity: Tau² = 0.20; Chi² = 5.30, df = 3 (P = 0.15); I² = 43%
Test for overall effect: Z = 0.32 (P = 0.75)
Test for subgroup differences: Not applicable





**Footnotes**

(1) Health equality impact: Possibly negative; SES indicator: Income level
(2) Health equality impact: Possibly positive; SES indicator: Insurance status
(3) Health equality impact: Possibly positive; SES indicator: Education level; Comparator: NRT patch
(4) Health equality impact: Possibly negative; SES indicator: Education level; Comparator: NRT patch

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# Nicotine Replacement Therapy

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **NRT** | Single form NRT vs Placebo | | | | | | | | | 2 |
| | Combination NRT vs Placebo | | | | | | | | | 2 |
| | Combination vs single-form NRT | | | | | | | | | 4 |
| | Preloading vs post-quit use | | | | | | | | | 3 |
| | Duration of combination therapy | | | | | | | | | 1 |
| | NRT tester period plus participant-selected NRT vs usual Quitline care | | | | | | | | | 1 |
| | Other NRT Offering vs no offer of NRT | | | | | | | | | 1 |

## Single form NRT versus placebo

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Piper 2010a | USA | High | ↓ | Possibly negative | Unclear | 0.11 [0.01, 1.30] |
| Nollen 2006 | USA | High | ↔? | No sig. difference | High | Methods: *"All 2-way interactions were then assessed for the final set of predictors that were identified. The subset of predictors in the final selected model was all statistically significant (P<.05)."*<br>Results: *"None of the 2-way interactions for the final subset of predictors were statistically significant, and therefore, were not included in the final model."* |

## Combination NRT versus placebo or control (no NRT)

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Dahne 2020 | USA | High | ↑ | Possibly positive | High | 2.48 [0.90, 6.88] |
| Piper 2010a | USA | High | ↓ | Possibly negative | Unclear | 0.52 [0.09, 3.02] |
| **Pooled estimate** | - | - | ↑ | **Possibly positive** | - | **1.35 [0.30, 6.04]** |

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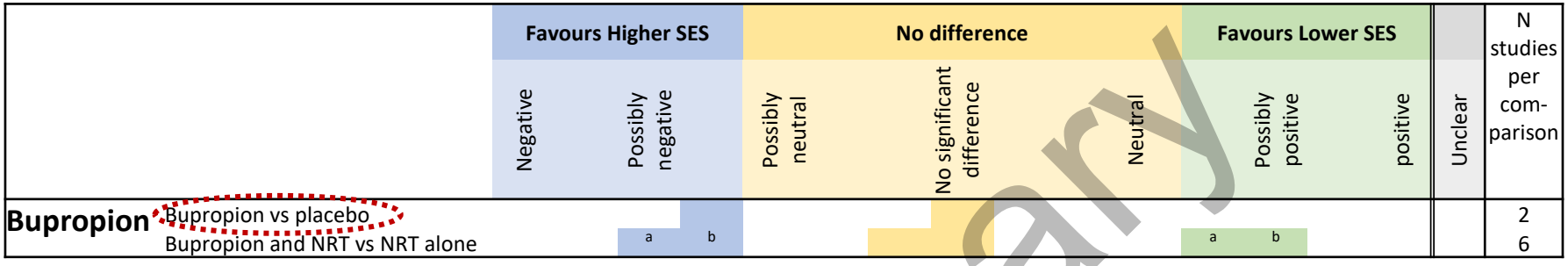
# Bupropion




## Bupropion versus placebo

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Killen 2006 | USA | High | ↔? | No sig. difference | High | Quote from corresponding author's response to email requesting further information: *"Education level was measured in all the trials you reference and would be the only potential index of SES. No main or moderator effects observed."* |
| Piper 2010a | USA | High | ↓ | Possibly negative | Unclear | 0.05 [0.00, 1.00] |

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# Bupropion

## Bupropion and NRT versus NRT alone

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Piper 2010a (lozenge comparator) | USA | High | ↓ | Possibly negative | Unclear | 0.87 [0.15, 4.86] |
| Piper 2010b (lozenge comparator) | USA | High | ↑ | Possibly positive | High | 1.19 [0.33, 2.98] |
| Piper 2010a (patch comparator) | USA | High | ↑ | Possibly positive | Unclear | 2.80 [0.24, 32.46] |
| Piper 2010b (patch comparator) | USA | High | ↓ | Possibly negative | High | 0.75 [0.22, 2.57] |
| Simon 2004 | USA | High | ↔? | No sig. difference | High | *"We used a backward stepwise procedure to examine the relation between demographic and historical variables and self-reported smoking cessation at 6 months and biochemically validated smoking cessation at 12 months." "We found no interactions between treatment assignment and the other variables."* |
| Stapleton 2013 | UK | High | ↔? | No sig. difference | High | *"To examine if the effect of treatment was moderated for subgroups we fitted logistic regression models with interaction terms for treatment by each of the characteristics shown in Table 1. For this analysis we included only the 1014 participants known to have received their assigned treatment. Among these characteristics, only for lifetime history of depression was there some evidence of a differential treatment effect ($\chi 2 = 6.5$, $P = 0.011$ and $\chi 2 = 2.86$, $P = 0.091$ for DH4 and RS6, respectively)."* |
| **Pooled estimate (lozenge)** | - | - | ↑ | **Possibly positive** | - | **1.06 [0.38, 2.98]** |
| **Pooled estimate (Patch)** | - | - | ↔ | **Possible neutral** | - | **0.98 [0.32, 2.94]** |

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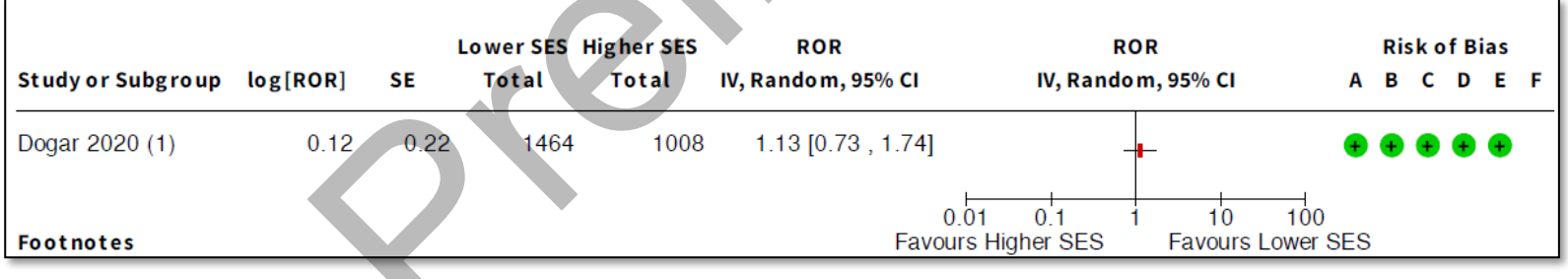
# Nicotine receptor partial agonists

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | | |
| **Cytisine** | Cytisine vs placebo | | | | | | | | | | 1 |
| **Varenicline** | No studies | | | | | | | | | | 0 |

## Cytisine vs placebo

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Dogar 2020 | Bangladesh and Pakistan | Lower-Middle | ↑ | Possibly positive | Low | 1.13 [0.73, 1.74] |

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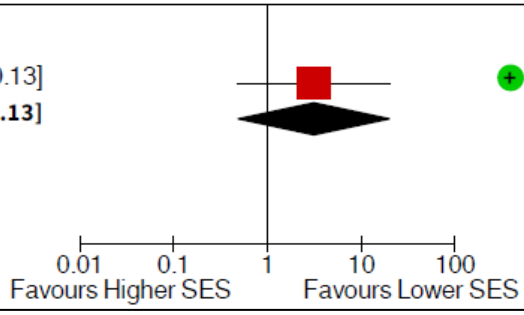
# Electronic cigarettes

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **ECs** | Nicotine EC vs NRT | | | | | | | | | 1 |
| | Nicotine EC vs Non-nicotine EC | | | | | | | | | 1 |

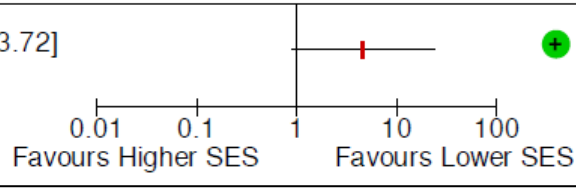
## Nicotine EC versus NRT

| Study or Subgroup | log[ROR] | SE | Lower SES Total | Higher SES Total | Weight | ROR IV, Random, 95% CI | ROR IV, Random, 95% CI | Risk of Bias A B C D E F |
|---|---|---|---|---|---|---|---|---|
| **9.1.1 Education level** | | | | | | | | |
| Hajek 2019 (1) | 1.14 | 0.95 | 41 | 328 | 100.0% | 3.13 [0.49 , 20.13] | | + + + + + |
| **Subtotal (95% CI)** | | | **41** | **328** | **100.0%** | **3.13 [0.49 , 20.13]** | | |
| Heterogeneity: Not applicable | | | | | | | | |
| Test for overall effect: Z = 1.20 (P = 0.23) | | | | | | | | |
| Test for subgroup differences: Not applicable | | | | | | | | |




## Nicotine EC versus Non-nicotine EC

| Study or Subgroup | log[ROR] | SE | Lower SES Total | Higher SES Total | ROR IV, Random, 95% CI | ROR IV, Random, 95% CI | Risk of Bias A B C D E F |
|---|---|---|---|---|---|---|---|
| Walker 2020 (1) | 1.52 | 0.84 | 356 | 633 | 4.57 [0.88 , 23.72] | | + + − + + |




**Footnotes**

Preliminary

# Combination versus single form pharmacotherapies

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **Other** | Bupropion and NRT vs bupropion alone | | | | | | | | | 3 |

## Bupropion and NRT versus bupropion alone

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Piper 2010a | USA | High | ↑ | Possibly positive | Unclear | 7.39 [0.34, 160.32] |
| Piper 2010b | USA | High | ↑ | Possibly positive | High | 3.71 [0.82, 16.76] |
| Stapleton 2013 | UK | High | ↔? | No sig. difference | High | *"To examine if the effect of treatment was moderated for subgroups we fitted logistic regression models with interaction terms for treatment by each of the characteristics shown in Table 1. For this analysis we included only the 1014 participants known to have received their assigned treatment. Among these characteristics, only for lifetime history of depression was there some evidence of a differential treatment effect ($\chi 2$ = 6.5, P = 0.011 and $\chi 2$ = 2.86, P = 0.091 for DH4 and RS6, respectively)."* |
| **Pooled estimate** | - | - | **↑↑** | **Positive** | - | **4.24 [1.09, 16.42]** |

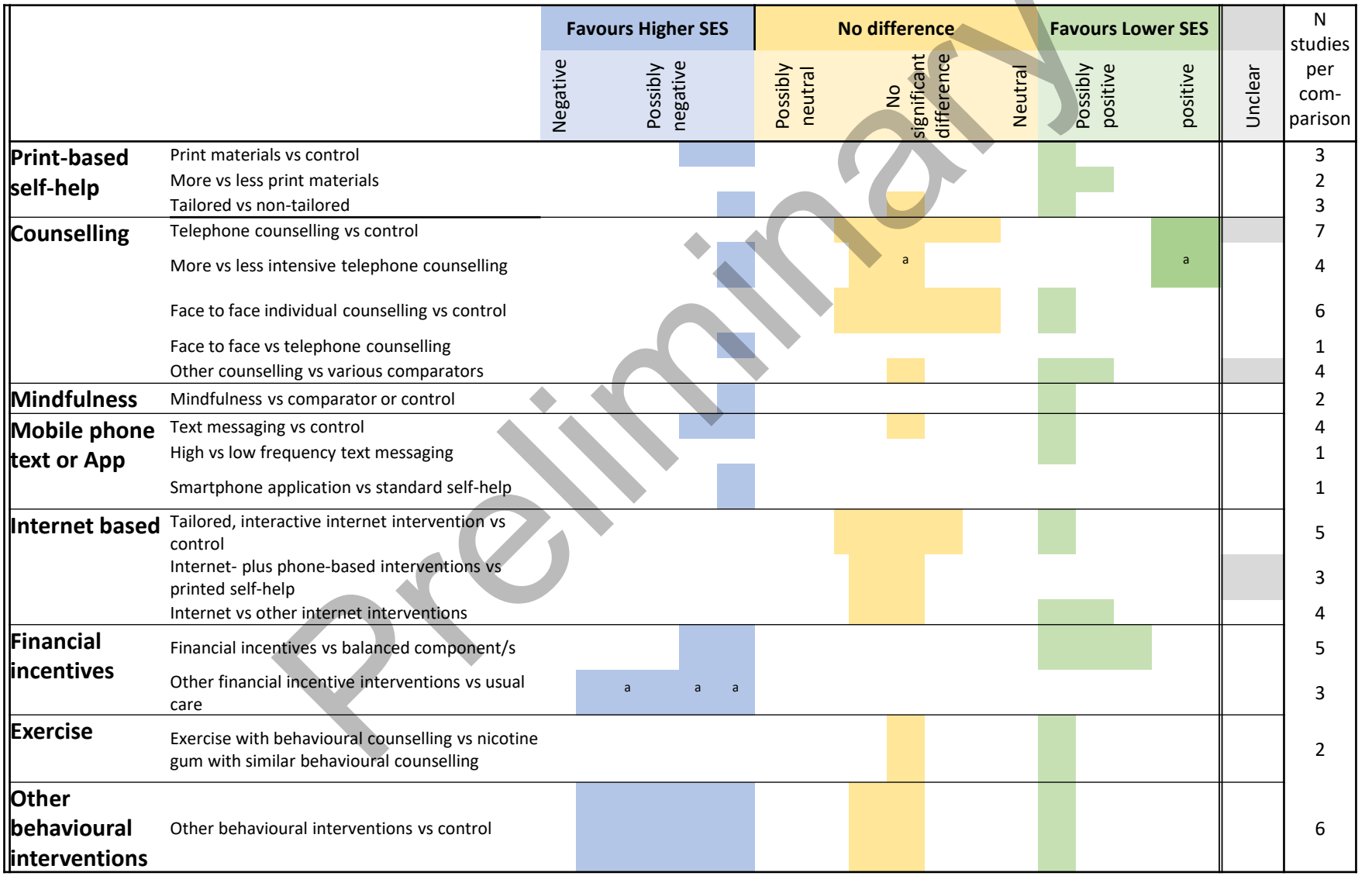
Preliminary

# Behavioural intervention comparisons

Preliminary

# EFFECTS OF INTERVENTIONS

## Behavioural intervention comparisons




Preliminary

# Print-based self-help

| | | Favours Higher SES | | No difference | | | Favours Lower SES | | Unclear | N studies per com-parison |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Negative | Possibly negative | Possibly neutral | No significant difference | Neutral | Possibly positive | positive | | |
| **Print-based self-help** | Print materials vs control | | | | | | | | | 3 |
| | More vs less print materials | | | | | | | | | 2 |
| | Tailored vs non-tailored | | | | | | | | | 3 |

## Print materials vs no materials or balanced treatment

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Etter 2001 | Switzerland | High | ↓ | Possibly negative | High | 0.14 [0.01, 1.73] |
| Martinez 2021 | USA | High | ↓ | Possibly negative | Low | 0.73 [0.48, 1.10] |
| Unrod 2016 | USA | High | ↑ | Possibly positive | Unclear | 1.11 [0.79, 1.54] |
| **Pooled estimate** | - | - | **↓** | **Possibly negative** | - | **0.85 [0.52, 1.38]** |

## More versus less print materials

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Becona 2001 | Spain | High | ↑ | Possibly positive | Unclear | 1.77 [0.49, 6.32] |
| Brandon 2016 | USA | High | ↑ | Possibly positive | Unclear | 1.23 [0.76, 2.01] |
| **Pooled estimate** | - | - | **↑** | **Possibly positive** | - | **1.29 [0.82, 2.04]** |

## Tailored versus non-tailored self-help print materials

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Gilbert 2013 | UK | High | ↑ | Possibly positive | High | 1.43 [0.77, 2.68] |
| Gilbert 2017 | UK | High | ↓ | Possibly negative | Low | 0.79 [0.35, 1.81] |
| Martinez 2021 | Spain | High | ↔ | Possible neutral | Low | 0.89 [0.64, 1.24] |
| **Pooled estimate** | - | - | **↓** | **Possibly negative** | - | **0.96 [0.73, 1.27]** |

Preliminary

# Telephone counselling

## Telephone counselling versus no treatment, minimal or balanced component

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Bastian 2013 | USA | High | ↔? | No sig. difference | High | Results: *"At each of the three follow-up time points, four predictors were tested for their interaction with arm in the prediction of abstinence. Only the interaction of arm with age (continuous) at 2 weeks postintervention was statistically significant (p = .046)."* |
| Boyle 2007 | USA | High | ↔? | No sig. difference | High | *"All six of the two-way interactions tested were nonsignificant (p > .17), suggesting that the association of treatment group and quitting status did not vary by age, gender, amount smoked prior to using the medication, education, chronic disease status, or the specific medication used."* |
| Ferguson 2012 | UK | High | ?? | Unclear | High | Methods: *"Finally, to establish whether the effect of each treatment was similar for different socioeconomic groups, we carried out a test for interaction between the index of multiple deprivation and each treatment effect for the primary outcome."*<br>Result: No extractable data |
| Graham 2015 | USA | High | ↔? | No sig. difference | High | Methods: *"Effect modification analyses were conducted by fitting interactions between treatment and prespecified moderators. The latter were examined in groups (demographic, smoking, and psychosocial) using forward selection."*<br>Results: *"Interaction analyses identified daily smoking as the only moderator of direct intervention effects on abstinence..."* |
| Piper 2017 | USA | High | ↔? | No sig. difference | High | *"The main and interaction effects of the six intervention components on 26-week abstinence rates were not moderated by gender, race, education, time to first cigarette, or living with a smoker."* |
| Skov-Ettrup 2016 | Denmark | High | ↑↑ | Positive | High | 4.31 [1.28, 14.51] |
| Zbikowski 2011 | USA | High | ↔? | No sig. difference | High | *"Similar to other studies (Japuntich et al., 2006; Strecher et al., 2006), we found that gender, ethnicity, education, motivation, baseline cigarette use, nicotine dependence, and stress were not significant moderators of treatment."* |

Preliminary

# Face-to-Face counselling Vs Control

Face-to-face individual counselling versus less intensive face-to-face counselling, balanced components or usual care

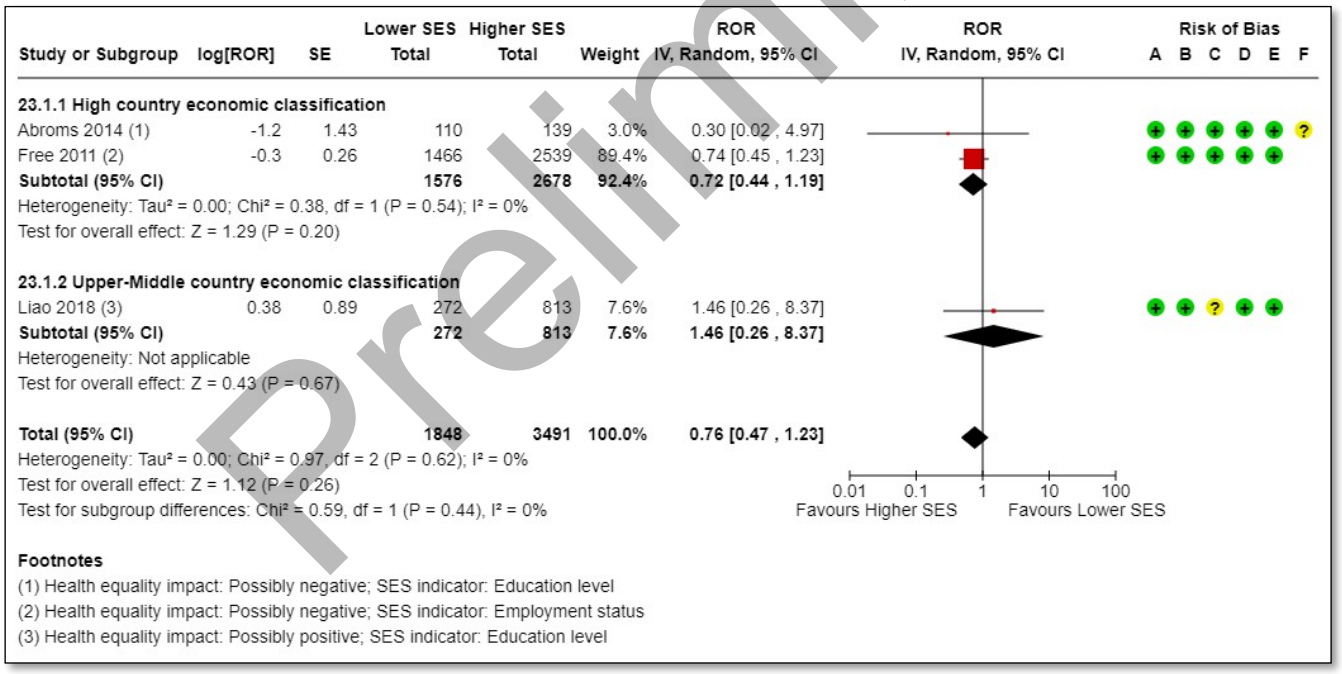
| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data<br>ROR (95% CI) or narrative description |
|---|---|---|---|---|---|---|
| Garvey 2012 | USA | High | ↔? | No sig. difference | High | "There were no statistically significant interactions between treatment condition and any of the potential moderator variables examined."<br>"For education level (coded as less than college graduate vs. college graduate), interaction effects with treatment condition were nonsignificant (all p values > .64)."<br>"...and the interaction of treatment group and percent employed was not significant (p = .37)." |
| Nohlert 2009 | Sweden | High | ↑ | Possibly positive | High | 1.26 [0.18, 8.93] |
| Piper 2017 | USA | High | ↔? | No sig. difference | High | *"The main and interaction effects of the six intervention components on 26-week abstinence rates were not moderated by gender, race, education, time to first cigarette, or living with a smoker."* |
| Quist-Paulsen 2005 | Norway | High | ↔? | No sig. difference | High | *"Predictors in intervention versus control group"*<br>*"Additional logistic regression analyses were performed in the control and intervention groups separately. Having previous coronary heart disease and a diagnosis other than myocardial infarction as the reason for admission were strong negative predictors for 12 months smoking cessation in the control group, both in univariate and multivariate analyses, but not in the intervention group, where the odds ratios being about three times higher in the control group than the intervention group. If having previous coronary heart disease and/or a diagnosis other than myocardial infarction as reason for admission, only 18% managed to quit in the control group compared with 42% in the intervention group. However, when analyzing previous coronary heart disease and/or myocardial infarction as a reason for admission in the subgroup interaction analyses, none reached level of significance, possibly due to small group sizes."*<br>*"Regarding the other predictors, there were only small differences in adjusted odds ratios between the two groups. Smoking a first cigarette within 30 min of waking was a strong negative predictor in both groups (adjusted OR 3.3 and 2.4 in the intervention and control groups, respectively)."* |
| Smit 2016 | The Netherlands | High | ↔? | No sig. difference | High | Thesis: *"A top-down approach was used starting with the most extensive model including main intervention effects, main effects of potential covariates (i.e. age, gender, educational level, addiction level, the number of past quit attempts, depression score, and the number of preparatory and coping plans; based on assumptions from the ICM (De Vries et al., 2003) and findings from previous studies (e.g. Fucito et al., 2010, Strecher et al., 2006), interaction effects between intervention and covariates, a random intercept and random slopes. Firstly, non-significant random effects were removed from the model. Secondly, non-significant interactions effects were removed. Thirdly, nonsignificant covariates were removed. Factors were considered significant when p<.10, using a conservative approach in excluding random and interaction effects (Rosnow and Rosenthal, 1989). **When significant interaction effects were detected, subgroup analyses were conducted** within subsamples consisting of approximately 50% of respondents. In subgroup analyses, intervention effects were considered significant when p<.05."*<br>Author correspondence: *"From the text you selected here, I derive that in both studies interaction effects were analyzed, but in neither study this turned out to be a significant interaction, yes."* |
| Wiggers 2006 | The Netherlands | High | ↔? | No sig. difference | High | *"No interaction effects of treatment and patients' characteristics on abstinence were found."* |

Preliminary

# Text messaging

## Text messaging versus no or minimal treatment

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data |
|---|---|---|---|---|---|---|
| Abroms 2014 | USA | High | ↓ | Possibly negative | Unclear | 0.03 [0.02, 4.97] |
| Free 2011 | UK | High | ↓ | Possibly negative | Low | 0.74 [0.45, 1.23] |
| Haug 2013 | Switzerland | High | ↔? | No sig. difference | High | Quote from corresponding author: *"Educational level was tested as a moderator, however we did not find a moderating effect for this variable. This might be because nearly 80% of the sample had a similar educational level (secondary school education) and only few had a lower or higher educational level."* |
| Liao 2018 | China | Upper-Middle | ↑ | Possibly positive | Unclear | 1.46 [0.26, 8.37] |
| **Pooled estimate** | - | - | ↓ | **Possibly negative** | - | **0.76 [0.47, 1.23]** |




Preliminary

# Internet interventions

**Tailored, interactive internet intervention versus no or minimal intervention (static website, no intervention or usual care), or balanced components**

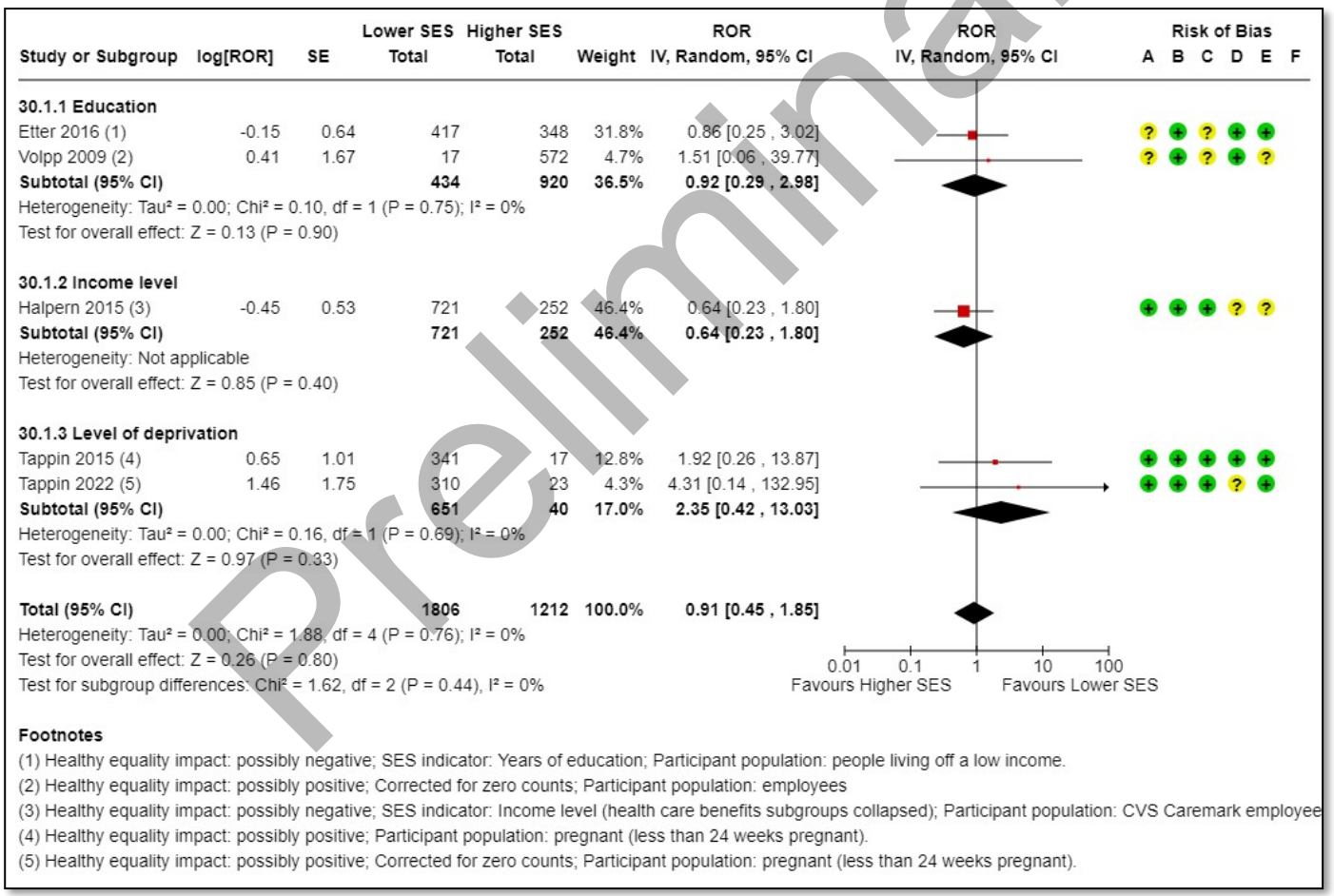
| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data |
|---|---|---|---|---|---|---|
| Brown 2014 | UK | High | ↑ | Possibly positive | Low | 1.49 [0.99, 2.25] |
| Graham 2015 | USA | High | ↔? | No sig. difference | High | Methods: *"Effect modification analyses were conducted by fitting interactions between treatment and prespecified moderators. The latter were examined in groups (demographic, smoking, and psychosocial) using forward selection."* Results: *"Interaction analyses identified daily smoking as the only moderator of direct intervention effects on abstinence…"* |
| Smit 2012 | The Netherlands | High | ↔? | No sig. difference | High | *"We investigated interaction effects between condition and baseline demographic or behavioural measures, although none of these turned out to have a significant influence on any of the abstinence measures reported after 6 weeks or 6 months (data not reported)."* |
| Smit 2016 | The Netherlands | High | ↔? | No sig. difference | High | Author correspondence: *"From the text you selected here, I derive that in both studies interaction effects were analyzed, but in neither study, this turned out to be a significant interaction, yes."* |
| Zbikowski 2011 | USA | High | ↔? | No sig. difference | High | "Similar to other studies (Japuntich et al., 2006; Strecher et al., 2006), we found that gender, ethnicity, education, motivation, baseline cigarette use, nicotine dependence, and stress were not significant moderators of treatment." |

Preliminary

# Financial incentives

**Financial incentives versus balanced component/s**

| Study ID | Country | Country economic classification | Direction of effect | Intervention impact on healthy equality | Overall RoB judgement | Supporting data |
|---|---|---|---|---|---|---|
| Van 2018 | The Netherlands | High | ↔? | No sig. difference | High | *"The analyses investigating possible effect modification of income, education, or nicotine dependency showed no significant interactions (all p values ≥0·079; appendix), indicating similar effects for these subgroups. The results for the lowest income and education groups show similar patterns to the whole group; that is, an intervention effect was obtained after 6 months (table 4)."* |




**Footnotes**

(1) Healthy equality impact: possibly negative; SES indicator: Years of education; Participant population: people living off a low income.
(2) Healthy equality impact: possibly positive; Corrected for zero counts; Participant population: employees
(3) Healthy equality impact: possibly negative; SES indicator: Income level (health care benefits subgroups collapsed); Participant population: CVS Caremark employee
(4) Healthy equality impact: possibly positive; Participant population: pregnant (less than 24 weeks pregnant).
(5) Healthy equality impact: possibly positive; Corrected for zero counts; Participant population: pregnant (less than 24 weeks pregnant).

Preliminary

# Other intervention comparisons

## Other pharmacotherapy comparisons

- Bupropion vs combination NRT
- Varenicline vs single-form NRT
- Varenicline vs combination NRT
- Free-of-charge pharmacotherapy vs recommendation to purchase pharmacotherapy

## Other behavioural comparisons

- More versus less intensive telephone counselling
- Face to face versus telephone counselling
- Mindfulness
- High versus low frequency text messaging
- Smartphone application vs standard self-help
- Internet- plus phone-based interventions versus printed self-help
- Internet versus other internet interventions
- Other financial incentive interventions versus usual care
- Exercise interventions
- Other behavioural interventions

## Combined pharmacological and behavioural smoking cessation interventions

- Behavioural support and NRT versus control
- More intensive versus less intensive multicomponent intervention
- Other comparisons

Preliminary

# SUMMARY OF FINDINGS

**Pharmacological or behavioural interventions for smoking cessation at ≥ 6 months by socioeconomic status**

**Population:** adults (sample majority aged ≥ 18 years) who smoked cigarettes
**Outcome:** smoking abstinence at ≥ 6 months by lower versus higher socioeconomic status
**Intervention:** Pharmacological or behavioural smoking cessation interventions
**Comparator:** *Pharmacological comparison:* Placebo or control; *Behavioural comparators:* no, minimal, less intensive or balanced intervention components
**Setting:** USA, UK, The Netherlands, Switzerland, New Zealand, China, Denmark, Sweden, Norway, Bangladesh and Pakistan *(ordered by most to least common settings).*

## Pharmacological and EC intervention comparisons

| Intervention | N Participants (N Studies) | ROR [95% CI] | Health equality Impact | Evidence certainty | Notes |
|---|---|---|---|---|---|
| **Cytisine** | 2472 (1 RCT) | 1.13 [0.73, 1.74] | Possibly positive ↑ | VERY LOW | - |
| **Nic ECs** | 989 (1 RCT) | 4.57 [0.88, 23.72] | Possibly positive ↑ | VERY LOW | - |
| **Bupropion** | 716 (2 RCTs) | 0.05 [0.00, 1.00] | Possibly negative ↓ | VERY LOW | ROR for 1/2 RCTs |
| **NRT** | 1706 3 (RCTs) | 1.35 [0.30, 6.04] | Unclear ?? | VERY LOW | ROR for 2/3 RCTs |
| **Varenicline** | 0 (0 RCTS) | - | - | - | - |

Preliminary

# SUMMARY OF FINDINGS

**Pharmacological or behavioural interventions for smoking cessation at ≥ 6 months by socioeconomic status**

**Population:** adults (sample majority aged ≥ 18 years) who smoked cigarettes
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**Setting:** USA, UK, The Netherlands, Switzerland, New Zealand, China, Denmark, Sweden, Norway, Bangladesh and Pakistan *(ordered by most to least common settings).*

## Pharmacological and EC intervention comparisons

| Intervention | N Participants (N Studies) | ROR [95% CI] | Health equality Impact | Evidence certainty | DOWNGRADED |
|---|---|---|---|---|---|
| **Cytisine** | 2472 (1 RCT) | 1.13 [0.73, 1.74] | Possibly positive ↑ | VERY LOW | RoB; 2 x levels indirectness |
| **Nic ECs** | 989 (1 RCT) | 4.57 [0.88, 23.72] | Possibly positive ↑ | VERY LOW | Imprecision; 2 x levels RoB |
| **Bupropion** | 716 (2 RCTs) | 0.05 [0.00, 1.00] | Possibly negative ↓ | VERY LOW | RoB 2 x levels imprecision |
| **NRT** | 1706 3 (RCTs) | 1.35 [0.30, 6.04] | Unclear ?? | VERY LOW | RoB Inconsistency 2 x imprecision |
| **Varenicline** | 0 (0 RCTS) | - | - | - | - |

Preliminary

# SUMMARY OF FINDINGS

## Behavioural intervention comparisons

| Intervention | N Participants (N Studies) | ROR [95% CI] | Health equality Impact | Evidence certainty | Notes |
|---|---|---|---|---|---|
| **Print-based self-help** | 4440 (3 RCTs) | 0.85 [0.52, 1.38] | Possibly negative ↓ | LOW | - |
| **Text messaging** | 8135 (4 RCTs) | 0.76 [0.47, 1.23] | Possibly negative ↓ | LOW | ROR from 1/6 RCTs |
| **Financial incentives** | 3621 (6 RCTs) | 0.91 [0.45, 1.85] | Possibly negative ↓ | VERY LOW | ROR from 5/6 RCTs |
| **Face-to-face counselling** | 2098 (6 RCTs) | 1.26 [0.18, 8.93] | Possibly neutral ↔ | VERY LOW | ROR from 1/6 RCTs |
| **Telephone counselling** | 6339 (7 RCTs) | 4.31 [1.28, 14.51] | Possibly positive ↑ | VERY LOW | ROR for 1/7 RCTs |
| **Internet** | 8118 (5 RCTs) | 1.49 [0.99, 2.25] | Possibly positive ↑ | VERY LOW | ROR from 1/6 RCTs |

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# SUMMARY OF FINDINGS

## Behavioural intervention comparisons

| Intervention | N Participants (N Studies) | ROR [95% CI] | Health equality Impact | Evidence certainty | DOWNGRADED |
|---|---|---|---|---|---|
| Print-based self-help | 4440 (3 RCTs) | 0.85 [0.52, 1.38] | Possibly negative ↓ | LOW | 2 x levels imprecision |
| Text messaging | 8135 (4 RCTs) | 0.76 [0.47, 1.23] | Possibly negative ↓ | LOW | 1/6 RCTs |
| Financial incentives | 3621 (6 RCTs) | 0.91 [0.45, 1.85] | Possibly negative ↓ | VERY LOW | 2 x levels imprecision Indirectness |
| Face-to-face counselling | 2098 (6 RCTs) | 1.26 [0.18, 8.93] | Possibly neutral ↔ | VERY LOW | Imprecision 2 x levels RoB |
| Telephone counselling | 6339 (7 RCTs) | 4.31 [1.28, 14.51] | Possibly positive ↑ | VERY LOW | 1/7 RCTs |
| Internet | 8118 (5 RCTs) | 1.49 [0.99, 2.25] | Possibly positive ↑ | VERY LOW | Imprecision 2 x levels RoB |

Preliminary

# Potential biases in the review process

## Search strategy

- screening of included studies within Cochrane reviews
- More recent evidence may not be included
- Contacted experts in the field - led to the inclusion of newer evidence

## Numerical data was no longer attainable

## Differences around defining, measuring, and reporting of SES indicators

- No universally accepted definition for 'low' and 'high' SES
- Different types of SES indicators across studies that may also vary in meaning across time and context.

## Evidence from trial settings only

- participants who volunteer in these settings may not be generalisable to the wider demographic

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# Our conclusions

## IMPLICATIONS FOR PRACTICE

**no clear evidence to support**

- the use of differential individual-level smoking cessation interventions for people from lower or higher SES groups,
- any one intervention would have an effect on health inequalities.
- conclusion may change as further data becomes available

## IMPLICATIONS FOR RESEARCH

- RCTs should collect, analyse and report quit rates by SES by study arm
- Further RCTs on
  - individual level SC interventions (e.g.) with quit rates by SES
  - Trials outside of high income countries

Preliminary

# Further doctoral research projects

*Addressing health inequalities in smoking*

**P1**

## Cochrane systematic review

To synthesise evidence on the differential effectiveness of individual-level smoking cessation interventions by socioeconomic indicators, to estimate the potential of interventions to increase or decrease health inequalities caused by tobacco use

**P2**

## Repeated cross-sectional population-level study

To investigate population-level trends and differences in smoking cessation behaviours and outcomes by multiple measures of socioeconomic position, in England, between 2014 to 2023

**P3**

## Qualitative interview study

To use in-depth interviews with people from predominately lower socioeconomic groups to explore factors that may influence uptake, use, and success of smoking cessation support, specifically behavioural support, electronic cigarettes, nicotine replacement therapy (NRT), and financial incentives

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# Questions ?

## Thank you

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Rotary

UNIVERSITY OF OXFORD

NUFFIELD DEPARTMENT OF PRIMARY CARE HEALTH SCIENCES

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