

A Trial of the Effectiveness of E-cigarettes for Tobacco Smoking Cessation amongst NSW Opiate Agonist Treatment Clients

Melissa Jackson, Paul Haber, Nick Lintzeris, Nadine Ezard,
Richard Hallinan, Craig Rodgers, Tim Ho, Chris
Oldmeadow, Coral Gartner

CI's Billie Bonevski & Adrian Dunlop

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Acknowledgement of Country

I acknowledge that we are on the lands of the Gadigal people. I pay my respects to Elders past and present and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of NSW



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E-cigarettes

- Evidence supports e-cigarettes for tobacco harm reduction¹
- High certainty evidence that E-cigarettes can assist smoking cessation more effectively than NRT (patches, gum, chews)²

¹ Edwards S et al. Tobacco Harm Reduction with Vaporised Nicotine (THRiVe): A Feasibility Trial of Nicotine Vaping Products for Smoking Cessation Among People Living with HIV. *AIDS Behav.* 2023 Feb;27(2):618-627.

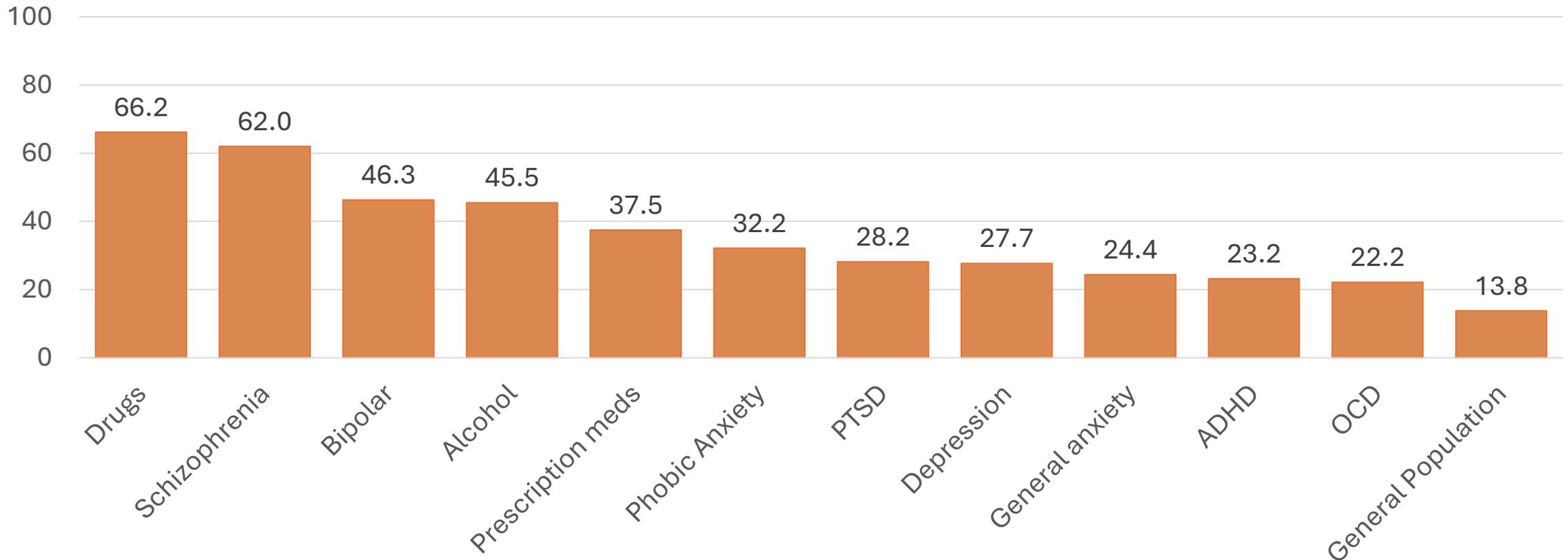
² Lindson N et al Electronic cigarettes for smoking cessation. *Cochrane Database of Systematic Reviews* 2024, Issue 1. Art. No.: CD010216.

Substance use and Tobacco



Prevalence of daily smoking by mental disorder (%)

ICD-10 classification, Australians aged 18+, 2017-18



Population

Opiate Treatment Clients

- People receiving treatment for opiate dependence have the highest rates of smoking.⁴
- Mortality rate 18 x higher due to tobacco smoking⁵
- Reported tobacco smoking rates between 73% to 94%⁴

4. Guydish J et al. An international systematic review of smoking prevalence in addiction treatment. *Addiction*. 2016 Feb;111(2):220-30

5. Engstrom A et al. Mortality in patients with substance abuse: a follow-up in Stockholm County, 1973-1984. *International Journal of the Addictions*. 1991;26(1):91-106

Design

Design: Randomised single blinded parallel group trial

Intervention: E-cigarettes vs Combination NRT

Duration: 12-week treatment + 12-week follow-up

Target Recruitment: 572

Sites: 6 x NSW Health opioid treatment clinics

- Hunter New England LHD
- Sydney LHD
- South West Sydney LHD
- Western Sydney LHD
- St Vincent's LHN
- South East Sydney LHD

Participants

- Aged 18+ years
- Accessing opioid agonist treatment from a participating service
- Self-report daily tobacco smoking
- Wanting to quit or cut down
- Not currently vaping (no more than 1 day/week in past 30 days)

Participants

Intervention

E-cigarette group received:

- Innokin Endura T18-II starter kit + 5 spare coils
- 12-weeks supply unflavoured e-liquid nicotine
- 1-week supply of NRT patches
- Instructions for correct use



Intervention

NRT group received:

- 12 weeks combination NRT
 - Patch (Step 1/21mg)
 - Inhalator (15mg)
 - Gum (4mg)
 - Lozenge (4mg)
 - QuickMist (150sprays @ 1mg)
- Pre-packaged, not customizable
- Instructions for correct use



Outcomes

Self-reported 7-day pp abstinence from tobacco (12-weeks)



Verified 7-day point prevalence abstinence from tobacco (12 weeks)

Self-reported 7-day pp abstinence from tobacco (24 weeks)



Self-reported 30-day continuous abstinence from tobacco (24 weeks)

Safety of liquid nicotine



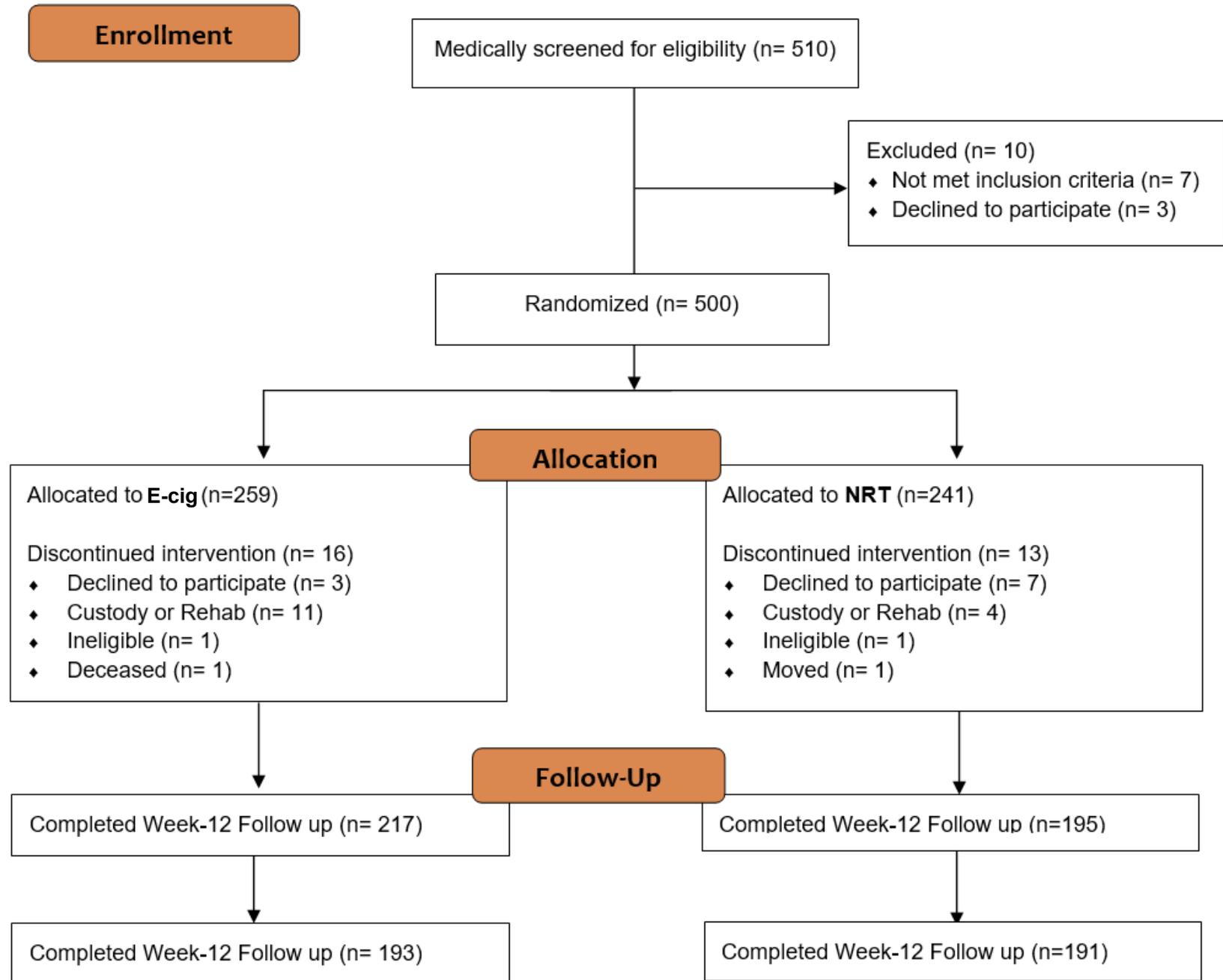
Study retention

Treatment adherence



Economic Evaluation

Participant Flow



Demographics

Characteristic	E-cigs N = 259	NRT N = 241	Overall N = 500
Gender: Male	157 (61%)	151 (63%)	308 (62%)
Aboriginal or Torres Strait Island origin	63 (24%)	553 (22%)	116 (23%)
Age (mean, SD)	46 (10)	46 (9)	46 (10)
Education up to & including year 10	183 (71%)	171 (71%)	354 (71%)
Income: Government benefit or pension	212 (82%)	203 (84%)	415 (83%)

Participant Characteristics

Health Behaviours

Characteristic	E-cigs N = 259	NRT N = 241	Overall N = 500
Opiate Treatment: Methadone	145 (56%)	122 (51%)	267 (53%)
Average Treatment length: years	5.6	5.4	5.5
Anxiety/Depression (PHQ4): Mod + Severe	186 (72%)	173 (71%)	359 (71%)
Nicotine Addiction (HSI): Mod + High	210 (81%)	192 (79%)	402 (80%)
Quit attempts in past year: Zero	142 (55%)	139 (58%)	281 (56%)
Previous quit method: Willpower	81 (70%)	81 (79%)	162 (75%)

Participant Characteristics

Participant Characteristics

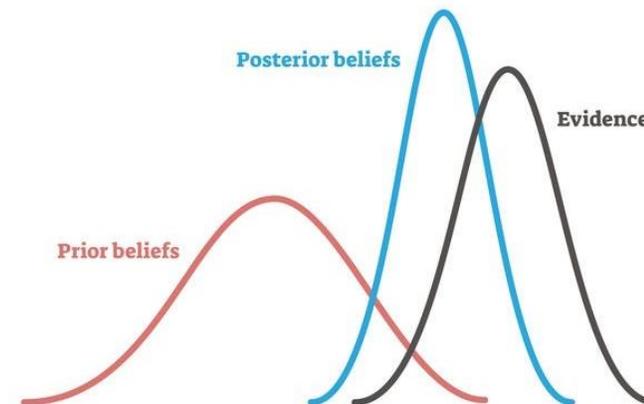
Substance Use

Past 28-day use	E-cigs N = 259	NRT N = 241	Overall N = 500
Cannabis	94 (36%)	84 (35%)	178 (36%)
Alcohol	80 (31%)	67 (28%)	147 (29%)
Benzodiazepine	48 (19%)	48 (20%)	96 (20%)
Amphetamine	45 (17%)	38 (16%)	83 (17%)
Heroin	46 (18%)	35 (15%)	81 (16%)
Illicit Opioid	8 (3%)	8 (3%)	16 (3%)
Cocaine	3 (1%)	5 (2%)	8 (2%)

Data Analysis

Bayesian Framework

- Effects included:
 - Treatment group
 - Timepoint
 - Treatment group x Timepoint
 - Cannabis use at baseline
 - Random intercept to account for repeated measures within participants
- Used vague priors [$N(0,1000)$]



Data Analysis

Bayesian Framework

- Treatment effects reported as:
 - Mean posterior rate ratio (risk ratio)
 - Absolute difference between treatment groups with 95% credible intervals (CrI)
 - Bayes Factor
 - Probability of direction (treatment effect >0)
- Missing data multiply imputed

E-cig	NRT	Risk ratio	Mean difference	Bayes factor	Posterior probability
52/217 (24%)	24/195 (12%)	1.99 (CrI 1.32, 2.98)	0.12 (CrI 0.05, 0.18)	1,719	>0.99

Results

Primary Outcome

Effect of treatment on 7-day abstinence from tobacco at **week 12**.

E-cig	NRT	Risk ratio	Mean difference	Bayes factor	Posterior probability
52/217 (24%)	24/195 (12%)	1.99 (CrI 1.32, 2.98)	0.12 (CrI 0.05, 0.18)	1,719	>0.99

Bayes Factor	Interpretation
> 100	Extreme evidence for E-cig compared to NRT
30 – 100	Very strong evidence for E-cig compared to NRT
10 – 30	Strong evidence for E-cig compared to NRT
3 – 10	Moderate evidence for E-cig compared to NRT
1 – 3	Anecdotal evidence for E-cig compared to NRT
1	No evidence for E-cig compared to NRT

Secondary Outcomes

Abstinence

Outcome	Time	E-cig	NRT	Risk Ratio	Mean difference	Bayes factor	Posterior probability
7-day pp tobacco abstinence (CO verified)	Week 12	29/32 (91%)	9/13 (69%)	1.16 (CrI 0.93, 1.65)	0.12 (CrI -0.07, 0.37)	7.95	0.88

Secondary Outcomes



Abstinence

Outcome	Time	E-cig	NRT	Risk Ratio	Mean difference	Bayes factor	Posterior probability
7-day pp tobacco abstinence (CO verified)	Week 12	29/32 (91%)	9/13 (69%)	1.16 (CrI 0.93, 1.65)	0.12 (CrI -0.07, 0.37)	7.95	0.88
30-day continuous tobacco abstinence (self-report)	Week 24	35/193 (18%)	17/191 (9%)	1.96 (CrI 1.14, 3.45)	0.09 (CrI 0.02, 0.15)	159.80	>0.99

Bayes Factor	Interpretation
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1	No evidence for E-cig compared to NRT

Secondary Outcomes

Abstinence

Outcome	Time	E-cig	NRT	Risk Ratio	Mean difference	Bayes factor	Posterior probability
7-day pp tobacco abstinence (CO verified)	Week 12	29/32 (91%)	9/13 (69%)	1.16 (CrI 0.93, 1.65)	0.12 (CrI -0.07, 0.37)	7.95	0.88
30-day continuous tobacco abstinence (self-report)	Week 24	35/193 (18%)	17/191 (9%)	1.96 (CrI 1.14, 3.45)	0.09 (CrI 0.02, 0.15)	159.80	>0.99
7-day pp tobacco abstinence (self-report)	Week 24	49/193 (25%)	23/191 (12%)	2.02 (CrI 1.37, 3.15)	0.13 (CrI 0.06, 0.2)	2,975.7	>0.99

Secondary Outcomes

Safety

Adverse Event	E-cig N = 84	NRT N = 64
Dry mouth	7 (9.1%)	0 (0%)
Throat irritation	7 (9.1%)	1 (1.6%)
Cough	6 (7.8%)	4 (6.3%)
Headache	6 (7.8%)	6 (9.4%)
Shortness of breath	5 (6.5%)	4 (6.3%)
Device event	5 (6.5%)	0 (0%)
Nausea	1 (1.3%)	10 (16%)
Severity of event	E-cig	NRT
Mild	62 (79%)	53 (84%)
Moderate	9 (12%)	6 (9.5%)
Severe	7 (9.0%)	4 (6.3%)
Probable relationship to the intervention	39 (52%)	33 (57%)

Secondary Outcomes

Nicotine product utilisation

Outcome	Time	E-cigs	NRT	Risk Ratio	Mean difference	Bayes factor	Posterior probability
Use of nicotine product in past 12-weeks	Week 12	77/90 (86%)	112/159 (70%)	1.13 (0.83, 1.34)	0.08 (-0.12, 0.21)	4.03	0.801
	Week 24	123/193 (64%)	87/190 (46%)	1.36 (1.05, 1.73)	0.16 (0.02, 0.27)	115.58	0.991

Bayes Factor	Interpretation
> 100	Extreme evidence for E-cig compared to NRT
30 – 100	Very strong evidence for E-cig compared to NRT
10 – 30	Strong evidence for E-cig compared to NRT
3 – 10	Moderate evidence for E-cig compared to NRT
1 – 3	Anecdotal evidence for E-cig compared to NRT
1	No evidence for E-cig compared to NRT

Secondary Outcomes

Study Retention

Outcome	Time	E-cigs	NRT	Risk Ratio	Mean difference	Bayes factor	Posterior probability
Retention in Study	Week 12	217/259 (84%)	195/241 (81%)	1.02 (0.95, 1.11)	0.02 (-0.04, 0.09)	2.52	0.716
	Week 24	193/259 (75%)	191/241 (79%)	0.93 (0.85, 1.03)	-0.05 (-0.13, 0.02)	0.07	0.069

Cost-effectiveness analysis

Costs broken down by treatment

	NRT		E-cigarette's	
Baseline	21mg Patches (28 pack)	\$57.24	E-cigarette device	\$37.07
	2 x Inhalator 15mg (20 pack)	\$77.97	Innokin Prism Coil Pack T18/22	\$9.58
	Oral spray 1mg (3 pack)	\$74.99	8 x 12mg nicotine e-liquid	\$48.07
	Medical screening	\$46.54	21mg Patches (7 pack)	\$60.07
	Educational brochure	\$0.36	Medical screening	\$46.54
			Educational brochure	\$0.36
Week 4	21mg Patches (28 pack)	\$57.24	8 x 12mg nicotine e-liquid	\$48.07
	2 x Inhalator 15mg (20 pack)	\$77.97		
	4 x 4mg lozenge	\$228.94		
	1 x 4mg gum (large)	\$57.24		
Week 8	21mg Patches (28 pack)	\$57.24	8 x 12mg nicotine e-liquid	\$48.07
	2 x Inhalator 15mg (20 pack)	\$77.97		
	4 x 4mg lozenge	\$228.94		
	1 x 4mg gum (large)	\$57.24		
Total		\$1,099.87		\$297.85

Cost-effectiveness analysis

Incremental cost-effectiveness ratio (ICER)

- Evaluates whether a new, more effective health intervention justifies its additional cost compared to an existing one
- Calculated using:

Difference in Intervention Costs

Difference in Quit Rates

- At end of treatment (week 12):

$$\$298 \text{ (E-cig)} - \$1,100 \text{ (NRT)} = -\$802$$

$$0.24 \text{ (E-cig)} - 0.12 \text{ (NRT)} = 0.12$$

Cost-effectiveness analysis

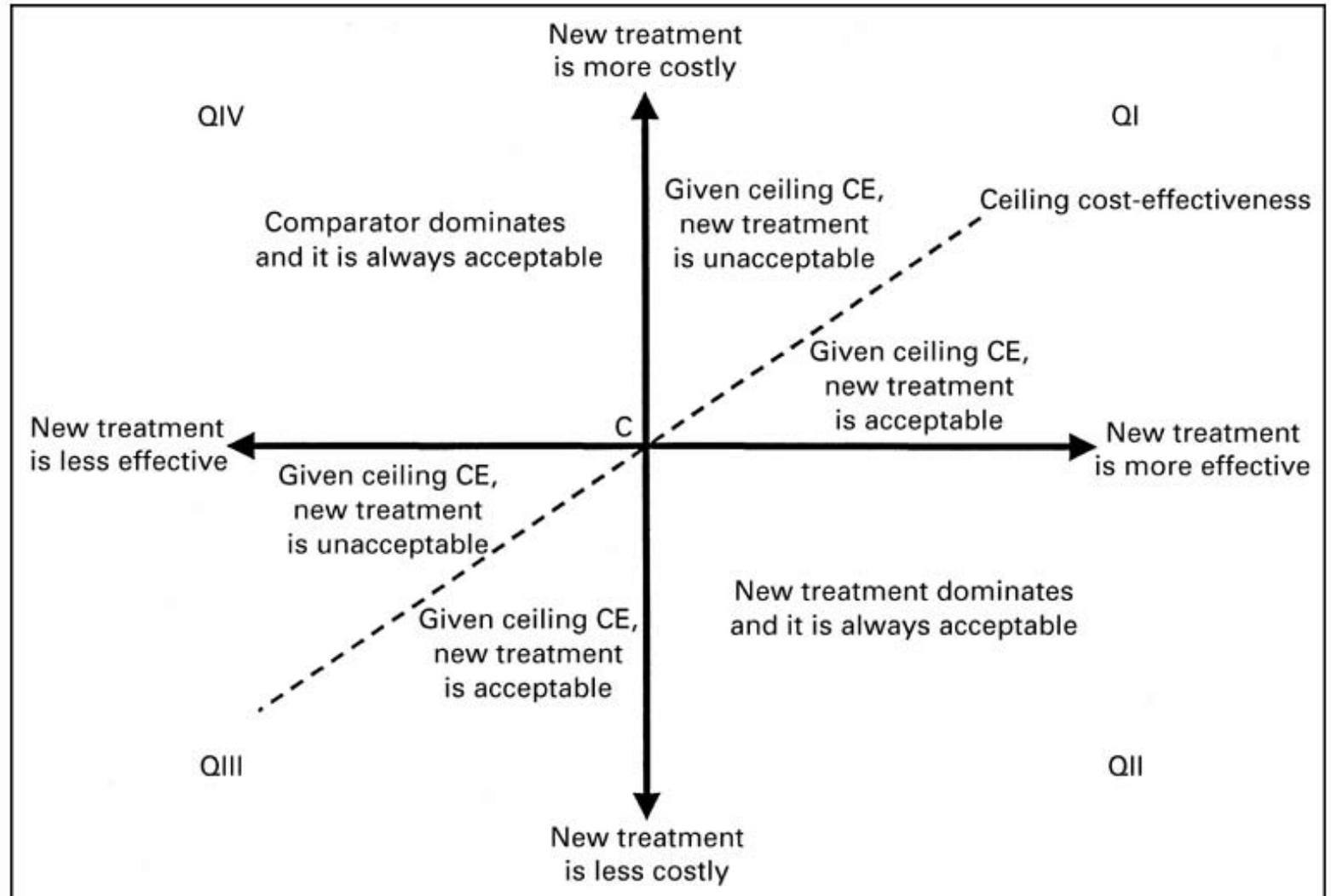
Incremental cost-effectiveness ratio (ICER)

	12-Weeks	24-weeks
Incremental quit rate	0.12 (CI 0.05, 0.18)	0.09 (CI 0.02, 0.15)
Incremental cost	-\$802 (-\$1,100, -\$298)	-\$802 (-\$1,100, -\$298)
ICER	Dominant*	Dominant*

- E-cigarettes → more effective and less costly than NRT
- Ideal scenario with better health outcomes
- Health decisions should be straightforward for dominant strategies.

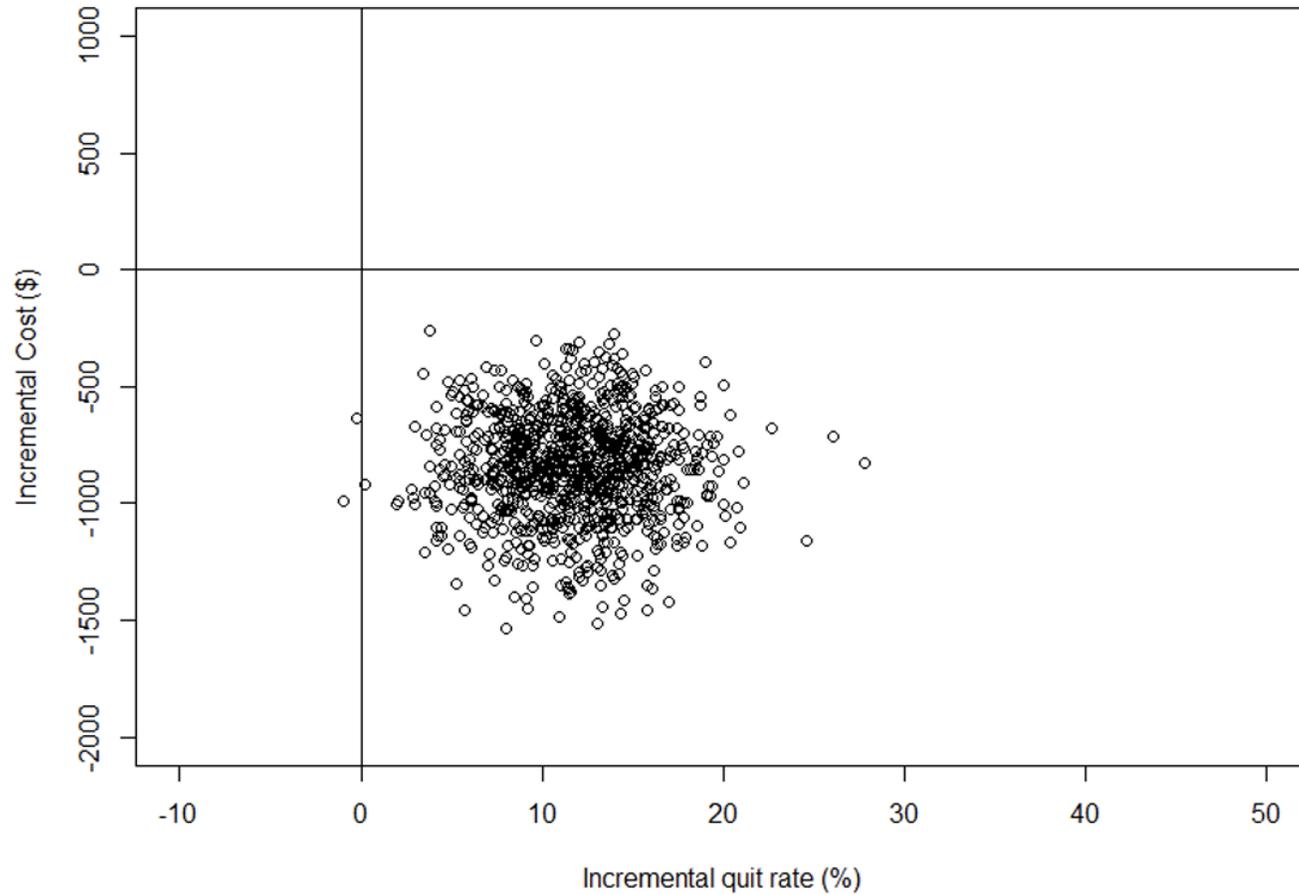
Cost-effectiveness analysis

Cost-effectiveness plane



Secondary Outcomes

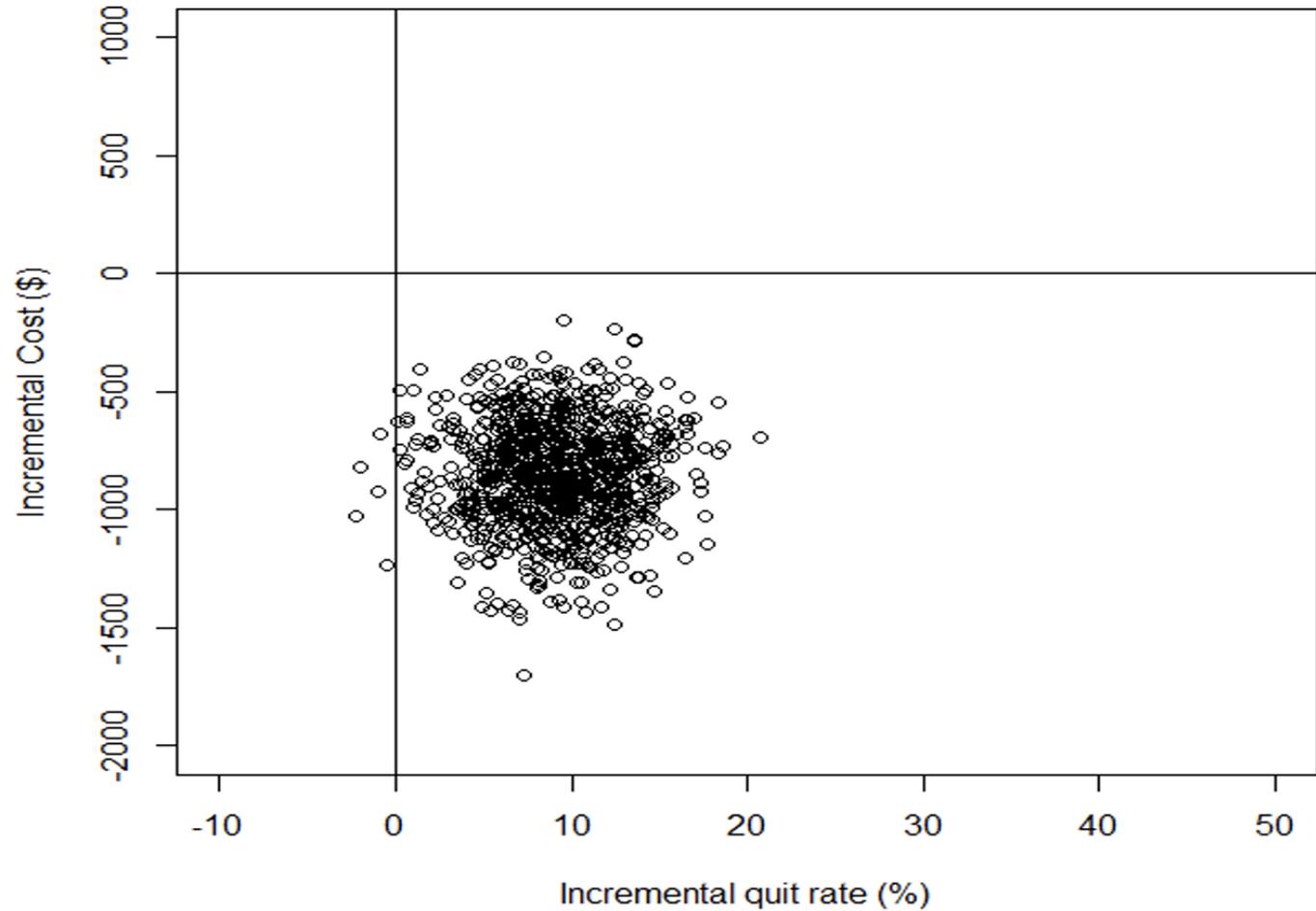
Cost-effectiveness plane



7-day point prevalence at 12 weeks

Secondary Outcomes

Cost-effectiveness plane



30-day continuous abstinence at 24 weeks

- E-cigarettes are **cost-effective** compared to NRT but further modelling using downstream effects on health service use is required
- Overall, e-cigarettes are **relatively effective** and **safe** for opioid treatment clients to stop tobacco use
- Findings could significantly **impact** tobacco **smoking prevalence** in priority populations

Discussion

- Publication of results
- Planned discussions with **NSW Health** regarding results and potential implementation
- An **implementation trial** to evaluate the uptake and integration of E-cigarettes into routine health care

What's next



HARMONY

HARM reduction for Opiates Nicotine & You

Thank You

Contact:

Mel.Jackson@health.nsw.gov.au



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Secondary Outcomes



Tobacco Withdrawal

Outcome	Time	E-cig	NRT	Mean difference	Bayes factor	Posterior probability
Withdrawal Symptoms	Week 12	0.98 (0.67)	1.03 (0.73)	-0.02 (CrI -0.18, 0.12)	1.62	0.619

Secondary Outcomes

Cigarette Craving

Outcome	Time	Frequency	E-cigs	NRT	Ratio (RR or OR) ³	Bayes factor	Posterior probability
Craving frequency	Week 12	Hourly or more often	51 (32%)	69 (42%)	1.86 (CrI 1.07, 3.21)	76.60	0.987
		Several times a day	56 (35%)	52 (31%)			
		At least once a day	32 (20%)	35 (21%)			
		Less than daily	13 (8%)	7 (4%)			
		Never	6 (4%)	3 (2%)			

Secondary Outcomes

Cigarette Craving

Outcome	Time	Strength	E-cig	NRT	Odds Ratio	Bayes factor	Posterior probability
Craving Strength	Week 12	No urge	6 (6%)	2 (2%)	0.78 (CrI 0.49, 1.23)	6.77	0.871
		Slight	19 (18%)	16 (17%)			
		Moderate	49 (47%)	51 (53%)			
		Strong	26 (25%)	20 (21%)			
		Very strong	4 (4%)	4 (4%)			

Secondary Outcomes

Quit attempts

Outcome	Time	E-cig	NRT	Ratio (RR or OR) ³	Mean difference	Bayes factor ⁴	Posterior p ⁵
Attempted to quit	Week 12	87/157 (55%)	97/165 (59%)	1.02 (0.89, 1.18)	0.02 (CrI -0.08, 0.11)	1.77	0.639
	Week 24	55/139 (40%)	69/166 (42%)	1.05 (0.83, 1.3)	0.02 (CrI -0.09, 0.12)	1.84	0.648

Secondary Outcomes

Cigarette Reduction

Outcome	Time	E-cigs	NRT	Ratio (RR or OR) ³	Mean difference	Bayes factor ⁴	Posterior p ⁵
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