BMJ Open

Synthesis using prospective meta-analysis to reduce youths' e-cigarette use (SPARKE): a protocol for an individual participant data prospective meta-analysis (IPD PMA) examining interventions for the prevention of youth e-cigarette use

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To cite: McCrabb S, Hunter KE, Turon H, *et al*. Synthesis using prospective meta-analysis to reduce youths' e-cigarette use (SPARKE): a protocol for an individual participant data prospective meta-analysis (IPD PMA) examining interventions for the prevention of youth e-cigarette use. *BMJ Open* 2025;**15**:e093028. doi:10.1136/bmjopen-2024-093028

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2024-093028).

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Received 29 August 2024
Accepted 01 May 2025

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ABSTRACT

Introduction Youth electronic cigarette (e-cigarette) use is a global health challenge, with multiple jurisdictions wrestling with appropriate responses, in the face of limited evidence available on effective interventions. Identifying and synthesising evidence on the effects of interventions to prevent youth e-cigarette use is required to inform prevention-focussed health policy and practice.

Methods and analysis We plan to undertake an individual participant data (IPD) prospective meta-analysis (PMA). We will conduct systematic searches to identify eligible planned or ongoing randomised controlled trials (RCTs) using trial registries via WHO ICTRP and ClinicalTrials.gov and databases Medline, Embase, CENTRAL, PsycINFO, Web of Science, CINAHL and Europe PMC. We will also search grant websites for additional studies. We will include any RCT of e-cigarette and cigarette prevention interventions for youth including non-smoking and non-vaping youth aged 10 to 19 years, with no intervention, waitlist, usual care or active control. Primary outcomes will be measures of current or ever e-cigarette use. Secondary outcomes include measures of current and ever cigarette (conventional cigarette) use. Investigators from relevant trials will be invited to join the Synthesis using Prospective meta-Analysis to Reduce youths' E-cigarette use (SPARKE) consortium prior to trial outcomes being known using harmonised methods. They are then asked to share their data within 12 months of trial completion.

The primary outcomes will be analysed in a two-stage IPD meta-analysis model under an intention-to-treat framework. First, effect estimates and variances will be calculated for each trial with log-binomial regression models adjusting for key prognostic factors. For cluster RCTs, a nested random effect will be specified within trials to account for correlations within clusters. Second, effect estimates will be combined across trials in a random treatment effect, inverse variance meta-analysis model. Effect estimates will be reported as relative risk ratios with 95% CIs.

Discussion This study aims to generate and expedite the synthesis of data regarding prevention interventions for adolescent e-cigarette use to inform real-world decision making. Findings will be of interest to key stakeholders, including policy makers and research funders.

Ethics and dissemination Each trial will be responsible for obtaining their own ethics approval. While secondary analysis of data does not usually require ethics approval, we have received cross-institutional ethics approval from the University of Sydney (2023/714) and the University of Newcastle (H-2023–0389).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first study to monitor the international literature on adolescent e-cigarette prevention interventions using a novel individual participant data (IPD) prospective meta-analysis (PMA) technique.
⇒ Using our novel IPD PMA technique will provide a robust mechanism for harmonising outcome measures for synthesis, addressing biases introduced by standard meta-analytic techniques.
⇒ Using this method will provide greater flexibility to explore the effects of heterogeneity, improving external validity and use of research findings for end-users.

INTRODUCTION

Globally, the use of electronic cigarettes (e-cigarettes) among youth has increased rapidly, particularly over the last decade, and has been labelled an epidemic by the US Surgeon General.[1] This surge in e-cigarette use threatens to create new generations of nicotine-addicted individuals aged 10 to 19 years[2] (henceforth called youth) and alongside other risks, erode decades of progress in tobacco control. Here, e-cigarettes refer to any device used to heat a liquid which usually contains propylene glycol, vegetable glycerine/glycerol, flavours and nicotine, to produce an aerosol containing a range of chemicals, some of them toxic[3 4] which can then be inhaled (a process known as vaping). These devices can include vapes, e-hookahs, e-cigars or e-pipes.

E-cigarettes are heavily marketed towards youth, with a focus on appealing device types, designs and flavours,[5] with rates of use increasing over recent years. For example, in Australia, in 2022–2023, 29.9% of 12–17-year-old secondary students reported ever using e-cigarettes and 15.7% reported use in the past month, around three times the use observed in 2017.[6] In Great Britain, the percentage of 11–17-year-olds who had ever used e-cigarettes increased from 15.8% in 2022 to 20.5% in 2023.[7] Similarly, New Zealand observed the prevalence of youth (15–17 years) using e-cigarettes daily rose from 8.3% in 2021–2022 to 15.4% in 2022–2023.[8] In the USA, 7.7% of middle and high school students reported current use of e-cigarettes in 2023.[9]

Reviews conducted for the World Health Organization (WHO), the Australian Government and the Office of the US Surgeon General found no health benefits for e-cigarette use in non-smokers and a range of harms. For example, research suggests e-cigarette use in youth can increase the risk of subsequent cigarette use by twofold.[10] Their use may also increase the risk of addiction, nicotine toxicity, acute respiratory injuries and asthma.[10–12] Addressing youth e-cigarette use, therefore, is an international health priority.[13 14]

The WHO Report on the Global Tobacco Epidemic published in 2023 outlines a number of recommended government and public health actions to address the increased prevalence of e-cigarette use in youth.[15] This report includes government policy and legislative action to restrict the supply of e-cigarettes to youth,[15] which have been enacted to varying degrees across many countries. Nonetheless, even in countries with restriction on sales and age of purchasing (eg, Canada, New Zealand, USA), youth e-cigarette use remains prevalent.[16] As such, to supplement policy and legislative approaches,[17 18] the US Substance Abuse and Mental Health Services Administration recommends implementation of behavioural interventions, including individual, setting-based and community-level approaches to curb use among youth.[17]

However, few rigorous studies have investigated the impact of prevention programmes on youth e-cigarette use.[19] A Cochrane living systematic review with a latest search date of July 2024 identified one completed randomised controlled trial (RCT) with published outcomes to prevent or cease e-cigarette use among youths.[2] A further 27 ongoing potentially eligible RCTs were identified, with a further three awaiting classification, indicating the growing body of literature on this topic internationally. Nonetheless, considerable investments are being made to prevent e-cigarette use in youth. For example, $A30 million have been allocated to protect Australians from e-cigarette/tobacco use by the Australian government.[20] Similarly, the UK government is investing more than £100 million per year in cessation support, national campaigns and law enforcement.[21] Generating evidence regarding the effectiveness of e-cigarette prevention initiatives is, therefore, critical to guide such investments and ensure that they are having a beneficial impact.[19]

Individual participant data (IPD) prospective meta-analysis (PMA) of RCTs represents gold standard evidence synthesis, providing a rigorous and timely evidence base for policy and practice decision-making.[22] This method leverages and coordinates research undertaken globally to maximise statistical power for identifying effective interventions and enables valid conclusions regarding cause-and-effect relationships. A PMA is particularly useful when the evidence base is uncertain but rapidly emerging—as is the case for youth e-cigarette prevention. Unlike conventional systematic reviews which retrospectively search for completed trials (and are therefore prone to bias), a PMA prospectively searches, identifies and 'recruits' eligible trials before their results are known.[22] Investigators of participating trials agree to harmonise key methods, including core sets of outcome measures, and to share IPD (row-by-row deidentified raw data) to pool as part of an international collaborative consortium. By doing so, IPD PMA provides greater pragmatic flexibility to explore important effect heterogeneity given the inherent variability of interventions and contexts—improving external validity and utility for end-users, such as governments, in the design of prevention interventions.[23]

Given the potential threat e-cigarette use poses to public health, and the current limited evidence base to address this, IPD PMA provides an opportunity to maximise the utility of e-cigarette prevention trials to support prevention efforts. As such, we will conduct the following IPD PMA, known as the Synthesis using Prospective meta-Analysis to Reduce youths' E-cigarette use (SPARKE) collaboration (https://www.sparkecollaboration.org/).

Objectives

We aim to:

1. Assess the effectiveness of interventions to prevent initiation of e-cigarette use in non-vaping and non-smoking youth (aged 10–19 years),[24] compared with no intervention, waitlist, usual care or active control on:
   a. Ever (lifetime) and/or current use (past 30 days) of e-cigarettes at 12 months post-baseline assessment, primary outcome of PMA, and

b. Ever (lifetime) and/or current use (past 30 days) of cigarettes at 12 months post-baseline assessment, secondary outcome of PMA.

METHODS AND ANALYSIS

We will conduct a systematic review and IPD PMA following best-practice methods for IPD[25] and PMA as outlined in the Cochrane Handbook for Systematic reviews[26 27] and developed by the TOPCHILD collaboration.[28 29] Simply, investigators from eligible studies will be invited to join the SPARKE collaboration *before* the results of their studies are known,[29] where outcomes of participating trials will be prospectively harmonised (where possible), and IPD will be combined on completion of included studies to assess intervention effects. This protocol was written in line with PRISMA-P[30] and PRISMA-IPD[31] guidelines with PMA-specific headings added (eg, collaboration management, data safety monitoring, data harmonisation, timelines) and has been based on published guidance and previously registered IPD PMA.[28 29] Prospero registration number: CRD42023444612.

Patient and public partnership statement

It was not appropriate or possible to involve patients or the public in the design, conduct reporting or dissemination plans of our research.

Eligibility criteria

Types of studies

Both individually randomised and cluster RCTs will be included in this study. We will include RCTs as they represent the highest quality study design for the assessment of intervention effects,[22] are appropriate for the types of interventions assessed in this review, are recommended as the basis for public health decision making and were prioritised by our partners. There will be no language restrictions.

Trial participants

Participants in trials assessing the effects of e-cigarette prevention interventions on youth aged 10–19 years (as per the WHO definition of youth)[24] will be eligible for study inclusion. Participants must not have previously used e-cigarettes (and related products with or without nicotine) or conventional cigarettes to be eligible. Trials with both current and non-users of e-cigarettes will be eligible, with only data from the non-users included if able to be isolated. Trials can include participants over 19 years or under 10 years, so long as the median age of the sample at baseline is <19 years and >10 years, with only those participants fulfilling our eligibility criteria included in the combined analysis. We will exclude pilot trials of less than 50 participants. Where uncertainty exists for any trial's potential eligibility, consensus will be sought from the collaboration steering group.

Types of interventions

The focus of this review will be behavioural interventions, which are defined as 'coordinated sets of activities designed to change specific behaviour patterns'.[32] They include those targeting the capability, opportunity or motivation of an individual via social, educational, experiential, health promotion, marketing, system, environmental, regulatory or other strategies. We will include any health behaviour intervention, undertaken in any setting (eg, education, health, workplace, sporting clubs, recreation) designed to prevent e-cigarette use in youth aged 10 to 19 years. There will be no restriction on the mode of delivery or the minimum intensity of the intervention. Interventions undertaken in laboratories or other simulated contexts will be excluded.

To be eligible, trials must: (i) have a follow-up period of at least 12 months from baseline to enable sufficient period of latency for the primary and secondary outcomes, (ii) have not commenced analysis (and therefore trial results are not known to investigators) at the time of trial recruitment to the SPARKE collaboration, (iii) agree to provide IPD or detailed customised summary data that can be included in the main analysis if trials are unable to provide IPD due to ethical constraints and (iv) agree to the research procedures, including collection of primary core outcomes to enable harmonisation for analysis.[33]

Types of comparisons

Eligible comparator groups include no intervention, waitlist, usual care or active control.

Types of outcome measures

Trials recruited to the PMA will be required to report at least one measure of e-cigarette current use and/or ever use. We encourage investigators of planned/ongoing studies to collect the primary and secondary outcomes listed in box 1. For the primary and secondary outcomes, the primary endpoint will be 12 months.

Primary outcomes

E-cigarette use

Consistent with the core outcome set available for e-cigarette use in youth,[34] we will include two primary outcomes: 'current use' (defined as use in the past 30 days) and 'ever use' (defined as any lifetime use) among never users of e-cigarettes at baseline. The primary timepoint will be 12 months post-baseline, common to population monitoring approaches (eg, Global Youth Tobacco Survey).[35]

Secondary outcomes

Cigarette use

We will also include as a secondary outcome two measures of cigarette use: 'current use' (defined as cigarette use in the past 30 days) and 'ever use' (defined as any lifetime use of cigarettes) among never smokers (ie, people who have never smoked a conventional cigarette) at baseline. We will use biochemically verified measures of cigarette use where they are available. However, biochemically verified measures will not be a requirement for participating trials as this

Box 1 List of outcomes of interest in PMA

Primary outcome measures of interest in PMA
Current/ever e-cigarette use at 12 months post-baseline

Secondary outcome measures of interest in PMA
Current/ever cigarette use at 12 months post-baseline

Other additional outcome measures for exploratory analysis
Current/ever e-cigarette use at follow-up period different to the primary outcome (eg, 6 months, 24 months)
Frequency of vape use (eg, daily, past 30 days)
Vape device type (eg, disposable, rechargeable)
Flavour vaped (eg, mint, clove, spice, candy)
Presence of nicotine in vape (yes/no/don't know)
Vaping intentions and beliefs (eg, intentions to vape in the future; belief about harmfulness of vapes)
Current/ever cigarette use at follow-up period different to the primary outcome (eg, 6 months, 24 months)
Frequency of cigarette use (eg, daily, last 30 days)
Beliefs about smoking (eg, beliefs about harmfulness of cigarette)
First product used (cigarette, e-cigarettes, both, none)
Vaping other substances (eg, marijuana)
Cravings to vape
Nicotine pouches (use, influence to try, beliefs and intentions, second-hand exposure, accessibility, cessation
Other oral nicotine products (ONP) (awareness, use, beliefs and intentions, accessibility, cessation)
Second-hand exposure to nicotine products
Adverse events (eg, self-reported from participants to trialists)

is often considered unnecessary for prevention studies—given youth cigarette use is often intermittent and concordant between verified and self-reported measures.[36] The primary timepoint of interest will be 12 months follow-up post-baseline.

For both primary and secondary outcomes, where trials collect outcomes using a different format (eg, 7-day point prevalence abstinence rather than 30-day point prevalence abstinence), data will be included in secondary outcome analysis (eg, we will define participants as abstained 'yes' vs 'no' regardless of the response format). Where trials include longer/shorter follow-up periods, secondary analyses will be undertaken including all available data, pooling data from all follow-up periods; also analysed grouped in timeframes (eg, 0–6 months, 18–24 months follow-up).

Outcomes of interest for the PMA are listed in box 1, with full survey items available in online supplemental file 1. While not essential for trial inclusion in the PMA collaboration, these measures are recommended to trialist for inclusion to contextualise findings. Some outcomes will be used in exploratory analysis.

Additional trial information

Demographic measures

All included trials will be asked to provide any individual level demographic data including participant age, gender, sex, household income, education level/schooling type, socioeconomic position,[37] parental employment status, regional breakdown (regional/rural/urban), country of birth, immigration status, main language spoken at home, racial background/ethnicity and others if available. Where possible, measures will be harmonised at baseline according to a standardised coding template. Where this is not possible, attempts will be made to retrospectively harmonise variables collected at follow-up.

Trial-level data, such as setting, intervention timing, mode of delivery, comparator/control details, method of sequence generation, allocation concealment, geographical location, outcome measures and definitions will be extracted independently from intervention materials. Extracted information will be collected in duplicate into a database and cross-checked against any published reports, trial protocols, registration records and metadata provided by trial investigators. Discrepancies will be resolved via consensus.

Intervention delivery features

If there are sufficient resources available, we will code delivery features of included interventions. Examples of an approach which may be used include describing intervention features using ontologies from the Human Behaviour Change Project[38] and drawing on the Template for Intervention Description and Replication (TIDieR) checklist.[39]

Behaviour change techniques

If there are sufficient resources, techniques used to modify the behaviour of interest (e-cigarette use) will be coded according to a standardised framework such as Behaviour Change Taxonomies.[40]

Information sources and search strategy

Eligible RCTs will be prospectively identified and recruited. A comprehensive search strategy (online supplemental file 2) will be executed to identify eligible planned and ongoing studies.

We will undertake searches consistent with best-practice guidance[41] using the WHO International Clinical Trials Registry Platform (ICTRP), which captures data from all primary registries, and ClinicalTrials.gov to identify trials as they are registered.[41] We will also search outcomes of international research funding schemes (National Health and Medical Research Council; Medical Research Future Fund; National Institute of Health, Medical Research Council and National Institute for Health and Care Research); and search electronic bibliographic databases including Europe PMC (to capture preprints), CENTRAL (Cochrane library), MEDLINE (Ovid), Embase (Ovid), PsycINFO (Ovid), Web of Science (Clarivate) and CINAHL (EBSCO) for published trial protocols. For bibliographic database searches,

Table 1 Time frames for conducting searches

Source	Search conducted
Database search	Monthly
Trial registry searches	Monthly
Grant funding websites	6 monthly
Searching of references from relevant reviews and included studies	As identified in database searches

we will use existing peer-reviewed filters for 'population' (eg, youth, adolescents)[42]; 'intervention' (eg, e-cigarettes, vaping)[43] and 'design' (RCT),[22 42] and terms for 'protocols'. The time frames for conducting searches of each source are shown in table 1.

Selection of studies for inclusion in the review

Two reviewers will independently screen all identified records against eligibility criteria. Where uncertainty exists due to lack of information in trial registries, trialists will be contacted to confirm details about their study and their eligibility in participating in the collaboration. Discrepancies will be resolved by discussion with a third review author, or through discussion with the project group.

Recruitment of eligible trials

Chief investigators/corresponding authors from identified eligible trials will be invited to join the SPARKE collaboration. Trialists will initially receive an invitation via email, offering them the option to take part in a one-on-one meeting with the SPARKE research team (not mandatory). In the event the invitation email is unsuccessful, attempts will be made to contact trialists through other methods, including additional emails to alternate publicly available email accounts, phone calls, and messaging via social media or Research Gate, and through approaching investigators through our networks (eg, current members of the SPARKE collaboration). Following, study information will be requested from trialists (eg, ethics approval, participant information statements, study protocols etc) to further assess eligibility. If the trial is deemed eligible and the trialist agrees to join the collaboration, they will be asked to complete a conflict of interest statement using a secure REDCap form.[44] Once signed, the form will be reviewed by the research team. If the trialists are deemed to have no remarkable conflicts of interest, trialists are considered members of the SPARKE collaboration. Where the severity of a conflict of interest is unclear, the conflict will be reviewed by the project team in line with Cochrane's conflict of interest policy.[45] Depending on the level of the conflict (eg, trialist has received tobacco industry funding), their data may be omitted from primary analysis or included in sensitivity analysis and the trialist may not be included in the collaboration.

Data collection, management, and confidentiality

Data receipt/extraction

Trialists of all eligible studies will be invited by the SPARKE data management team to share their deidentified IPD via a secure data transfer platform. Data will be accepted in any format and recoded as necessary. The data will be received and stored in perpetuity according to the University of Sydney Data Management Policy 2014.

Trialists will be asked to provide metadata (ie, data that provides information about their trial dataset), such as questionnaires, data collection forms and data dictionaries to aid understanding of the dataset.

Where trialists choose not to provide or are unable to provide IPD, aggregate data will be used where available. Online supplemental file 3 lists all current SPARKE collaboration trialists as of July 2024.

Data processing

Data that are received in raw format will be recoded into a standardised format. The quality and integrity of included studies and their data will be assessed by examining the IPD and published materials using guidance and checklists developed specifically for IPD.[46–49] These include checking for retraction notices and ethical approval and examining data with respect to completeness/missingness, range/implausible values, internal inconsistencies and consistency with published reports. The randomisation process will also be examined by reviewing the chronological randomisation sequence and pattern of assignment, as well as the balance of participant characteristics across intervention and control groups. Any issues identified will be discussed with trialists and/or data managers and resolved by consensus. Once finalised, data from each of the trials will be combined into a single SPARKE Collaboration database.

Risk of bias assessment

Two reviewers will independently assess studies for risk of bias using the Cochrane Risk of Bias (RoB) 2 tools for RCTs and cluster RCTs,[50] with several enhancements arising from availability of IPD.[51] Any discrepancies will be resolved with a third reviewer. Reviewers will not conduct risk of bias assessments for any studies they are an author on.

RoB assessments will be conducted for the review outcomes (e-cigarette use and cigarette use) at 12 months follow-up. The tool includes assessments based on the following domains: bias arising from the randomisation process, bias due to deviations from intended interventions (assessing the effect of assignment to the intervention), bias due to missing outcome data, bias in measurement of the outcome and bias in selection of the reported results. An additional domain 'risk of bias arising from the timing of identification or recruitment of participants' will be assessed for cluster RCTs. Each domain contains signalling questions to assess and categorise the risk of bias as: 'low risk', 'some concerns' or 'high risk', and we will record information to support

judgements. Overall risk of bias will be assessed using the RoB 2 tool algorithms which will be reviewed and verified by authors before accepting.

Certainty of evidence

Two reviewers will independently assess the certainty of evidence using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.[52] Any discrepancies will be resolved through discussion or consultation with a third review author. GRADE will be assessed on five domains: risk of bias (for the primary outcome), consistency of effect, imprecision, indirectness and publication bias. The certainty of the body of evidence for each individual outcome will be graded as 'high', 'moderate', 'low' or 'very low' in accordance with the Cochrane Handbook for Systematic Reviews of Interventions.[53]

Data analysis

Analysis will be of all participants randomised to the included trials under an intention-to-treat framework. Statistical analysis will be undertaken using 'R' statistical software.[54] For all analyses, we will use an alpha of 0.05. The primary analysis for all outcomes will be conducted using a 'two-stage' approach combining all available IPD and detailed customised summary data for collaborators unable to provide IPD due to ethical restraints.[55] For outcomes that are not rare, two-stage models perform as well as one-stage models, but they are less error-prone, allow better inclusion of summary-level data and are less likely to encounter convergence problems.[56] First, we will calculate effect estimates for each trial, using linear regressions for continuous outcomes, generalised linear models with a binomial distribution and log link function for binary outcomes. We will adjust for key prognostic factors age and sex. Second, effect estimates will be combined across trials in random-treatment effect meta-analytic models.

The effect estimate will be reported as relative risk ratios with 95% CIs. Risk ratios will be used as the outcomes we are looking at are not rare. ORs may be used if the risk ratio models do not converge.

For cluster RCTs, a nested random effect will be specified within trials to account for correlations within clusters. Heterogeneity of intervention effects across trials will be investigated using visual inspection of forest plots and explored through subgroup analyses if appropriate.[22]

Balancing end-user needs and pragmatic considerations, updates to review findings will follow living systematic review guidance.[57] We will publish updates to review findings when new studies and data are identified that change result findings and summary estimates for the conclusion of the review.

Subgroup analyses

A major advantage of IPD is the ability to undertake individual-level subgroup analyses to determine whether interventions are more or less effective in specific population subgroups. Planned individual-level subgroup analyses will be undertaken for each primary outcome based on: age, sex, gender, factors targeted by the intervention classified according to the domains of the Theory of Triadic Influence, country income level (low, middle, high or gross national income)[58] using World Bank classification,[59] education level/schooling type, socioeconomic position[37] (including household income and parental employment status), individual level regional breakdown (classified regional/rural/urban) and immigration status. These subgroup analyses are in line with the Cochrane PROGRESS-Plus framework for assessing equity.[60] A scoping review has highlighted these factors as significantly associated with e-cigarette use.[61] We will look at differential effects for different subgroups by fitting interaction models within each trial and then combining interaction estimates across trials. If interactions are detected at $p<0.10$, subgroup-specific treatment effects will be estimated without aggregation bias in a within-trial framework.[62]

Where possible, trials will collect harmonised demographic variables, but some retrospective harmonisation might also be necessary to facilitate IPD analysis.

Sensitivity analyses

To assess whether results are robust, sensitivity analyses will be performed on the two primary outcomes: (i) using multiple imputation for any missing individual data (within trial) testing a range of missing data assumptions if data are missing for more than 30% of participants within a trial; (ii) removing data from trials at high risk of bias; (iii) excluding trials with some integrity concerns, but where these concerns are not sufficient to warrant exclusion from the meta-analysis entirely; (iv) including aggregate data from trials that did not provide IPD or customised detailed summary-level data and had no serious conflicts of interest, using a two-stage approach; (v) examining effects of measurement strategy (eg, biochemically verified, self-reported, etc); and (vi) including aggregate data from all trials that did not provide IPD, including those with serious conflicts of interest (eg, industry funding) using a two-stage approach.

Project management

Membership of the SPARKE Collaboration includes one to two trial representatives from each of the trials contributing IPD to the project. Trialists are invited to provide input into the protocols, statistical analysis plan and results manuscript/s and are welcome to contribute their expert knowledge to the SPARKE Collaboration through the international advisory group (https://www.sparkecollaboration.org/trialists-partners).

The Project Team is responsible for data collection, management and analysis. They also handle communication within the Collaboration, including newsletter updates, maintenance of the SPARKE website/social media and organisation of virtual or face-to-face collaborator meetings. Most members of the Project Team are

independent from participating trials; however, there are some members involved in the Barnes trial (CB, SMc, LW, HT, RH). For this trial, the project team will not be involved in any data analysis, RoB, integrity or GRADE assessments.

The Australian-Based Steering Group will comprise of invited experts specialising in cigarette/tobacco control/e-cigarette use, IPD and PMA, statistics, behavioural science, implementation science, and policy. Representatives of invested government (ie, policy makers) and non-government organisations (eg, the Lung Foundation) will also be included.

The international advisory group will include trial representatives and SPARKE Collaboration project investigators as well as selected international experts in systematic reviews/IPD/PMA, cigarette/tobacco control/e-cigarettes, and representatives from leading international agencies, for example, WHO.

ETHICS AND DISSEMINATION

Each trial will be responsible for obtaining their own ethics approval from their respective Human Research Ethics Committee or Institutional Review Board for both the conduct of their trial and for sharing their IPD for the PMA.

While secondary analysis of data does not usually require ethics approval, we have received approval from the University of Sydney as the data management centre to cover data handling and any other ethical considerations for this secondary analysis of data (2023/714). Cross-institutional ethics has been received from the University of Newcastle (H-2023–0379).

Data sharing

The SPARKE Collaboration obtains permission to use data but are not data custodians of participating trials. Data sharing is therefore restricted to agreements/contracts that have been made with data custodians of participating trials. Future opportunities for the SPARKE Collaboration may arise. Following the completion of the initial project, a moderated process for access to the SPARKE dataset may be established if there is a desire for further research. Access will be by application via the Project team, where approved research questions will be circulated to data custodians of participating trials, so they are able to indicate their interest to participate. Ethical approvals for additional research questions will be required by the applicant.

Publication policy

SPARKE manuscripts will be prepared by the Project Team in consultation with the Australian-Based Advisory Group and circulated to the full Collaboration for comment, revision and approval prior to submission for publication. Any reports of the results of this study will be published either in the name of the collaborative group, or by representatives of the collaborative group on behalf of the SPARKE Collaboration, as agreed by members of the collaborative group. We anticipate receiving initial trialist data by the end of 2025, with analysis expected to take approximately 3 months. Publication of results will then follow.

Dissemination

Different strategies will be used to disseminate information from publications to key stakeholders. For example, copies of publications will be circulated via email to key researchers, policy briefs will be prepared for key outcome papers to communicate with national, state and local policy makers as appropriate, and brief targeted summaries will be prepared for health professionals (eg, shared through practice journals/association newsletters).

DISCUSSION

The study described above will be a first of its kind, providing essential data to stakeholders and end-users on the impact of interventions for the prevention of youth e-cigarette use. To date, eight trials with a planned sample size of over 24 600 participants have agreed to contribute their IPD to this study. Findings from this study have the potential to greatly impact e-cigarette use among adolescents, prevent associated illnesses and burden of disease. Conducting an IPD PMA ensures best-practice methods are used to examine outcomes, with the aim to have synthesised data published as soon as readily available and shared with end-user policy and decision makers, with subsequent rounds expected as updates are prompted. Extending the application of PMA methods to this novel health area will promote knowledge of the research methods, potentially promoting greater application of the methodology to other areas of public health, contributing to greater research efficiency and reduced research waste.

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Acknowledgements We would like to acknowledge the work of Megan Duffy, Lucy Couper, Stephanie Mantach and Caitlin Bialek from the University of Newcastle for their assistance in establishing the SPARKE Research collaboration.

Contributors SMc and KH are co-first authors. LW and ALS are co-senior authors. LW along with SMc, EB, SY, AM, RKH and ALS led the conception and design of the study. SMc wrote the first draft of the manuscript. HT and CB assisted with the development and ongoing screening. ALS, JGW, MA and KEH are responsible for the data analysis. All authors critically revised the manuscript for intellectual content and agreed and approved the final manuscript. LW is the guarantor of this manuscript.

Funding This work was supported by the Medical Research Futures Fund (MRFF) Maternal Health and Healthy Lifestyles grant number (2023364). The MRFF has not participated in any other parts of the project including the design of the project's protocol and analysis plan, as well as data collection and analysis. The funder will have no role in the interpretation or publication of the results. CB receives salary support from an NSW Ministry of Health PRSP Research Fellowship. RKH receives salary support from a NHMRC Early Career Fellowship (APP1160419). EB receives salary support from an NHMRC Investigator (L3) Fellowship (APP2017742). LW receives salary support from an NHMRC Investigator (L1) Fellowship. SY receives funding from a Heart Foundation Future Leader Fellowship (106654). (APP11960419). ML receives funding from the Virginia Foundation for Healthy Youth (8521389). BHF is funded for this project by the NIH/NCI number 1R01CA263121-01. CS receives project funding from Arnold Ventures (grant 20-04319). KF receives funding from the National Heart, Lung, and Blood Institute (K23HL166771). PAW receives funding for this project by the NIH/NIDA grant 1R01DA050991-01. LAS and SH receive funding for this project from the National Institute on Alcohol Abuse and Alcoholism (R01AA027253, R01AA027253-03S1, R01AA027253-03S2). ALS receives salary support from an NHMRC Investigator (EL1) Grant (2009432).

Competing interests Dr. BHF is the Founder and Executive Director of the Stanford Tobacco Prevention Toolkit, an educational resource aimed at preventing middle and high school students' use of tobacco and nicotine products. She has also been a paid expert scientist in some litigation against the e-cigarette industry and an unpaid scientific advisor and expert regarding some tobacco-related policies. All other authors have no other conflicts of interest to disclose.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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