The role of Artificial Intelligence in interventions for public health: Linked systematic and scoping reviews

Sean Harrison*[1]
Joelle Kirby[1]
Sophie Robinson[1]
Rhiannon Evans[2]
Rabeea'h Waseem Aslam[2]
Joht Singh Chandan[3]
Ruth Garside[1]
Jo Thompson Coon[1, 4]
G.J. Melendez-Torres[1]

[1]Faculty of Health and Life Sciences, University of Exeter, UK
[2]DECIPHer, School of Social Sciences, Cardiff University, Cardiff, UK
[3]Institute of Applied Health Research, University of Birmingham, Edgbaston, Birmingham, UK
[4]NIHR Applied Research Collaboration South West Peninsula (PenARC)

* Corresponding Author
Address: University of Exeter Medical School, South Cloisters, St Luke's Campus, Heavitree Road, Exeter, EX1 2LU
United Kingdom
Email: s.harrison4@exeter.ac.uk
Tel: +44(0)1392 726056/57

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Scientific Abstract

Background: Artificial intelligence (AI) is a broad field encompassing various techniques, including machine learning, natural language processing, and computer vision. AI, which refers to algorithms integrated into systems and tools, learns from data to be able to perform automated tasks without explicit human programming. AI is particularly useful for tasks requiring pattern recognition, prediction, and data analysis.

In public health, AI has been used for spatial modelling, risk prediction, misinformation control, public health surveillance, disease forecasting, and epidemic and pandemic modelling. Additionally, conversational AI interventions have been used to support smoking cessation and reducing alcohol intake, and AI-assisted apps have been used to improve exercise technique. Other uses of AI in public health remain hypothesised but un- or under-explored in practice, for instance in public communication.

However, even if AI-assisted interventions in public health are shown to be effective, there are nonetheless barriers to the adoption of AI. These include public trust, health equity, ethical considerations, data privacy concerns, and the need for training and expertise to use AI effectively.

Given the potential scale of use of AI, there is a need to regularly examine how AI-assisted interventions have been, are being, and could be used in public health contexts. To better understand and guide the potential use of AI in public health in high-income countries, we will conduct five linked reviews to systematically synthesise evidence from primary studies, reviews, opinion pieces, and editorials to address the following questions:

1. What is the role of AI-assisted interventions for reducing engagement with smoking, drinking alcohol, and physical inactivity (three systematic reviews)
2. What is the current role of AI in health surveillance and policy decision making (scoping review)
3. What is the potential role of AI in public health (scoping review)

These reviews aim to inform public health professionals about the practical applications and most promising options for using AI in public health.

Methods: Review question 1: We will conduct three systematic reviews to identify and summarise evidence from randomised controlled trials (RCTs) of AI-assisted interventions for reducing smoking, drinking alcohol, and physical inactivity. Trials will be searched for using two strategies, firstly by searching directly for relevant trials published since 2010, and secondly by searching for reviews of trials of any intervention for reducing smoking, drinking alcohol, or physical inactivity published since 2023, then searching through all references of eligible reviews for relevant trials. References for trials from both the primary search and from eligible reviews will be screened independently and in duplicate. References for reviews will be screened by one reviewer. Data will be extracted and synthesised by one reviewer and checked by another, using meta-analysis or network meta-analysis to synthesise studies where possible, and narrative synthesis where not possible. Included trials will be appraised using Cochrane RoB2 independently and in duplicate. GRADE will be used to assess the certainty of evidence.

Review question 2: We will conduct a scoping review to identify studies examining how AI is, or has been, used in public health in local authority and national public health contexts in articles published since 2020. Given that AI could utilise information from databases, the internet (including social media), or from any other source, a search for primary studies will be conducted. Relevant studies will be collated and narratively summarised. Relevant studies would include those that are using, or have used, AI for outbreak detection and early warning, trend prediction, or public health response modelling or assessment. Additionally, studies would also include those that are using, or have used, AI to help public health professionals assess, rank, or prioritise public health interventions, or otherwise used AI to help make public health policy decisions. Studies discussing potential AI applications without reporting actual trials or experiences will be excluded. This review will be started after review question 1 has been completed. Completion of the review will require sufficient evidence to be found at screening.

Review question 3: We will conduct a scoping review to identify studies looking at how AI could potentially be used in public health contexts. This review will focus on potential applications of AI in public health, together with the associated benefits and challenges, rather than current practice. The potential role of AI in pandemic contexts will not be considered, nor will the potential role of AI in healthcare and clinical contexts, such as in diagnostic tests. Given this, reviews from 2020 onwards will be identified, including systematic, rapid, scoping and literature reviews, as well as opinion pieces, and editorials. This review will be started after review question 2 has been completed (either fully, or after the decision that there is insufficient evidence to continue). Completion of the review will require sufficient evidence to be found at screening.

The review questions can be broadly thought of as how AI has been used in the past, how it is being used presently, and how it could be used in the future to assist in public health. For all review questions, to help maximise the utility of these reviews for a UK setting, only studies considering AI in high-income countries (as defined by the World Bank) will be included only.

We will undertake three phases of patient and public involvement to refine the review scope, interpret the emerging synthesis, and develop funder recommendations.

Dissemination: We will generate a number of outputs to support dissemination. We will produce publication for high impact peer-reviewed academic journals. We will generate a briefing paper for dissemination through the HDRCs, PHIRSTs and Local Government AI Hub. We will identify ongoing opportunities to share findings at academic, policy and practice conferences.

Plain language summary

Artificial intelligence (AI) is a technology that aims to learn from data to be able to perform tasks without human involvement. AI has been used in public health for various purposes, such as to support stopping smoking and reducing alcohol drinking, as well as tracking diseases, finding people who might have been exposed to a disease, and predicting where diseases might go next. Other uses of AI in public health remain have not been fully explored yet.

To better understand and guide the potential use of AI in public health, we will search for evidence that answers the following questions:

1) Can AI help to reduce smoking, drinking alcohol, and physical inactivity?
2) How is AI being used in public health presently?
3) How could AI be used in the future to improve public health?

Broadly, these questions can be thought of as how AI has been used in the past, how it is being used now, and how it could be used in the future, to improve public health.

We will engage with the public to help plan for and interpret this work.

1. Background

Artificial intelligence (AI) is a broad field encompassing various techniques, including machine learning, natural language processing, and computer vision (1). AI, which refers to algorithms integrated into systems and tools, learns from data to be able to perform automated tasks without explicit human programming (2-4).

AI is particularly useful for tasks requiring pattern recognition, prediction, and data analysis (5). In healthcare, for instance, AI applications have been used to enhance image analysis, streamline operations, enable personalized and predictive healthcare, and support clinical decision-making (6). In public health, AI has been used for spatial modelling, risk prediction, misinformation control, public health surveillance, disease forecasting, and epidemic and pandemic modelling (5). Additionally, conversational AI interventions have been used to support smoking cessation (7) and reducing alcohol intake (8), and AI-assisted apps have been used to improve exercise technique (9). Other uses of AI in public health remain hypothesised but un- or under-explored in practice, for instance in public communication (10).

The COVID-19 pandemic, in particular, highlighted both the challenges and opportunities for using AI in public health. The scale and severity of the pandemic underscored the need for more efficient and effective interventions, and AI was used for disease surveillance, contact tracing, combating misinformation, predicting transmission patterns, and forecasting disease spread (5).

While the theoretical groundwork for machine learning and deep learning was laid in the 1980s, recent advancements in computing power and the development of large language models like OpenAI's ChatGPT and Google's Gemini have sparked renewed interest in AI. These models, with more user-friendly interfaces and general-purpose applications, offer the potential to help tackle a wide range of problems (11).

However, even if AI-assisted interventions in public health are shown to be effective, there are nonetheless barriers to the adoption of AI. These include public trust, health equity, ethical considerations, data privacy concerns, and the need for training and expertise to use AI effectively (4, 10, 12, 13).

Given the potential scale of use of AI, there is a need to regularly examine how AI-assisted interventions have been, are being, and could be used in public health contexts. To better understand and guide the potential use of AI in public health, we will conduct five linked reviews. The first three reviews will assess the effectiveness of AI-assisted interventions for reducing engagement with smoking, drinking alcohol, and physical inactivity. The fourth review will summarize current AI applications in health surveillance and policy decisions. The fifth review will explore the potential role of AI in public health, including potential benefits and challenges. To help maximise the utility of these reviews for a UK setting, only studies considering AI in high-income countries will be included. Additionally, all reviews will have a focus on health equity, particularly concerning inequities in access or use to AI-assisted interventions.

These reviews aim to inform public health professionals about the practical applications and most promising options for using AI in public health.

2. Review Aim

The present reviews will systematically synthesise evidence from primary studies, reviews, opinion pieces, and editorials around the use of AI in public health in high-income countries to address the following questions:

1. What is the role of AI-assisted interventions for reducing engagement with smoking, drinking alcohol, and physical inactivity (three systematic reviews)
2. What is the current role of AI in health surveillance and policy decision making (scoping review)
3. What is the potential role of AI in public health (scoping review)

3. Methods

The systematic reviews for **review question 1** will be conducted with reference to the Cochrane Handbook for Systematic Reviews of Interventions (14). Certainty of evidence will be assessed through GRADE (15-17). The protocols for these reviews are reported with reference to Cochrane Handbook (14) and PRISMA (18, 19).

The scoping reviews for **review questions 2 and 3** will be conducted with reference to the JBI updated methodological guidance for scoping reviews (20), and the protocols are reported with reference to JBI best practice guidance and reporting items for the development of scoping review protocols (21).

The reviews will be completed sequentially, that is, **review questions 2 and 3** will only commence once the previous review has been completed. Additionally, we will collaboratively decide whether review questions 2 and 3 will continue past screening based on the amount and quality of evidence that is identified.

3.1. Patient and Public Involvement (PPI)

We will undertake a programme of patient and public involvement (PPI) with relevant stakeholder groups. There will be three phases of engagement (Table 1). First will be engagement in protocol refinement and confirmation, with a primary focus on specifying the inclusion criteria and clarifying the definition of key constructs related to: AI and its sub-domains; and the remit of public health that will be considered. Second will be engagement to provide feedback on preliminary and final synthesis findings. Third will be engagement on the development of implications for research, policy and practice.

We will undertake PPI with three UK wide communities of practice. Two of these communities are from NIHR funded research infrastructures:

- **NIHR Health Determinants Research Collaborations (HDRCs):** The NIHR has funded thirty HDRCs that aim to boot research capacity and capability within local

government. They aim to embed a culture of using evidence in decision-making and to understand how decision impact on health and health inequalities. These collaborations have the potential to use AI in their public health decision-making and practice.

- **NIHR Public Health Intervention Responsive Studies Teams (PHIRST):** Teams provide timely and accessible evaluations of public health interventions to Local Authorities. Evaluations have, or intend to, examine interventions that have used AI.
- **Local Government Association Artificial Intelligence Hub:** The hub comprises an AI network of over 300 office members that works to discuss AI risks, rewards and readiness in local government across the UK.

At each of these three phases we will host two online meetings, comprising a mixture of professionals from the three communities of practice. Combining professionals will hopefully spark dynamic and challenging discussion, while hosting two meetings will aim to maximise attendance.

3.2. Approach to Searching and Data Sources

One AI search facet will be used across the three reviews. This draws upon published and unpublished AI search filters either created by members of the InterTASC (Technology Appraisal Support Collaboration) Information Specialists' Sub-Group (ISSG) or hosted on the associated ISSG Search Filter Resource (22).

Review question 1 comprises two elements. The first will combine the AI facet with terms for the three risk behaviours - alcohol drinking, smoking, and physical inactivity - as well as the Cochrane Highly Sensitive Search Strategy for identifying randomized trials in MEDLINE (23). A date limit from 01 January 2010 onwards will be applied.

The second acknowledges that reviews two and three approach the concept of AI as a distinct and definable concept, and relevant literature should explicitly state its use. However, scoping searches for this review suggest the use of AI may not always be

detailed in searchable article metadata (e.g. where interventions are AI-assisted but referred to by device name). Therefore, a second search will be conducted with no AI terms, utilising risk behaviour terms and a systematic review filter (24). Public health and "prevention" terms will be added to risk behaviour search strings to increase precision in lieu of the precision granted by the AI intervention facet. This will enable potentially relevant RCTs to be obtained from reference lists that may otherwise be missed. This search will employ a date limit from 01 January 2023 onwards.

We will conduct forward citation searching on included trials to find all sister studies, that is, all published studies reporting results using included trial data.

The search for **review question 2** will combine the AI facet with broad public health terms as well as those reflecting activities linked to the research question, such as policy making and surveillance. These terms have been derived from iterative searching, with keywords and MeSH terms harvested from relevant papers and reference lists. No study design filter will used, but a date limit from 01 January 2020 onwards will be added.

The search for **review question 3** will combine the AI facet with public health terms and terms to capture papers discussing the future of AI in public health. As for **review question 2**, these "future" terms have been derived from iterative searching, with pertinent words and MeSH terms harvested from relevant papers and reference lists. To this a systematic review filter (24) will be added. A second more focused search, without a study design filter, will be conducted and combined to ensure key editorials and opinion pieces are retrieved. A date limit from 01 January 2020 onwards will be used.

For all reviews, we will conduct searches in: Medline (Ovid); Embase (Ovid); Web of Science; and Scopus. Searches of Web of Science and Scopus will be undertaken to take advantage of their multi-disciplinary coverage, given the technological focus of the topic. Additionally, we will conduct supplementary literature searching as determined by the needs of each review, which may include checking reference lists, citation tracking, contacting authors, and web searching for unpublished material and policy documents.

Search strategies for Medline for **all review questions** are presented in Supplement A.

3.3. Eligibility Criteria

The overall eligibility criteria for each review question are presented in Table 2. These will be refined with stakeholders during the first phase of PPI.

For **review question 1**, there will be one review for each risk behaviour. For all three reviews, there will be two searches, one for reviews and one for primary studies.

The eligibility criteria for reviews are a focus on interventions for reducing engagement with smoking, drinking alcohol, or physical inactivity. Reviews that obviously do not include relevant RCTs will be excluded, i.e. reviews of studies in non-high-income countries or healthcare settings, reviews of drug interventions only, and reviews of study designs other than RCTs. The reference lists of eligible reviews will be extracted using Citationchaser (25) or manually, depending on the number of included studies in the review, and whether the reference list of the review contains the included studies.

The eligibility criteria for primary studies (identified both from included reviews and identified in searches) are listed in Table 2. Briefly, interventions must be assisted by AI (broadly defined as algorithms integrated into systems and tools that can learn from data to be able to perform automated tasks without explicit human programming), set in a public health context, and target smoking, drinking alcohol, or physical inactivity. AI-assisted interventions could be of any modality (for example, text, audio, images) and technology (for example wearables, social media, sensors), and may be part of a wider intervention. Public health contexts exclude trials performed in healthcare and medical contexts (for example, the NHS).

For **review question 2**, interventions must be AI tools or systems that are being used, or were used, for outbreak detection, early warning, trend prediction, or public health

response modelling or assessment. Interventions must be in local authority or national public health contexts, not healthcare settings or other contexts.

For **review question 3**, interventions must be AI tools that could be used in public health contexts in the future, including public health interventions, decision making, local disease modelling and prediction, or any other element of public health.

For **all review questions**, included studies must be set in, or relevant to, high-income countries, as defined by the World Bank. Included studies must also be in English language.

For titles and abstracts for all reviews, the first 100 studies will be screened by all reviewers, and conflicts will be resolved to improve consistency of screening, with any necessary clarifications made to the eligibility criteria.

3.4. Study Screening Methods

For **review question 1**, the titles and abstracts from the search for reviews will be screened by one reviewer (excluding the first 100 titles and abstracts, which will be screened by all reviewers, as above). The titles and abstracts from the search for primary studies, from the reference lists of eligible reviews, and from the searches from **review questions 2 and 3**, will be screened independently and in duplicate by two members of the review team. References included by at least one reviewer on eligibility assessment will progress to full-text screening.

For **all review questions**, full texts of references will be independently screened by two reviewers. References identified through other means, such as reference checking and citation searching, will undergo duplicate title and abstract screening as above.

Conflicts in assessment will be resolved through discussion and recourse to a third member of the review team.

3.5. Software

Retrieved study reports from the data sources will be exported to Endnote 21, where they will be combined and de-duplicated. They will then be uploaded to Rayyan platform for title and abstract screening, and Microsoft Excel will be used for full text screening, data extraction, and quality appraisal (as necessary).

3.6. Quality Appraisal

The rationale for quality appraisal of study reports is to assess clarity and transparency of reporting; methodological rigour in the research process; robustness in the findings, including robustness in any claims to generalisability; and compliance with ethical standards. Nonetheless, we will only conduct quality appraisal for **review question 1**, as **review questions 2 and 3** are scoping reviews and will likely include evidence from diverse studies, often without participants, where quality appraisal will likely be of limited use.

We will use the Cochrane RoB2 tool to assess the effect of assignment to the intervention on engagement with each risk behaviour, with crossover and cluster trials appraised with the appropriate RoB2 tool variants (26). Assessed domains of bias are:

1. bias arising from the randomization process
2. bias due to deviations from intended interventions
3. bias due to missing outcome data
4. bias in measurement of the outcome
5. bias in selection of the reported result

Signalling questions for each domain will be assessed as “Yes”, “Probably yes”, “Probably no”, “No”, or “No information”. The overall risk of bias judgement options will be “High”, “Some concerns”, and “Low”, determined by using the RoB2 algorithm, unless otherwise specified. Appraisal will be conducted independently by two reviewers, with conflicts in

appraisal will be resolved through discussion and recourse to a third member of the review team.

3.7. Number of Reviewers

One member of the review team will lead information specialist activities related to study report retrieval (JK). Six members of the review team will undertake screening, extraction, and appraisal (SH; JK; RE; GMT; SL; RA). The remainder of the review team will serve as arbiters of decision conflicts in study screening, support the synthesis of findings, and develop the final funder recommendations.

3.8. Data Extraction and Coding

For **review question 1**, we will extract data for:

- Study identification: method of study identification; first author; publication year; title
- Study characteristics and methodology: country; setting; data collection year(s); study design; risk behaviour targeted; sampling strategy; allocation method; blinding; data clustering (if necessary); data collection method; analysis method; outcome measure timing and reliability
- Population: baseline participant demographics (engagement with risk behaviour, age, sex, ethnicity, co-morbidities, education, employment, any other socioeconomic status variables); inclusion and exclusion criteria; group differences at baseline; total sample size; number and reason for withdrawals
- Intervention: standard of care; intervention characteristics (modality and type of AI, context of intervention, timing and frequency of intervention, total intervention length, other relevant information about the AI intervention, wider intervention description)
- Outcome data: outcome data for each relevant outcome (including, but not limited to, the outcome, timepoint, scale, adjustment, number of participants, mean with standard deviation or error, median with interquartile range, difference, risk ratio,

odds ratio, or hazard ratio with standard error or 95% confidence interval, and p value)

For **review question 2**, we will extract data for:

- Study identification: method of study identification; first author; publication year; title
- Study characteristics and methodology: country; setting; data collection year(s); study design; data collection method; analysis method; outcome measure timing and reliability
- Public health context: area and context of public health activities
- Intervention: how AI was or is used; context of AI usage; modality and type of AI; alternative to AI previously or currently used; other relevant information about the use of AI
- Outcome data: performance of AI, including direct outcomes (for example, time to outbreak detection or early warning, accuracy of trend prediction), indirect outcomes (lives saved, diseases prevented), and acceptability of the AI tool among public health workers and the public; any other relevant outcome data

For **review question 3**, we will extract data for:

- Study identification: method of study identification; first author; publication year; title
- Public health context: area and context of AI use in public health activities
- Intervention: how AI could be used; context of AI usage; modality and type of AI; alternative to AI currently used; other relevant information about the use of AI
- Outcome data: anticipated benefits; anticipated challenges

Additional data in each review may be extracted depending on the needs of the review.

3.9. Synthesis

For **review question 1**, if possible, results from studies with similar interventions, comparators, and outcomes will be combined using meta-analysis, and potentially

network meta-analysis. The possibility of meta-analysis within interventions for each risk behaviour is dependent on the available data: at least 5 trials must have measured the same outcome (for example, change in engagement with the risk behaviour) using comparable statistical methods (for example, relative risks, odds ratios) at similar timepoints (for example, 4 weeks, 8 weeks, 16 weeks) for us to consider meta-analysis possible. Additionally, the main analysis will only use fixed effect meta-analysis if the trials are sufficiently similar (for example, using similar interventions in similar populations), otherwise random-effects meta-analysis will be used (fixed-effect meta-analyses will also be presented as a sensitivity analysis). If meta-analysis is not possible, narrative summaries of each study will be reported, grouped similarly by intervention, comparator, and outcomes, along with a broad overall synthesis.

If there is sufficient number of trials for each risk behaviour, intervention component analyses will characterise how AI is used in included interventions (27). Intervention components analysis is an inductive approach used to comprehensively describe and categorise intervention components in a target body of evidence. Analysis will focus on intervention descriptions in reports of trials. Key AI-specific components used in the different identified trials will be identified, and where possible, linked to the effectiveness of interventions.

Certainty of evidence for each of the main outcomes within each review will be assessed through GRADE (15-17), see 3.11 below.

For **review questions 2 and 3**, broad summaries of how AI has been, is being, or could be used in public health will be reported. The exact organisation of evidence will be determined once the studies have been identified and extracted, but will likely be structured by the type of intervention: outbreak detection, early warning, trend prediction, or public health response modelling or assessment for **review question 2**; public health interventions, decision making, local disease modelling and prediction, and any other element of public health for **review question 3**. For **review question 2**, within each type of intervention, we will report on the studies that have used, or are using, AI, including the

performance of the intervention (if reported). For **review question 3**, the anticipated benefits and challenges of using AI will be discussed.

Across **all review questions**, we will highlight health equity considerations, with reference to PROGRESS-Plus characteristics (28). Specifically, any trials identified for **review question 1** that conduct moderation analyses to determine whether any PROGRESS-Plus characteristic moderates the effect of the intervention will be highlighted, as will trials that are tailored specifically to target underserved groups. Additionally, if there is sufficient evidence, then subgroup analyses or meta-regression will be used to examine whether PROGRESS-Plus characteristics or intervention components are associated with intervention effectiveness. For **review questions 2 and 3**, any findings from studies highlighting how use of AI has or could impact upon health equity will be reported.

3.10. Synthesis Output

For **all review questions**, key characteristics of all included studies will be reported in summary tables. If possible, we will develop infographics to present the results of each review question. Finally, to support future intervention research and practice in this field, we will report on implications for research, policy, and practice.

A Gantt chart showing anticipated timelines for **review question 1** is presented in Supplement B, **review questions 2 and 3** will begin after **review question 1** has been completed, and progression past screening will depend on the amount and quality of evidence identified.

3.11. Certainty of Evidence

For **review question 1**, we will use the GRADE tool to assess the certainty of evidence for each risk behaviour (15-17). We will first construct review findings summaries from the textual narrative for up to seven outcomes with the most evidence. Each review finding

will be assessed according to five domains: risk of bias, inconsistency, indirectness, imprecision and publication bias. Each evidence statement will be rated as high in the first instance and rated down where there is concern about each domain, or up if there were a large effect, dose response, or all plausible confounding and bias would reduce a demonstrated effect or would suggest a spurious effect if no effect was observed. From here an overall assessment of confidence in the evidence will be made, which will be rated as high, moderate, low, or very low. Evidence summaries will we generated by one member of the review team and then discussed and confirmed with the remainder. A summary of findings table will display a summary of each review finding, the GRADE assessment of confidence in that finding, and the explanation for that assessment.

We will not assess the certainty of evidence for **review questions 2 and 3**.

4. Ethics

Ethical approval for these reviews will not be required. PPI consultation with stakeholder groups will be conducted in accordance with any ethical requirements stipulated by the organisations and research studies that recruit participating members.

5. Discussion

These reviews will summarise evidence showing how AI has been, is being, and could be used in public health contexts. It will inform thinking around how AI could be best used in public health, considering the effectiveness of previous AI-assisted interventions, current use of AI, and the anticipated benefits and challenges associated with potential future uses of AI in public health.

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Table 1. Stakeholder Engagement in Review Process

Review Stage	Stakeholder Groups	Identification of Stakeholders	Aims of Engagement
Development and confirmation of protocol	Two stakeholder groups. Each group to comprise 6 to 8 professionals from across the three communities of practice. Each group will aim to achieve representation from across the four nations.	**NIHR Health Determinants Research Collaborations (HDRCs):** • Members of existing HDRCs from England, Scotland and Wales. Northern Ireland does not currently have a funded HDRC. **NIHR Public Health Intervention Responsive Studies Teams (PHIRST):** • Academic members from the PHIRST teams across England, Northern Ireland, Scotland and Wales. • Representatives from local authorities who have participated in PHIRST evaluations. **Local Government Association Artificial Intelligence Hub:** • Office members of the AI Intelligence hub.	Refine inclusion criteria through definition of key concepts (for example, AI, public health).
Refinement and confirmation of preliminary and final findings	Two stakeholder groups. Each group to comprise 6 to 8 professionals from across the three communities of practice. Each group will aim to achieve representation from across the four nations.	**NIHR Health Determinants Research Collaborations (HDRCs):** • Members of existing HDRCs from England, Scotland and Wales. **NIHR Public Health Intervention Responsive Studies Teams (PHIRST):** • Academic members from the PHIRST teams across England, Northern Ireland, Scotland and Wales. • Representatives from local authorities who have participated in PHIRST evaluations. **Local Government Association Artificial Intelligence Hub:** • Office members of the AI Intelligence hub.	Provide feedback on preliminary findings. Refine and confirm final findings.
Development and confirmation of recommendations and dissemination strategy	Two stakeholder groups. Each group to comprise 6 to 8 professionals from across the three communities of practice. Each group will aim to achieve representation from across the four nations.	**NIHR Health Determinants Research Collaborations (HDRCs):** • Members of existing HDRCs from England, Scotland and Wales. **NIHR Public Health Intervention Responsive Studies Teams (PHIRST):** • Academic members from the PHIRST teams across England, Northern Ireland, Scotland and Wales. • Representatives from local authorities who have participated in PHIRST evaluations. **Local Government Association Artificial Intelligence Hub:** • Office members of the AI Intelligence hub.	Generate implications for policy, practice and research. Refine and confirm dissemination strategy. Ensuring findings are accessible to intended audience.

Table 2: Inclusion and Exclusion Criteria

Table 2a. Review Question 1 Inclusion and Exclusion Criteria

	Included	**Excluded**
Population	Any	
Setting	High-income countries, as defined by the World Bank	Middle- and lower-income countries
Context	Public health	Healthcare, clinical and other contexts
Intervention	AI-assisted interventions aiming to reduce engagement with smoking, drinking alcohol, or physical inactivity. AI is broadly defined as algorithms integrated into systems and tools that can learn from data to be able to perform automated tasks without explicit human programming. Interventions can be delivered through any technology including wearable, sensors, and computers. Can be delivered through any modalities, including text, images, videos, sensory data, and audio. AI delivery may be supported by a third-party individual (for example, a health professional) or organisation or directly accessed by the participant.	Other interventions
Comparator	Usual care or an active comparator	
Outcomes	Any outcome directly associated with smoking, drinking alcohol, or physical inactivity, including engagement with risk behaviour (initiation, cessation, amount of engagement). Additionally, satisfaction with and acceptability of the intervention, cost-effectiveness, and side effects.	Other outcomes
Language	English	Other languages
Date of publication	From 01 January 2010 for primary studies, from 01 January 2023 for reviews, up to 03 February 2025	

Study design	Randomised controlled trials, including crossover and cluster randomised controlled trials, and any equity-specific moderation analyses linked to these trials. Sibling studies from included trials will also be searched for and included	Other study designs, including all observational study designs, editorials, commentaries, and reviews (although reviews will be searched for primary studies)
Publication type	Published or preprint, although conference abstracts of trials will only be included if there is sufficient information for data extraction and risk of bias appraisal	

Table 2b. Review Question 2 Inclusion and Exclusion Criteria

	Included	**Excluded**
Population	Any	
Setting	High-income countries, as defined by the World Bank	Middle- and lower-income countries
Context	Local authority and national public health contexts	Healthcare, clinical and other contexts
Intervention	AI tools that are being used, or were used, for outbreak detection, early warning, trend prediction, or public health response modelling or assessment. AI is broadly defined as algorithms integrated into systems and tools that can learn from data to be able to perform automated tasks without explicit human programming.	Other interventions, including how AI tools could be used in public health contexts
Outcomes	Outcomes associated with the performance of the AI tool, including direct outcomes (for example, time to outbreak detection or early warning, accuracy of trend prediction), indirect outcomes (lives saved, diseases prevented), and acceptability of the AI tool among public health workers and the public	Other outcomes
Language	English	Other languages
Date of publication	01 January 2020 to 03 February 2025	
Study design	Experimental or observational studies, editorials, commentaries	Other study designs, including reviews and modelling studies where the intervention was not trialled in practice
Publication type	Published or preprint	Conference abstracts

Table 2c. Review Question 3 Inclusion and Exclusion Criteria

	Included	**Excluded**
Population	Any	
Setting	High-income countries, as defined by the World Bank, or no specific country if applicable to high-income countries	Middle- and lower-income countries
Context	Any public health context	Pandemic, healthcare (including diagnostic), clinical, and other contexts
Intervention	AI tools that could be used in public health contexts in the future, including: • public health interventions • decision making • local disease modelling and prediction • any other element of public health AI is broadly defined as algorithms integrated into systems and tools that can learn from data to be able to perform automated tasks without explicit human programming.	Other interventions
Outcomes	The anticipated benefits and challenges of using AI in public health	Other outcomes
Language	English	Other languages
Date of publication	01 January 2020 to 03 February 2025	
Study design	Reviews (systematic, rapid, scoping, literature), opinion pieces, commentaries, editorials	Other study designs, including modelling studies
Publication type	Published or preprint	Conference abstracts

Supplement A: Search Strategies

Search Strategy for trials

Database: Ovid MEDLINE(R) ALL (1946 to 14 January 2025)

Note: search includes alcohol, physical inactivity, and smoking

#	Query	Results
1	exp artificial intelligence/	221,017
2	exp Machine Learning/	83,676
3	(AI or AI4H).ti,ab.	64,862
4	("comput* intelligence" or "comput* reasoning" or "machine intelligence" or "artificial intelligence" or "natural language processing" or 'llm*1 or "large language model*" or "language learning model*" or "classification algorithm*" or "computer heuristic*" or "convolutional network*" or DALL-E or "decision support system*" or "decision tree" or DeepAI or "deep learning" or "data science" or "feature detection" or "generative pre-trained transformer" or "generative pretrained transformer" or invideo or "learning algorithm*" or "machine learning" or "neural net*" or "reinforcement learning" or "learning algorithm*" or "*supervised learning" or "intelligent agent*").ti,ab,kf.	352,219
5	("boltzmann machine*" or "long short-term memory" or "gated recurrent unit*" or "rectified linear unit*" or autoencoder or "auto-encoder" or backpropagation or "multilayer perceptron" or "multi-layer perceptron" or convnet or "convolutional learning").ti,ab,kf.	19,295
6	("Bing chat" or ChatGPT* or "Chat GPT" or "Google* Bard" or "Google* Gemini" or "IBM Watson" or "Microsoft* Bing" or "Microsoft* Copilot" or OpenAI or "Open AI" or PathAI or "Path AI").ti,ab,kf.	5,902
7	1 or 2 or 3 or 4 or 5 or 6	471,291
8	exp Drinking Behavior/	88,122

9	exp *Alcoholic Beverages/	17,990
10	exp Alcohol-Related Disorders/pc [Prevention & Control]	7,965
11	(alcohol* or beer* or wine* or liqo?r* or spirits or alcopop* or drink*).ti.	221,012
12	((drink* or alcohol*) adj5 (influenc* or reduc* or problem* or harm* or abstain* or abstinence or refus* or prevent* or stop* or delay* or depend* or addict* or abuse* or misuse* or unhealthy or problem* or binge* or binging or excess* or frequent or heavy or high-risk or "high risk" or harm* or consum* or behavio?r* or hazard* or intoxicat* or temperance or teen* or youth* or adolescen* or juvenile* or underage* or under-age* or highschool* or higher education or college* or universit* or school* or messaging or promot* or change* or changing or modification or modify* or program* or intervention* or counsel*)).ab,kf.	179,957
13	8 or 9 or 10 or 11 or 12	343,734
14	exp Tobacco Smoking/	7,169
15	Smoking/th [Therapy]	2,116
16	Smoking Cessation/	34,161
17	Smoking Reduction/	123
18	"Tobacco Use Cessation"/	1,562
19	(smoking or smoke* or tobacco* or nicotine or cigar? or cigs or cigarette* or cigarilloi* or "hand roll*" or handroll* or rollies or "roll up*" or rollup*).ti,kf.	183,108
20	(smoking or smoke* or tobacco* or nicotine or cigar? or cigs or cigarette* or cigarilloi* or "hand roll*" or handroll* or rollies or "roll up*" or rollup*).ab.	411,596
21	14 or 15 or 16 or 17 or 18 or 19 or 20	456,610
22	exp Exercise/	266,814
23	exp Sports/	229,588
24	exp *Exercise Movement Techniques/	8,752
25	Sedentary Behavior/	14,980

26	screen time/	1,525
27	(Physical* adj3 (activit* or exertion)).ti,kf.	77,413
28	(sedentary or inactiv* or "screen time").ti,kf.	73,055
29	("physical inactivity" or "sedentary behavio?r*").ab.	21,286
30	(exercis* or walk* or running or jog or jogging or sports or sport or cycling or bicyc* or swimming or "active living" or "active transport" or "active travel*" or "leisure activi*" or aerobic* or dancing or dance*).ti,kf.	342,435
31	22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30	663,175
32	exp randomized controlled trial/	632,143
33	controlled clinical trial.pt.	95,680
34	randomized.ab.	676,644
35	placebo.ab.	255,371
36	drug therapy.fs.	2,773,156
37	randomly.ab.	451,255
38	trial.ab.	734,261
39	groups.ab.	2,794,977
40	32 or 33 or 34 or 35 or 36 or 37 or 38 or 39	6,181,156
41	exp animals/ not humans.sh.	5,299,221
42	40 not 41	5,414,972
43	7 and 13 and 42	447
44	limit 43 to yr="2010 -Current"	383
45	7 and 21 and 42	879
46	limit 45 to yr="2010 -Current"	762
47	7 and 31 and 42	1,153
48	limit 47 to yr="2010 -Current"	1,051

Database: Embase (1974 to 15 January 2025)

Note: search includes alcohol, physical inactivity, and smoking

#	Query	Results
1	exp artificial intelligence/	123,253
2	exp machine learning/	536,942
3	(AI or AI4H).ti,ab.	84,462
4	("comput* intelligence" or "comput* reasoning" or "machine intelligence" or "artificial intelligence" or "natural language processing" or 'llm*1 or "large language model*" or "language learning model*" or "classification algorithm*" or "computer heuristic*" or "convolutional network*" or DALL-E or "decision support system*" or "decision tree" or DeepAI or "deep learning" or "data science" or "feature detection" or "generative pre-trained transformer" or "generative pretrained transformer" or invideo or "learning algorithm*" or "machine learning" or "neural net*" or "reinforcement learning" or "learning algorithm*" or "*supervised learning" or "intelligent agent*").ti,ab,kf.	405,522
5	("boltzmann machine*" or "long short-term memory" or "gated recurrent unit*" or "rectified linear unit*" or autoencoder or "auto-encoder" or backpropagation or "multilayer perceptron" or "multi-layer perceptron" or convnet or "convolutional learning").ti,ab,kf.	20,351
6	("Bing chat" or ChatGPT* or "Chat GPT" or "Google* Bard" or "Google* Gemini" or "IBM Watson" or "Microsoft* Bing" or "Microsoft* Copilot" or OpenAI or "Open AI" or PathAI or "Path AI").ti,ab,kf.	6,161
7	1 or 2 or 3 or 4 or 5 or 6	742,783
8	drinking behavior/	58,618
9	exp *alcoholic beverage/	14,401
10	exp alcoholism/pc [Prevention]	3,427
11	exp alcohol abuse/	52,130

12	(alcohol* or beer* or wine* or liqo?r* or spirits or alcopop* or drink*).ti.	267,842
13	((drink* or alcohol*) adj5 (influenc* or reduc* or problem* or harm* or abstain* or abstinence or refus* or prevent* or stop* or delay* or depend* or addict* or abuse* or misuse* or unhealthy or problem* or binge* or binging or excess* or frequent or heavy or high-risk or "high risk" or harm* or consum* or behavio?r* or hazard* or intoxicat* or temperance or teen* or youth* or adolescen* or juvenile* or underage* or under-age* or highschool* or higher education or college* or universit* or school* or messaging or promot* or change* or changing or modification or modify* or program* or intervention* or counsel*)).ab,kf.	250,454
14	8 or 9 or 10 or 11 or 12 or 13	435,835
15	exp smoking/	505,913
16	exp "tobacco use"/pc [Prevention]	7,362
17	smoking cessation/	72,979
18	smoking reduction/	532
19	smoking prevention/	1,261
20	(smoking or smoke* or tobacco* or nicotine or cigar? or cigs or cigarette* or cigarilloi* or "hand roll*" or handroll* or rollies or "roll up*" or rollup*).ti,kf.	216,667
21	15 or 16 or 17 or 18 or 19 or 20	605,537
22	exp exercise/	471,127
23	exp sport/	229,486
24	exp sedentary lifestyle/	23,617
25	screen time/	4,006
26	(Physical* adj (activit* or inactiv* or exertion)).ti,kf.	95,481
27	"physical activit*".ab.	213,108
28	(sedentary or inactive* or "screen time").ti,kf.	23,059

29	(exercis* or walk* or running or jog or jogging or sports or cycling or bicyc* or swimming or "active living" or "active transport" or "active travel*" or "leisure activi*" or aerobic* or dancing or dance*).ti.	320,552
30	22 or 23 or 24 or 25 or 26 or 27 or 28 or 29	932,482
31	exp randomized controlled trial/	861,989
32	Controlled clinical trial/	441,735
33	random$.ti,ab.	2,145,745
34	randomization/	99,519
35	intermethod comparison/	309,420
36	placebo.ti,ab.	384,958
37	(compare or compared or comparison).ti.	636,821
38	((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.	3,046,121
39	(open adj label).ti,ab.	120,822
40	((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.	288,040
41	double blind procedure/	226,091
42	parallel group$1.ti,ab.	34,644
43	(crossover or cross over).ti,ab.	130,994
44	((assign$ or match or matched or allocation) adj5 (alternate or group$1 or intervention$1 or patient$1 or subject$1 or participant$1)).ti,ab.	447,409
45	(assigned or allocated).ti,ab.	529,107
46	(controlled adj7 (study or design or trial)).ti,ab.	489,959
47	(volunteer or volunteers).ti,ab.	292,740
48	human experiment/	671,524
49	trial.ti.	443,741
50	or/31-49	6,801,141

51	(random$ adj sampl$ adj7 ("cross section$" or questionnaire$1 or survey$ or database$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.)	10,170
52	Cross-sectional study/ not (exp randomized controlled trial/ or controlled clinical study/ or controlled study/ or randomi?ed controlled.ti,ab. or control group$1.ti,ab.)	419,720
53	(((case adj control$) and random$) not randomi?ed controlled).ti,ab.	23,061
54	Systematic review.ti,ab. not (trial or study).ti.	383,065
55	(nonrandom$ not random$).ti,ab.	19,829
56	"random field$".ti,ab.	3,099
57	(random cluster adj3 sampl$).ti,ab.	1,704
58	(review.ab. and review.pt.) not trial.ti.	1,238,175
59	"we searched".ab. and (review.ti. or review.pt.)	55,907
60	"update review".ab.	151
61	(databases adj4 searched).ab.	73,042
62	(rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset$1).ti. and animal experiment/	1,272,440
63	Animal experiment/ not (human experiment/ or human/)	2,677,718
64	or/51-63	4,714,414
65	50 not 64	5,962,111
66	7 and 14 and 65	1,168
67	limit 66 to yr="2010 -Current"	1,094
68	7 and 21 and 65	2,245
69	limit 68 to yr="2010 -Current"	2,158
70	7 and 30 and 65	3,779
71	limit 70 to yr="2010 -Current"	3,624

Database: Scopus (search: 15 January 2025) - smoking

#	Query	Results
1	(TITLE (alcohol* OR beer* OR wine* OR liqo?r* OR spirits OR alcopop* OR drink*)) AND (TITLE-ABS-KEY ("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR DeepAI OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invideo OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR OpenAI OR "Open AI" OR PathAI OR "Path AI")) AND PUBYEAR > 2009 AND PUBYEAR < 2026	316

Database: Web of Science (search: 15 January 2025) - smoking

#	Query	Results
1	(TI=(alcohol* OR beer* OR wine* OR liqo?r* OR spirits OR alcopop* OR drink*)) AND TS=("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR deeper OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invidia OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR opened OR "Open AI" OR patman OR "Path AI") AND TS=(randomised OR randomized OR randomisation OR randomisation OR placebo* OR (random* AND (allocat* OR assign*)) OR (blind* AND (single OR double OR treble OR triple))) NOT TS=(animal or animals or pisces or fish or fishes or catfish or catfishes or sheatfish or silurus or arius or heteropneustes or clarias or gariepinus or fathead minnow or fathead minnows or pimephales or promelas or cichlidae or trout or trouts or char or chars or salvelinus or salmo or oncorhynchus or guppy or guppies or millionfish or poecilia or goldfish or goldfishes or carassius or auratus or mullet or mullets or mugil or curema or shark or sharks or cod or cods or gadus or morhua or carp or carps or cyprinus or	434

	carpio or killifish or eel or eels or anguilla or zander or sander or lucioperca or stizostedion or turbot or turbots or psetta or flatfish or flatfishes or plaice or pleuronectes or platessa or tilapia or tilapias or oreochromis or sarotherodon or common sole or dover sole or solea or zebrafish or zebrafishes or danio or rerio or seabass or dicentrarchus or labrax or morone or lamprey or lampreys or petromyzon or pumpkinseed or pumpkinseeds or lepomis or gibbosus or herring or clupea or harengus or amphibia or amphibian or amphibians or anura or salientia or frog or frogs or rana or toad or toads or bufo or xenopus or laevis or bombina or epidalea or calamita or salamander or salamanders or newt or newts or triturus or reptilia or reptile or reptiles or bearded dragon or pogona or vitticeps or iguana or iguanas or lizard or lizards or anguis fragilis or turtle or turtles or snakes or snake or aves or bird or birds or quail or quails or coturnix or bobwhite or colinus or virginianus or poultry or poultries or fowl or fowls or chicken or chickens or gallus or zebra finch or taeniopygia or guttata or canary or canaries or serinus or canaria or parakeet or parakeets or grasskeet or parrot or parrots or psittacine or psittacines or shelduck or tadorna or goose or geese or branta or leucopsis or woodlark or lullula or flycatcher or ficedula or hypoleuca or dove or doves or geopelia or cuneata or duck or ducks or greylag or graylag or anser or harrier or circus pygargus or red knot or great knot or calidris or canutus or godwit or limosa or lapponica or meleagris or gallopavo or jackdaw or corvus or monedula or ruff or philomachus or pugnax or lapwing or peewit or plover or vanellus or swan or cygnus or columbianus or bewickii or gull or chroicocephalus or ridibundus or albifrons or great tit or parus or aythya or fuligula or streptopelia or risoria or spoonbill or platalea or leucorodia or blackbird or turdus or merula or blue tit or cyanistes or pigeon or pigeons or columba or pintail or anas or starling or sturnus or owl or athene noctua or pochard or ferina or cockatiel or nymphicus or hollandicus or skylark or alauda or tern or sterna or teal or crecca or oystercatcher or haematopus or ostralegus or	

	shrew or shrews or sorex or araneus or crocidura or russula or european mole or talpa or chiroptera or bat or bats or eptesicus or serotinus or myotis or dasycneme or daubentonii or pipistrelle or pipistrellus or cat or cats or felis or catus or feline or dog or dogs or canis or canine or canines or otter or otters or lutra or badger or badgers or meles or fitchew or fitch or foumart or foulmart or ferrets or ferret or polecat or polecats or mustela or putorius or weasel or weasels or fox or foxes or vulpes or common seal or phoca or vitulina or grey seal or halichoerus or horse or horses or equus or equine or equidae or donkey or donkeys or mule or mules or pig or pigs or swine or swines or hog or hogs or boar or boars or porcine or piglet or piglets or sus or scrofa or llama or llamas or lama or glama or deer or deers or cervus or elaphus or cow or cows or bos taurus or bos indicus or bovine or bull or bulls or cattle or bison or bisons or sheep or sheeps or ovis aries or ovine or lamb or lambs or mouflon or mouflons or goat or goats or capra or caprine or chamois or rupicapra or leporidae or lagomorpha or lagomorph or rabbit or rabbits or oryctolagus or cuniculus or laprine or hares or lepus or rodentia or rodent or rodents or murinae or mouse or mice or mus or musculus or murine or woodmouse or apodemus or rat or rats or rattus or norvegicus or guinea pig or guinea pigs or cavia or porcellus or hamster or hamsters or mesocricetus or cricetulus or cricetus or gerbil or gerbils or jird or jirds or meriones or unguiculatus or jerboa or jerboas or jaculus or chinchilla or chinchillas or beaver or beavers or castor fiber or castor canadensis or sciuridae or squirrel or squirrels or sciurus or chipmunk or chipmunks or marmot or marmots or marmota or suslik or susliks or spermophilus or cynomys or cottonrat or cottonrats or sigmodon or vole or voles or microtus or myodes or glareolus or primate or primates or prosimian or prosimians or lemur or lemurs or lemuridae or loris or bush baby or bush babies or bushbaby or bushbabies or galago or galagos or anthropoidea or anthropoids or simian or simians or monkey or monkeys or marmoset or marmosets or callithrix or cebuella or tamarin or tamarins or saguinus or	

	leontopithecus or squirrel monkey or squirrel monkeys or saimiri or night monkey or night monkeys or owl monkey or owl monkeys or douroucoulis or aotus or spider monkey or spider monkeys or ateles or baboon or baboons or papio or rhesus monkey or macaque or macaca or mulatta or cynomolgus or fascicularis or green monkey or green monkeys or chlorocebus or vervet or vervets or pygerythrus or hominoidea or ape or apes or hylobatidae or gibbon or gibbons or siamang or siamangs or nomascus or symphalangus or hominidae or orangutan or orangutans or pongo or chimpanzee or chimpanzees or pan troglodytes or bonobo or bonobos or pan paniscus or gorilla or gorillas or troglodytes)	

Database: Scopus (search: 15 January 2025) – physical inactivity

#	Query	Results
1	(TITLE (exercis* OR walk* OR running OR jog OR jogging OR sports OR sport OR cycling OR bicyc* OR swimming OR "active living" OR "active transport" OR "active travel*" OR "leisure activi*" OR aerobic* OR dancing OR dance* OR "physical activit*" OR "physical exertion" OR "screen time" OR sedentary OR inactive*)) AND (TITLE-ABS-KEY ("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR DeepAI OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invideo OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR OpenAI OR "Open AI" OR PathAI OR "Path AI")) AND PUBYEAR > 2009 AND PUBYEAR < 2026	1,172

Database: Web of Science (search: 15 January 2025) – physical inactivity

#	Query	Results
1	(TI=(exercis* OR walk* OR running OR jog OR jogging OR sports OR sport OR cycling OR bicyc* OR swimming OR "active living" OR "active transport" OR "active travel*" OR "leisure activi*" OR aerobic* OR dancing OR dance* OR "physical activit*" OR "physical exertion" OR "screen time" OR sedentary OR inactive*)) AND TS=("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR deeper OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invidia OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR opened OR "Open AI" OR patman OR "Path AI") AND TS=(randomised OR randomized OR randomisation OR randomisation OR placebo* OR (random* AND (allocat* OR assign*)) OR (blind* AND (single OR double OR treble OR triple))) NOT TS=(animal or animals or pisces or fish or fishes or catfish or catfishes or sheatfish or silurus or arius or heteropneustes or clarias or gariepinus or fathead minnow or fathead minnows or pimephales or promelas or cichlidae or trout or trouts or char or chars or salvelinus or salmo or oncorhynchus or	1,865

	guppy or guppies or millionfish or poecilia or goldfish or goldfishes or carassius or auratus or mullet or mullets or mugil or curema or shark or sharks or cod or cods or gadus or morhua or carp or carps or cyprinus or carpio or killifish or eel or eels or anguilla or zander or sander or lucioperca or stizostedion or turbot or turbots or psetta or flatfish or flatfishes or plaice or pleuronectes or platessa or tilapia or tilapias or oreochromis or sarotherodon or common sole or dover sole or solea or zebrafish or zebrafishes or danio or rerio or seabass or dicentrarchus or labrax or morone or lamprey or lampreys or petromyzon or pumpkinseed or pumpkinseeds or lepomis or gibbosus or herring or clupea or harengus or amphibia or amphibian or amphibians or anura or salientia or frog or frogs or rana or toad or toads or bufo or xenopus or laevis or bombina or epidalea or calamita or salamander or salamanders or newt or newts or triturus or reptilia or reptile or reptiles or bearded dragon or pogona or vitticeps or iguana or iguanas or lizard or lizards or anguis fragilis or turtle or turtles or snakes or snake or aves or bird or birds or quail or quails or coturnix or bobwhite or colinus or virginianus or poultry or poultries or fowl or fowls or chicken or chickens or gallus or zebra finch or taeniopygia or guttata or canary or canaries or serinus or canaria or parakeet or parakeets or grasskeet or parrot or parrots or psittacine or psittacines or shelduck or tadorna or goose or geese or branta or leucopsis or woodlark or lullula or flycatcher or ficedula or hypoleuca or dove or doves or geopelia or cuneata or duck or ducks or greylag or graylag or anser or harrier or circus pygargus or red knot or great knot or calidris or canutus or godwit or limosa or lapponica or meleagris or gallopavo or jackdaw or corvus or monedula or ruff or philomachus or pugnax or lapwing or peewit or plover or vanellus or swan or cygnus or columbianus or bewickii or gull or chroicocephalus or ridibundus or albifrons or great tit or parus or aythya or fuligula or streptopelia or risoria or spoonbill or platalea or leucorodia or blackbird or turdus or merula or blue tit or cyanistes or pigeon or pigeons or columba or	

	pintail or anas or starling or sturnus or owl or athene noctua or pochard or ferina or cockatiel or nymphicus or hollandicus or skylark or alauda or tern or sterna or teal or crecca or oystercatcher or haematopus or ostralegus or shrew or shrews or sorex or araneus or crocidura or russula or european mole or talpa or chiroptera or bat or bats or eptesicus or serotinus or myotis or dasycneme or daubentonii or pipistrelle or pipistrellus or cat or cats or felis or catus or feline or dog or dogs or canis or canine or canines or otter or otters or lutra or badger or badgers or meles or fitchew or fitch or foumart or foulmart or ferrets or ferret or polecat or polecats or mustela or putorius or weasel or weasels or fox or foxes or vulpes or common seal or phoca or vitulina or grey seal or halichoerus or horse or horses or equus or equine or equidae or donkey or donkeys or mule or mules or pig or pigs or swine or swines or hog or hogs or boar or boars or porcine or piglet or piglets or sus or scrofa or llama or llamas or lama or glama or deer or deers or cervus or elaphus or cow or cows or bos taurus or bos indicus or bovine or bull or bulls or cattle or bison or bisons or sheep or sheeps or ovis aries or ovine or lamb or lambs or mouflon or mouflons or goat or goats or capra or caprine or chamois or rupicapra or leporidae or lagomorpha or lagomorph or rabbit or rabbits or oryctolagus or cuniculus or laprine or hares or lepus or rodentia or rodent or rodents or murinae or mouse or mice or mus or musculus or murine or woodmouse or apodemus or rat or rats or rattus or norvegicus or guinea pig or guinea pigs or cavia or porcellus or hamster or hamsters or mesocricetus or cricetulus or cricetus or gerbil or gerbils or jird or jirds or meriones or unguiculatus or jerboa or jerboas or jaculus or chinchilla or chinchillas or beaver or beavers or castor fiber or castor canadensis or sciuridae or squirrel or squirrels or sciurus or chipmunk or chipmunks or marmot or marmots or marmota or suslik or susliks or spermophilus or cynomys or cottonrat or cottonrats or sigmodon or vole or voles or microtus or myodes or glareolus or primate or primates or prosimian or prosimians or lemur or lemurs or lemuridae or loris or bush baby or bush babies or	

	bushbaby or bushbabies or galago or galagos or anthropoidea or anthropoids or simian or simians or monkey or monkeys or marmoset or marmosets or callithrix or cebuella or tamarin or tamarins or saguinus or leontopithecus or squirrel monkey or squirrel monkeys or saimiri or night monkey or night monkeys or owl monkey or owl monkeys or douroucoulis or aotus or spider monkey or spider monkeys or ateles or baboon or baboons or papio or rhesus monkey or macaque or macaca or mulatta or cynomolgus or fascicularis or green monkey or green monkeys or chlorocebus or vervet or vervets or pygerythrus or hominoidea or ape or apes or hylobatidae or gibbon or gibbons or siamang or siamangs or nomascus or symphalangus or hominidae or orangutan or orangutans or pongo or chimpanzee or chimpanzees or pan troglodytes or bonobo or bonobos or pan paniscus or gorilla or gorillas or troglodytes)	

Database: Scopus (search: 15 January 2025) - smoking

#	Query	Results
1	(TITLE (smoking OR smoke* OR tobacco* OR nicotine OR cigar? OR cigs OR cigarette* OR cigarilloi* OR "hand roll*" OR handroll* OR rollies OR "roll up*" OR rollup*)) AND (TITLE-ABS-KEY ("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR DeepAI OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invideo OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR OpenAI OR "Open AI" OR PathAI OR "Path AI")) AND PUBYEAR > 2009 AND PUBYEAR < 2026	174

Database: Web of Science (search: 15 January 2025) - smoking

#	Query	Results
1	(TI=(smoking OR smoke* OR tobacco* OR nicotine OR cigar? OR cigs OR cigarette* OR cigarilloi* OR "hand roll*" OR handroll* OR rollies OR "roll up*" OR rollup*)) AND TS=("comput* intelligence" OR "comput* reasoning" OR "machine intelligence" OR "artificial intelligence" OR AI OR "natural language processing" OR 'llm*1 OR "large language model*" OR "language learning model*" OR "classification algorithm*" OR "computer heuristic*" OR "convolutional network*" OR DALL-E OR "decision support system*" OR "decision tree" OR deeper OR "deep learning" OR "data science" OR "feature detection" OR "generative pre-trained transformer" OR "generative pretrained transformer" OR invidia OR "learning algorithm*" OR "machine learning" OR "neural net*" OR "reinforcement learning" OR "learning algorithm*" OR "*supervised learning" OR "intelligent agent*" OR "boltzmann machine*" OR "long short-term memory" OR "gated recurrent unit*" OR "rectified linear unit*" OR autoencoder OR "auto-encoder" OR backpropagation OR "multilayer perceptron" OR "multi-layer perceptron" OR convnet OR "convolutional learning" OR "Bing chat" OR ChatGPT* OR "Chat GPT" OR "Google* Bard" OR "Google* Gemini" OR "IBM Watson" OR "Microsoft* Bing" OR "Microsoft* Copilot" OR opened OR "Open AI" OR patman OR "Path AI") AND TS=(randomised OR randomized OR randomisation OR randomisation OR placebo* OR (random* AND (allocat* OR assign*)) OR (blind* AND (single OR double OR treble OR triple))) NOT TS=(animal or animals or pisces or fish or fishes or catfish or catfishes or sheatfish or silurus or arius or heteropneustes or clarias or gariepinus or fathead minnow or fathead minnows or pimephales or promelas or cichlidae or trout or trouts or char or chars or salvelinus or salmo or oncorhynchus or guppy or guppies or millionfish or poecilia or goldfish or goldfishes or carassius or auratus or mullet or mullets or mugil or curema or shark or	437

	sharks or cod or cods or gadus or morhua or carp or carps or cyprinus or carpio or killifish or eel or eels or anguilla or zander or sander or lucioperca or stizostedion or turbot or turbots or psetta or flatfish or flatfishes or plaice or pleuronectes or platessa or tilapia or tilapias or oreochromis or sarotherodon or common sole or dover sole or solea or zebrafish or zebrafishes or danio or rerio or seabass or dicentrarchus or labrax or morone or lamprey or lampreys or petromyzon or pumpkinseed or pumpkinseeds or lepomis or gibbosus or herring or clupea or harengus or amphibia or amphibian or amphibians or anura or salientia or frog or frogs or rana or toad or toads or bufo or xenopus or laevis or bombina or epidalea or calamita or salamander or salamanders or newt or newts or triturus or reptilia or reptile or reptiles or bearded dragon or pogona or vitticeps or iguana or iguanas or lizard or lizards or anguis fragilis or turtle or turtles or snakes or snake or aves or bird or birds or quail or quails or coturnix or bobwhite or colinus or virginianus or poultry or poultries or fowl or fowls or chicken or chickens or gallus or zebra finch or taeniopygia or guttata or canary or canaries or serinus or canaria or parakeet or parakeets or grasskeet or parrot or parrots or psittacine or psittacines or shelduck or tadorna or goose or geese or branta or leucopsis or woodlark or lullula or flycatcher or ficedula or hypoleuca or dove or doves or geopelia or cuneata or duck or ducks or greylag or graylag or anser or harrier or circus pygargus or red knot or great knot or calidris or canutus or godwit or limosa or lapponica or meleagris or gallopavo or jackdaw or corvus or monedula or ruff or philomachus or pugnax or lapwing or peewit or plover or vanellus or swan or cygnus or columbianus or bewickii or gull or chroicocephalus or ridibundus or albifrons or great tit or parus or aythya or fuligula or streptopelia or risoria or spoonbill or platalea or leucorodia or blackbird or turdus or merula or blue tit or cyanistes or pigeon or pigeons or columba or pintail or anas or starling or sturnus or owl or athene noctua or pochard or ferina or cockatiel or nymphicus or hollandicus or skylark or alauda or tern or	

	sterna or teal or crecca or oystercatcher or haematopus or ostralegus or shrew or shrews or sorex or araneus or crocidura or russula or european mole or talpa or chiroptera or bat or bats or eptesicus or serotinus or myotis or dasycneme or daubentonii or pipistrelle or pipistrellus or cat or cats or felis or catus or feline or dog or dogs or canis or canine or canines or otter or otters or lutra or badger or badgers or meles or fitchew or fitch or foumart or foulmart or ferrets or ferret or polecat or polecats or mustela or putorius or weasel or weasels or fox or foxes or vulpes or common seal or phoca or vitulina or grey seal or halichoerus or horse or horses or equus or equine or equidae or donkey or donkeys or mule or mules or pig or pigs or swine or swines or hog or hogs or boar or boars or porcine or piglet or piglets or sus or scrofa or llama or llamas or lama or glama or deer or deers or cervus or elaphus or cow or cows or bos taurus or bos indicus or bovine or bull or bulls or cattle or bison or bisons or sheep or sheeps or ovis aries or ovine or lamb or lambs or mouflon or mouflons or goat or goats or capra or caprine or chamois or rupicapra or leporidae or lagomorpha or lagomorph or rabbit or rabbits or oryctolagus or cuniculus or laprine or hares or lepus or rodentia or rodent or rodents or murinae or mouse or mice or mus or musculus or murine or woodmouse or apodemus or rat or rats or rattus or norvegicus or guinea pig or guinea pigs or cavia or porcellus or hamster or hamsters or mesocricetus or cricetulus or cricetus or gerbil or gerbils or jird or jirds or meriones or unguiculatus or jerboa or jerboas or jaculus or chinchilla or chinchillas or beaver or beavers or castor fiber or castor canadensis or sciuridae or squirrel or squirrels or sciurus or chipmunk or chipmunks or marmot or marmots or marmota or suslik or susliks or spermophilus or cynomys or cottonrat or cottonrats or sigmodon or vole or voles or microtus or myodes or glareolus or primate or primates or prosimian or prosimians or lemur or lemurs or lemuridae or loris or bush baby or bush babies or bushbaby or bushbabies or galago or galagos or anthropoidea or anthropoids or simian or simians or monkey or monkeys or marmoset or	

	marmosets or callithrix or cebuella or tamarin or tamarins or saguinus or leontopithecus or squirrel monkey or squirrel monkeys or saimiri or night monkey or night monkeys or owl monkey or owl monkeys or douroucoulis or aotus or spider monkey or spider monkeys or ateles or baboon or baboons or papio or rhesus monkey or macaque or macaca or mulatta or cynomolgus or fascicularis or green monkey or green monkeys or chlorocebus or vervet or vervets or pygerythrus or hominoidea or ape or apes or hylobatidae or gibbon or gibbons or siamang or siamangs or nomascus or symphalangus or hominidae or orangutan or orangutans or pongo or chimpanzee or chimpanzees or pan troglodytes or bonobo or bonobos or pan paniscus or gorilla or gorillas or troglodytes)	

Search Strategy for reviews

Database: Ovid MEDLINE(R) ALL (1946 to 13 January 2025)

Note: search includes alcohol, physical inactivity, and smoking

#	Query	Results
1	exp Drinking Behavior/	88,111
2	exp *Alcoholic Beverages/	17,987
3	exp Alcohol-Related Disorders/pc [Prevention & Control]	7,965
4	(alcohol* or beer* or wine* or liqo?r* or spirits or alcopop* or drink*).ti.	220,984
5	1 or 2 or 3 or 4	260,350
6	exp *Tobacco Smoking/	4,982
7	*Smoking/th [Therapy]	1,285
8	Smoking Cessation/	34,154
9	Smoking Reduction/	123
10	"Tobacco Use Cessation"/	1,562
11	(smoking or smoke* or tobacco* or nicotine or cigar? or cigs or cigarette* or cigarilloi* or "hand roll*" or handroll* or rollies or "roll up*" or rollup*).ti,kf.	183,075
12	6 or 7 or 8 or 9 or 10 or 11	188,257
13	exp *Exercise/	169,917
14	exp *Sports/	158,900
15	exp *Exercise Movement Techniques/	8,741
16	*Sedentary Behavior/	8,367
17	screen time/	1,522
18	(Physical* adj (activit* or inactiv* or exertion)).ti,kf.	78,091
19	(sedentary or inactive* or "screen time").ti,kf.	20,095
20	(exercis* or walk* or running or jog or jogging or sports or cycling or bicyc* or swimming or "active living" or "active transport" or "active travel*" or "leisure activi*" or aerobic* or dancing or dance*).ti,kf.	327,449
21	13 or 14 or 15 or 16 or 17 or 18 or 19 or 20	521,636
22	*Health Promotion/	54,258
23	exp Preventive Health Services/	711,205
24	Primary Prevention/	20,397
25	exp Public Health/	9,794,931
26	("public health" or "health promotion").ti,ab,kf,hw.	579,612
27	(behavio?r adj (modif* or chang*)).ti,ab,kf.	32,577
28	(influenc* or reduc* or problem* or harm* or abstain* or abstinence or refus* or prevent* or protect* or avoid* or stop* or delay* or depend* or addict* or abuse* or misuse* or unhealthy or problem* or binge* or	4,894,446

	binging or excess* or frequent or heavy or high-risk or "high risk" or harm* or consum* or behavio?r* or hazard* or intoxicat* or temperance or teen* or youth* or adolescen* or juvenile* or youngster* or underage* or under-age* or highschool* or education* or college* or universit* or school* or messaging or promot* or change* or changing or modification or modify* or motiva* or encourag* or increase* or program* or intervention* or counsel*).ti.	
29	22 or 23 or 24 or 25 or 26 or 27 or 28	13,389,322
30	(systematic review or meta-analysis).pt.	372,420
31	meta-analysis/ or systematic review/ or systematic reviews as topic/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/ or network meta-analysis/	416,016
32	((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).ti,ab,kf.	397,997
33	((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).ti,ab,kf.	18,963
34	((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).ti,ab,kf.	45,194
35	(data synthes* or data extraction* or data abstraction*).ti,ab,kf.	49,207
36	(handsearch* or hand search*).ti,ab,kf.	11,897
37	(mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).ti,ab,kf.	40,457
38	(met analy* or metanaly* or technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).ti,ab,kf.	13,758
39	(meta regression* or metaregression*).ti,ab,kf.	17,772
40	(meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.	557,005
41	(medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.	413,014
42	(cochrane or (health adj2 technology assessment) or evidence report).jw.	22,328
43	(comparative adj3 (efficacy or effectiveness)).ti,ab,kf.	20,369
44	(outcomes research or relative effectiveness).ti,ab,kf.	12,152
45	((indirect or indirect treatment or mixed-treatment or bayesian) adj3 comparison*).ti,ab,kf.	4,873
46	[(meta-analysis or systematic review).md.]	0
47	(multi* adj3 treatment adj3 comparison*).ti,ab,kf.	321
48	(mixed adj3 treatment adj3 (meta-analy* or metaanaly*)).ti,ab,kf.	185
49	umbrella review*.ti,ab,kf.	2,491
50	(multi* adj2 paramet* adj2 evidence adj2 synthesis).ti,ab,kf.	15

51	(multiparamet* adj2 evidence adj2 synthesis).ti,ab,kf.	19
52	(multi-paramet* adj2 evidence adj2 synthesis).ti,ab,kf.	13
53	or/30-52	807,451
54	5 and 29 and 53	5,166
55	limit 54 to yr="2023 -Current"	715
56	12 and 29 and 53	5,538
57	limit 56 to yr="2023 - 2025"	706
58	21 and 29 and 53	17,033
59	limit 58 to yr="2023 -Current"	3,923

Database: Embase (1974 to 13 January 2025)

Note: search includes alcohol, physical inactivity, and smoking

#	Query	Results
1	drinking behavior/	58,610
2	exp *alcoholic beverage/	14,389
3	exp alcoholism/pc [Prevention]	3,427
4	exp alcohol abuse/	52,109
5	(alcohol* or beer* or wine* or liqo?r* or spirits or alcopop* or drink*).ti.	267,738
6	1 or 2 or 3 or 4 or 5	322,526
7	exp "smoking and smoking related phenomena"/	562,666
8	exp "tobacco use"/pc [Prevention]	7,362
9	smoking cessation/	72,939
10	smoking reduction/	530
11	(smoking or smoke* or tobacco* or nicotine or cigar? or cigs or cigarette* or cigarilloi* or "hand roll*" or handroll* or rollies or "roll up*" or rollup*).ti,kf.	216,558
12	7 or 8 or 9 or 10 or 11	616,200
13	exp *exercise/	190,524
14	exp *sport/	101,109
15	exp *sedentary lifestyle/	6,742
16	screen time/	3,996
17	(Physical* adj (activit* or inactiv* or exertion)).ti,kf.	95,380
18	(sedentary or inactive* or "screen time").ti,kf.	23,040
19	(exercis* or walk* or running or jog or jogging or sports or cycling or bicyc* or swimming or "active living" or "active transport" or "active travel*" or "leisure activi*" or aerobic* or dancing or dance*).ti,kf.	396,504
20	13 or 14 or 15 or 16 or 17 or 18 or 19	580,982
21	exp *health promotion/	43,244
22	exp preventive health service/	31,840
23	primary prevention/	49,079
24	exp public health/	248,449
25	("public health" or "health promotion").ti,ab,kf,hw.	756,016
26	(behavio?r adj (modif* or chang*)).ti,ab,kf.	38,708
27	(influenc* or reduc* or problem* or harm* or abstain* or abstinence or refus* or prevent* or protect* or avoid* or stop* or delay* or depend* or addict* or abuse* or misuse* or unhealthy or problem* or binge* or binging or excess* or frequent or heavy or high-risk or "high risk" or harm* or consum* or behavio?r* or hazard* or intoxicat* or temperance or teen* or youth* or adolescen* or juvenile* or youngster* or underage*	5,551,850

	or under-age* or highschool* or education* or college* or universit* or school* or messaging or promot* or change* or changing or modification or modify* or motiva* or encourag* or increase* or program* or intervention* or counsel*).ti.	
28	21 or 22 or 23 or 24 or 25 or 26 or 27	6,154,437
29	(systematic review or meta-analysis).pt.	0
30	meta-analysis/ or systematic review/ or systematic reviews as topic/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/ or network meta-analysis/	725,299
31	((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).ti,ab,kf.	472,372
32	((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).ti,ab,kf.	21,390
33	((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).ti,ab,kf.	62,553
34	(data synthes* or data extraction* or data abstraction*).ti,ab,kf.	58,722
35	(handsearch* or hand search*).ti,ab,kf.	14,400
36	(mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).ti,ab,kf.	52,690
37	(met analy* or metanaly* or technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).ti,ab,kf.	23,286
38	(meta regression* or metaregression*).ti,ab,kf.	21,295
39	(meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.	854,707
40	(medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.	525,679
41	(cochrane or (health adj2 technology assessment) or evidence report).jw.	32,081
42	(comparative adj3 (efficacy or effectiveness)).ti,ab,kf.	29,329
43	(outcomes research or relative effectiveness).ti,ab,kf.	17,277
44	((indirect or indirect treatment or mixed-treatment or bayesian) adj3 comparison*).ti,ab,kf.	8,521
45	[(meta-analysis or systematic review).md.]	0
46	(multi* adj3 treatment adj3 comparison*).ti,ab,kf.	452
47	(mixed adj3 treatment adj3 (meta-analy* or metaanaly*)).ti,ab,kf.	263
48	umbrella review*.ti,ab,kf.	2,549
49	(multi* adj2 paramet* adj2 evidence adj2 synthesis).ti,ab,kf.	36
50	(multiparamet* adj2 evidence adj2 synthesis).ti,ab,kf.	22
51	(multi-paramet* adj2 evidence adj2 synthesis).ti,ab,kf.	31

52	or/29-51	1,137,788
53	6 and 28 and 52	4,458
54	limit 53 to yr="2023 -Current"	594
55	12 and 28 and 52	8,182
56	limit 55 to yr="2023 -Current"	1,154
57	20 and 28 and 52	11,154
58	limit 57 to yr="2023 -Current"	2,585

Database: Scopus (search: 14 January 2025) - smoking

#	Query	Results
1	(TITLE (alcohol* OR beer* OR wine* OR liqo?r* OR spirits OR alcopop* OR drink*)) AND (TITLE (influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binging OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion")) AND PUBYEAR > 2022 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE,"re"))	455

Database: Web of Science (search: 15 January 2025) - smoking

#	Query	Results
1	(TI=(alcohol* OR beer* OR wine* OR liqo?r* OR spirits OR alcopop* OR drink*)) AND TI=(influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binging OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion") and Review Article (Document Types) and 2023 or 2024 or 2025 (Publication Years)	399

Database: Scopus (search: 14 January 2025) – physical inactivity

#	Query	Results
1	(TITLE (exercis* OR walk* OR running OR jog OR jogging OR sports OR sport OR cycling OR bicyc* OR swimming OR "active living" OR "active transport" OR "active travel*" OR "leisure activi*" OR aerobic* OR dancing OR dance* OR "physical activit*" OR "physical exertion" OR "screen time" OR sedentary OR inactive*)) AND (TITLE (influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binging OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion")) AND PUBYEAR > 2022 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE,"re"))	1,669

Database: Web of Science (search: 15 January 2025) – physical inactivity

#	Query	Results
1	(TI=(exercis* OR walk* OR running OR jog OR jogging OR sports OR sport OR cycling OR bicyc* OR swimming OR "active living" OR "active transport" OR "active travel*" OR "leisure activi*" OR aerobic* OR dancing OR dance* OR "physical activit*" OR "physical exertion" OR "screen time" OR sedentary OR inactive*)) AND TI=(influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binding OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion")	1,646

Database: Scopus (search to 14 January 2025) - smoking

#	Query	Results
1	(TITLE (smoking OR smoke* OR tobacco* OR nicotine OR cigar? OR cigs OR cigarette* OR cigarilloi* OR "hand roll*" OR handroll* OR rollies OR "roll up*" OR rollup*)) AND (TITLE (influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binging OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion")) AND PUBYEAR > 2022 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE,"re"))	279

Database: Web of Science (search to 15 January 2025) - smoking

#	Query	Results
1	(TI=(smoking OR smoke* OR tobacco* OR nicotine OR cigar? OR cigs OR cigarette* OR cigarilloi* OR "hand roll*" OR handroll* OR rollies OR "roll up*" OR rollup*)) AND TI=(influenc* OR reduc* OR problem* OR harm* OR abstain* OR abstinence OR refus* OR prevent* OR protect* OR avoid* OR stop* OR delay* OR depend* OR addict* OR abuse* OR misuse* OR unhealthy OR problem* OR binge* OR binging OR excess* OR frequent OR heavy OR high-risk OR "high risk" OR harm* OR consum* OR behavio?r* OR hazard* OR intoxicat* OR temperance OR teen* OR youth* OR adolescen* OR juvenile* OR youngster* OR underage* OR under-age* OR highschool* OR education* OR college* OR universit* OR school* OR messaging OR promot* OR change* OR changing OR modification OR modify* OR motiva* OR encourag* OR increase* OR program* OR intervention* OR counsel* or "public health" OR "health promotion")	241

Supplement B: Gantt Chart for Review Delivery (Review Question 1)

	2024			2025											
	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Protocol															
Protocol development															
Submission to NIHR															
Patient and public involvement															
Phase 1: Protocol															
Phase 2: Synthesis															
Phase 3: Dissemination															
Searches and Screening															
Database searches															
Supplementary searches															
Screening															
Extraction and Appraisal															
Data extraction															
Quality appraisal															
Synthesis of Findings															
Synthesis of findings															
Publication and Reporting															
Draft of publication															
Submission to NIHR															