

Preplanned Studies

Bibliometric and Content Analysis of Artificial Intelligence in Smoking Cessation — Worldwide, 1982–2026

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Summary

What is already known about this topic?

Tobacco use remains a major public health challenge and the leading preventable cause of death worldwide. Artificial intelligence is increasingly applied in smoking cessation research, but its overall thematic landscape and development trends have not been systematically described.

What is added by this report?

This bibliometric and content analysis identified 1,728 publications on artificial intelligence (AI) in smoking cessation from inception to March 5, 2026. Research output increased markedly after 2017, with intervention as the dominant domain, while prediction and diagnosis emerged as closely related AI areas and monitoring remained substantially underexplored.

What are the implications for public health practice?

AI has strong potential to enhance tobacco control through digital interventions, predictive analytics, diagnostic support, and longitudinal monitoring. Expanding monitoring applications and strengthening trustworthy governance of AI may help improve smoking cessation strategies and support global tobacco control goals.

ABSTRACT

Introduction: Artificial intelligence (AI) is increasingly influencing smoking cessation research through digital intervention delivery, predictive modelling, diagnostic screening, and longitudinal monitoring. Although AI applications continue to expand, the overall trends of AI in tobacco control have not been systematically characterized. This study aimed to map the research landscape on smoking cessation and identify the major themes most relevant to current and emerging AI applications.

Methods: A bibliometric and content analysis of smoking cessation literature was conducted using nine electronic databases from inception to March 5, 2026.

Publications were analyzed by publication year, author frequency, thematic distribution, keyword co-occurrence, and time overlay visualization.

Results: The overall publication output has increased markedly since 2017. The publications were classified into four domains based on keywords: intervention (31.4%, 542/1,729), prediction (24.9%, 430/1,728), diagnosis (13.9%, 241/1,729), and monitoring (3.3%, 57/1,729). Time overlay analysis revealed new research hotspots, such as machine learning, real-time monitoring, and emerging nicotine products.

Conclusion: Smoking cessation studies primarily focus on digital interventions, whereas prediction and diagnosis are emerging sectors closely connected to AI. Monitoring is an underexplored area that suggests important future opportunities. Leveraging evolving AI applications could support tobacco control efforts in alignment with global strategies and national initiatives in China.

Tobacco use is a persistent major public health challenge and leading behavioral risk factor for death worldwide (1). Tobacco substantially increases mortality from health conditions including cancers, heart diseases, and chronic respiratory diseases (1). In China, tobacco use accounts for over 1 million deaths annually, and over 100,000 deaths are attributable to secondhand smoke exposure (2). However, smoking prevalence remains high, with the China CDC reporting a prevalence of 23.2% (male: 43.9%; female: 1.8%) among individuals aged ≥15 years in 2024 (3).

As smoking is the most preventable cause of death, a range of interventions and policies have been developed to reduce smoking prevalence and improve quality of life (1). Artificial intelligence (AI) has become increasingly important in smoking cessation research through digital intervention delivery, predictive modelling, diagnostic classification, and follow-up monitoring. Given its increased adoption in

tobacco control, a better understanding of its overall thematic evolution and publication trends is required. Bibliometric analysis offers a visualization-based approach to systematically map the research landscape using vast volumes of scientific data. Macrolevel evidence generated from factors such as authors, hotspots, and intellectual structure can inform research resource allocation and policy development. This study aimed to answer the following questions:

First, what is the overall publication trend for artificial intelligence in smoking-cessation research?

Second, what are the main research themes and their connections?

Third, what are the temporal patterns of the research topics, hotspots, and gaps?

Data extraction involved a comprehensive, single-day search over nine electronic databases (PubMed, APA PsycINFO, Cochrane Library, CINAHL, Scopus, Web of Science, Embase, MEDLINE, and ClinicalTrials.gov), covering inception to March 5, 2026, to capture the collective evolution of AI applications in smoking cessation research. The search strategy included keywords related to AI, tobacco control, and AI application approaches, as outlined

in [Supplementary Table S1](https://weekly.chinacdc.cn/) (available at <https://weekly.chinacdc.cn/>). The AI keywords were based on the operational definition of AI as a computational method for data pattern extraction to enable automated decision-making (4). Classical and modern approaches were both included to capture the extended historical evolution of these algorithms. The records were limited to those published in English and were downloaded in RIS format.

Figure 1 shows the data screening and analysis. The initial search identified 4,052 entries. After deduplication, 1,728 records remained. Following coder training by the senior author (AWH), two screeners (HYFC, GL) conducted independent manual title and abstract screening. Records were coded into one of four research domains (intervention, diagnosis, monitoring, and prediction) or an unclassified category based on their principal research objectives and the domain definitions, subdomain categories, and relevant keywords in [Table 1](#). The unclassified category comprised publications lacking meaningful relevance to AI and smoking cessation. Coding discrepancies were resolved through discussion with AWH. The records were analyzed using Python (version 3.12; The

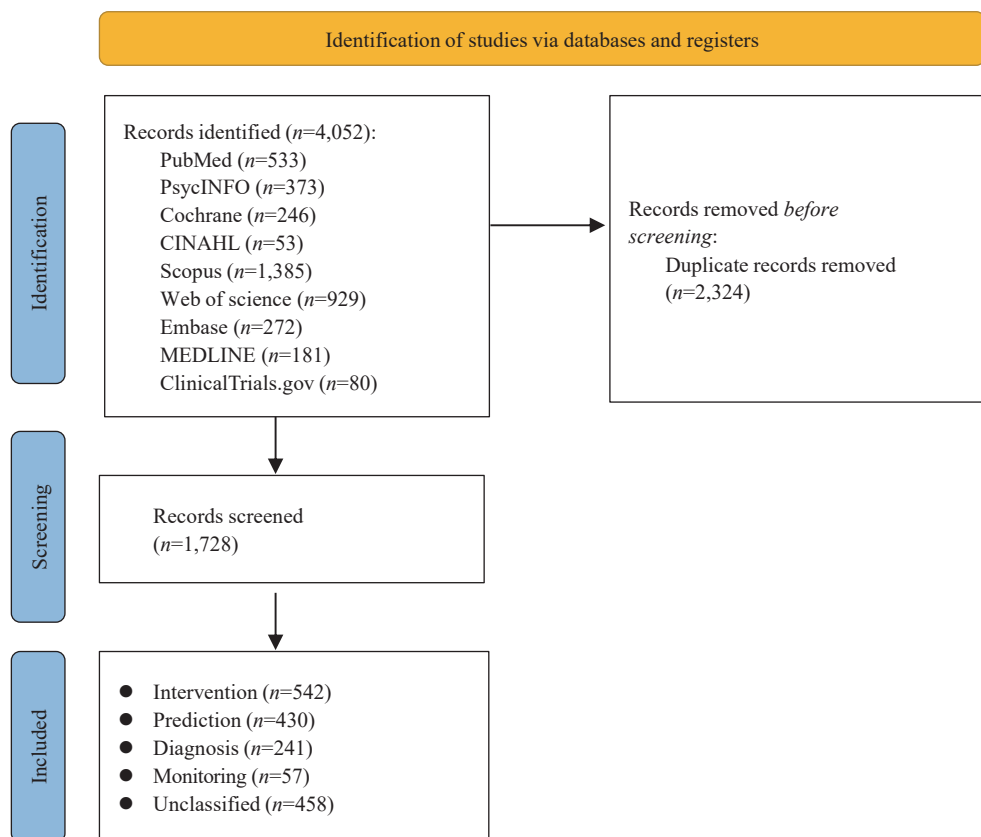


FIGURE 1. Workflow of the bibliometric analysis, including record identification, screening, and inclusion.

TABLE 1. Content analysis framework based on the four research themes for AI use in smoking cessation support.

Main domain	Definition	Subdomains	Normalized keyword groups
Intervention	Studies evaluating or delivering smoking cessation support	Behavioral intervention, digital intervention, pharmacotherapy, counseling, quitline, intervention evaluation	Intervention/treatment/therapy
			Intervention effect
			Trial/protocol
			Pharmacologic and non-pharmacologic intervention
			Behavioral/lifestyle/psychological intervention
			Health education/rehabilitation
			Counseling/brief advice
			Smoking cessation/cessation program/quitline
			Nicotine replacement therapy
			Cessation medications
			Digital intervention-related terms
			Motivational interviewing
			Prediction-related terms
Prediction	Studies using models or predictors to estimate cessation-related outcomes	Quit success prediction, relapse prediction, abstinence prediction, risk prediction, trajectory modeling	Forecasting/estimation/projection
			Predictive modeling
			Risk prediction/risk factor
			Trend prediction
			Probability/likelihood
			Prognostic/outcome-related terms
			Relapse prediction
			Cessation success prediction
			Diagnosis-related terms
			Detection/identification
Diagnosis	Studies identifying, screening, detecting, or classifying smoking-related status or conditions	Smoking status detection, nicotine dependence screening, diagnostic classification, biomarker/imaging-based detection	Screening
			Classification
			Diagnostic accuracy
			Biomarker/testing/imaging
			Smoking status assessment
			Nicotine/tobacco dependence assessment
			Withdrawal/craving assessment
			Quit readiness/motivation assessment
			Monitoring/tracking/surveillance
			Follow-up/reassessment/review
Monitoring	Studies involving follow-up, surveillance, adherence, or longitudinal tracking	Remote monitoring, relapse monitoring, abstinence follow-up, adherence monitoring, surveillance	Longitudinal/prospective observation
			Adherence/compliance
			Continuous/ambulatory monitoring
			Ecological momentary assessment

Note: There are four cluster themes for the content analysis. Publications were allocated to one of the four predefined primary application themes based on their dominant research direction. The framework contains the main domain (overall thematic category), definitions (conceptual meaning of each domain), subdomains (specific subthemes), and normalized keyword groups (merged synonyms, concepts, and variants).

Abbreviation: AI=artificial intelligence.

Python Software Foundation) for publication year, author appearance frequency, and thematic analysis.

VOSviewer (version 1.6.20; Leiden University, Netherlands) was used to create the author

collaboration network, keyword co-occurrence, and time overlap analysis of the records. The analysis used a minimum keyword occurrence threshold of 19, full counting, and standardization based on association strength.

Publications within the field began in 1982 and have continuously increased in volume. The complete Kneedle algorithm identified 2017 as a critical turning point, with a sensitivity parameter of $S=1$. The annual publication output (Figure 2A) increased gradually from two in 1982 to 49 in 2017. Following the inflection point, this number increased substantially, peaking at 282 in 2025. There were 578 publications in the 36 years up to 2017 and 1,088 in the 9 years after 2017.

Figure 2B presents the author collaboration network. The ten most-prolific authors contributed to 227 publications (13.1%). Prochaska from the University of Rhode Island contributed the most articles (39 publications), followed by Velicer from the same university (30 publications). Further author details are listed in Supplementary Table S2 (available at <https://weekly.chinacdc.cn/>).

Content analysis was conducted to characterize thematic emphasis within the research field. Using keyword-driven coding, the records were classified into four major AI application domains: intervention, prediction, diagnosis, and monitoring (Table 1; details in Supplementary Table S3, available at <https://weekly.chinacdc.cn/>). Intervention is the largest domain, comprising 542 records (31.4%), followed by prediction (430 records, 24.9%), diagnosis (241 records, 13.9%), and monitoring (57 records, 3.3%). The remaining 458 (26.5%) records were unclassified.

High-frequency keyword groups within each domain were used to characterize thematic emphasis and identify areas of importance, as outlined in Supplementary Table S3 (available at <https://weekly.chinacdc.cn/>). The intervention domain was dominated by treatment (425), smoking cessation (405), effect (285), trial (161), digital intervention (123), and counseling (74). The prediction domain was characterized by predictive modeling (338), prediction (318), forecasting (113), and prognostics (74). The diagnosis domain included detection (122), testing (110), and screening (78). Monitoring included surveillance (36), longitudinal (5), and adherence (5). The content analysis in Figure 2C maps the keywords across the four domains, revealing interdisciplinary relationships and close cross-theme research between certain domains (e.g., intervention and diagnosis,

monitoring and prediction).

The keyword co-occurrence analysis revealed research hotspots (Figure 2D). The red cluster keywords include "artificial intelligence," "tobacco control," "intervention," "health promotion," and "health behavior." The yellow cluster contains the AI subtheme of machine learning, where "diagnosis" and "monitoring" are the most closely related. The green cluster represents predictive modelling and its diverse implementations ("risk assessment," "risk factor"). The blue cluster keywords are related to general smoking-cessation research, such as "randomized controlled trial," "outcome," "self-efficacy," and "abstinence." The time overlay chart shows a clear evolutionary trend (Figure 2E). The keywords for the years before 2017 (purple and blue) represent core research themes ("smoking cessation," "artificial intelligence," "intervention," "treatment outcome," "nicotine") and earlier AI paradigms ("expert system," "data mining"). For 2017–2021 (green), AI applications emphasized "risk assessment," "screening," "classification," and "forecasting." From 2021 onwards, new research hotspots (yellow) include recent AI applications ("monitoring," "real-time," "machine learning"), recent AI platforms ("mobile phones," "chatbots"), and emerging alternative smoking products ("ASPs," "electronic cigarettes," "vaping"). High-resolution versions of Figures 2B–2E are provided in Supplementary Figures S1–S4 (available at <https://weekly.chinacdc.cn/>).

DISCUSSION

The use of AI is expanding rapidly everywhere. Our critical review and analysis of trends in the publications of the past 45 years reveal that interest in the use of AI within smoking cessation research is accelerating, especially in the last decade. The rising trend also suggests persistent expansion in the future. This expansion aligns with wider digital healthcare research patterns, which show accelerating development of AI in public health, personalized interventions, and clinical decision-support across various settings (5).

Within the four themes of AI in smoking-cessation research, current research primarily focuses on intervention-focused studies, underscoring sustained efforts on cessation strategies and potential targeted support for at-risk individuals. Applications for prediction and diagnosis are emerging to a lesser extent. The focus on prediction reflects attention to modelling and assessment. Diagnostic research

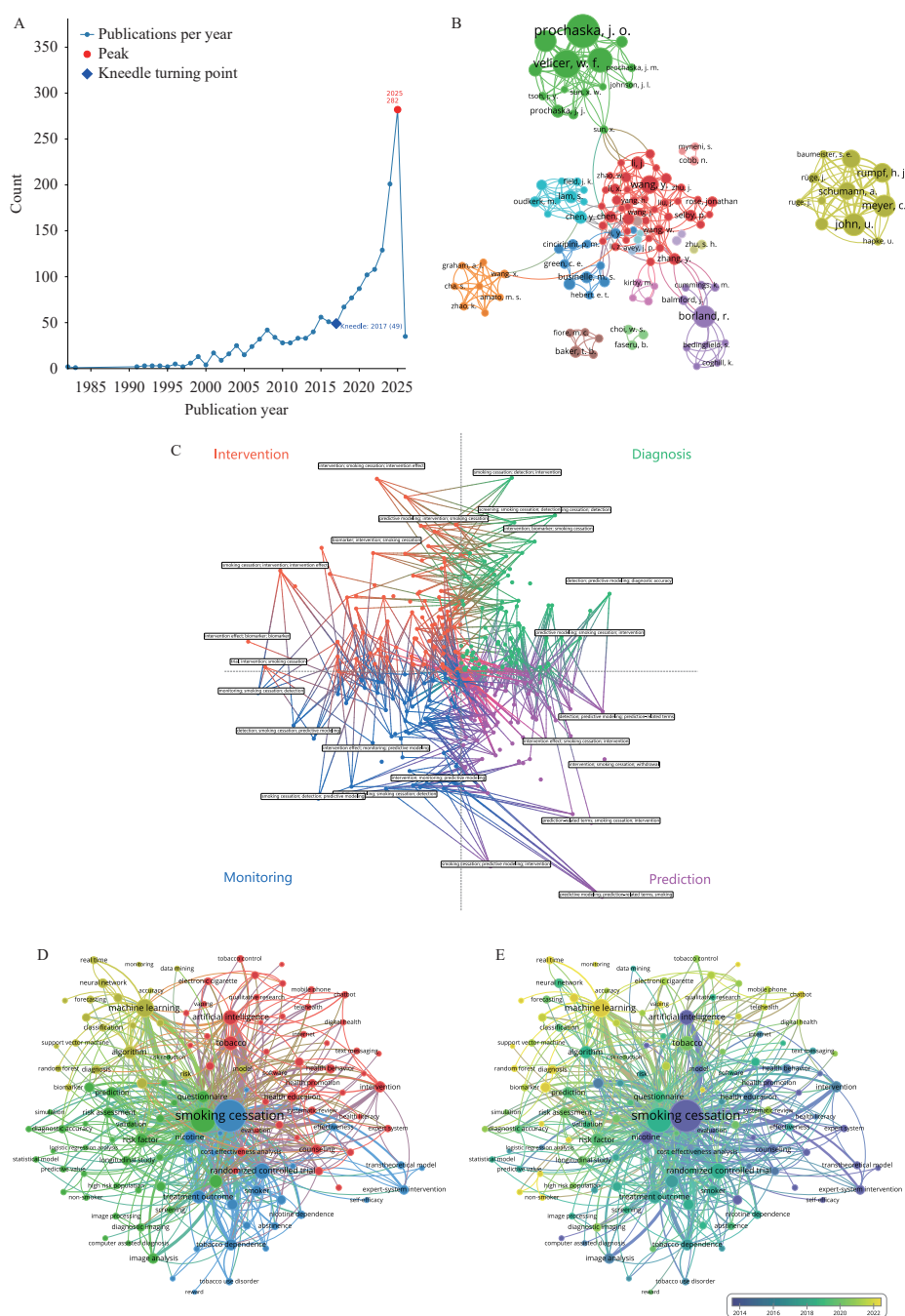


FIGURE 2. Bibliometric visualizations of AI application in smoking cessation research ($N=1,728$). (A) Annual number of publications from 1982 to 2026; (B) Author collaboration network of the top 146 authors; (C) Visualization of four research themes of intervention, prediction, diagnosis, and monitoring; (D) Keyword co-occurrence network; (E) Time overlay map.

Note: In the author collaboration network, each node represents an author in the field. Larger nodes indicate more records. The connections indicate coauthorship across publications, and thicker lines indicate more frequent collaboration. In the research theme visualization, each node represents a single publication placed in one of the four theme quadrants. The connections between nodes indicate the similarity between records, and thicker lines indicate stronger similarity through more shared keywords. Node proximity also reflects similarity. The labels indicate the most important keywords in each theme. In the keyword co-occurrence network, each node represents a keyword and larger node sizes reflect a higher frequency of occurrence within the literature. The connections between nodes represent co-occurrence relationships, and link strength depicts the volume of publications with shared occurrences. In the time-overlay map, node color indicates the average publication year of the corresponding literature for each keyword, with lighter colors representing newer research topics.

Abbreviation: AI=artificial intelligence.

indicates opportunities for early identification. By contrast, research on monitoring approaches using AI for tobacco control is relatively new and underexplored, indicating a gap in research and policy. AI can contribute to tobacco use monitoring with longitudinal tracking and real-time adaptive feedback systems, particularly within community and primary healthcare settings. AI-based sustained monitoring could improve time efficiency and minimize manual effort. A multifaceted approach is encouraged, and the four domains should be systematically integrated to achieve effective smoking cessation and sustained tobacco control.

Globally, AI will increasingly influence smoking cessation efforts, warranting standardized protocols specific to healthcare practices using the FUTURE-AI framework (6). These international consensus guidelines are based on six principles: fairness, universality, traceability, usability, robustness, and explainability. FUTURE-AI spans the lifecycle of healthcare AI, including its design, development, validation, deployment, and monitoring (6). The integration of human expertise and oversight into AI systems is also vital. Co-design among diverse stakeholders, including academics, clinicians, policymakers, patients, public-health practitioners, and the general public, should be actively promoted to effectively address the complex and evolving health needs of populations.

By 2030, the Chinese government aims to reduce its high smoking prevalence to below 20% in individuals aged ≥ 15 years within Healthy China Action (2019–2030) (2). Hong Kong has a current prevalence of 8.5% (538,100/6,353,200) and a target prevalence of 7.8% by 2025 (7). The action plan outlines the development of a comprehensive smoking-cessation service to promote brief advice interventions, national-level tobacco product surveillance, and routine outpatient smoking-history documentation, providing multiple integration points for the four themes of AI approaches in national tobacco-control efforts. Key applications include prediction models for personalized digital intervention delivery, patient tobacco-use screening, and longitudinal monitoring of smoking-related patterns.

This promising and expanding research and policy interest also carries potential risks. Notable challenges include bias and equity issues affecting fairness and the accuracy of predictions and interventions in algorithmic decision-making (8). AI involves data collection and utilization, which are beneficial for

model training and intervention personalization, but potentially subject to data leaks and misuse (8). Hence, since 2017, the Chinese government has taken early and steady actions to support and regulate AI use, laying the regulatory groundwork and establishing advisory committees (9–10). In 2020, voluntary ethical guidelines shifted to formal legal regulations, strengthening regulatory oversight of AI use (9). This oversight comprises three pillars: data protection, algorithmic governance, and content moderation (9). Data protection focuses on the ethical, safe, and responsible use of personal information. Algorithmic governance involves AI system registration and the use of reliable training datasets. Content moderation includes content labeling, transparency, and the strict control of harmful information. This adaptive, coordinated governance system in China may serve as a useful framework for the global implementation of AI in tobacco-control systems.

The findings in this report are subject to at least five limitations. First, the bibliometric analysis reflects publication activity from selected databases, excluding unpublished research and gray literature, limiting result comprehensiveness. Second, the restriction to English-language records may have caused the overrepresentation of research from countries where English is the primary language. Third, changes in the terminology definitions related to AI and tobacco products over time could affect the content analysis accuracy. Fourth, manual theme classification inherently involves subjective judgment, particularly for records spanning multiple domains. Finally, the bibliometric findings should not be interpreted as indicators of exact trends in practical implementation and policy progress.

Within its evolving landscape, AI holds substantial potential for advancing smoking cessation efforts across multiple research domains. Although smoking intervention, predictive analytics, and diagnostic support are the primary areas of AI application in current research, the use of AI in monitoring remains underutilized, indicating crucial opportunities to expand its expertise and deployment. With the global expansion of AI use in tobacco control, the adoption of FUTURE-AI frameworks is essential to ensure the systematic integration of AI into healthcare practices. In China, the comprehensive, multifaceted application of AI across the four research domains in alignment with national health strategies may provide valuable support for tobacco-control efforts.

Conflicts of interest: No conflicts of interest.

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SUPPLEMENTARY MATERIALS

SUPPLEMENTARY TABLE S1. Search strategy for the bibliometric analysis of artificial intelligence in smoking cessation research.

Category	No.	Search term
Artificial intelligence	1	Artificial intelligence
	2	AI
	3	Artificial learning
	4	Computer reasoning
	5	Computational intelligence
	6	Computer intelligence
	7	Machine learning
	8	Supervised learning
	9	Unsupervised learning
	10	Reinforcement learning
	11	Hierarchical learning
	12	Transfer learning
	13	Decision tree*
	14	Random forest*
	15	Random decision forest
	16	SVM
	17	Bayesian
	18	Deep learning
	19	Neural networks
	20	Artificial neural networks
	21	Autoencoder
	22	Perceptrons
	23	Generative AI
	24	Large language model
	25	Generative pre-trained transformer
	26	ChatGPT
	27	Generative adversarial networks
	28	Natural language processing
	29	text mining
	30	Robotic*
	31	Expert System*
	32	Inference engines
	33	Fuzzy logic
	34	Fuzzy cognitive
	35	Computer vision
	36	Image analysis
	37	Image classification
	38	Image segmentation
	39	Machine vision
	40	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39

Continued

Category	No.	Search term
Smoking cessation	41	Smoking cessation
	42	Smoking intervention
	43	Smoking regulation
	44	Smoking abstinence
	45	Smoking reduction
	46	Smoking prevention
	49	Giving up smoking
	50	Stopping smoking
	51	Quit smoking
	52	Quitting smoking
	53	Reduce smoking
	54	Reducing smoking
	55	Tobacco cessation
	56	Tobacco use cessation
	57	Tobacco regulation
	58	Tobacco control
	59	Tobacco reduction
	60	Tobacco prevention
	61	Tobacco use disorder
	62	Tobacco dependen*
	63	Tobacco program
	64	Tobacco endgame
	65	Nicotine cessation
	66	Nicotine use disorder
	67	Nicotine addiction
	68	Nicotine dependence
	69	Nicotine gum
	70	Nicotine patch
	71	Nicotine replacement
	72	NRT
	73	41 OR 42 OR 43 OR 44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70 OR 71 OR 72
Intervention	74	Prediction
	75	Predictive
	76	Predictive analytics
	77	Predictive learning model
	78	Machine predictive models
	79	Risk factor
	80	Risk assessment
	81	Risk-benefit assessment
	82	Risks and benefits
	83	Risk analysis
	84	Predictive value*

Continued

Category	No.	Search term
Intervention	85	Patient monitoring
	86	Health monitoring
	87	Remote monitoring
	88	Remote patient monitoring
	89	Telemonitoring
	90	Digital monitoring
	91	Continuous monitoring
	93	Adherence monitoring
	94	Behavioral monitoring
	95	Relapse monitoring
	96	Symptom monitoring
	97	Surveillance
	98	Intervention
	99	Treatment
	100	Therapy
	101	Cessation
	102	Regulation
	103	74 OR 75 OR 76 OR 77 OR 78 OR 79 OR 80 OR 81 OR 82 OR 83 OR 84 OR 85 OR 86 OR 87 OR 88 OR 89 OR 90 OR 91 OR 92 OR 93 OR 94 OR 95 OR 96 OR 97 OR 98 OR 99 OR 100 OR 101
Combined search terms	104	40 AND 73 AND 102

Abbreviations: AI=artificial intelligence; ChatGPT=chat generative pretrained transformer; NRT=nicotine replacement therapy; SVM=support vector machine.

* indicates a truncated wildcard, in which the listed keyword represents multiple word variations sharing the same root.

SUPPLEMENTARY TABLE S2. Top-10 authors contributing on artificial intelligence use in smoking cessation research from 1982 to 2026.

Rank	Author	Country	Number of publications
1	Prochaska JO	United States	39
2	Velicer WF	United States	30
3	Redding CA	United States	25
4	John U	Germany	22
5	Borland R	Australia	21
6	Meyer C	Germany	21
7	Rossi JS	United States	20
8	Rumpf HJ	Germany	17
9	Ulbricht S	Germany	16
10	Wang Y	China	16

SUPPLEMENTARY TABLE S3. The content analysis framework with the keyword library, based on four research themes for AI in smoking cessation support.

Main domain	Definition	Subdomains	Normalized keyword groups	Keywords library	Occurrence
Intervention	Studies evaluating or delivering smoking cessation support	Behavioral intervention, digital intervention, pharmacotherapy, counseling, quitline, intervention evaluation	Intervention/treatment/ therapy	Intervention; treatment; therapy; management; regimen	425
			Intervention effect	Effectiveness; efficacy; impact	285
			Trial/protocol	clinical trial*; randomized controlled trial; RCT; controlled trial; protocol	161
			Pharmacologic and non-pharmacologic intervention	Pharmacologic*; non-pharmacologic*	22
			Behavioral/lifestyle/ psychological intervention	Behavioral intervention*; lifestyle intervention*; psychological intervention*	17
			Health education/rehabilitation	Health education; rehabilitation	14
			Counseling/brief advice	Counseling; brief advice	74
			Smoking cessation/cessation program/quitline	Smoking cessation; cessation program*; quit smoking; quit attempt*; quitline	405
			Nicotine replacement therapy	Nicotine replacement therap*; NRT	70
			Cessation medications	Varenicline; bupropion	46
			Digital intervention-related terms	Digital intervention*; web-based; internet-based; online program*; mHealth; smartphone app*; mobile app*; telehealth; telemedicine; SMS; text message*; chatbot*; e-health; virtual coach*	123
			Motivational interviewing	Motivational interview*; motivational enhancement therap*; MET	37
Prediction	Studies using models or predictors to estimate cessation-related outcomes	Quit success prediction, relapse prediction, abstinence prediction, risk prediction, trajectory modeling	Prediction-related terms	Predict*; prediction; predictive; predictor*	318
			Forecasting/estimation/projection	Forecast*; estimate*; projection*; anticipated	113
			Predictive modeling	Model*; probabilistic model*; risk model	338
			Risk prediction/risk factor	Risk prediction; risk factor	44
			Trend prediction	Future trend*; trend analysis	3
			Probability/likelihood	Likelihood; probability	62
			Prognostic/outcome- related terms	Prognostic; outcome; expected outcome	74
			Relapse prediction	Relapse risk; relapse prediction; time to relapse	7
			Cessation success prediction	Quit success; cessation success; quit probability; cessation outcome*	31
Diagnosis	Studies identifying, screening, detecting, or classifying smoking-related status or conditions	Smoking status detection, nicotine dependence screening, diagnostic classification, biomarker/imaging-based detection	Diagnosis-related terms	Diagnos*; diagnostic; differential diagnosis; misdiagnos*	50
			Detection/identification	Detect*; detection; identify; identification; early detection	122
			Screening	Screen*; screening	78
			Classification	Classification; classify	47
			Diagnostic accuracy	False positive; false negative; sensitivity; specificity; accuracy	67
			Biomarker/testing/ imaging	Biomarker*; test*; imaging	110
			Smoking status assessment	Smoking status	29
			Nicotine/tobacco dependence assessment	Nicotine dependence; tobacco dependence; dependence level	20
			Withdrawal/craving assessment	Withdrawal symptom*; craving*; urge to smoke	15
			Quit readiness/motivation assessment	Readiness to quit; motivation to quit	2

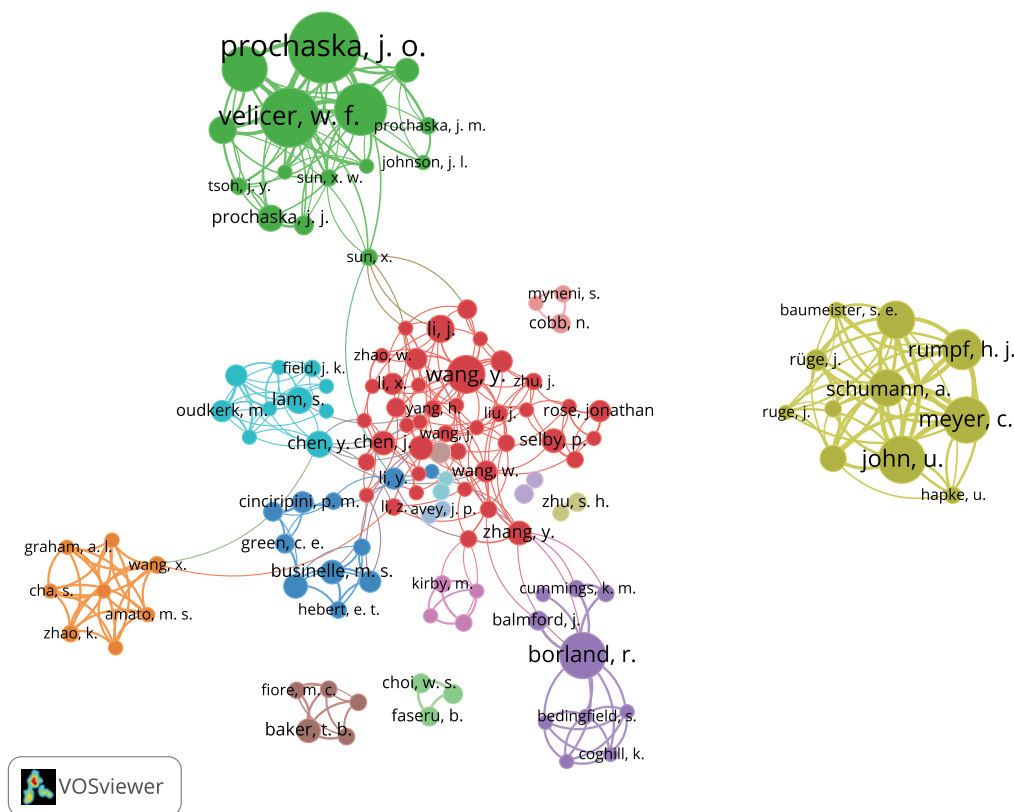
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Main domain	Definition	Subdomains	Normalized keyword groups	Keywords library	Occurrence
Monitoring	Studies involving follow-up, surveillance, adherence, or longitudinal tracking	Remote monitoring, relapse monitoring, abstinence follow-up, adherence monitoring, surveillance	Monitoring/tracking/surveillance	Monitor*; monitoring; surveillance; track*; observation	36
			Follow-up/reassessment/review	Follow-up; follow up; reassessment; periodic review; serial assessment	4
			Longitudinal/prospective observation	Longitudinal; prospective	5
			Adherence/compliance	Adherence; compliance	5
			Continuous/ambulatory monitoring	Continuous monitoring; ambulatory monitoring	1
			Ecological momentary assessment	Ecological momentary assessment; EMA	1

Note: There are four cluster themes for the content analysis. Publications were allocated to one of the four predefined primary application themes based on their dominant research direction. The framework contains the main domain (overall thematic category), definition (conceptual meaning of each domain), subdomains (specific subthemes), normalized keyword groups (merged synonyms, concepts, and variants), and keyword library (a full detailed list of extracted keywords used for analysis). The asterisk

Abbreviation: APP=application; CO=carbon monoxide; EMA=ecological momentary assessment; MET=motivational enhancement therapy; NRT=nicotine replacement therapy; RCT=randomized controlled trial; SMS=short message service.

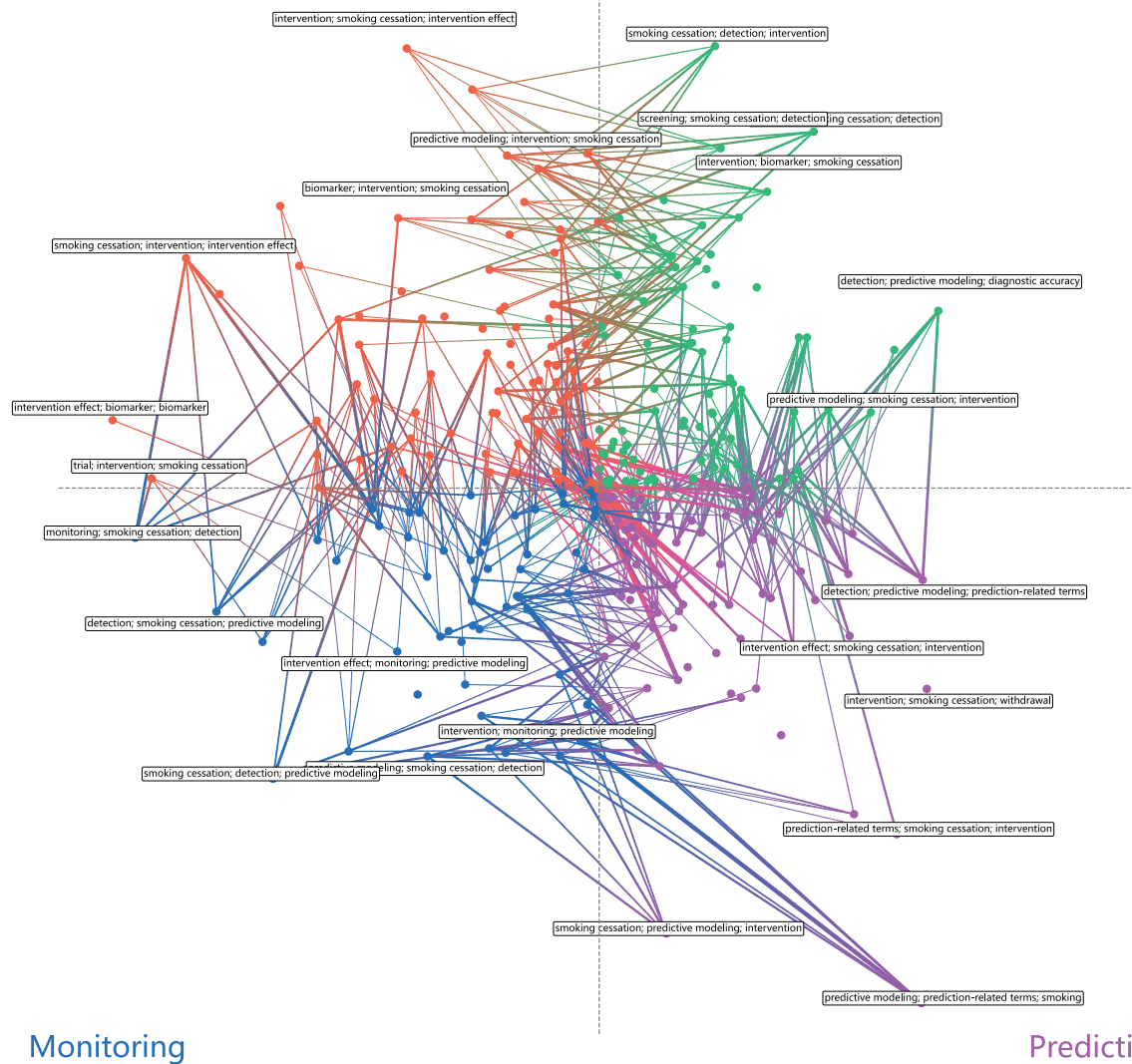
* Indicates a truncated wildcard, in which the listed keyword represents multiple word variations sharing the same root.



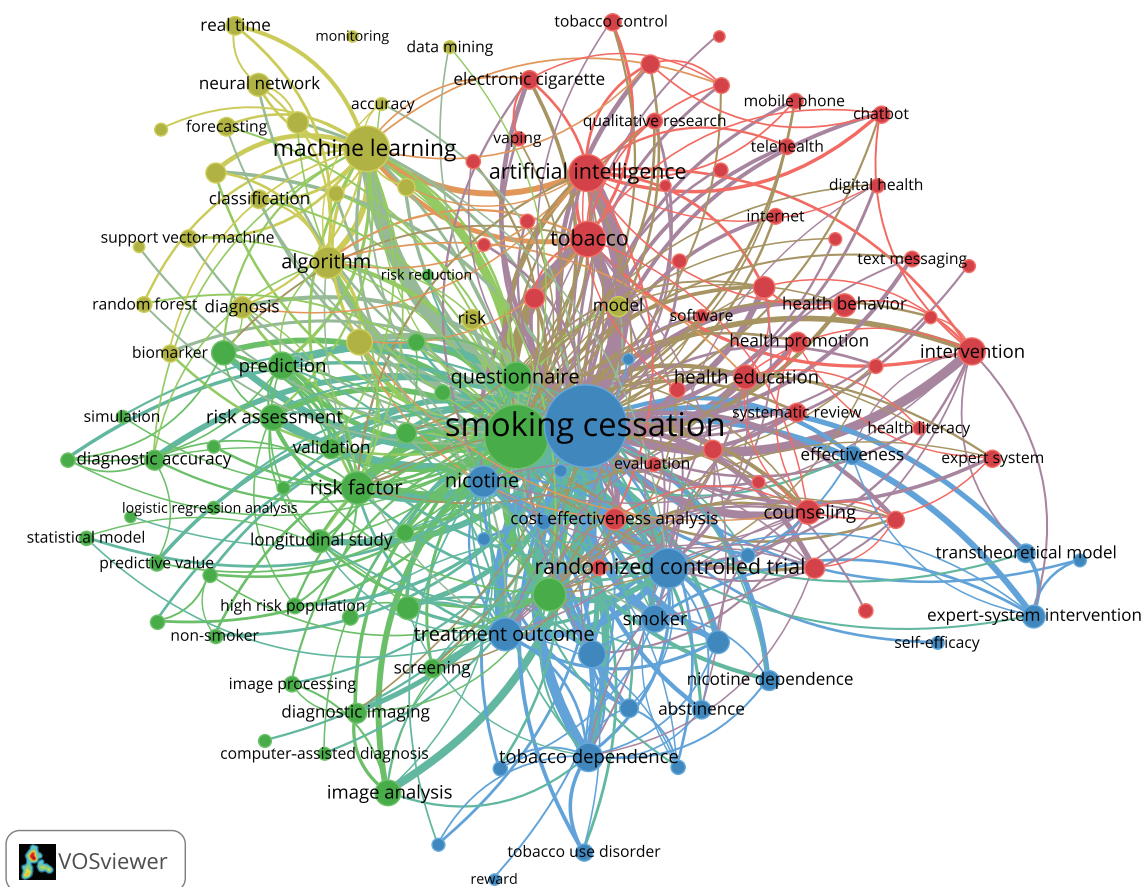
SUPPLEMENTARY FIGURE S1. Author collaboration network of the top 146 authors.

Intervention

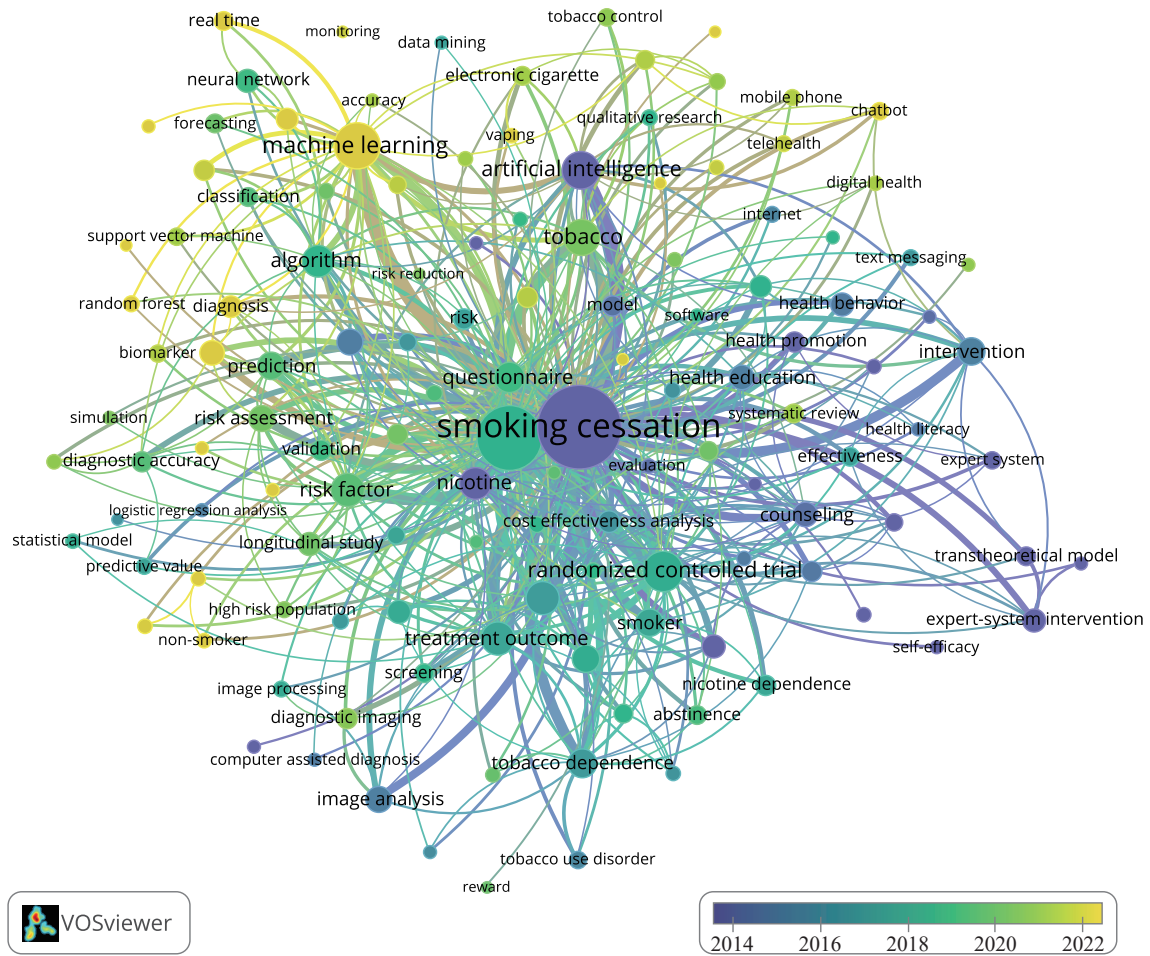
Diagnosis



SUPPLEMENTARY FIGURE S2. Visualization of the four research themes of intervention, prediction, diagnosis, and monitor.



SUPPLEMENTARY FIGURE S3. Keyword co-occurrence network.



SUPPLEMENTARY FIGURE S4. Time overlay visualization map.