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Surveillance Technologies for Suicide Prevention in Public Places: A Scoping Review of Their Nature and Feasibility

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ABSTRACT

Objective: This scoping review maps the range of surveillance technologies being implemented and proposed for suicide prevention in public locations, and explores the reported feasibility of implementing surveillance technologies for suicide prevention.

Method: Searches were conducted via EBSCO (PsycINFO, MEDLINE, CINAHL, Computer Source), Ovid (SPP), Web of Science, PTSDpubs, CENTRAL (Cochrane), and IEEE Xplore. Grey literature searches were conducted through Overton, preprint databases (e.g., PsyArXiv), and industry/government websites. Studies were included if they were written in English and described surveillance technologies in public locations that could identify possible suicide-related incidents.

Results: 169 reports were included, mostly from academia. Around half of the reports described technology that had already been implemented. CCTV was the most discussed technology, and the railways were the most common location referenced. 111 reports discussed the feasibility of implementing these technologies. Key factors which determined feasibility included the processes and procedures involved in installing or using the technology, legal and ethical issues, staff and public attitudes toward technology, the appropriateness of the technology for particular contexts or locations, and cost-effectiveness.

Conclusions: Key gaps in the current research include a lack of lived experience involvement and ethical consideration being reported, and a disparity in research coming from high and low/middle income countries. Future research needs to prioritize transparency around ethical implications, consulting people with lived experience, and sharing findings internationally to further the global suicide prevention imperative.

HIGHLIGHTS

- Having a clear response pathway to respond to an incident is key following an alert
- The technology must be appropriate and suitable for the intended location/context
- Ethical implications and lived experience involvement are priorities for future work

KEYWORDS

Suicide prevention;
surveillance technology;
railways

INTRODUCTION

A suicide in a public place is defined as occurring outside of a private home that has the possibility of being witnessed or discovered by members of the public (Public Health England, 2015). International evidence suggests that around a third of suicides take place in public places away from the home, however it is difficult to determine the exact number of suicides that happen in public places as this information is not always captured by coroners or other agencies involved in recording suicides (Public Health England, 2015; Cox et al., 2022; Shin et al., 2025b). Deaths occurring in public places can have devastating consequences for those at the scene, in addition to the individual who has sadly lost their life and those who are bereaved. Suicide prevention strategies usually address several priorities for preventing suicides in public places, including increasing the opportunity for intervention by a third party, increasing opportunities for help-seeking, restricting access to means, and changing the public image of the location (Public Health England, 2015; HSE National Office for Suicide Prevention (NOSP), 2025; World Health Organization, 2022).

Research to date has most commonly evaluated interventions such as barriers and fences that restrict access to locations, with evidence suggesting they can be effective for preventing suicides (Barker et al., 2017; Hawton et al., 2024; Steeg et al., 2025). Yet there are challenges associated with means restriction, such as barriers not being feasible due to engineering constraints, and potential possible public backlash if iconic views are obstructed or altered (Shin et al., 2025a). A key concern is that restricting access to a certain location may result in the individual finding a substitute location or method, but there is limited evidence to suggest this is the case as of yet (Hawton et al., 2024; Daigle, 2005; Too et al., 2025). The cost of barrier installation can also mean they are not feasible. However, means restriction can have cost-saving benefits if it negates the resources and costs associated with a suicide attempt (Bandara et al., 2022). There is a lack of robust economic evaluations to inform the decision making around cost-effectiveness.

A recent rapid review of interventions to reduce suicide in public places identified surveillance technologies as showing the most promise for reducing suicides (Kiseleva et al., 2025). There may be greater opportunities for third party intervention when suicide attempts take place in public, and implementing surveillance technology to monitor high-risk areas and facilitate the identification of potential suicide-related incidents is one way of increasing opportunities for intervention. However, an important consideration seemingly lacking from the current evidence base is how people with lived experience feel about such technologies for suicide prevention. This group can include those who have lived/living experience of suicidal thoughts and/or behaviors, those who support others with suicidality, or those who are bereaved by suicide. The perspectives of people with lived/living experiences are rarely sought when evaluating suicide prevention measures, despite the crucial insights they can provide through sharing their expertise in research (Mackenzie et al., 2025).

Surveillance technologies may include Closed-Circuit Television (CCTV) cameras or drones that are monitored/operated by staff, or 'smart' technologies which include automation either in the detection of an incident or in the response to an incident. Automated detection can be performed by motion-activated cameras or sensors, and responses can include, for example, automated announcements or lighting (Joyner et al.,

2024a). These interventions may enhance the speed and/or accuracy of detecting suicide-related incidents, but given the recent rapid development of such technologies, little is currently known about their full scope and the practicalities of implementing them at high-risk public locations. Previous reviews have focused solely on what is contained within academic literature (Onie et al., 2021), despite much work on this topic having been developed and documented in industry reports (e.g., Onie et al., 2021). Similarly, the challenges around means restriction, such as costs, method substitution or public backlash, may also apply with surveillance technologies. As these technologies are increasingly being implemented (Joyner et al., 2024b), it is crucial that we understand more about the range and feasibility of surveillance technologies to help guide decision making around preventing suicides in public places.

This scoping review aimed to explore published and grey literature to 1) identify the range of surveillance technologies being implemented for suicide prevention in public locations, 2) identify the range of surveillance technologies being proposed for use for suicide prevention in public locations, 3) explore the reported feasibility of implementing surveillance technologies for suicide prevention.

METHODS

A detailed overview of the methods can be found in the systematic review protocol (Joyner et al., 2024a). The original protocol listed two further objectives, which included exploring whether surveillance technologies are able to prevent suicides and detect behaviors preceding suicides. Given the volume of literature identified, the authors decided to report the findings of the review in two separate papers. A second paper will discuss the findings relating to the effectiveness of technologies at preventing suicides (Joyner et al., 2024b). A scoping review is most appropriate in this instance due to the broad nature of the current objectives, the need to map the available literature across sectors, and to provide an overview of the key feasibility characteristics surrounding these types of technology (Arksey and O'Malley, 2005; Munn et al., 2018). The methodological framework proposed by Arksey and O'Malley (Arksey and O'Malley, 2005) was followed to ensure a systematic approach was taken. Other steps taken to reduce bias and increase reliability were transparent and comprehensive reporting of all findings, searching multiple databases and other data sources, and completing the PRISMA-ScR checklist.

Inclusion Criteria

This review included both academic literature and grey literature such as academic or industry reports. It was decided to include grey literature and non-peer-reviewed reports due to the volume of suicide prevention work happening outside of academia that is often reported in, for example, policy documents, the media, and industry reports. To capture the full scope of surveillance technologies that may be used for suicide prevention in public places, it is necessary to look beyond academia. This is particularly relevant to address the objective regarding the feasibility of implementing surveillance technologies, given that this information is held largely by those in industry who use these technologies in practice. In addition, given the rapid development of such technologies, including grey and non-peer-reviewed literature also allows insights from works in progress (Benzies et al., 2006).

All documents included in the review will be referred to as reports throughout for simplicity. Reports were included that pertained to:

Population: Human behavior focusing on the individual rather than group behavior. Any research focusing solely on behavior that is not initiated by a human (e.g., autonomous vehicles, etc.) was excluded from this review.

Intervention: Surveillance technologies in public locations that had the capacity to identify possible suicide-related incidents (e.g., through being monitored by a human, or automatically detecting movement/specific behaviors). Reports referring to private locations (e.g., hospitals, prisons) were excluded. Studies which solely utilized surveillance output (e.g., CCTV footage) to better understand suicide were excluded from the review.

Outcome: Feasibility including public/staff acceptability, cost-effectiveness, ethical considerations, environmental factors, and potential risks or unintended consequences.

Study type: No restrictions were made relative to study type, however, systematic reviews were excluded if they did not contribute any additional literature to what had been identified through the searches. Reports were included if they were written in English and published since January 1st 1990.

Search Strategy

Searches were performed on the following databases: EBSCO (PsycINFO, MEDLINE, CINAHL, Computer Source), Ovid (SPP), Web of Science, PTSDpubs, CENTRAL (Cochrane), and IEEE Xplore. These databases were chosen to identify literature across the relevant sectors including psychology, computer science and public health. Reference lists were also searched for further relevant literature, and targeted grey literature searches were conducted through Overton, preprint databases (e.g., PsyArXiv), and industry/government websites (e.g., RESTRAIL, National Highways). The search was first run in March 2024, and again in October 2024. Search terms pertained to suicidal thoughts/behaviors and surveillance technologies. See [Supplementary Material 1](#) for the full search strategy for each database.

Covidence was used for data screening. BC and LJ independently screened the reports, beginning with a screen of title and abstracts, followed by full paper screening. Any disagreements flagged on Covidence were discussed and a resolution was reached.

Data Charting

Details from the included reports were charted in an Excel spreadsheet, including the study details (year, author, publication type, and whether it was peer reviewed), the research methods (aims/objectives, study design, sample type and sample size), the intervention being studied (technology type, analytics being performed and the type of response produced, such as notifying emergency services or sounding an alarm), the context of the surveillance (the location being monitored and any other interventions present), outcomes of interest, and the findings (including ethical considerations and implications). BC and LJ carried out the data charting, cross-checking 10% to ensure accuracy. Any discrepancies were resolved through discussion between BC and LJ, consulting with LM and JMM when needed.

Data Synthesis

The types of technology being implemented or proposed for suicide prevention in public places are summarized in tables below, with narrative syntheses exploring common types of technology types and response mechanisms. Findings regarding the feasibility of the technologies were also synthesized using a narrative approach. The findings were coded using qualitative content analysis (Elo and Kyngäs, 2008). First, BC and LJ independently coded roughly 10% of the findings inductively, and then compared their codes to develop a coding scheme by grouping them into common factors which were discussed with the wider team. BC and LJ proceeded to apply the coding scheme to the rest of the data, iteratively amending the coding scheme where necessary.

A quality or risk-of-bias assessment was not performed. Not conducting methodological quality appraisal or risk-of-bias assessment is consistent with PRISMA-ScR guidance for scoping reviews (PRISMA, 2018), as the objective was to map the extent and nature of the evidence rather than to evaluate study quality.

RESULTS

Initial searches resulted in 3,616 reports (3,435 from databases and registers, 181 from other sources), and 969 duplicates were removed. Following title and abstract screening, 2,350 were removed. During full text screening, a further 128 were excluded. Following peer review, ten more articles were excluded for being literature reviews that added no further information as the reports they contained were already included in this review. This resulted in 169 reports being included that outline surveillance technologies for suicide prevention, 111 of which explored the feasibility of implementing them. See [Tables 1–3](#) for details regarding the included studies including feasibility findings. Please see [Figure 1](#) for PRISMA flow diagram.

Within the 169 documents, 84 (49.7%) discussed technology that had already been implemented and 63 (37.3%) discussed technology that was being proposed for suicide prevention. An additional 14 (8.3%) reported technology that had been piloted but not yet implemented. There were five (3%) hypothetical examples of technology used for suicide prevention. One report (0.6%) reviewed both implemented and proposed technologies, and two (1.2%) reported on the impact of the absence of any surveillance technology.

The majority of reports came from academia (117/169, 69.2%). Of these, most were journal papers (69/117, 59%) or conference proceedings (30/117, 25.6%). Others included book chapters (6/117, 5.1%), researcher letters/reports (5/117, 4.3%), theses (5/117, 4.3%), and editorials/commentary (3/117, 2.6%). A further 41/169 (24.3%) were from government, industry or charity sectors and included primarily research or technical reports (25/41, 61%). A smaller percentage (11/169, 6.5%) came from the media (e.g., news articles) and were included if they added something unique not present in the academic literature.

While interest in the use of technology for suicide prevention has increased in recent years ([Figure 2](#)), “smart” surveillance technologies have been deployed for suicide prevention for more than three decades.

Within the 169 reports, 66 (39.1%) did not report on research but instead offered descriptions of technology or ideas for how it could be used. The remaining 105 included were various study types, the most common being literature reviews (16/105, 15.2%), simulations of AI models (20/105, 19.1%), case studies (14/105, 13.3%), and pilot/proof-of-concept studies (12/105, 11.4%).

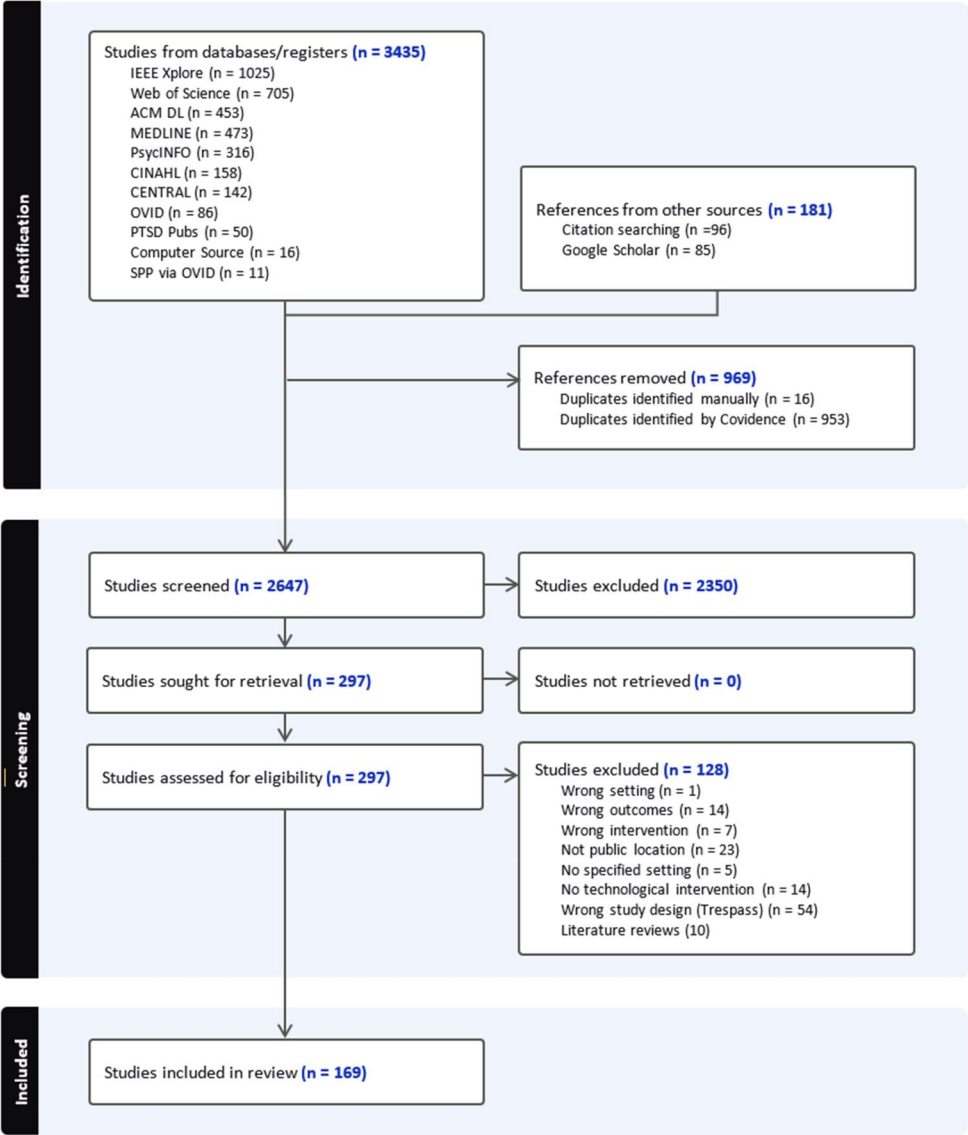


Figure 1. PRISMA flow diagram.

Technology Locations

Evidence primarily came from higher income countries, with relatively few reports from lower- and middle-income countries (LMICs). See Figure 3 for a map showing the countries represented in the review.

Over half of the locations were railways (97/169, 57.4%). 20 of these were underground/subway/metro stations, nine were level crossings, two were railway tunnels, one was a railway on a bridge over water, and the remainder discussed the railways more generally (implemented = 36, proposed = 45, piloted = 13, discussing the impact of the absence of technology = 2, hypothetical = 1). See Table 1 for details regarding each of these studies.

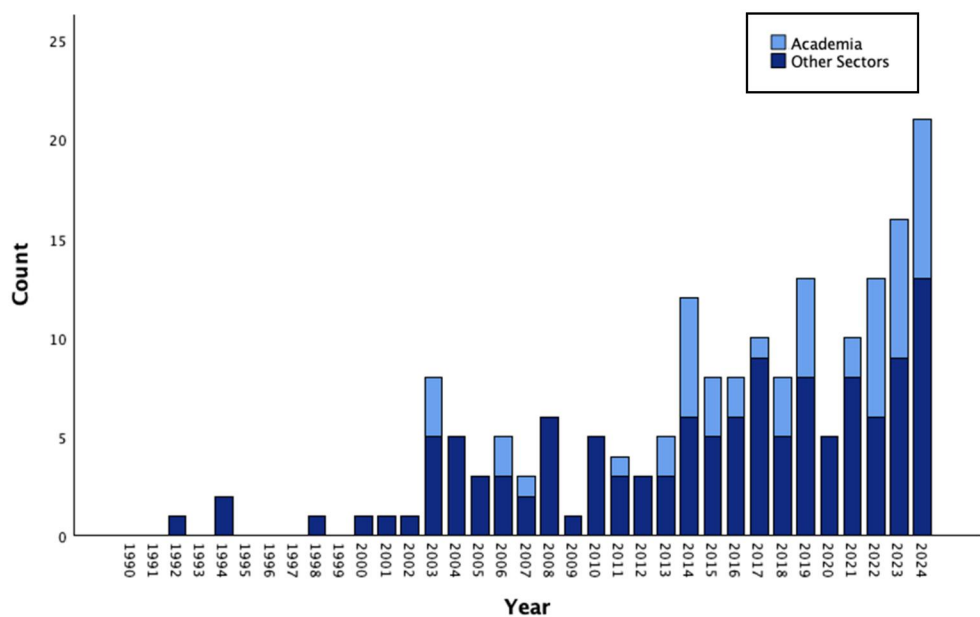


Figure 2. Count of reports by publication year and sector.

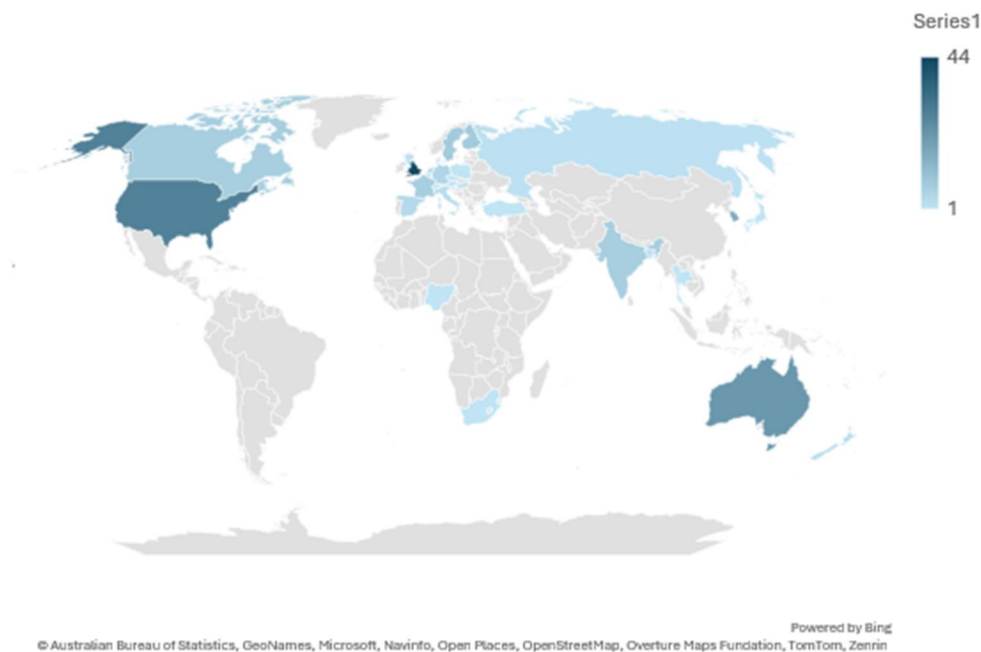


Figure 3. Country of research.

There were also reports relating to 22 bridges, 19 of which were over water. One paper discussed a hypothetical bridge, one discussed bridges generally with no location specified, and one discussed an unnamed bridge. Most technologies discussed in relation to bridges had already been implemented (17/22, 77.3%). See Table 2 for details regarding each of these studies.

Table 1. Literature describing technology at railway locations (n = 97).

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Agarwal, 2021*	Conference proceedings outlining a study testing the accuracy rate of a suicide prediction based on preceding behaviors	52 videos of suicides captured on CCTV were tested	Railways generally	CCTV [Implemented]	Yes	Rail personnel notified	N/A (not site-specific)	No findings regarding feasibility.
Alawad, Kaewunruen & An, 2020*	Academic journal paper testing a deep learning approach to detecting falls	Images and videos of passenger behavior on railways	Railways generally	Computer vision and pattern recognition [proposed]	No—accidental and intentional falls onto tracks	Alert the station control center	N/A (not site-specific)	No findings regarding feasibility.
Anagnostopoulos, 2014*	Conference proceedings describing a surveillance system to predict suicide	N/A	Urban metro stations generally	CCTV to detect emotion states [proposed]	Yes	Notification to security guard	N/A (not site-specific)	No findings regarding feasibility.
Baron & da Silva, 2019	Industry/government report piloting drones for trespass detection	32 drone flights took place	Railway tracks in Maine (USA)	Remotely piloted drone with thermal imaging [piloted]	No—trespass & suicide	None mentioned	None mentioned	Context: drones are useful for hard to reach, remote areas.
Bhandari & Park, 2022*	Academic proof of concept study for an intrusion detection system	System tested on 2 plastic human models	Railway tracks (South Korea)	Surveillance camera with deep learning to detect intrusion [proposed]	No—crime and suicide	Text message sent to safety and security managers	None mentioned	No findings regarding feasibility.
Black, Velastin & Boghossian, 2005*	Conference proceedings describing a real time surveillance system	N/A	Subway station (Paris)	Thermal cameras to detect events of interest including loitering [piloted]	No—crime and suicide	Generate an alarm	None mentioned	No findings regarding feasibility.
Bongiorno, 2024	News article providing an overview of a pilot AI system	N/A	Metro station (Montreal)	AI + CCTV to detect emotional states indicative of distress [piloted]	Yes	A warning sent to the control room	None mentioned	No findings regarding feasibility.
Botha et al., 2014	Industry/ government report reviewing literature of suicide countermeasures	Unclear	Commuter & metro rail systems (USA)	Motion detectors; Platform Track Intrusion Detection System (PTIDS) using CCTV and radar [implemented]	Yes	Sends signal to automatically stop the train	Review also discusses signage, drainage pits	Cost-effectiveness: Training original staff to work with the tech would be cheaper than hiring new personnel. Cameras integrated into larger security systems are more cost-effective than standalone ones.
Burkhardt, Rådbo, Silla & Paran, 2014*	Conference proceedings reviewing literature and describing a model of suicide processes	N/A	Railways generally (Europe)	Infrared camera [proposed]	Yes	Alerts infrastructure manager	N/A (not site-specific)	No findings regarding feasibility
Candamo et al., 2010*	Academic literature review of human surveillance in transit systems	52 papers were included	Railways broadly	Visual surveillance systems that detect intrusion [proposed]	No—crime, vandalism, terrorism & suicide	A warning is given (no further information provided)	None mentioned	No findings regarding feasibility
Chajka-Cadin et al., 2016	Government report giving an overview of tech solutions to safety risks on transportation	N/A	Transportation systems in USA broadly	Unmanned aircraft systems mounted with cameras programmed with video analytics to detect ‘abnormal’	No—all possible hazards, including suicide	Notification sent to control room and automated lighting	N/A (not site-specific)	Cost-effectiveness: each camera system would cost around \$13,000.

(continued)

Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type behaviors or emergency incidents [proposed]	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Cisco International Limited, 2023	Industry report summarizing tech trialed at stations	N/A	Network rail owned stations (UK)	Smart cameras to detect objects and behaviors [piloted]	No—all elements of usage including suicide detection	Notification to staff	None mentioned	Process: there were significant numbers of fake alarms from passenger's reflections in train windows No findings regarding feasibility
Clarke & Poyner, 1994*	Academic journal paper reporting on a field visit and discussions with staff at the site	Field visits to 8 high risk stations	London underground stations (UK)	CCTV [Implemented]	Yes	Staff can communicate with individuals via speakers.	None mentioned	No findings regarding feasibility
da Silva et al., 2007	Industry / government report giving an overview of intrusion and obstacle detection tech	N/A	Railways in USA (primarily level crossings and rail rights of way)	Sensor technologies (e.g., radar, laser, infrared, ultrasonic) [implemented]	No—trespassing, vandalism, accidents, terrorism & suicide	Notification to train driver or rail operations control center; audible; alarm on platform; automated stop signal sent to train.	N/A (not site-specific)	Cost-effectiveness: cheapest options are locomotive-based equipment that can monitor whole rail network.
da Silva et al., 2006	Industry / government report giving an overview of a trespass monitoring system	N/A	Railway bridge over water in Pittsford (New York)	CCTV camera; infrared illuminator; motion and heat detection using doppler microwave & passive infrared [implemented]	No—trespass related fatalities	Alarm sounds to notify security attendant who can play audible warning announcement.	None mentioned	Cost-effectiveness: System costs \$13,500; Yearly operating and maintenance costs— \$12,660; Design and installation costs of prototype \$200,000; design and installation per site (similar systems) costs \$40,000
Dent & Marinov, 2019*	Conference proceedings discussing the hypothetical application of automated obstacle detection	N/A	Level crossings (Britain)	CCTV cameras; induction loops; LIDAR, radar, infrared thermal imaging and ultrasonic sensors. [hypothetical]	No—deaths on the railway generally	Send a signal and lower barriers	N/A (not site-specific)	Context: CCTV not effective in low light, so thermals may be better. Thermal cameras also fare well in different weather. Visible tech may be more likely to be vandalized. Would need multiple ultrasonic sensors to cover large areas. Cost-effective: CCTV is cheap if part of preexisting infrastructure.
El Koursi & Bruyelle, 2016*	Academic paper describing suicide and trespass prevention measures	N/A	Railways in France (including level crossings)	CCTV; detection systems; lighting; sensors; optic beams; sonic detector;	Yes (and trespass)	Alarms; lighting changes; notifications to control center and drivers	N/A (not site-specific)	Cost-effectiveness: all tech types are costly. Context: optical beams cannot work in

(continued)

Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Eom, Kim & Jung, 2010*	Conference proceedings describing an intrusion detection framework	N/A	Korean urban transit	inductive loop; radar [implemented]				snow. Inductive loops cannot detect pedestrians.
Erlangsen et al., 2023*	Academic mixed methods pilot study to evaluate suicide prevention measures	Reviewed 11 suicide incidents	Railways (Denmark)	CCTV that detects presence [proposed] Motion sensitive lights [piloted]	No—fire, suicide & intrusion Yes	System informs supervisors Motion sensitive lights	None mentioned Signs and barriers	No findings regarding feasibility No findings regarding feasibility
Fayyaz & Johnson, 2020*	Academic paper reporting an in silico evaluation of a deep learning tool for suicide prevention	Images were used to train the model	Level crossing (UK)	Cameras with deep learning techniques; radar sensors [proposed]	Yes	Notification to train driver or an operational cycle at the level crossing is initiated	None mentioned	No findings regarding feasibility
Gabree et al., 2014	Government / industry report reviewing various suicide countermeasures	N/A	Passenger and freight railways (USA)	Motion-sensitive camera; obstruction sensor; microwave technology; video-based detection system [implemented]	Yes	Alert to authorities / train crews; strobe light to warn train engineer	Review also covers blue lights, platform doors, draining pits	Process: the response after an incident is detected is essential for effectiveness. There are high rate of false alarms with surveillance systems.
Gabree et al., 2019	Government / industry report summarizing suicide prevention efforts	N/A	USA railways	CCTV; thermal cameras; PTZ cameras; drones / UAVs [implemented]	Yes	Alerts to law enforcement; audible warnings through live speaker	N/A (not site-specific)	Cost-effectiveness: Camera installation is \$1.5million + \$325,000 annually for monitoring and maintenance costs. Ongoing costs are cheaper than in-person monitoring, but a higher initial cost.
Gaylord & Lester, 1994*	Academic paper giving guidelines on suicide prevention measures from a case study	Data on fatalities & survivals	Hong Kong subway	200 CCTV cameras across 38 stations [implemented]	Yes	CCTV sends images back to the Control Room	Station design	Procedures: animals and debris can lead to false alarms. Legal & ethics issues: drones pose privacy challenges for local residents and with data storage. No findings regarding feasibility
Giles, 2003	News article giving a brief overview of tech that can be used in crime science	N/A	London underground platform (UK)	A software package that automates CCTV to detect possible suicide incidents [implemented]	No—crime & suicide	None mentioned (but there are CCTV operators who may be notified)	None mentioned	Attitudes: staff are happy working with this software system

(continued)

Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Gregor, Maedche & Morana, 2019*	Conference proceedings describing a literature review and workshops for designing and demonstrating applicability of an AI system	Workshops with industry staff from train company security control center (number unknown)	Railways (unspecified—pseudonym used)	Video surveillance system to detect and categorize objects as suspicious or not [proposed]	Yes	Notification to staff	CCTV also monitored by humans	No findings regarding feasibility.
Grey, 2015	News article providing an overview of suicide prevention on railways	N/A	UK rail network	Motion detection cameras; mobile CCTV; sensors; blue lights [implemented]	Yes	Alert of unusual movements (recipient unspecified)	N/A (not site-specific)	No findings regarding feasibility.
Hallowell, Ryan, Hughes & Coad, 2023*	Academic paper reviewing literature and consulting stakeholders about lighting interventions	Consultation with 13 stakeholders in the transport industry and/or trespass prevention interventions. 32 documents included in the literature review	UK railways	Sensors on the track and CCTV [proposed]	Yes (and trespass & risky behaviors)	Prerecorded warning messages; signal to driver to stop the train; lighting	Barriers	Process: motion activated lighting might be more effective than constant / fixed lighting due to the sudden environmental change
Havàrneanu, Bonneau & Colliard, 2016*	Academic paper reviewing literature, analyzing cost-effectiveness & running pilot field tests	Unclear	Railways generally (Europe)	CCTV on front of trains; detection systems [piloted]	Yes (and trespass)	Alarm (unclear); warning message over loudspeaker	Paper also reviews fencing, training, signage, media guidelines etc	Process: liaising with various stakeholders following an incident is key to ensuring effectiveness of the tech
Havàrneanu, Burkhardt & Silla, 2017*	Academic journal paper describing a workshop to discuss measures to prevent suicides	32 workshop participants (22 railway experts and 10 non-experts) from 13 countries.	Railway systems (Europe)	CCTV with algorithms / motion detection in intrusion zones [proposed]	Yes (and trespass)	The system can warn station staff or the individual directly	Paper also includes discussion around fencing, signage, campaigns etc	Context: CCTV + audio warnings may be more effective at deterring children more so than adults.
Heesen et al., 2024*	Academic paper describing qualitative interviews to understand the process of suicide	Interviews with 27 people who have survived suicide attempt (7 of these were on the railways)	Railways in Netherlands	Video cameras [implemented]	Yes	None mentioned	N/A (not site-specific)	Attitude: Cameras can pose a barrier to suicide as they are a deterrent
Hogan, 2003	News article on the use of cameras on the underground	N/A	London underground stations (UK)	CCTV cameras to detect or predict events (e.g., lingering, people letting several trains pass) [implemented]	Yes (and trespass, overcrowding & suspicious packages)	Alert sent to someone who can investigate (unspecified)	None mentioned	Attitude: Automating detection eases the burden on staff. Legal & ethics: some are worried about it being an invasion of privacy
Hunter, Solti, McMullan & Maxwell, 2019	Industry report discussing suicide prevention strategies	N/A	Underground rail (New Zealand) but reviewing international strategies	CCTV with intrusion detection [proposed]	Yes	Motion activated voice messages; holographic virtual assistants	Also reviews barriers; platform doors, lighting, staff training, awareness	Process: tech still relies on human intervention
Hwang et al., 2010*	Academic proof of concept study testing of a laser radar sensor	N/A	Station platform (South Korea)	Laser pulse feedback to detect presence; cameras [piloted]	Yes (and other causes of casualty e.g., falling)	Transmits a signal to the train to stop it	None mentioned	No findings regarding feasibility
Kalberg & Silla, 2017*					No—trespassing & suicide		None mentioned	

(continued)

Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
	Academic journal paper piloting the effects of a sound warning system on trespassing rates	Counts of trespassing (1517 at site A and 1049 at site B)	2 sites where an illegal footpath crosses the railway line (Finland)	Infrared sensor and CCTV with motion detection [piloted]		Sound warning with prerecorded message		Context: this type of tech is well-suited to concentrated errors e.g. footpaths. Attitude: Sound warning may disturb local residents. No findings regarding feasibility
Keating & Gordon, 2018	Conference proceedings of the development of an automated risk detection system	Unclear—work in progress	Railways (Australia)	Automated risk detection via CCTV [proposed]	Yes (and other trespass related accidents)	Real time alerts to rail operators	N/A (not site-specific)	
Kerkhof, 2003*	Academic editorial discussing responsibility for suicide prevention	N/A	Railway 'hotspots' and level crossings	CCTV [proposed]	Yes	None mentioned	N/A (not site-specific)	Cost-effectiveness: combining measures is most effective, but this is expensive No findings regarding feasibility
Ketcham, Ganokratanaa & Srinhichaarnun, 2014*	Conference proceedings of a test of an intruder detection system	Video clips of suicides were tested using the system to determine accuracy	Railway platform (Thailand)	CCTV + image analysis to detect intruders / motion [proposed]	Yes (and other trespass related accidents)	Audible alarm played on the platform and the train is prevented from entering the station	None mentioned	
Lin et al, 2022	Government report reviewing strategies to prevent trespass and suicide	11 case studies of railway locations and their suicide / trespass prevention efforts	Railways (including level crossings, platforms, etc) in America	Detecting people crossing yellow lines, tracks, level crossings etc using CCTV cameras with AI; seismic sensors; leaky coax cables; Fiber optic system; drones [implemented]	Yes (and trespass)	Flashing lights or audible alerts. Alert sent to law enforcement.	Infrastructure changes; increasing patrols; staff training; signage.	Legal & ethics: drones pose privacy and data storage challenges
Little, 2006	Industry report giving an overview of risk and possible solutions at level crossings	N/A	Level crossings in Britain	Object detection through radio (radar); light waves (Lidar); cameras: induction loops; fiber optic sensors; ultrasonic sensors [proposed]	No—fatalities and casualties	Railway signaling and communications with train driver	N/A (not site-specific)	Cost-effectiveness: Costs vary per tech type and supplier. Costs for cameras are likely cheaper than a human level crossing guard. Induction loops are inexpensive (but can only detect vehicles). Context: cameras and sensors may be affected by weather. Cameras may be a deterrent.
Luff, Heath & Jirotko, 2000*	Academic journal paper describing an ethnography of train control rooms	Ethnography with supervisors who monitor stations	London underground (UK)	Point tilt zoom camera monitored by staff in control room [implemented]	No—general passenger behavior	None mentioned	None mentioned	Context: camera placement determines effectiveness due to possible blind spots. Legal & ethics: people

(continued)

Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Marsh, Marzano, Mosse & Mackenzie, 2021*	Academic qualitative interviews to understand the planning behind railway suicide	Interviews with 34 adults who had considered/ attempted suicide	Railways in the UK	Cameras [implemented]	Yes	None mentioned	N/A (not site-specific)	Attitudes: surveillance tech can be a deterrent or people may try to avoid it Cost-effectiveness: the camera is inexpensive Process: the automated surveillance is less error prone than human supervision and it does not 'fatigue'
Martínez Núñez, López Hernández & Rainer Granados, 2024*	Academic journal paper describing a tech system for detecting objects / people	The system was tested against video clips (number unknown)	Underground stations (Spain)	CCTV that detects objects/ people on the tracks [proposed]	No—general object or person detection	A 'person on the track' alarm will be triggered and the operator notified	None mentioned	Cost-effectiveness: the camera is inexpensive Process: the automated surveillance is less error prone than human supervision and it does not 'fatigue'
Marzano et al., 2019*	Academic mixed methods research to understand factors determining decisions around railway suicides	Survey (N = 353) and interviews (N = 34) with people who had considered/ attempted suicide on the railways	Railways in the UK	Cameras [absence of cameras discussed]	Yes	None mentioned	N/A (not site-specific)	Attitude: absence of cameras may make the railways seem more accessible as a location to die by suicide.
Mishara, 2007*	Academic journal literature review of research around suicides on railways, & commentary	Unclear	Railways / metro systems generally (international)	CCTV [proposed]	Yes	Operators must dispatch help or notify train drivers	N/A (not site-specific)	Process: Human involvement needed to orchestrate help to the scene
Mishara, Bardon & Dupont, 2016*	Academic paper describing a study attempting to identify suicidal behaviors via video clips	66 CCTV recordings were tested	Metro station (Canada)	CCTV + human coding of behaviors [piloted]	Yes	Could signal trains to slow down or alert someone to look at a specific monitor to assess risk	None mentioned	Process: It is difficult to determine behaviors preceding suicide.
Mosley, 2018	News article discussing a new surveillance system	N/A	Railways in California	Surveillance cameras [implemented]	Yes	Cameras monitored remotely and operator can interact with individual through a speaker around the train tracks	N/A (not site-specific)	Cost-effectiveness: the surveillance will cost \$11.5 million and are hoped to be more effective than human guards due to night vision and further range.
Mukherjee & Ghosh, 2017*	Conference proceedings describing a CCTV analysis system	System tested on video clips of suicides	Metro rail platforms (India)	CCTV that detects presence and positioning in the environment [proposed]	Yes	Notification (recipient not specified)	None mentioned	No findings regarding feasibility
Muller & Boos, 2002*	Academic journal paper providing a case study of a CCTV system to develop a typology of use	Unclear	Zurich train station (Switzerland)	CCTV [proposed]	Yes (and crime)	None mentioned	None mentioned	Attitudes: there may be opposition from passengers, staff, trade unions. Process: CCTV alone

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Murshed, Dhruba, Bhuiyan & Akter, 2022*	Conference proceedings describing a system to automatically detect pedestrians	N/A	Level crossings in Bangladesh	Camera based pedestrian detection system [proposed]	No—accidents and negligence	Emergency signal sent to the incoming train and to emergency services	None mentioned	does not solve the problem so is inefficient No findings regarding feasibility
Niederkrötenhaler et al., 2012*	Academic quantitative study examining predictors of suicide	107 suicide attempts and 185 completed suicides across 84 stations, 16 of which had surveillance	Subway stations (Austria)	Surveillance units [implemented]	Yes	None mentioned	N/A (not site-specific)	No findings regarding feasibility
O'Donnell & Farmer, 1992*	Academic paper of a multiple case study investigating characteristics of railway suicides	23 metro stations provided suicide data	Metro stations (international)	Infrared beams detecting pedestrians in the metro tunnels; CCTV [implemented]	Yes	Pedestrians can be addressed over a loudspeaker; staff can signal trains to initiate emergency break	N/A (not site-specific)	No findings regarding feasibility
Paden et al., 2016*	Academic feasibility study of locomotive bumpers	Tested 4 bumper types	Railways (fronts of trains)	Pair of vision systems to detect pedestrians [piloted]	No—casualties	Train bumper is rotated to expose a soft cushion	None mentioned	No findings regarding feasibility
Qian, Rizos & Virzilaos, 2023	Government notice of a project proposal	Unclear	Level crossings (USA)	A surveillance unit with computer vision and AI; Intelligent Aerial Drones [proposed]	No- trespass (and suicide)	Real time communications with railroads and local first responders	N/A (not site specific)	No findings regarding feasibility
Rådbo & Lindberg, 2016	Industry report of a proof-of-concept study for thermal cameras	Number of alarms including false alarms	Railways in Sweden	Thermal cameras with video analytics to detect human behavior [piloted]	Yes	Alarm in traffic control center	Fencing	Attitude: staff feel the system works well. Context: the system struggles when the incident is at a distance or there are difficult weather conditions. Process: around a quarter of alarms were false.
Rådbo, Renck & Andersson, 2011a*	Academic book chapter describing a qualitative focus group to understand feasibility of suicide prevention strategies	Focus group with 22 accident investigators and safety experts	Railways in Sweden	Camera surveillance, including thermal cameras [proposed]	Yes	Warning sound signals, triggered by the presence of the individual	N/A (not site specific)	Attitude: staff trust the surveillance systems. Context: Cameras used in road contexts may not be as suitable on the railways as you need a greater range due to the breaking distance
Rådbo, Svedung & Andersson, 2012*	Academic book chapter of a qualitative multiple case study of rail suicides	22 cases of railway suicides reviewed	Railways in Sweden	This chapter notes a lack of cameras & sensors in places with suicides [absence of cameras discussed]	Yes	Describes how tech can trigger warning systems	Physical barriers	Context: tech is necessary in places with rail suicides

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
RESTRAIL, 2013	News article discussing video analytics	N/A	Railways generally	CCTV that can detect motion or lack of motion, as well as behaviors like loitering [proposed] CCTV [proposed]	No—intrusion and “unusual” behavior	Notifications can be sent to smart devices	N/A (not site-specific)	No findings regarding feasibility
RESTRAIL, 2014d	Industry report on field tests of platform fencing	51 stations in Britain were used as pilot sites	Railways in Britain		Yes (and trespass)	None mentioned	Fencing is the main intervention evaluated in this paper	Cost-effectiveness: CCTV costs £7400 Context: CCTV primarily designed for security may be positioned in areas that are not ideal for detecting suicide. Context: this tech is best suited to concentrated areas like footpaths to increase reliability and reduce noise pollution for local residents
RESTRAIL, 2014b	Industry report on a quantitative study evaluating trespassing pre- and post- intervention	Counts of trespass pre and post implementing preventative measures	Railways in Finland	Video camera with intrusion detection [implemented]	Yes (and trespass)	Warning speaker	N/A (not site-specific)	Increases effectiveness of cameras in low light. Ethical & legal: there are privacy concerns with FCCCTV recording train drivers & other passengers Attitude: There may be public resistance and locals may misuse the system.
RESTRAIL, 2014c	Industry report providing guidance on implementing suicide prevention measures	N/A	Railways generally	CCTV with detection systems; CCTV on train fronts (FFCCTV); motion activated lighting [proposed]	Yes (and trespass)	Sound warnings; motion activated lighting	Also discusses fencing, training, signage, campaigns, etc	Context: night sight increases effectiveness of cameras in low light. Ethical & legal: there are privacy concerns with FCCCTV recording train drivers & other passengers Attitude: There may be public resistance and locals may misuse the system.
RESTRAIL, 2024a	Industry report providing guidance on incident detection systems	N/A	Railways in Europe	Motion detection systems, RADAR, LIDAR, or glass fiber technologies to detect movement [proposed]	Yes (and trespass)	Automated sound warning	N/A (not site-specific)	Cost-effectiveness: One cost example for this tech type was 700,000 Euros Processes & procedures: the tech would be most suitable at platform ends. Staff need to be trained appropriately. Attitudes: possible sound pollution from the warnings may be unwelcome, the system may be misused
RESTRAIL, 2024b	Industry report providing guidance on intelligent CCTV	N/A	Railways in Europe	Intelligent CCTV with AI that detects intrusion in a specified zone [proposed]	Yes (and trespass)	Sound warning (alarm noise or spoken message)	N/A (not site-specific)	

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
RESTRAIL, 2024c	Industry report providing guidance on motion activated lighting	N/A	Railways in Europe	Motion detection sensors, RADAR, LIDAR or glass fiber technologies [proposed]	Yes (and trespass)	Motion activated lighting	N/A (not site-specific)	Legal & ethics: the blue lighting can be dangerous to retinas so lights shouldn't be too intense. Attitude: there may be light pollution for local residents so they should only be used at night time.
RESTRAIL, 2024d	Industry report providing guidance on motion activated spotlights	N/A	Railways in Europe	Motion detection sensors, RADAR, LIDAR or glass fiber technologies [proposed]	Yes (and trespass)	Motion activated spotlight that tracks movement	N/A (not site-specific)	Legal & ethics: the blue lighting can be dangerous to retinas so lights shouldn't be too intense. Attitude: there may be light pollution for local residents so they should only be used at night time.
Rudall, 2003a*	Academic journal paper reviewing research in suicide prevention	Unclear	London underground (UK)	CCTV cameras [implemented]	Yes (and trespass)	None mentioned	None mentioned	No findings regarding feasibility.
Rudall, 2003b*	Academic journal paper reviewing research in suicide prevention	Unclear	London underground (UK)	CCTV cameras [implemented]	Yes (and trespass)	None mentioned	None mentioned	No findings regarding feasibility.
Ryan, 2013*	Academic mixed methods paper reporting secondary analysis of suicide data & interviews	Suicide behavior data. Interviews with rail staff and Samaritans. Sample sizes unclear.	Railways generally (Great Britain)	CCTV [proposed]	Yes	Audio warning	Lighting, barriers, staff training	Context: CCTV may miss things at large locations due to blind spots
Ryan, Wronska & Stevens, 2017*	Conference proceedings of a literature review and interviews about suicide prevention measures	6 interviews with industry staff	Railways generally (UK)	Smart camera system to detect if someone is close to platform edge [implemented]	Yes	Warning played through speaker	Blue lights	No findings regarding feasibility.
Ryan, 2018*	Academic journal paper of a review of literature, intervention testimonies, behavior descriptions from CCTV footage, and a workshop with experts to develop framework of pre-suicide behaviors	Analysis of data from 257 suicide incidents, 19 intervention testimonies, and 2 workshops with 12 rail staff & Samaritans	Railways generally (UK)	CCTV to detect behaviors [implemented]	Yes	None mentioned	N/A (not site specific)	Context: Occlusion may prevent accurate detection, and there may be false alarms.
Ryan et al., 2018*	Academic journal paper of a literature review and expert workshop	22 railway experts from RESTRAIL consortium	Railways broadly (Europe)	Glass fiber sensing; motion detectors; CCTV inside train cabs; Intelligent camera [proposed]	Yes (and trespass)	Sound warnings; lighting linked to movement sensor; warning signals sent to stop train	The review also covered fencing, campaigns, patrols, landscaping	Legal & ethics: train drivers monitoring CCTV could be distracting for them.
Scotrail, 2023		N/A	Railways in Scotland	CCTV with analytics for linger time, object	Yes	Notification to control room	N/A (not site-specific)	No findings regarding feasibility.

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Seifert & Ramesh, 2008*	Industry report providing an overview of tech systems for suicide prevention Conference proceedings describing how image analytics can enhance security	N/A	Railways generally	tripwire [implemented] Image analytics to detect behaviors preceding suicide [proposed]	No—various object and behavior detection	Audible warnings; generating alerts	N/A (not site-specific)	Context: system performance influenced by weather & lighting. Legal & ethics: the facial recognition technology masks faces to protect the identity of rail passengers and staff
Shirres & Milne, 2017	Industry news publication describing proactive CCTV uses	N/A	Railways, including level crossings (England)	Infrared cameras; thermal cameras; facial recognition; algorithms to detect specific behaviors at particular locations (e.g., platform edge) [proposed]	Yes (and trespass & vandalism)	Alert to staff; audible warning on platform	None mentioned	Legal & ethics: the facial recognition technology masks faces to protect the identity of rail passengers and staff
Silla, 2022*	Academic paper reporting an expert workshop reviewing suicide prevention measures	13 railway safety and public health experts	Railway environments (Finland)	Motion detection through camera surveillance and radar; cameras on the front of trains [proposed]	Yes	Real time light or sound warnings	The measures were evaluated against e.g., training, patrols, signage; train design	Process: a clear response pathway is needed following incident detection. Legal & ethics: could attract suicidal people to the location Attitude: other station users might be annoyed by the system. There may be false alarms for staff to manage
Smazhinka, Kavan & Hrinko, 2024*	Academic journal paper reporting on a literature review and interviews to identify safety measures	Interviews with experts with experience in the implementation of security and safety measures (number unknown)	Tunnels on the rail network (Czech Republic)	Lidar; pressure sensor; point tilt zoom cameras; radar [proposed]	No—trespass (and suicide)	Motion activated lighting; alarm to emergency services; signal to railway traffic; prerecorded warning message	None mentioned	Process: there are a large number of false alarms to be processed.
Stevens, 2013*	Conference proceedings giving an overview of their prevention approach to suicide	N/A	Railways including level crossings (UK)	Infrared camera to detect presence in an intrusion detection zone [implemented]	Yes	System can provide a warning (no further information given)	None mentioned	No findings regarding feasibility
Svensson, Heath & Luff, 2006*	Academic book chapter reporting on an ethnography to show everyday workings of surveillance	Ethnography in the control room during morning rush hour	Railway station, London (UK)	Point tilt zoom camera [implemented]	No—general station behavior and issues	Control room have direct phone lines with platform staff	None mentioned	Process: Things may be missed as staff are often multi-tasking whilst monitoring the cameras
Teague, Green & Leith, 2010*	Conference proceedings describing an ethnography & interviews investigating transport officers work culture	Interviews with 41 transit officers. 12 week ethnography	Railways, Australia	CCTV [implemented]	No—staff safety (including responding to suicides)	CCTV operators can speak through a loudspeaker on the platform	None mentioned	Attitudes: staff think CCTV keeps them safe whilst dealing with situations, and its useful for reviewing footage to learn from

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings an incident / train staff
Teague, 2012	PhD thesis using ethnography to explore safety of transit officers	N/A	Australian railway network	CCTV (point tilt zoom cameras) [implemented]	No—staff safety (including responding to suicides)	CCTV is monitored in a control room (no further intervention mentioned)	N/A (not site-specific)	Attitudes: staff are aware of CCTV monitoring them and this makes them more inclined to comply with regulations rather than assessing risk. No findings regarding feasibility
Too et al., 2015*	Academic journal paper exploring factors associated with suicide rates (including implementing surveillance systems)	Explored 334 suicides and the social, physical and economic factors associated with them	Railways in Victoria, Australia	CCTV video surveillance [implemented]	Yes	None mentioned	N/A (not site-specific)	No findings regarding feasibility
Topel et al., 2019*	Academic systematic review of studies around rail suicide	46 studies were included in the review	Railways broadly (international)	Video cameras, motion detectors; infrared sensors [implemented]	Yes	Audible deterrents over loudspeaker; alarms at security company who can validate alarm and call police	N/A (not site specific)	Process: clear response pathways needed following identification of incident. Tech can have many false positives. Cost-effectiveness: Investment is justified using statistical value of life at \$3 million
Transport for London, 2023	Freedom of information request response outlining a proof-of-concept study of smart technology	N/A	Underground station (London)	CCTV cameras with AI to detect unauthorized access (e.g., end of platform barriers) or safeguarding issues (e.g., lingering, leaning over platform edge) indicating risk. [piloted]	No—fare evasion and safety incidents	Real time notifications (unspecified recipient)	None mentioned	Processes & procedures: staff may become passive to alerts after time
Transportation Research Board, 2023a	Government notice of a project proposal	N/A	Level crossing (USA)	A surveillance unit, real-time communication unit & deep-learning artificial intelligence (AI) [proposed]	No—trespass	Notify railroads and local first responders	None mentioned	No findings regarding feasibility
Transportation Research Board, 2023b	Government notice of a project proposal	N/A	Utah transit systems	Point tilt zoom camera, radar, loud speaker, and Red/Blue LED lights [proposed]	No—trespass	Notification to control room, motion activated lights & audible alert over loudspeaker	None mentioned	No findings regarding feasibility
Uittenbogaard & Ceccato, 2015*	Academic quantitative paper exploring temporal and spatial suicide patterns. Conference proceedings describing a test of an	292 suicide events across 124 stations 27 video clips from train station CCTV	Subway stations (Stockholm) Train station in Brugge	CCTV [implemented] Long-wave infrared image (LWIR) sensor to	Yes	None mentioned	N/A (not site-specific)	No findings regarding feasibility Context: LWIR is useful even in low light and

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Van Beek, Van Engeland, Vennikens & Goedemé, 2017*	infrared system to detect abnormal behavior			detect abnormal behavior [proposed]				harsh weather conditions. Legal & ethics: LWID avoids privacy issues by not capturing personal data. Process: there's an issue of false alarms (30%)
Van Overmeiren, 2019	Industry report of a pilot test of a CCTV system	Number of justified alarms (70%) versus false alarms (30%)	Railway tunnel (Belgium)	CCTV that detects presence in tunnel [piloted]	No—trespass	Sound warning in the detection zone	None mentioned	Process: human intervention required to prioritize when multiple alarms occur simultaneously
Velastin, 2003a	Industry report giving an overview of how CCTV is currently used	N/A	Railways broadly (UK)	CCTV + AI to detect behavior, positioning in an environment, lingering. [implemented]	No—vandalism	Alarm in control room	N/A (not site specific)	Context: tech needs to be adaptable to the needs of the environment (e.g., weather, lighting)
Velastin, 2003b	Industry report giving an overview of visual surveillance research	N/A	Railways broadly (UK)	Computer vision to detect behavior [proposed]	No—crime, vandalism, suicide and other incidents	None mentioned	N/A (not site specific)	Attitudes: Staff felt the tech made the station safer and they found it useful. Context: Cameras need to be well-positioned to be effective and avoid false alarms
Velastin et al., 2005*	Conference proceedings describing a survey to explore staff's attitudes toward tech	A survey with station managers and staff (sample size unspecified)	Underground station (London)	CCTV cameras that can detect loitering and intrusion [implemented]	No—overcrowding, trespass, crime, and other unusual behaviors	Notification sent to control room	None mentioned	Cost-effectiveness: this tech could be cost-effective when fencing/ barriers are not an option
Warner et al., 2022a	Government guidance on strategies to reduce rail trespass	N/A	Railways in USA broadly	AI cameras to predict pre-suicidal behavior [proposed]	No—trespass & suicide	Automated warning sound	N/A (not site-specific)	Cost-effectiveness: range from \$13,500—\$2.1million. Costs can be influenced by the location's connectivity, size and configuration. Attitude: Video analytics have too many false positives. Processes & procedures: sensors are often faulty. Human intervention is still required.
Warner et al., 2022b	Government research report evaluating strategies to deter rail trespass, including a survey	An online quantitative survey of 48 people working in rail transit	North American domestic and international railways	Droids/drones; big data analytics; Fiber-optic devices to monitor activity; pedestrian gates/connected fences with sensors. [implemented]	No—trespass & suicide	Notifications (recipient unspecified) and audible alarms	N/A (not site-specific)	No findings regarding feasibility
Wasatch Front Regional Council, 2023	Government report updating on suicide prevention activities	N/A	3 light rail and 3 commuter rail locations (USA)	Infrared camera; radar [implemented]	Yes	Triggering an alarm; notifying control room; alerting operator to slow train.	Signage & fencing	

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Table 1. Continued.

Authors; year	Study design/research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Wu, Campbell & Keating, 2017*	Conference proceedings describing mixed methods action design research including a literature review and focus group	Industry practitioners (number unknown)	Railways generally	Video system to detect physiological signs of suicide including behaviors and emotions to tag passengers with a suicide risk rating [proposed]	Yes	Railway staff and drivers will have a mobile app linked to the surveillance system	N/A (not site-specific)	No findings regarding feasibility
Yeo et al., 2006*	Conference proceedings giving an overview of a surveillance system	N/A	Underground station platform in South Korea	Camera with video analytics to detect emergency situations [proposed]	No—accidents on the railway, including suicide & accidental falls	Notification sent to railroad operators and command center	None mentioned	Cost-effectiveness: installation would cost 400–500 million Won per station. Maintenance would cost 40–50 million Won per year. Process: misclassification commonly came from body posture or being obscured by something. Context: effectiveness of tech depends on placement within the site.
Yogesana et al., 2023*	Conference proceedings describing a study analyzing accuracy of an AI model for detecting incidents	Number of incidents identified by AI	Two railway stations in New South Wales (Australia)	CCTV with pedestrian detection algorithm [proposed]	Yes	None mentioned	None mentioned	Context: there may be challenges with occlusion, weather, and environmental conditions. Legal & ethics: main issues are privacy, risks of gender/ racial biases, and data integrity.
Zhang et al., 2022*	Academic paper reviewing latest trends in CCTV	N/A	Railways (unspecified)	Infrared cameras; detection of abnormalities / behaviors/ individuals; CCTV [proposed]	Yes—and trespass & security	Alert sent to surveillance operator	N/A (not site-specific)	

*denotes a document that was peer reviewed.

Table 2. Literature describing technology in bridge locations (n = 22).

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Feasibility findings
Alwani et al., 2017*	Conference proceedings describing how location design can target suicide prevention	Community events and workshops: the team conducted in-depth research with over 100 individuals	Bridge over water—River & riverbanks (Derry)	Lighting + CCTV [implemented]	Yes	Lighting is a deterrent	Pods that house arts, commercial, educational and well-being activities	No findings regarding feasibility
Bennewith, Nowers & Guntell, 2011*	Academic mixed methods paper including reviewing suicide data & interviews	Reviewed 61 coroners records, data from 421 incidents, and interviews with 10 staff	Bridge over water (Bristol, UK)	CCTV [implemented]	Yes	Staff monitor CCTV	Barriers, sloping wire fence, staff patrols	Attitudes: cameras are helpful for alerting staff so they are able to respond quicker
Botha, 2008	Master's thesis using mixed methods (interviews + survey) to explore experiences of suicide negotiators	Survey: 8 Interviews: 12 Participants were staff from the suicide negotiation team	Bridge over water (South Africa)	Cameras [implemented]	Yes	None mentioned	Emergency telephones	Context: cameras cannot see in the dark so they are insufficient at this location
Graud, 2022	Industry presentation giving an overview of tech being used for suicide prevention	N/A	5 bridge over water (London)	Camera, sensor and video analytics to detect falls from bridges [implemented]	Yes	Cameras feed into a control room	Signage, training, leaflets	No findings regarding feasibility
Halsband & Heinrichs, 2022*	Academic journal paper discussing whether AI should be used for suicide prevention	N/A	A hypothetical bridge	CCTV [hypothetical example]	Yes	None mentioned	N/A (hypothetical example)	Legal & ethics: AI should be used for suicide prevention but private companies have no obligation to do so.
Kim et al., 2019**	Academic journal paper reporting on outcomes of suicide prevention measures	Data around suicide deaths and suicide attempts	Bridge over water (South Korea)	Motion based sensors [implemented]	Yes	Illuminates messages offering hope or humor.	None mentioned	Legal & ethics: interventions can draw attention to the bridge and increase suicide attempts—suicide attempts increased by 16x
Kölves, Leske & De Leo, 2023*	Academic quantitative paper comparing suicide data pre-post intervention	Data from 72 suicides at Story Bridge (Australia) and other locations	Bridge over water (Australia) and other bridges	CCTV [implemented]	Yes	None mentioned	Barriers and help phones	No findings regarding feasibility
Lee, Lee & Park, 2016**	Academic pilot study analyzing performance of system to detect suicide attempts and enable an early response	Data from 101 rescue attempts	Two bridges over water (South Korea)	Infrared security fence (sensors) and CCTV surveillance [implemented]	Yes	Warning played over a speaker. LED lights illuminate.	None mentioned	Context: Tech can malfunction in strong winds
Park, 2021 ^a	News article discussing a new AI system for suicide prevention	N/A	Bridge over water (South Korea)	AI based CCTV surveillance system to detect hazardous situations [implemented]	Yes	AI sends notification to rescue team	Emergency phones	No findings regarding feasibility
Rilkoff et al., 2018	Public health report reviewing interventions to reduce suicides, including literature and jurisdictional review, and analysis of suicide data	N/A	Bridges in Toronto	CCTV [implemented]	Yes	None mentioned	CCTV combined with physical barriers or signage	Cost-effectiveness: CCTV can cost between \$5000 – 15,000 each but this does not account for installation / maintenance costs

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Table 2. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Feasibility findings
Seoul Metropolitan Government, 2014 ^a	Government press release: reporting on changes in suicides following suicide prevention measures	Numbers of fatal and non-fatal suicide attempts at the bridge	Bridge over water (South Korea)	Motion detection CCTV & detection sensors on the fence [implemented]	Yes	None mentioned	Fence, help phones	Legal & ethics: interventions can draw attention to the bridge and increase suicide attempts
Shadwell, 2018	News article describing delays to anti-suicide cameras	N/A	Bridges over water (five bridges in London, UK)	Cameras with analytics and thermal imaging for person detection [proposed]	Yes	None mentioned	None mentioned	Cost-effectiveness: the project costs £1.4 million
Shim, Park & Yoon, 2013 ^{a*}	Academic proof of concept study testing a danger detection system	Footage of 1 person on a bridge	Bridge over water (South Korea)	CCTV to detect object in a zone of interest [proposed]	Yes	None proposed	None mentioned	No findings regarding feasibility.
Shin, 2024 ^a	News article discussing a new AI system for suicide prevention	N/A	Bridge over water (South Korea)	Camera using deep learning to identify behaviors indicative of a crisis (e.g., lingering, climbing over railings) [implemented]	Yes	AI sends notification to rescue team who typically arrive within 5 minutes	Emergency phones	Cost-effectiveness: the project costs 1.24 billion Won (\$897,510).
Shin et al., 2024 ^{a*}	Academic quantitative study comparing suicide deaths pre and post intervention installation	Number of suicide deaths	4 bridges over water (South Korea)	Tension wire sensors that detects if a wire on bridge barrier is cut or pulled more than 10 centimeters; CCTV [implemented]	Yes	Alert sent to rescue team	Help phones, signage and barriers	No findings regarding feasibility
Shin et al., 2024 ^{b*}	Academic paper describing a quantitative pre-post study evaluating changes in suicides following intervention implementation	Suicidal acts where intervention occurred before jumping: non-fatal suicide attempts by jumping; suicide deaths by jumping	A bridge over water with no pedestrian access, only vehicles (South Korea)	Speed sensors that detect slow speeds + CCTV cameras to track the vehicle [implemented]	Yes	Warning sent to operational control team	1 meter high rail with spinning bars	No findings regarding feasibility
Somos, 2021 ^a	News article discussing a new AI system for suicide prevention	N/A	Bridges over water (South Korea)	CCTV camera (fixed, rotating and thermographic) using deep learning to identify behaviors indicative of a crisis [implemented]	Yes	Notification to the rescue team	Emergency phones	Cost-effectiveness: the government spent CAD\$10.3 million to expand the system to 8 more bridges.
Spencer et al., 2019 [*]	Academic book chapter describing their design-based suicide prevention approach	Community events and workshops: the team conducted in-depth research with over 100 individuals (unclear)	Bridge over water including river & riverbanks (Derry)	Motion activated lighting + CCTV [proposed]	Yes	Lighting is a deterrent	Pods that house arts, commercial, educational and well-being activities	No findings regarding feasibility
Srikanth, Sirigneedi, Belapukonda & Bhanurangarao, 2023 [*]	Academic journal paper describing an in silico evaluation of integrated surveillance technologies	Testing on images (unclear)	Bridges generally	Internet of Things sensor detects behavior change which is analyzed using AI to assign risk level [proposed]	Yes	None mentioned	N/A (not site specific)	No findings regarding feasibility.
Wandsworth borough council, 2024	Council news report discussing the benefits of CCTV	N/A	Bridges over water (London)	CCTV cameras [implemented]	No—Crime & suicide	They are monitored in a control room	None mentioned	No findings regarding feasibility.

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Table 2. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Feasibility findings
Wilson, Smyth & Connolly, 2011	Charity project report providing anecdotal evidence around suicide incidents	N/A	Bridge over water (Derry)	CCTV cameras [implemented]	Yes	Search and rescue team can be paged	None mentioned	Context: CCTV prevents lifelines being vandalized which are used to rescue people
Wong et al., 2009 ^a	Academic paper describing quantitative retrospective record-based study examining suicide deaths	Data from 12 suicide attempts	Three bridges over water (Hong Kong)	CCTV cameras [implemented]	Yes	Officer in bridge control tower notifies staff member & emergency services	Safety barrier	Process: Bridge staff can respond within 2 minutes, emergency services within 9 minutes, and rescue team can begin searches within 20 minutes.

^{*}denotes a document that was peer reviewed.
^aDenotes different studies relating to the same location.

50 other locations identified included coastal/cliff locations (9/50, 18%), multi-storey buildings (6/50, 12%), high streets (5/50, 10%), university campuses (2/50, 4%), a forest, roads, and a cruise ship out at sea (one each) (implemented = 31, proposed = 14, various implemented/proposed = 1, hypothetical = 3, piloted = 1). 50% (25/50) of documents referred only to “public spaces” or similar. (See [Table 3](#) for details regarding each of these studies. It is also important to note that some locations featured in multiple reports, for example seven of the nine reports from coastal/cliff locations relate to the same location.

Table 3. Literature describing technology at other locations (coastal/cliff locations, multi-storey buildings, high streets, university campuses, a Forest, a road, and a cruise ship out at sea (n = 50)).

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Beautrais, 2007*	Academic journal knowledge review of approaches to prevent suicide by jumping	Unclear	Multiple: high-rise buildings e.g., hotels, psychiatric hospitals, car parks, bridges and viaducts, and cliffs and terraces.	CCTV [implemented]	Yes	None mentioned	Review also discusses signage, barriers, restricting access.	Context: cameras cannot monitor entire large structures one time.
Boronenko, Isaeva & Zelensky, 2021*	Conference proceedings describing a study developing pupillograms to determine emotional state in a lab-	30 university students	Universities (Russia)	Video camera to detect emotion states [proposed]	Yes—and aggression	None mentioned	N/A (lab study, no specific site)	No findings regarding feasibility
British Parking Association, 2022	Industry guidance for reducing suicides	N/A	Multi-storey car parks (Britain)	Motion activated cameras [proposed]	Yes	Intervention from staff or security	Barriers, lighting, patrols, signage, etc	Process: CCTV useless without skilled and confident staff to monitor. CCTV reduces response time.
Brown, 2008*	Academic opinion piece reviewing the law, legal cases, and literature	N/A	Public places broadly (USA)	CCTV with infrared vision and motion detection; cameras that track, archive, and identify “suspect behavior” [proposed]	No—crime and suicide mentioned	None mentioned	N/A (not site-specific)	Legal & ethics: there are risks around police misuse of CCTV and policy is needed to protect human rights to privacy.
Chatterjee et al., 2004	Academic paper exploring privacy and anonymity issues relating to surveillance technologies using legal case studies as examples	2 case studies where footage of suicides ended up in the public domain. Other non-suicide related examples are also given.	1. A New York city housing project 2. A public high street in Britain [Peck case]	CCTV [implemented]	No—crime and suicide	1. None mentioned 2. CCTV operator alerted police who attended and took him to the police station	None mentioned	Legal & ethics: There is the risk of violating people’s rights of anonymity and the public have little recourse over it
Chiranjeevi and Elangovan, 2019*	Conference proceedings describing a study testing a deep learning system	10 simulated video clips (5 of hanging, 5 of ‘normal’ behavior)	No location specified, but examples of colleges and prisons given.	CCTV + deep learning [proposed]	Yes	Notification (unspecified recipient)	N/A (not site-specific)	No findings regarding feasibility.

(continued)

Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
City of London Corporation Environment Department and Public Health Team, 2022	Government planning advice for high rise buildings and structures	N/A	Buildings of 4 storeys or higher with roof access, balconies or ledges (UK)	Motion-activated lighting; monitored and recorded CCTV with motion detection, thermal imaging and random sweep patterns [proposed]	Yes	Alert to staff; motion activated lighting	N/A (not site-specific)	Attitude: local residents may be affected by light pollution. Process: human involvement is required to attend to the incident, and responders need skills, knowledge & confidence to intervene
Davenport, 2003*	Academic case study reporting a legal review of the 'Peck case'	A case study of an incident where footage of a suicidal man was shown on TV	A public high street (Britain)	CCTV [implemented]	Yes—and crime	CCTV operator alerted police who attended and detained him under the Mental Health Act (1983)	None mentioned	Legal & ethics: The use of CCTV was beneficial as the individual received assistance, but the release of CCTV footage of the incident highlights a need to mask CCTV footage to protect privacy.
Edwards, 2008	Academic paper examining the law and legal cases relating to CCTV	N/A	Public places generally (Britain)	CCTV [implemented]	No—crime and suicide	None mentioned	N/A (not site specific)	Legal & ethics: The public need to be aware of how prevalent CCTV is, and policy is needed to protect human rights to privacy.
Farrington, Jolliffe, Bowles & Barnard, 2010	Academic research report of case file analysis and interviews to assess how to measure impact of CCTV on criminal justice outcomes	8 interviews with police, town center managers, CCTV forensics, National Policing Improvement Agency team. Analysis of 14 crime case files	Public places generally—no specific location types mentioned (UK)	CCTV [implemented]	No—crime	None mentioned	N/A (not site specific)	Process: CCTV can help save resources when confirming suicides
Fay, 1998	Academic paper reviewing privacy risks around CCTV drawing on notable issues reported in the media	N/A	Public places generally (Britain)	CCTV [implemented]	No—crime and suicide	None mentioned	N/A (not site specific)	Legal & ethics: There are risks of CCTV being abused for voyeuristic or entertainment purposes, or it being a means of social control or exclusion particularly for marginalized groups.

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Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Fyfe, Stevenson & Woolnough, 2015*	Academic paper reconstructing missing person's cases	3 missing person's cases	Location not specified	CCTV [implemented]	No—missing people	None mentioned	N/A (site unknown)	Process: CCTV helpful for missing person's cases by giving police more data
Gallagher, 2002*	Academic case study reporting a legal review of the 'Peck case'	A case study of an incident where footage of a suicidal man was shown on TV	A public high street (Britain)	CCTV [implemented]	Yes—and crime	CCTV operator alerted police who attended and detained him under the Mental Health Act (1983)	None mentioned	Legal & ethics: the law around privacy needs to keep up with the evolving landscape of tech
Gunnell, Novers & Bennewith, 2005*	Academic literature review of suicide prevention measures	N/A	Jumping spots broadly (international)	CCTV [implemented]	Yes	None mentioned	N/A (not site specific)	No findings regarding feasibility.
Hancock, 2004	Master's thesis using a survey and interviews to explore knowledge and attitudes around CCTV for women's safety	295 women in the community were surveyed, 6 women were interviewed who work with / are interested in CCTV or similar	Inner city public streets in Perth (Australia)	CCTV [hypothetical]	No—women's safety	None mentioned	N/A (not site specific)	Attitudes: older women believe CCTV is for suicide prevention more so than younger women. Legal & ethics: women were undecided about privacy and civil liberty issues with CCTV
Hardy et al., 2024*	Academic mixed methods research using a survey, interviews and a focus group to explore acceptability of CCTV + AI for suicide prevention	Survey of population (N = 1,096); Interviews with 6 people bereaved by suicide; Focus group with 7 police officers	Public 'hotspots' (Australia)	CCTV with AI to automatically detect behaviors indicative of crisis in real time (hypothetical)	Yes	None mentioned	N/A (not site specific)	Attitude: There were broad levels of acceptance, particularly those with lived experience. Acceptance was lower for 'younger respondents, women, and those declining to state their ethnicity' They felt human input was required at all stages. Police were concerned about false alarms. Legal & ethics: There were concerns around racial, gender and ethnicity bias, as well as AI being unable to

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Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Joyner et al., 2025 (pre-print)*	Academic journal paper describing a survey to see what surveillance tech is being used for suicide prevention	108 professional stakeholders involved in suicide prevention	Multiple UK locations including bridges, coast, multi storey buildings, parks, railways, roads.	ANPR, Bluetooth beacons, CCTV, AI analytics, drones, virtual fencing [both implemented and proposed technologies explored]	Yes	Human response, audio alerts, visual alerts, call to emergency services, alert in control room	Signage, patrols, barriers, staff training	detect nuance in distress presentations. Context: technology needs to be appropriate for the location. Attitude: tech by itself isn't enough to prevent suicide, particularly if it's not designed for suicide prevention. Cost-effectiveness: costs ranged from £350 to £125,000. Costs are a barrier to installation. Legal & ethics: there are concerns about human rights. It may exacerbate suicides by drawing attention to the site. Legal & ethics: bias within AI could misdirect police. Attitude: police are open to using AI they do have concerns around inherent biases of inaccuracies
Kim, Christiaans & Cho, 2024*	Academic journal paper describing expert workshops to understand decision making in missing person's cases	1 workshop with 4 police. 1 workshop with 8 computer science researchers. 1 workshop with 3 police	Public places generally (no location specified but research is done in South Korea)	CCTV monitoring and mobile phone tracking [implemented]	No—missing people	None mentioned	N/A (not site specific)	Legal & ethics: there is a need to protect human rights in the era of Big Data
Krotoszynski, 2014*	Academic journal paper exploring human rights in relation to big data	N/A	A public high street (Britain)	CCTV [implemented]	No—crime and suicide mentioned	CCTV operator alerted police who attended and detained him under the Mental Health Act (1983)	None mentioned	Legal & ethics: there is a need to protect human rights in the era of Big Data
Lacohee & Phippen, 2008	Conference proceedings reporting on qualitative focus groups exploring issues of trust and privacy with tech	UK citizens (sample size unspecified)	UK (no specific locations)	CCTV for mass surveillance [implemented]	No—crime, terrorism, suicide mentioned	Security may attend	N/A (not site specific)	Attitude: Citizens were distrustful of surveillance and felt it encroached on their private lives. Legal & ethics: There should be greater clarity around what data is stored about people.

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Table 3. Continued.

Authors, year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Lee et al., 2024*	Conference proceedings reviewing AI privacy incidents to explore whether AI changes / exacerbates privacy risks	Review of 321 documented AI privacy incidents taken from AI incident databases	International (no specific locations)	CCTV cameras to detect and prevent suicide; AI to predict risk of suicide [implemented]	No—crime and suicide	None mentioned	N/A (not site specific)	Legal & ethics: In most cases AI created new risks or exacerbated existing ones, partly due to the scale of data collected
Li et al., 2022**	Academic journal paper testing performance of surveillance system	15 video clips were evaluated	Coastal cliff location in Australia	CCTV + video analytics to identify specific crisis behaviors [implemented]	Yes	None mentioned	Fencing	Processes: mis-identification occurs for behaviors similar to the identified crisis behaviors. No findings regarding feasibility.
Li et al., 2023a*	Conference proceedings describing a study testing trajectory analysis within video clips	15 test video clips (10 of normal behavior, 5 'abnormal' behavior e.g., lingering)	Coastal cliff location in Australia	CCTV + abnormal behavior detection [implemented]	Yes	None mentioned	Fencing	No findings regarding feasibility.
Liang et al., 2021**	Conference proceedings testing a proposed framework to detect pre-suicidal behavior	98 video clips from the location containing human activity (70 for training the model and 28 for testing it)	Coastal cliff location in Australia	CCTV with spatiotemporal action localization [implemented]	Yes	None mentioned	None mentioned	No findings regarding feasibility.
Lockley et al., 2014**	Academic case study using mixed methods to evaluate suicide prevention measures	18 interviews with stakeholders. Police call out data and death data.	Coastal cliff location in Australia	CCTV cameras that transmit to remote monitoring hub [implemented]	Yes	None mentioned	Fencing, phones, signage and landscaping	No findings regarding feasibility.
Lyons, 2015	Industry report updating on the infrastructure at the location	N/A	Coastal location (UK)	ANPR [implemented] Smart surveillance [proposed]	Yes	None mentioned	Staff training, local taxi driver training	Process: an increase in alerts would require a commissioned service to handle them No findings regarding feasibility.
Macklay, 2006*	Academic paper of a qualitative survey and interviews to explore the role of CCTV	60 interviews. Survey respondents unknown. Participants	Public places generally (UK)	CCTV [implemented]	No—crime	Control room summon emergency services	N/A (not site specific)	No findings regarding feasibility.

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Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Malikharjuna, Agrawal, Reyya & Varma, 2024	Conference proceedings describing computer vision techniques to identify suspicious behavior	N/A were senior staff.	High-rise environments generally	CCTV camera with deep learning to identify if someone stands on or crosses over a wall which is used to predict probability of risk [proposed]	Yes (and suspicious behavior)	Notify the relevant authorities; support groups, or caretakers.	N/A (not site specific)	No findings regarding feasibility.
Manzo, 2017*	Academic qualitative case study of security officers	2 security officers	Multi-storey shopping mall (Canada)	CCTV [implemented]	Yes	Security officers respond	None mentioned	Process: viewing an incident via CCTV leads to more factual descriptions of incidents, compared to in-person being more immersive Process: may increase workload for staff. There can be high rates of false positives. Legal & ethics: it was associated with more harassing methods from police and there's a risk of racial discrimination. Cost-effectiveness: funds may be better spent on prevention initiatives.
Milburn & Syed, 2025*	Academic literature review & commentary of gunshot detection systems	N/A	USA (no specific locations)	Acoustic gunshot detection system [implemented]	No—gun violence	Information is sent to police	N/A (not site specific)	Attitudes: those who are bereaved can find CCTV images helpful to make sense of the death (providing they are ready to and the exposure to images is limited). No findings regarding feasibility.
Mowli, Adams & Darling, 2017*	Academic case study to gauger helpfulness for the bereaved seeing images of violent death	Case studies of 2 bereaved families	Australia (no specific locations)	CCTV camera that captured images of a suicide [implemented]	Yes	None mentioned	N/A (not site specific)	
Nair et al., 2018*	Academic journal paper describing a suicide prevention system	N/A	India (no specific locations)	CCTV camera [proposed]	Yes	None mentioned	N/A (not site specific)	
		N/A	Roads (UK)	CCTV + video analytic technology [proposed]	Yes	None mentioned	Also mentions signs, phones, barriers	Process: CCTV reduces response times, but it (continued)

Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
National Highways, 2022	Industry suicide prevention toolkit							is only effective when monitored by trained staff
Neyland, 2004*	Academic single case study to explore how CCTV works in practice	A case study of an incident where footage of a suicidal man was shown on TV	A public high street (Britain)	CCTV [implemented]	Yes (and crime)	CCTV operators have a radio to connect with police	None mentioned	Legal & ethics: there are possible biases in interpreting CCTV footage which may be misused for own interests
Nunn, 2001*	Academic journal paper describing different technologies used by police in cities	N/A	Cities—no specific location	Video surveillance cameras using behavioral and facial recognition to identify individuals [implemented]	No—crime and public safety	None mentioned	N/A (not site specific)	Legal & ethics: There are concerns about 'profiling' and violation of privacy rights.
Onie et al., 2023*	Academic paper describing a survey to asses acceptability of CCTV	Online survey of 1090 members of the public	Australia (no specific locations)	CCTV and machine learning that analyses footage [hypothetical]	Yes	None mentioned	N/A (not site specific)	Attitude: People with lived experience had higher levels of agreement with CCTV being used for suicide prevention
Örtlund & Larsson, 2018	Undergraduate thesis including a literature review and field test of device to detect person onboard	N/A	Cruise ship at sea	Long Range Wide Area Networks (LoRa); CCTV; infrared camera; computer vision [piloted]	No—person onboard (accidental falls & suspected suicides)	Signal received which can then track the person onboard device	None mentioned	Context: LoRa most suitable due to its long range, high capacity, small size. Cost-effectiveness: as device needs to be distributed to all on board, LoRa is ideal as its an inexpensive option
Owens et al., 2015*	Public health guidance reporting on a literature review, consultation with local government, interviews with suicide survivors.	6 interviews with suicide survivors. Other sample sizes unknown	Coastal cliff location (Australia)	CCTV including fixed, pan- tilt and thermal cameras that detect behaviors indicative of distress [implemented]	Yes	Sending alerts to the police and rescue services with the exact location of the person	Fencing, signage, crisis telephone, and improved landscaping	Process: CCTV in itself isn't the solution and human monitoring & intervention is required
Rahman et al., 2021*	Conference proceedings testing an anomaly detection	10483 images, including 250 of suicide attempts	Public places generally, no specific location of focus	Deep learning to detect anomalies [proposed]	No—security threats (g abuse, f fire, road accident, robbery, suicide, etc)	Text message (recipient unspecified); alarm sounded	N/A (not site specific)	Cost-effectiveness: alarms can be preventative which can save labor and time

(continued)

Table 3. Continued.

Authors; year	Study design/ research methods model against	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Reid et al., 2020*	Conference proceedings testing accuracy of activity recognition model against video clips	2 videos, one containing 14 people and one containing 13 people	Data from car park but proposed use in railways	Computer vision to automatically detect and interpret human behaviors [proposed]	Yes	None mentioned	None mentioned	Process: such detection technologies need a lot of computer resources to function (e.g., memory, processing speed)
Ross, Koo & Kölves, 2020**	Academic mixed methods study reviewing effectiveness of suicide prevention measures	120 suicide deaths reviewed	Coastal cliff location (Sydney, Australia)	CCTV; sensors [implemented]	Yes	Alarm triggered for security monitoring service and alert sent to the police	Fencing, phone booths, signage.	No findings regarding feasibility
Sakthivel, Suriya, Lee & Prakash, 2023	Academic book chapter describing a proposal for a deep learning model	N/A	Beaches generally	Automated drones with thermal imaging that use deep learning to detect drowning [proposed]	No—drowning & theft detection	Notification to lifeguards via a mobile app,	N/A (not site specific)	No findings regarding feasibility
Sato, 2024	News article describing the use of drones at Mount Fuji	N/A	A forest at the base of Mount Fuji (Japan)	Autonomous drone with infrared camera, paired with a hand operated drone [implemented]	Yes	Messages over the drone's speakers such as, "If you need help, wave your hand," and, "Are you all right?" as patrollers approach the area on foot.	Human patrols	No findings regarding feasibility
Smith, 2014	Academic book chapter exploring how camera operators relationally interface with CCTV	Unclear	Location unspecified	CCTV [implemented]	No—crime, suicide, terrorism, fire, traffic accidents, etc	None mentioned	N/A (not site specific)	Legal & ethics: It is very emotionally intensive for people monitoring CCTV
Smith, 2016*	Academic paper describing an ethnography of camera operators	320 hours of shadowing camera operators	Public spaces generally (UK)	CCTV [implemented]	No—suicide, crime, accidents, etc	None mentioned – but cameras are monitored	N/A (not site specific)	Legal & ethics: It is very emotionally intensive for people monitoring CCTV
Taylor, 2002*	Academic paper reviewing the law, legal cases, and literature around CCTV	N/A	UK (no specific locations)	CCTV that can identify behavioral patterns [implemented]	No—crime, safety and suicide	Alert to security guard	N/A (not site specific)	Legal & ethics: there are concerns around privacy with intensive surveillance

(continued)

Table 3. Continued.

Authors; year	Study design/ research methods	Sample size & type	Location	Technology type	Suicide primary focus?	Response mechanisms	Other interventions at the site	Key feasibility findings
Tork et al., 2023 ^{a,c}	Academic quantitative paper comparing suicide deaths pre- and post- intervention	Records of 221 deaths	Coastal cliff site (Australia)	CCTV cameras, virtual fence [implemented]	Yes	Alert sent to police from virtual fence	Signage, phones, fencing	Legal & ethics: there was some evidence of displacement within the local area
Yuksel et al., 2019 ^a	Conference proceedings proposing a framework to monitor stress levels	N/A	University campuses in USA	Biosensors that measure sweat and hormone levels to measure stress [proposed]	No—stress	None mentioned	None mentioned	Attitudes: people may be more willing to share data when it is for the greater good of the community
Yusuff, 2011	Academic expert opinion piece reviewing the law, legal cases, and literature to explore CCTV & privacy	N/A	Public places generally (Canada)	CCTV [proposed]	No—crime	None mentioned	N/A (not site specific)	Legal & ethics: there are risks around corruption and abuse of CCTV, so strict guidelines and regulatory frameworks are needed.
Zhen, 2021	Master's thesis of a case study including a physical inspection of the site, an interview, and analyzing media reports and suicide death statistics	Interview with 1 chief operating officer from the parking authority. Data from 181 suicide deaths, 13 media reports	Multi-storey garage (New Haven)	CCTV cameras on all levels of the car park [implemented]	Yes	None mentioned, but cameras are monitored 24/7	Staff training, signage, patrols	Attitude: interventions seem to be helpful, but less so for people who jump impulsively.

^aDenotes a document that was peer reviewed.

^cDenotes different studies conducted at the same location.

WHAT SURVEILLANCE TECHNOLOGIES ARE BEING IMPLEMENTED/PROPOSED FOR SUICIDE PREVENTION IN PUBLIC PLACES?

See Table 4 for references pertaining to each technology type. It is worth noting that not all technologies were primarily implemented or proposed for suicide prevention. Suicide prevention was the primary focus in 65.7.% reports (111/169). In the remaining reports the primary focus of the technology included preventing crime, trespass, terrorism and anti-social behavior, with suicide prevention being a secondary function. See Tables 1–3 for further information.

Technology Types

Cameras were the most mentioned surveillance ‘data source’ (160/169, 94.7%). In nearly a third of reports where cameras were discussed there was no mention of the cameras having any ‘smart’ features (47/160, 29.4%), e.g., using sensors or analytics to help fully or partially-automate the surveillance process (36 = implemented, 8 = proposed, 2 = hypothetical, 1 = discussing the impact of the absence of this type of technology). This means that human monitoring or reviewing of footage was required as part of the surveillance process.

Conversely, in 68/160 (42.5%) reports cameras incorporated analytics, for example to detect motion or presence in an intrusion area (such as the end of a railway platform), or to detect specific behaviors (such as lingering or climbing over railings) or emotions indicative of a crisis. The use of automatic number plate registration (1 = implemented) and facial recognition cameras (1 = proposed, 1 = implemented) were also identified which may help with identifying people within camera footage (e.g., missing persons). In contrast to cameras without analytics, only 20/68 (29.4%) had been implemented, compared to 46.4% (32/69) being proposed and 11.6% (8/69) being piloted. Two reports discussed hypothetical examples, and one discussed a range of technologies that had been implemented or proposed.

In 43/160 (26.9%) reports, cameras were used/proposed alongside another type of technology. For example, a wide range of sensors were also identified as ‘data sources.’ In some surveillance systems (28/43, 65%) the sensor could detect changes in the environment (e.g., via pressure mats, passive infrared, radar) which could then activate a camera (implemented = 16, proposed = 8, piloted = 2, hypothetical = 1, reporting on the impact of not having these technologies = 1). Another example is thermal or infrared cameras being deployed on piloted or autonomous drones (6/45, 13.3%; implemented = 3, proposed = 3).

Only 10 reports discussed technology that was not used in conjunction with cameras. This was primarily sensors that detected environmental changes such as identifying persons in an unsafe location (7/10, 70%; implemented = 2, proposed = 5). One additional report proposed biosensors being used to assess emotional states through sweat and hormone levels. There was also an example of a system that has been implemented to detect gunshot sounds using acoustic sensing as opposed to physical presence. Finally, one paper reported a pilot test of motion sensitive lighting. See Table 4 for further information.

In 38.5% (65/169) of the reports, technology was not discussed in relation to a specific location. In the remaining 105 reports, 52 surveillance systems were discussed alongside another intervention(s). This included fencing/barriers (32/52, 61.5%), signage (21/52, 40.4%), emergency help phones (14/52, 26.9%), staff training (10/52, 19.2%), human patrols (9/52, 17.3%), changes to the landscape/area design (6/52, 11.5%), awareness campaigns (4/52, 7.7%), and train platform doors (2/52, 3.9%). In 50.5% (53/105) reports where technology was discussed in relation to a specific site, no other interventions were mentioned.

Table 4. Technology types.

Technology grouping	Type of technology	N (%)	References
Cameras alone	Cameras	47 (29.4%)	(RESTRAIL, 2014d; Agarwal, 2021; Beautrais, 2007; Bennewith et al., 2011; Botha, 2008; Chatterjee et al., 2004; Clarke and Poyner, 1994; Davenport, 2003; Edwards, 2008; Farrington et al., 2010; Fay, 1998; Fyfe et al., 2015; Gallagher, 2002; Gayford and Lester, 1994; Gunnell et al., 2005; Halsband and Heinrichs, 2022; Hancock, 2004; Heesen et al., 2024; Kerkhof, 2003; Kölves et al., 2023; Krotoszynski, 2014; Lacohee and Phippen, 2008; Lockley et al., 2014; Luff et al., 2000; Mackay, 2006; Manzo, 2017; Marsh et al., 2021; Marzano et al., 2019; Mishara, 2007; Mosley, 2018; Mowl et al., 2017; Muller and Boos, 2002; Nair et al., 2018; Neyland, 2004; Niederkrotenthaler et al., 2012; Rådbo et al., 2011a; Rilkoﬀ et al., 2018; Ryan, 2013; Smith, 2016; Smith, 2014; Svensson et al., 2006; Teague, 2012; Teague et al., 2010; Too et al., 2015; Uittenbogaard and Ceccato, 2015; Wandsworth Borough Council, n.d; Wilson et al., 2011; Wong et al., 2009; Yusuf, 2011; Zhen, 2021)
	Cameras with analytics ^a	68 (42.5%)	(Alawad et al., 2020; Bhandari and Park, 2022; Black et al., 2005; Bongiorno, 2024; Boronenko et al., 2021; British Parking Association, 2022; Brown, 2008; Burkhardt et al., 2014; Candamo et al., 2010; Chiranjeevi and Elangovan, 2019; Cisco International Limited, 2023; Eom et al., 2010; Giles, 2003; Gregor et al., 2019; Hardy et al., 2024; Havârneanu et al., 2016; Havârneanu et al., 2017; Hogan, 2003; Hunter et al., 2019; Ketcham et al., 2014; Lee et al., 2024; Li et al., 2022; Li et al., 2023a; Liang et al., 2021; Lyons, 2015; Malikharjuna Rao et al., 2024; Martínez Núñez et al., 2024; Mishara et al., 2016; Mukherjee and Ghosh, 2017; Murshed et al., 2022; National Highways, 2022; Nunn, 2001; Onie et al., 2023; Owens et al., 2015; Paden et al., 2016; Park, 2021; Rådbo and Lindberg, 2016; Rahman et al., 2021; Reid et al., 2020; Renton, 2013; RESTRAIL, 2014b; RESTRAIL, 2014c; RESTRAIL, 2024; Rudall, 2003a; Rudall, 2003b; Ryan, 2018; Ryan et al., 2017; ScotRail, 2023; Seifert and Ramesh, 2008; Shadwell, 2018; Shim et al., 2013; Shin, 2024; Shin et al., 2024; Shirres and Milne, 2017; Somos, 2021; Stevens, 2013; Taylor, 2002; Transport for London, 2023; Transportation Research Board, 2023; Van Overmeiren, 2019; Velastin, 2003b; Velastin, 2003a; Velastin et al., 2005; Warner et al., 2022a; Warner et al., 2022b; Wu et al., 2017; Yeo et al., 2006; Yogesan et al., 2023)
Cameras with other technology	Cameras and lighting	3 (1.8%)	(Alwani et al., 2017; City of London Corporation Environment Department and Public Health Team, 2022; Spencer et al., 2019)
	Drones with cameras	6 (3.5%)	(Chajka-Cadin et al., 2016; da Silva et al., 2006; Gabree et al., 2019; Qian et al., 2023; Sakthivel et al., 2023; Sato, 2024)
	Cameras, drones and environmental sensors ^b	2 (1.2%)	(Warner et al., 2022a; Lin et al., 2022)
	Cameras and environmental sensors	28 (17.5%)	

(continued)

Table 4. Continued.

Technology grouping	Type of technology	N (%)	References
No cameras	Cameras, Bluetooth beacons, ANPR, drones, virtual fencing	1 (0.6%)	(Shin et al., 2025a; Shin et al., 2024; da Silva et al., 2006; Australasian Centre for Rail Innovation, 2019; Dent and Marinov, 2019; El Koursi and Bruyelle, 2016; Fayyaz and Johnson, 2020; Gabree et al., 2014; Giraud, 2022; Grey, 2015; Hallelwell et al., 2023; Hwang et al., 2010; Kallberg and Silla, 2017; Lee et al., 2016; Little, 2006; O'Donnell and Farmer, 1992; Rådbo et al., 2011b; Ross et al., 2020; Ryan et al., 2018; Seoul Metropolitan Government, n.d; Silla, 2022; Smazínka et al., 2024; Topel et al., 2019; Torok et al., 2023; Transportation Research Board, n.d; Wasatch Front Regional Council, 2023; Zhang et al., 2022)
	Cameras and mobile phone tracking	1 (0.6%)	(Joyner et al., 2024a)
	Cameras and Long Range Wide Area Networks	1 (0.6%)	(Kim et al., 2024)
	Sensors to detect environmental changes	7 (4.4%)	(Örtlund and Larsson, 2018)
	Motion activated lighting	1 (0.6%)	(da Silva et al., 2007; Kim et al., 2019; RESTRAIL, 2024a; RESTRAIL, 2024d; RESTRAIL, 2024e; Srikanth et al., 2023; Van Beeck et al., 2017)
	Biosensors	1 (0.6%)	(Erlangsen et al., 2023)
	Acoustic gunshot detection	1 (0.6%)	(Yuksel et al., 2019)
			(Milburn and Syed, 2025)

^aAnalytics includes motion detection, intrusion detection, behavior recognition, emotion recognition, person identification.

^bSensors detecting change in environment include pressure, ultrasonic, glass fiber or infrared sensors, radar and LiDAR.

Response Mechanisms

113 of the reports discussed a response mechanism involved in the surveillance process. This varied between being a technological/fully automated response (22/113, 19.5%), a response that required human involvement (71/113, 62.8%), or a combination of both (20/117, 17.1%). In four instances, a response was mentioned though it was unclear what precisely the response was. See [Table 5](#) for references pertaining to each response type.

Table 5. Response mechanisms.

Response grouping	Type of response	N (%)	References
Automated response	Audible alert (e.g., alarm or prerecorded warning message)	12 (7.1%)	(Ryan, 2013; Black et al., 2005; Havårneanu et al., 2016; RESTRAIL, 2014b; RESTRAIL, 2014c; RESTRAIL, 2024; Ryan et al., 2017; Seifert and Ramesh, 2008; Van Overmeiren, 2019; Warner et al., 2022b; Australasian Centre for Rail Innovation, 2019; Kallberg and Silla, 2017; RESTRAIL, 2024a)
	Visible alert (e.g., lighting or messages of hope)	6 (3.5%)	(Alwani et al., 2017; Spencer et al., 2019; Kim et al., 2019; RESTRAIL, 2024e; RESTRAIL, 2024f; Erlangsen et al., 2023)
	Audible <i>and</i> visual alerts	3 (1.7%)	(Hunter et al., 2019; Lee et al., 2016; Silla, 2022)
	Train bumper rotates to expose cushion	1 (0.6%)	(Paden et al., 2016)
Response involving human input	Staff manually monitor tech & co-ordinate response	17 (10.1%)	(Bennewith et al., 2011; Chatterjee et al., 2004; Davenport, 2003; Gallagher, 2002; Gaylord and Lester, 1994; Krotoszynski, 2014; Mackay, 2006; Mishara, 2007; Neyland, 2004; Smith, 2016; Teague, 2012; Wandsworth Borough Council, n.d; Wong et al., 2009; Zhen, 2021; Giles, 2003; Giraud, 2022; Örtlund and Larsson, 2018)
	Notification in control room	12 (7.1%)	(Shin et al., 2025a; Alawad et al., 2020; Bongiorno, 2024; Eom et al., 2010; Gregor et al., 2019; Rådbo and Lindberg, 2016; ScotRail, 2023; Velastin, 2003a; Velastin et al., 2005; Yeo et al., 2006; Zhang et al., 2022)

(continued)

Table 5. Continued.

Response grouping	Type of response	N (%)	References
Combination of automated & human response	Notification to ground staff	17 (9.6%)	(Agarwal, 2021; Lacohee and Phippen, 2008; Manzo, 2017; Svensson et al., 2006; Bhandari and Park, 2022; British Parking Association, 2022; Burkhardt et al., 2014; Cisco International Limited, 2023; Hogan, 2003; Martínez Núñez et al., 2024; Mishara et al., 2016; Renton, 2013; Taylor, 2002; Sakthivel et al., 2023; Dent and Marinov, 2019; Anagnostopoulos, 2014; Botha et al., 2014)
	Notification direct to train driver	6 (3.4%)	(Murshed et al., 2022; Wu et al., 2017; Fayyaz and Johnson, 2020; Gabree et al., 2014; Hwang et al., 2010; Little, 2006)
	External notification (e.g., emergency services, rescue team)	12 (6.7%)	(Wilson et al., 2011; Mallikharjuna Rao et al., 2024; Owens et al., 2015; Park, 2021; Shin, 2024; Shin et al., 2024; Somos, 2021; Qian et al., 2023; Ross et al., 2020; Torok et al., 2023; Transportation Research Board, n.d; Milburn and Syed, 2025)
	Notification to an unspecified recipient	3 (1.7%)	(Chiranjeevi and Elangovan, 2019; Mukherjee and Ghosh, 2017; Transport for London, 2023)
	Staff liaise with individual via loudspeaker	4 (2.3%)	(Clarke and Poyner, 1994; Mosley, 2018; Teague et al., 2010; O'Donnell and Farmer, 1992)
	Lighting and notification to control room	2 (1.1%)	(City of London Corporation Environment Department and Public Health Team, 2022; Chajka-Cadin et al., 2016)
	Audible alert and notification to staff	11 (6.2%)	(Havârneanu et al., 2017; Ketcham et al., 2014; Rahman et al., 2021; Shirres and Milne, 2017; Warner et al., 2022a; da Silva et al., 2006; Gabree et al., 2019; Sato, 2024; Topel et al., 2019; Wasatch Front Regional Council, 2023; da Silva et al., 2007)
	Audible alert and lighting, notification to staff / train	5 (2.8%)	(Transportation Research Board, 2023; Lin et al., 2022; El Koursi and

(continued)

Table 5. Continued.

Response grouping	Type of response	N (%)	References
			Bruyelle, 2016; Hallewell et al., 2023; Ryan et al., 2018)
	Lighting, audible warning and notification to staff, emergency services and train driver.	2 (1.1%)	(Joyner et al., 2024b; Smažinka et al., 2024)
No response mentioned		51 (30%)	(Onie et al., 2021; RESTRAIL, 2014e; Beautrais, 2007; Edwards, 2008; Farrington et al., 2010; Fay, 1998; Fyfe et al., 2015; Gunnell et al., 2005; Halsband and Heinrichs, 2022; Hancock, 2004; Heesen et al., 2024; Kerkhof, 2003; Kölves et al., 2023; Lockley et al., 2014; Luff et al., 2000; Marsh et al., 2021; Marzano et al., 2019; Mowll et al., 2017; Muller and Boos, 2002; Nair et al., 2018; Niederkrotenthaler et al., 2012; Rilkoff et al., 2018; Smith, 2014; Too et al., 2015; Uittenbogaard and Ceccato, 2015; Yusuff, 2011; Boronenko et al., 2021; Brown, 2008; Hardy et al., 2024; Lee et al., 2024; Li et al., 2022; Liang et al., 2021; Lyons, 2015; National Highways, 2022; Nunn, 2001; Reid et al., 2020; Rudall, 2003a; Rudall, 2003b; Ryan, 2018; Shadwell, 2018; Shim et al., 2013; Velastin, 2003b; Yokesan et al., 2023; Seoul Metropolitan Government, n.d; Kim et al., 2024; Srikanth et al., 2023; Van Beeck et al., 2017; Yuksel et al., 2019; Botha et al., 2014; United States, 2019; Li et al., 2023b)
Response unclear (e.g., ‘warning is given’ and ‘alert of unusual movement’)		4 (2.3%)	(Candamo et al., 2010; Stevens, 2013; Grey, 2015; Rådbo et al., 2011b)

22 reports discussed “smart” technology where the response was fully automated and did not involve human intervention, (implemented = 5, proposed = 11, piloted = 6). Technological responses included the use of audible and visual deterrents. Audible

deterrents could be automated, such as an alarm or prerecorded message. Visual deterrents were typically changes in lighting, whether it be a fixed/flashing light when motion is detected, or a light that ‘tracks’ an individual across the site.

71 reports discussed the human involvement in the response (implemented = 42, proposed = 22, piloted = 7). Most commonly, human responses involved staff in a control room either monitoring the CCTV to identify an incident (18/71, 25.4%) or the system alerting them to a potential incident (12/71, 16.9%). They were then responsible for potentially validating the alert to be genuine and co-ordinating a response. In four of the reports, staff in the control room liaised directly with the individual via a loudspeaker, for example on a train platform. In other cases, the notifications were sent to staff on the ground (17/71, 23.9%) or to an external recipient (12/71, 16.9%) such as emergency services or a rescue team which could attend the incident. Some reports (6/71, 8.5%) described alerts being sent to a train driver so that they were able to slow or stop the train, including using strobe lighting to alert them to the incident.

In 20 reports a combination of automated and human-led responses was outlined (implemented = 9, proposed = 10, mix of implemented and proposed = 1). Most commonly this combination of responses entailed an audible alert sounding at the location in combination with a notification being sent to relevant staff (11/20, 55%). In five cases this was also alongside lighting.

WHAT IS THE FEASIBILITY OF IMPLEMENTING SURVEILLANCE TECHNOLOGIES FOR SUICIDE PREVENTION IN PUBLIC PLACES

111 reports discussed feasibility of the technology, 70 of which came from academia and 41 from the media, industry or government. Factors discussed in relation to feasibility of the technology included the processes and procedures involved in installing or using the technology, legal and ethical issues, staff and public attitudes toward technology, the appropriateness of the technology for particular contexts or locations, and cost-effectiveness.

Processes and Procedures

Regardless of the mode of detection, authors highlighted the importance of having a clear response pathway in place to prevent suicides once an incident has been identified (e.g., Bennewith et al., 2011). Some reports emphasized the importance of human involvement in the surrounding processes, for example for reviewing footage for certainty or for attending to the individual (e.g., Botha, 2008). For example, technology can be trained to detect certain situational factors such as lingering, but this is not 100% accurate and so a human may need to ‘check’ for false positives. On the other hand, the challenges of human involvement were also discussed. Some authors noted the increased workload from staff having to incorporate different elements of technology-assisted suicide prevention into their jobs (Lyons, 2015; Milburn and Syed, 2025). It was noted that they may miss possible incidents if multi-tasking (Svensson et al., 2006; Gabree et al., 2019) or if they become ‘passive’ from monitoring technology for long periods of time (Transport for London, 2023; Yeo et al., 2006). Incidents may also be

missed at big sites where staff may not be able to monitor it all at once (Beautrais, 2007). If staff are over-burdened and incidents are missed, this impedes the preventative capabilities of surveillance technologies which rely on human intervention. Consequently, for surveillance technologies to effectively prevent suicides, consideration must be paid to the surrounding procedures.

Legal and ethical Issues

Interestingly, only a third of the papers that discussed feasibility mentioned any ethical issues (36/111, 32.4%). Among those that did discuss ethical or legal issues, the human right to privacy was noted (e.g., Gaylord and Lester, 1994), including having to balance privacy and the safety of high-risk locations (e.g., Gunnell et al., 2005). Specific concerns include possible breaches of privacy for people living where drones may be used (Gabree et al., 2014), personal data being incorporated into training models without consent, and increasing the amount of person specific information collected (Lee et al., 2024). In *Peck .v. United Kingdom* (2003), the court ruled that a man had his privacy violated after footage of him attempting suicide was released to the press. This case was often cited as an example of why appropriate policy and good practice are needed (Chatterjee et al., 2004). It was suggested in one paper that masking CCTV (e.g., blurring footage) may protect people's privacy (Davenport, 2003), however, individuals may still be recognizable to those known to them¹.

The risk of discrimination within surveillance technologies was highlighted by Milburn and Syed (Milburn and Syed, 2025), who suggested that minoritised ethnic groups may be disproportionately subjected to police surveillance. Indeed, one paper discussed evidence suggesting CCTV operators do over-scrutinise marginalized groups (Taylor, 2002). Similarly, Milburn and Syed said the introduction of surveillance technologies led to greater harassment by the police (Milburn and Syed, 2025). The need to take intersectionality into account when considering issues of bias and discrimination was noted (Hardy et al., 2024). Moreover, the importance of involving people who have lived experience of suicidality in research and consultation was highlighted [e.g., 14,194]. Yet, only 3/169 (1.8%) of reports mentioned any lived experience consultation in designing their research, such as advising on survey or interview questions (Heesen et al., 2024; Hardy et al., 2024; Onie et al., 2023).

Legal and ethical obligations of private surveillance companies to intervene during a possible suicide incident were considered by Halsband & Heinrichs (2022) and Zhen (2021). Halsband and Heinrichs (2022) gave the hypothetical example of a private company using cameras for bridge maintenance who inadvertently identify someone who seems at risk of suicide. The authors concluded that, ethically and morally, the company are only obligated to notify relevant services, and not to actively offer help or

¹It is important to note that while the human right to privacy is enshrined in international legal frameworks such as the Universal Declaration of Human Rights (Art 12, 1948) and the European Convention of Human Rights (Art 8, 1950), privacy is not an absolute right. Interference (by relevant authorities) with the human right to privacy is lawful under certain circumstances, for example, to pursue legitimate public interests such as public safety (that includes measures to prevent suicide in public spaces). It is therefore important to distinguish between whether the deployment of suicide prevention surveillance technologies per se in public spaces is a primary privacy concern as opposed to breaches of privacy rights arising out of the unauthorised processing (e.g., use, disclosure, sharing) of personal data collected from these surveillance technologies.

intentionally monitor for suicides². Zhen (2021) noted that responsibility could lie with multiple agencies including the site owners, suicide prevention organizations, the local police or other professionals. This highlights a lack of clarity regarding who is responsible for implementing suicide prevention interventions.

Other ethical issues related to wider risks of technology including the impact on staff wellbeing from viewing incidents via CCTV for example, or from having to make difficult decisions about whether alerts are genuine or not (e.g., Marsh et al., 2021). A further risk included the installation of technology highlighting that a location is a possible site for suicide, thus increasing attendance and possibly suicide rates (e.g., Bennewith et al., 2011). Similarly, concerns were raised that people becoming aware of technology may displace incidents to other locations, increasing suicide rates at nearby areas (Hardy et al., 2024; Torok et al., 2023), or people may simply change their behavior to avoid detection (Luff et al., 2000; Marsh et al., 2021). In these instances, the unintended consequences counter the preventative aim of surveillance technologies and actually increase the risk. This underscores the importance of considering ethical issues surrounding these technologies to ensure stakeholders are aware of the possible risks.

Attitudes toward Surveillance Technologies

The attitudes of front-line staff toward technology were discussed in 12 reports. Staff who monitor these systems perceived technology to pose a deterrent, and to facilitate more rapid identification of incidents (e.g., Mowll, Adams & Darlin, 2017). Staff also felt that it kept them safe if they knew someone was monitoring them whilst attending an incident (Teague et al., 2010; Velastin et al., 2005). Conversely, negative attitudes stemmed from issues such as false alarms (Hunter et al., 2019; Van Overmeiren, 2019; Warner et al., 2022a; Silla, 2022; Smažinka et al., 2024; Topel et al., 2019; Milburn and Syed, 2025; Baron & da Silva, 2019). In one report, 23% of alarms were false positives (Rådbo et al., 2011b), 30% of alarms in another (Van Overmeiren, 2019) and in another the rate of false alarms was nearly double that of genuine alerts (Gabree et al., 2014). To give context to these percentages of false alerts, one report documented receiving 11,500 alerts over a six month period (Transport for London, 2023). Staff are instrumental in technology uptake as they are the ones tasked with incorporating it into their roles. This means that their attitudes can determine technologies' capabilities for preventing suicide, and thus learning from staff's perspectives is key.

Public opinion presented within reports was also somewhat divided. Possible public resistance has been noted due to issues such as noise or light pollution (City of London Corporation Environment Department and Public Health Team, 2022; Halleswell et al., 2023; Silla, 2022; RESTRAIL, 2024a; RESTRAIL, 2024e; RESTRAIL, 2024f). Surveillance technologies may be more acceptable if they are believed to be 'for the greater good' of communities; surveillance technologies have also been

²It is consistent with the law in most common law jurisdictions (like England and Wales) that do not impose a legal duty of care on individuals to rescue others in danger. However, many civil law systems (e.g., Germany, Spain, France) have "duty to rescue" laws, that impose a legal duty on individuals to provide help to someone in a life-threatening situation (where the helper can act without endangering themselves). This indicates that in some legal jurisdictions, private companies deploying surveillance technologies that inadvertently identify someone who appears to be at risk of suicide may be obligated (under a legal duty) to provide help.

described as ‘good if it saves lives’ (Hardy et al., 2024). Following their case study with bereaved families, Mowll, Adams & Darlin (2017) discuss how surveillance technologies may have benefits for those who are bereaved by suicide. The authors state that seeing images from the suicide may help the bereaved to understand more about the circumstances surrounding the death rather than relying on their imaginations. This may enable them to ‘re-story’ the death and help them to find peace. Given the diversity of experiences that people have in relation to suicide, others who are bereaved may find seeing footage or images of a suicide extremely challenging, emphasizing the importance of research investigating the breadth of lived experience. Other than this case study of attitudes amongst those bereaved by suicide, no research in this review explicitly explored the attitudes toward surveillance technology amongst those with lived/living experiences of suicide.

The Technology Being Appropriate for the Context

Seifert and Rameth (2008) note that the feasibility of the technology seemed to depend on the type and complexity of the target environment. For example, in larger areas cameras are unable to cover the whole landscape, there may be blind spots, or the images may be of poor quality (Luff et al., 2000; Ryan, 2013) so incidents are less able to be identified/prevented. Consequently, drones have been noted as particularly helpful for rural areas that are harder to monitor with static technologies (Baron & da Silva, 2019). Similarly, weather can pose issues (Rådbo, Svedung & Andersson, Rådbo et al. 2011a). As an example, high winds can cause technology placed at the top of bridges to malfunction (Lee et al., 2016). Consequently, specifications such as the capacity, range and efficiency of the technology were determining factors in suitability (Örtlund and Larsson, 2018). It was also noted that having back-up technology is key in case one system fails (da Silva et al., 2006).

Another important element of suitability was whether the technology had been designed specifically for suicide prevention. If not, it was highlighted that this may have negative outcomes for people who are suicidal as the technology would not be optimized for detecting situational factors associated with suicide more so than trespass. For example, if surveillance technologies are implemented on the railways to prevent trespass, they may not be placed in the correct areas to detect possible suicide incidents and so the technologies are less able to prevent suicide (RESTRAIL, 2014a). Equally, they may not be trained to detect certain behaviors indicative of suicide, such as lingering.

Cost-Effectiveness

No full economic evaluations of cost-effectiveness were identified in this review. Nevertheless, 26 reports included considerations on costs. Two reports suggested that technology may not be suitable or feasible due to the cost of installation, maintenance and updates (Joyner et al., 2024a; Havârneanu et al., 2016; Warner et al., 2022a). Several reports noted that cost-effectiveness may be reduced by additional costs possibly required to pay/train staff to monitor the technology, meaning that fully automated

systems technology may be most suitable depending on budget (Rilkoff et al., 2018; Little, 2006; Botha et al., 2014). However, as mentioned above, several reports discussed the importance of human involvement in the technology for monitoring and responding to individuals, as technology alone may not be sufficient to prevent a death (Mishara, 2007; Hardy et al., 2024; Hunter et al., 2019; Owens et al., 2015; Warner et al., 2022a; City of London Corporation Environment Department and Public Health Team, 2022; Havârneanu et al., 2015). This suggests that cheaper, fully automated options may not always be feasible.

DISCUSSION

To our knowledge, this is the first scoping review of surveillance technologies for suicide prevention. We have mapped out reports on the broad range of surveillance technologies that are being/may be used for suicide prevention in public places. Standard CCTV was the most commonly referenced type of technology, and the railways were the most commonly discussed location where these technologies were being implemented/proposed. Most responses to an incident involved a human element, rather than the technology being fully automated. This review also summarized findings regarding the feasibility of these technologies. Some of the key factors discussed in regard to feasibility were legal and ethical considerations, acceptability amongst staff and the general public, whether the technology is suitable for a particular location, and cost-effectiveness. Yet, it is worth noting that around a third of papers did not discuss or explicitly consider the feasibility of the technologies. This is despite feasibility being key for the implementation and effectiveness of such preventative measures. Future research must explore factors that determine feasibility in greater detail.

As demonstrated in the review, research in this area has been increasing in recent years alongside the rapid evolution of surveillance technologies. Improving surveillance through the use of CCTV and similar technologies is a priority area outlined in suicide prevention guidance (Public Health England, 2015), meaning it is likely that their use will increase in the years to come. In this review, we have identified three key gaps in the research that need to be addressed moving forward. Firstly, the role of lived experience in guiding decision making and implementation of surveillance technology needs to be prioritized. Secondly, ethical issues must be considered and reported to ensure that there is transparency around how these technologies are being implemented and evaluated, and that it is done so in ways that are safe, legal and ethical. Finally, this review highlighted a disparity in research coming from high income countries and LMICs. This is indicative of a broader issue around digital inclusivity, in which higher income countries may have access to potentially life-saving technologies and lower- and middle-income countries do not. These gaps will be discussed in more detail below.

A majority of the reports discussed here did not explicitly consider any ethical implications, despite the sensitivity of the topics. It may be that the authors did consider ethical issues, but that they were not mentioned in the reports. From those that did discuss ethical issues, it was clear that using surveillance technologies for suicide prevention is a highly complex area and several factors need to be taken into consideration. Issues like human rights, data protection, bias and discrimination were highly prevalent and need to be

explored further to better inform decision making around the use of surveillance technologies. Reporting on these factors is important for transparency around ethical implications of researching and/or implementing these technologies. Consulting people with lived experience would help to identify and elaborate on these ethical issues (Dempster et al., 2023).

Similarly, only three reports described involvement of people with lived experience in designing the research. This is despite several reports highlighting the importance of consulting people with lived experience when making decisions around surveillance technologies. Moreover, only one report sought opinions about surveillance technology from people with lived experience, in a case study of individuals bereaved by suicide (Mowll et al., 2017). Three other reports did include interviews with people who have lived experience, but not explicitly to gauge attitudes toward these technologies (Heesen et al., 2024; Marsh et al., 2021; Marzano et al., 2019). Understanding whether surveillance technologies are acceptable to those who may be affected by them is a key tenet of their feasibility. There has been a paradigm shift in recent years which is captured in the phrase ‘nothing about us without us’ (Krysinska et al., 2023). This encapsulates the idea that those with experience of the phenomena in question should be actively and directly involved in research on the subject. Yet, it was apparent in the current review that research in this area is potentially happening without those with lived experience of suicidality. Future research should seek to collaborate with such individuals to ensure the research is sensitive, relevant and well-informed. Similarly, greater exploration of what people with lived experience think about surveillance technology is essential to determine their safety, effectiveness and acceptability. It is essential that such exploration is done in a way which promotes participant safety, as with all research into sensitive topics, to avoid conducting research which causes emotional burden. Moreover, ensuring this lived experience involvement is reported on is key for readers to be aware of the processes involved in researching and/or implementing technologies, and to know whether lived experience has been prioritized.

An important finding is the dearth of research around surveillance technology for suicide prevention from LMICs despite 75% of annual suicides occurring there (World Health Organization, 2014). Unfortunately, suicide is still criminalized in several LMICs, which may prevent such research from taking place (Ochuku et al., 2022). There was some research from India, an LMIC where suicide has been decriminalized. However, these reports only discussed technology that was being proposed rather than having been implemented (Nair et al., 2018; Mukherjee and Ghosh, 2017; Murshed et al., 2022). This underscores the importance of sharing learnings around surveillance technologies internationally to ensure that decision makers are as informed as possible. This is in line with the ‘global imperative’ of suicide prevention (World Health Organization, 2014). It is however important to acknowledge that this review only contained reports published in the English language, as discussed below, which may have prevented inclusion of further research from LMICs.

Finally, a majority of the reports within this review focused on railway environments. Railways are unique in nature and size compared to other public locations where suicides may take place. They often have centrally managed infrastructure systems, with coordinated governance, standards, and operational control. This makes them fundamentally different from individual bridges, parks, or coastal locations, which are often

fragmented across multiple owners and authorities. Therefore, compared to isolated sites, railways offer a unique opportunity to implement, evaluate, and scale suicide prevention interventions (Marzano et al., 2025). However, given the complexity of railway locations, contextual factors such as station design, surveillance coverage, and the processes/staffing involved in surveillance monitoring/response must be considered when implementing these technologies. This is a key, practical example of how the findings in this review are applicable to real-world implementation, such as the importance of the technology being suitable for the location, as well as how staff appraise the technology.

Limitations

This was a comprehensive review that maps out a broad range of surveillance technologies for suicide prevention and considers their feasibility. Additionally, this review included technology in relation to a range of different locations which has the benefit of cross-location learning. Nevertheless, there are limitations to acknowledge. Firstly, around a quarter of the reports discussed technology that was implemented alongside other interventions such as barriers or signage. It may therefore be that discussions of feasibility were influenced by the other interventions present at the site and may not be entirely specific to surveillance technologies. Whilst it is acknowledged that implementing multiple interventions in one location may increase the likelihood of successfully identifying an incident, it is first important to learn more about the feasibility of different technologies to understand the possible impacts and unintended consequences that may arise.

This review was also limited by the decision to only include reports written in English. It is likely that reports written in other languages have been missed. Further efforts should be made to conduct a more inclusive review. Moreover, this review highlighted limited evidence regarding what people with lived experience of suicide think about surveillance technologies being used for suicide prevention. It is critical that future research considers their perspectives to ensure technology is both safe and acceptable. Similarly, little is known about technology where trials or implementation have been discontinued, and exploring this further would add insight into what renders technology unsuitable for suicide prevention. Additionally, this review focuses mostly on traditional CCTV. Whilst other technologies were discussed, this research is limited and more needs to be learnt about the broader range of surveillance technologies, particularly given the rapid pace at which they develop.

Finally, this review included grey literature and non-peer-reviewed documents in order to capture the breadth of surveillance technologies that can be used for suicide prevention in public places. However, it must be acknowledged that inclusion of these reports may weaken the reliability of the findings presented due to a possible lack of rigor, accuracy or standardization of reporting within those reports.

CONCLUSION

This scoping review identified a broad range of surveillance technologies that can be used for suicide prevention in public places, though CCTV was most commonly referenced. Factors determining the feasibility of these technologies were reported to relate

to the processes and procedures involved such as the response mechanism in place, the suitability of technology for specific locations depending on their size, exposure to weather, rurality, etc, and ethical considerations such as privacy and possible discrimination. However, there needs to be greater consideration of ethics in future research. In particular, working with people who have lived experience is essential to ensure the research is relevant and well-informed.

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