Annex A. PRISMA-ScR checklist

Table A1. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist [150]

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE
TITLE			
Title	1	Identify the report as a scoping review.	Title page
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1-2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4-6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4 and Annex B
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Annex C

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4-6 and Annex B, Annex D
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	4-6 and Annex B, Annex E
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	4-6 and Annex B, Annex E
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	4-6 and Annex B
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7-9 and Annex F
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9-35
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-35
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	9-35 and Annex G
SECTION	**ITEM**	**PRISMA-ScR CHECKLIST ITEM**	**REPORTED ON PAGE**
DISCUSSION			

Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	36-39
Limitations	20	Discuss the limitations of the scoping review process.	36
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	40
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	ii

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).
From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. ;169:467–473. doi: 10.7326/M18-0850

Annex B. Detailed description of methods

In this section, we provide details about the tasks undertaken to conduct this scoping review. This covers development of the scoping review protocol and our three methods of searching the literature (one search of four databases and repositories, one search of the European Commission's CORDIS repository of EU-funded research projects, and one series of targeted searches conducted in Google). We then go on to detail how we went about study selection, data extraction, analysis and synthesis, and reporting.

Protocol development

The study protocol (deliverable DL1.1.2 delivered to ECDC in November 2019) was developed following the PRISMA-ScR checklist [150], ensuring that we had taken into account all preferred reporting items when designing the study. The protocol document presented key elements of the proposed approach and methods (described in this chapter) to be used for the study. **Error! Reference source not found.** presents the PRISMA-ScR checklist [150] for this scoping review, indicating where each item can be found within this report.

Literature search

As noted above, the primary objectives of this scoping review and the associated research questions are broad, targeting the development of an expansive understanding of the quantity and nature of the available evidence related to digital technologies and infectious disease surveillance, prevention and control. Consequently, the search strategy and the inclusion criteria are necessarily wide-ranging, maintaining a broad scope in most areas (e.g. any emerging digital technology; any country; any infectious disease). The literature search was comprised of two sub-tasks as described below.

Literature search of scientific databases and repositories

We conducted a search of the publicly available scientific literature on the availability and use of digital technologies for infectious disease surveillance, prevention and control. The scoping review primarily focused on academic literature (including but not limited to systematic reviews, primary research studies, mathematical modelling studies, working papers and conference articles). The search strategy was limited to five years (2015-2019), and was peer-reviewed using the PRESS approach (Peer-Review of Electronic Search Strategies) [18].

Given the broad scope of the research questions we sought to address, we chose to search the following databases and repositories of peer-reviewed scientific literature: (i) PubMed; (ii) Scopus; (iii) Cochrane Database of Systematic Reviews (Wiley); and (iv) ACM Digital Library. The search strategies followed the same broad format across the databases but were tailored to make use of each database's individual search functions (e.g. MeSH terms, proximity operators, etc.). Specific search strategies for each database/repository are detailed in 0. These database/repository searches were run on 25 November 2019, and the results were brought together using EndNote X8.2 reference management software.

Supplementary literature searches

In addition to the database/repository searches described in Task 2a, we conducted supplementary targeted searches to identify a small number of additional articles. These searches were informed by emerging findings (e.g. gaps in the evidence) identified by the research team during the data extraction phase (Task 4). We also undertook a search of the European Commission's CORDIS repository [151].

Targeted searches

We conducted targeted searches of the literature using Google. The aim of these searches was to look for evidence, including non-academic literature if relevant to the study objectives, in those areas where other search strategies had revealed evidence gaps. The starting point for targeted searching was an analysis of the distribution of digital technologies within the data extracted from papers picked up in the database searches, from which we identified the technologies with limited coverage in the existing data set. Specifically, we identified those digital technologies discussed in fewer than 10 of the existing articles.

Using tailored search strings (see Table B.6 in 0), we ran targeted Google searches for each of the identified high-level technology groups1 with dates limited between 1 January 2015 and 25 November 2019 (the date on which the other database/repository searches were conducted). For each search, we screened the first 50 results produced by the Google search. Documents with a clear link to the study scope were identified for further consideration, and we reviewed the abstracts of these articles to confirm their relevance to the study scope. Our search included published academic articles and grey literature (specifically reports and policy documents) but excluded other content, such as websites, blogs, news articles and books. Documents identified by targeted search were cross-checked against our existing database of publications, with those already in the database excluded.

CORDIS

CORDIS is the European Commission's primary public repository and portal to disseminate information on all EU-funded research projects and their results [151]. It is thus a repository for a broad array of outputs and documentary artefacts including project summaries, journal articles, conference proceedings, report summaries, project reports, information on events, and interim findings on ongoing projects.

For CORDIS, our search strategy began with the acquisition of summary data on all active or completed CORDIS projects. The data was provided to RAND Europe by CORDIS administrators on 11 November 2019 and reflected active or completed projects at that time. The complete dataset comprised 57 projects covering a wide range of research areas. Using the longlist of CORDIS research projects, we developed a shortlist of projects based on their relevance to the scope of this study. We then scanned each project's CORDIS web portal (accessed via https://cordis.europa.eu/) for project outputs directly relevant to this study.

In scanning for project documents, we first screened peer-reviewed journal articles associated with each project. Here, we scanned article titles for a clear link to the study scope; namely, the application of digital technologies to infectious disease surveillance, prevention or control. Titles with no clear link were excluded. For those titles that were included, we then reviewed the abstracts of these articles to confirm their relevance to the study scope. In some cases, consideration of the abstract revealed no clear link to the study scope, thereby leading to exclusion of the article. Articles identified for inclusion were then cross-checked against our existing database of extracted publications (as obtained through our literature search of scientific databases and repositories), with those already in the database also excluded.

In addition to peer-reviewed articles, we also screened the broader outputs from each CORDIS project, including non-peer-reviewed articles, conference proceedings and project reports. Here, we used the same strategy as with peer-reviewed publications by scanning document titles for a clear link to digital technology and infectious disease surveillance, prevention or control. With respect to project reports, we considered only final project reports, or, where a project was ongoing, the most recent interim report. Our screening therefore excluded documents reporting on specific technical developments associated with the projects. One reason for this was that many such documents duplicated information already captured within peer-reviewed articles.

Study selection

The study selection was based on the inclusion and exclusion criteria outlined in **Error! Reference source not found.**. We selected eligible studies to include in the scoping review based on title and abstract screening.

[1] The analysis produced numerous digital technologies that spread across different topics and ranged from very specific technologies to more generic technology areas. Some of these technologies could be considered to belong to the same high-level 'family' or 'group' of technologies. Further information about this can be found in Section **Error! Reference source not found.** and **Error! Reference source not found.**.

Table B1. Inclusion and exclusion criteria for studies in the scoping review

	Inclusion	Exclusion
Population/Topic of interest	Infectious disease surveillance, prevention and control in humans	Infectious disease surveillance, prevention and control in plants and animals
Intervention	Any emerging or novel use of digital technologies for public health[2]	Any digital technologies that are not considered emerging within the past five years
Comparison	Any or no comparison	N/A
Outcome	Any potential benefit or disruption to public health key functions	No discussion of potential benefits or disruptions
Study	Completed research studies, research protocols, conference proceedings with full text, theoretical papers, commentaries, letters, working papers, books and book chapters	Conference proceedings that do not include full text
Date	Published in the last five years (2015–2019)	Published before 2015
Language	English articles included and extracted non-English articles included but data only extracted from the abstract	No exclusion based on language, but data only extracted from abstracts and articles available in English

Prior to commencing study selection, the study team engaged in a pilot screening exercise in order to test and refine the eligibility criteria and to ensure that the project team had a shared understanding of inclusion and exclusion criteria. Three reviewers (BL, EG, AG) participated in the pilot screening on 27 November 2019, with each reviewer screening the same 100 articles. After screening an initial 25 articles, the three screeners met with the project leader (SG) and manager (AD) to discuss which articles were eligible for inclusion. The project team then made refinements to the eligibility criteria based on these discussions. Pilot screening continued, with reviewers applying the revised eligibility criteria and discussing any areas of uncertainty or disagreement, until 100 articles had been screened with full agreement on inclusion. In 0, we provide information related to the types of articles and corresponding decisions made for inclusion/exclusion after pilot screening.

The remaining references were divided evenly among the three screeners (BL, EG, AG) by author last name. Any references about which the original screener was unsure were saved in a separate folder in EndNote, which was later screened by two members of the research team (BL, JF). In collaboration with the project leader (SG) and manager (AD), these researchers came to a consensus about each of the remaining articles until a final set of articles to be included in the full-text review had been identified.

Selection of eligible studies identified through the supplementary searches proceeded in a similar way. All results returned by the search of the CORDIS repository and targeted searches of Google and Google Scholar were screened for inclusion. These tasks were conducted by members of the research team who were involved with screening the articles identified through database searches (EG, JF). These researchers were therefore familiar with the inclusion/exclusion criteria as refined and agreed during the pilot phase of screening.

Data extraction

Having selected the studies to include in the scoping review, we proceeded to extract data from each publication to inform estimates of the amount, range and nature of the evidence on the availability and use of digital technologies for infectious disease surveillance, prevention and control. In cases where we were not able to acquire a copy of the full-text publication in English without additional cost, we extracted data from the relevant abstract

[2] For the purposes of this study, we include digital technologies employed for public health in ways that were novel or innovative at the time of publication (i.e. within the last five years). This includes emerging technologies such as artificial intelligence and Internet of Things, but also novel uses of established technologies such as smartphones.

or chapter summary. This occurred when the original article was written in a language other than English and when the full text was not available via RAND Knowledge Services. Cases where data were extracted only from an abstract or chapter summary were clearly marked in the data extraction template.

Because of the large number of articles identified for inclusion, data extraction was carried out by five reviewers (EG, GA, BL, JF, AG), each working independently and inputting data into an Excel extraction table (see **Error! Reference source not found.**). The reviewers communicated regularly to ensure that any uncertainties about how to use the template were resolved early, allowing for a consistent approach to be followed by all team members.

A sample of the extraction template with 23 articles was submitted to ECDC for review and feedback, before finalising the template and continuing with data extraction. The extraction template (**Error! Reference source not found.**) was designed to facilitate the filtering, summarising and analysis of the extracted data in Task 5. Columns were included in the extraction template to cover publication details such as date, study type, aims and research questions; geographical context of the intervention and the paper's key contributors (typically first and last authors); details about the novel digital technologies and novel applications of established digital technologies; infectious diseases and public health key functions (PHKF) targeted; potential obstacles and negative impacts of implementing the technologies in the context discussed; and space to record other noteworthy comments such as study findings and/or recommendations for future research. Where possible, drop-down menus were assigned to columns to limit the range of responses that could be submitted, thus facilitating data filtering and analysis. The fields in the different drop-down menus are presented in 0.

It is worth highlighting the field 'public health key function(s) impacted' in the extraction template. In discussion with ECDC and factoring in the nature and scope of the study, we devised the below categorisation of six public health key functions.

1. Screening and diagnostics: Identifying infectious disease in individuals
2. Surveillance and monitoring: Monitoring infectious disease patterns and trends in populations
3. Forecasting: Forecasting infectious disease outbreaks (e.g. for outbreak prediction)
4. Signal/outbreak detection and validation: Detecting and validating infectious disease outbreaks
5. Outbreak response: Responding to infectious disease outbreaks
6. Communication/collaboration: Communication involves informing, educating and empowering people about infectious diseases using digital technologies (e.g. social media). Collaboration refers to the technologies, platforms and tools used to improve reporting and communication across disciplines or sectors, as well as those used to improve the identification, selection and analysis of evidence.

These categories were arrived at by mapping a selection of high-level public health key functions (such as surveillance, monitoring, prevention, control, and prediction) against the World Health Organisation's (WHO) 10 essential public health operations [16] and the Centers for Disease Control and Prevention's (CDC) essential public health services [17], to identify areas of commonality that might help define and distinguish key functions. Each technology was assigned one PHKF code based on data extracted from the academic source under review. We used the data and the emphasis of the narrative describing each technology to guide how we applied the PHKF codes.

Table B2. Data extraction table for the scoping review[3]

Study number	Where picked up	Citation	Publication Year	Article type	Study type	Is it a comparative study?	Short description of comparison *(where relevant)*
		Free Text	*Drop-down menu*	*Drop-down menu*	*Drop-down menu*	*Drop-down menu*	*Free Text*
1	**Database Search**						
2	**CORDIS**						
3	**Targeted Search**						

Study number	Geographical context (EU/EEA, Non-EU/EEA or Both)	Specific country context	Study aims/ objectives	Main research question(s) (*when /as described by the authors)*	Contributing Region (EU/EEA, Non-EU/EEA or Both)	Prominent contributing countries (*e.g. first and last author country/-ies)*	Prominent contributing organisation(s) *(e.g. first and last author affiliations)*
	Drop-down menu	*Free Text*	*Free Text*	*Free Text*	*Drop-down menu*	*Free Text*	*Free Text*
1							
2							
3							

Study number	High-level technology group	Digital technology	Additional specific information associated with the digital technology *(e.g. platforms, service providers, algorithms)*	Concise description of digital technology (when/ *as described by authors)*	Specific disease(s) targeted by digital technology	Disease Category	Infectious disease(s) for coding
	Drop-down menu	*Drop-down menu*	*Free Text*	*Free Text*	*Free Text*	*Drop-down menu*	*Free Text*
1							
2							
3							

[3] Details of options available in each of the drop-down menus are provided in 0.

Study number	Public health key function(s) impacted	Potential benefits to public health functions (when/as described by authors)	Potential negative impacts of digital technology in the context of public health (as described by authors)	Potential obstacles/ barriers to implementation (when/as described by authors in the public health context described)	Implemented/ Proposed (or 'concept') in the public health context described	Additional comments (including relevant study findings/ recommendations)
	Drop-down menu	*Free Text*	*Free Text*	*Free Text*	*Drop-down menu*	*Free Text*
1						
2						
3						

Analysis and synthesis

The plan for the analysis and synthesis was devised and directed by the project leader (SG) in discussion with core members of the research team (AD, GA, EG). The extraction phase resulted in numerous digital technologies cutting across different areas and ranging from highly specific technologies to more generic technology areas. Some of these technologies could be considered as belonging to the same 'family' or high-level 'group' of technologies. To facilitate the analysis of the data on digital technologies, we matched the digital technologies recorded in the data extraction template against the most relevant technology descriptions from the European Commission's Digital Single Market glossary [33]. Drawing on this existing glossary, some additional sources and our own previous work in the field of digital technologies, we produced a set of high-level technology 'groups' to cluster the digital technologies recorded in our data extraction template. A glossary of the high-level technology groups is included in **Error! Reference source not found.** along with the method we used to develop the glossary. This was primarily done by the project manager (AD), with direction provided by the project leader (SG) and inputs from the researchers undertaking the data analysis (GA, EG).

The next step in Task 5 was to clean and prepare the master Excel file for analysis. Extracted data were harmonised across the file to ensure that all analyses produced accurate results. For example, all mentions of the 'US', 'USA', 'United States' and 'United States of America' were aligned to 'USA'.

All data recorded using drop-down menus or short-answer formats were analysed using Microsoft Excel. These analyses explored publication year, article/study type, geographical context, infectious disease, digital technology and public health key function, including cross-analyses of the relationships between these categories. These analyses were all conducted by two core members of the research team (GA, EG), with regular ongoing discussions with the project leader (SG) and manager (AD), to ensure a consistent approach across the analyses. The Excel spreadsheet was also reviewed by a senior RAND Europe researcher leader, who is not part of the core project team and has significant experience in both quantitative research and quality assurance processes.

For the open-text data column on barriers to successful implementation of digital technologies, we conducted a rapid manual analysis in Excel to arrive at a set of key themes. The process to identify the key themes was undertaken qualitatively and in an iterative manner. We began with an initial sweep through all the entries in the extraction template column to identify a series of themes. We then began to code the extracted open-text data on barriers under the identified themes. Throughout this process, we continued to identify additional themes and to group the themes according to shared concepts. This process of verifying and refining the themes produced a final list of key overarching themes. These analyses were conducted by a core member of the research team (GA) in discussion with the project leader (SG).

Reporting

Once the data collection and analysis were completed, we progressed to the reporting phase of the study. We integrated evidence from the different preceding tasks to address the core objectives of the study. This report (DL1.1.4) built on and further developed the interim scoping review report (DL1.1.3). The study team added and elaborated on information contained in the introduction and methods of DL1.1.3 and included a discussion of the main findings of the study, as well as relevant annexes. Finally, the report was shared with two independent reviewers within RAND Europe to carry out our internal quality assurance (QA) process. Final edits were made based on their comments and edits.

Annex C. Search strategies

Table C1. PubMed search strategy

#	Search terms	Results
#1	((infect*[tw] OR communicable[tw]) AND disease*[tw]) OR outbreak*[tw] OR "communicable diseases"[MeSH]	1,027,898
#2	(monitor*[tw] OR epidemiolog*[tw] OR surveillance[tw] OR diagnos*[tw] OR detect*[tw] OR respons*[tw] OR prevent*[tw] OR control*[tw] OR "IPC"[tw] OR notif*[tw] OR epidemiology[MeSH] OR diagnosis[MeSH] OR "infection control"[MeSH] OR "disease notification"[MeSH])	16,926,756
#3	(digital technolog*[tw] OR "information technology"[Mesh] OR information technolog*[tw] OR communication technolog*[tw] OR communications technolog*[tw] OR "ICT"[tw] OR new technolog*[tw] OR digital innovation*[tw] OR digital technolog*[tw] OR emerging technolog*[tw] OR disruptive technolog*[tw] OR machine learning[tw] OR blockchain[tw] OR "data mining"[tw] OR datamining[tw] OR crowdsourcing[tw] OR "crowd sourcing"[tw] OR "satellite imagery"[tw] OR automation[tw] OR "augmented reality"[tw] OR "virtual reality"[tw] OR virtual setting*[tw] OR drone[tw] OR drones[tw] OR 3D print*[tw] OR cloud[tw] OR "internet of things"[tw] OR "iot"[tw] OR 3G[tw] OR 4G[tw] OR 5G[tw] OR "artificial intelligence"[tw] OR "ai"[tw] OR "big data"[tw] OR "deep learning"[tw] OR "nano"[tw] OR "digital health"[tw] OR robotic*[tw] OR quantum comput*[tw] OR "additive manufacturing"[tw] OR ((cellular phone*[tw] OR cell phone*[tw] OR mobile phone*[tw]) AND health technol*[tw] OR biomedical technol* OR medical technol*) OR "social media"[tw] OR facebook[tw] OR instagram[tw] OR twitter[tw] OR remote sensing technol*[tw] OR satellite imaging[tw] OR satellite communication*[tw] OR autonomous vehicle*[tw] OR smart fabric*[tw] OR wearables[tw] OR wearable technol*[tw] OR ingestibles[tw] OR (ingestible[tw] AND (technol*[tw] OR sensor*[tw])) OR wearable electronic device*[tw] OR "Data Mining"[Mesh] OR "Crowdsourcing"[Mesh] OR "Automation"[Mesh] OR "Virtual Reality"[Mesh] OR "Printing, Three-Dimensional"[Mesh] OR "Cloud Computing"[Mesh] OR "Artificial Intelligence"[Mesh] OR "Big Data"[Mesh] OR ("Cell Phone"[Mesh] AND "Biomedical Technology"[Mesh]) OR "Social Media"[Mesh] OR "Remote Sensing Technology"[Mesh] OR "Satellite Communications"[Mesh] OR "Wearable Electronic Devices"[Mesh])	393,803
#4	#1 AND #2 AND #3	6,754
#5	**(#1 AND #2 AND #3) Filters: Publication date from 2015/01/01**	**3,147**

Table C2. Scopus search strategy

#	Search terms	Results
#1	((TITLE-ABS-KEY ((infect* OR communicable)) AND TITLE-ABS-KEY (disease*))) OR (TITLE-ABS-KEY (outbreak*))	1,565,588
#2	TITLE-ABS-KEY ((monitor* OR epidemiolog* OR surveillance OR diagnos* OR detect* OR respons* OR prevent* OR control* OR "IPC" OR notif*))	26,506,441
#3	TITLE-ABS-KEY ((digital W/2 technolog* OR information W/2 technolog* OR communication* W/2 technolog* OR "ICT" OR "new technolog*" OR digital W/2 innovation* OR digital W/2 technolog* OR emerging W/2 technolog* OR disruptive W/2 technolog* OR "machine learning"))	55,681
#4	TITLE-ABS-KEY ((blockchain OR data W/2 mining OR data W/2 mined OR datamining OR crowdsourcing OR "crowd sourcing" OR satellite W/2 imagery OR automation OR "virtual reality" OR "virtual setting" OR drone OR drones))	1,802
#5	TITLE-ABS-KEY (augmented W/2 reality OR 3D W/2 print*)	72
#6	(TITLE-ABS-KEY (cloud OR "internet of things" OR "iot" OR 3g OR 4g OR 5g OR "artificial intelligence" OR "ai" OR "big data" OR "deep learning" OR nano OR "digital health" OR robotic* OR "quantum comput*" OR "additive manufacturing"))	1,584,434
#7	TITLE-ABS-KEY ("social media" OR facebook OR instagram OR twitter OR "remote sensing technol*" OR satellite W/2 imaging OR satellite W/2 image* OR satellite W/2 communication* OR "autonomous vehicle*")	49,688
#8	TITLE-ABS-KEY (smart AND fabric* OR wearable* W/2 technol* OR ingestibles OR "wearable electronic device*")	2,896
#9	TITLE-ABS-KEY ((ingestible* AND (technol* OR sensor*)) OR ((cell* W/0 phone* OR cell* W/0 telephone* OR "mobile phone*") AND (health W/2 technol* OR biomedical W/2 technol* OR medical W/2 technol*)))	329
#10	#3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9	1,686,295
#11	#1 AND #2 AND #10	5,844
#12	**Limit #11 to (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015)**	**2,775**

Table C3. Cochrane Database of Systematic Reviews (CDSR) search strategy

#	Search terms	Results
#1	((infect* OR communicable)):ti,ab,kw AND (disease*):ti,ab,kw	53,335
#2	outbreak*:ti,ab,kw	1,085
#3	MeSH descriptor: [Communicable Diseases] explode all trees	1,361
#4	#1 OR #2 OR #3	54,038
#5	monitor*:ti,ab,kw OR epidemiolog*:ti,ab,kw OR surveillance:ti,ab,kw OR diagnos*:ti,ab,kw OR detect*:ti,ab,kw OR respons*:ti,ab,kw OR prevent*:ti,ab,kw OR control*:ti,ab,kw OR IPC:ti,ab,kw OR notif*:ti,ab,kw	1,127,703
#6	MeSH descriptor: [Epidemiology] explode all trees	46
#7	MeSH descriptor: [Diagnosis] explode all trees	321,324
#8	MeSH descriptor: [Infection Control] explode all trees	1,145
#9	MeSH descriptor: [Disease Notification] explode all trees	18
#10	#5 OR #6 OR #7 OR #8 OR #9	1,181,984
#11	("disruptive technolog*"):ti,ab,kw OR ("machine learning"):ti,ab,kw OR blockchain:ti,ab,kw OR ("data mining"):ti,ab,kw OR datamining:ti,ab,kw OR crowdsourcing:ti,ab,kw OR ("crowd sourcing"):ti,ab,kw OR ("satellite imagery"):ti,ab,kw OR automation:ti,ab,kw OR ("augmented reality"):ti,ab,kw OR ("virtual reality"):ti,ab,kw OR ("virtual setting"):ti,ab,kw OR drone:ti,ab,kw OR ("3d print*"):ti,ab,kw OR cloud:ti,ab,kw OR ("internet of things"):ti,ab,kw OR iot:ti,ab,kw OR 3G:ti,ab,kw OR 4G:ti,ab,kw OR 5G:ti,ab,kw OR ("artificial intelligence"):ti,ab,kw OR "ai":ti,ab,kw OR ("big data"):ti,ab,kw OR ("deep learning"):ti,ab,kw OR nano:ti,ab,kw OR ("digital health"):ti,ab,kw OR robotic*:ti,ab,kw OR ("quantum comput*"):ti,ab,kw OR ("additive manufacturing"):ti,ab,kw	15,835
#12	("digital technolog*"):ti,ab,kw OR ("information technolog*"):ti,ab,kw OR ("communication technolog*"):ti,ab,kw OR ("communications technolog*"):ti,ab,kw OR ICT:ti,ab,kw OR ("new technolog*"):ti,ab,kw OR ("digital innovation*"):ti,ab,kw OR ("digital technolog*"):ti,ab,kw OR ("emerging technolog*"):ti,ab,kw	573
#13	(("cellular phone*"):ti,ab,kw OR ("Cell phone*"):ti,ab,kw OR ("mobile phone*"):ti,ab,kw) AND (("health technol*"):ti,ab,kw OR ("biomedical technol*"):ti,ab,kw OR ("medical technol*"):ti,ab,kw)	0
#14	("social media"):ti,ab,kw OR facebook:ti,ab,kw OR instagram:ti,ab,kw OR twitter:ti,ab,kw OR ("remote sensing technol*"):ti,ab,kw OR ("satellite imaging"):ti,ab,kw OR ("satellite communication*"):ti,ab,kw OR ("autonomous vehicle*"):ti,ab,kw OR ("smart fabric*"):ti,ab,kw OR wearables:ti,ab,kw OR ("wearable technol*"):ti,ab,kw OR ingestibles:ti,ab,kw OR ((ingestible):ti,ab,kw AND (technol*:ti,ab,kw OR sensor*):ti,ab,kw) OR ("wearable electronic device*"):ti,ab,kw	1,207
#15	MeSH descriptor: [Data Mining] explode all trees	19
#16	MeSH descriptor: [Crowdsourcing] explode all trees	12

#17	MeSH descriptor: [Automation] explode all trees	850
#18	MeSH descriptor: [Virtual Reality] explode all trees	104
#19	MeSH descriptor: [Printing, Three-Dimensional] explode all trees	45
#20	MeSH descriptor: [Cloud Computing] explode all trees	3
#21	MeSH descriptor: [Artificial Intelligence] explode all trees	981
#22	MeSH descriptor: [Big Data] explode all trees	1
#23	MeSH descriptor: [Cell Phone] explode all trees	1,172
#24	MeSH descriptor: [Biomedical Technology] explode all trees	23
#25	MeSH descriptor: [Social Media] explode all trees	116
#26	MeSH descriptor: [Remote Sensing Technology] explode all trees	32
#27	MeSH descriptor: [Satellite Communications] explode all trees	1
#28	MeSH descriptor: [Wearable Electronic Devices] explode all trees	347
#29	#23 AND #24	2
#30	#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #29 OR #25 OR #26 OR #27 OR #28	18,151
#31	#4 AND #10 AND #30	535
#32	Cochrane Reviews – limited to 2015-present	12
#33	Trials – limited to 2015 -present	345
#34	**#32 OR #33**	**357**

Table C4. ACM Digital Library - Full Text Collection search strategy

#	Search terms	Results
#1	Any Field: matches all: infection Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Any Field: matches none: malware Year range: on or after: 2015	293*
#2	Any Field: matches all: infections Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Any Field: matches none: malware Year range: on or after: 2015	293*
#3	Any Field: matches all: Infectious Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Year range: on or after: 2015	107
#4	Any Field: matches all: communicable Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Year range: on or after: 2015	46
#5	Any Field: matches all: outbreak Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Year range: on or after: 2015	125†
#6	Any Field: matches all: outbreaks Any Field: matches any: monitor monitors epidemiology epidemiological surveillance diagnose diagnosis diagnoses diagnosed detection detect detects response responsive responses prevent prevents prevention control controls ipc notify notification notifies Year range: on or after: 2015	125†
#7	**Total**	**497**

*Search terms returned the same results as each other.

†Search terms returned the same results as each other.

Table C5. CORDIS search strategy

#	Search terms	Results
1	contenttype='project' AND (programme/code='H2020') AND ('infectious disease*' OR 'communicable disease*' OR 'outbreak*') AND ('monitor*' OR 'surveillance' OR 'detect*' OR 'respons*' OR 'prevent*' OR 'control*' OR 'IPC' OR 'notif*') AND ('technolog*' OR 'ICT')	57

Note: CORDIS is the European Commission's primary public repository and portal to disseminate information on all EU-funded research projects and their results in the broadest possible sense. It is thus a repository of a broad array of outputs and documentary artefacts including project summaries, journal articles, conference proceedings, report summaries, project reports, information on events, and interim findings on ongoing projects. As a result, unlike other bibliographic databases or repositories considered for this study, we adopted a different approach for CORDIS.

For CORDIS, the search focused on identifying an initial long-list of projects as a first step. From the initial long-list of projects, we filtered projects on the basis of their relevance to the scope of this study. For each relevant project, we considered a selection of project publications focussing on final project reports, published conference proceedings, and peer-reviewed journal articles. Where a relevant project was ongoing and had only interim project outputs available, we considered the most recent and detailed interim deliverable for extraction as part of the scoping review.

In consequence of this strategy, unlike the search results identified for PubMed, Scopus, Cochrane, and ACM, the results column in the above table refers to the number of projects instead of number of publications.

Table C6. Targeted search strings

Technology category	Search string used
3D-printing	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("3D printing" OR "3D-printing" OR "additive manufacturing")
Biosensors	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("biosensors")
Blockchain/Distributed ledger technology	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("blockchain" OR "distributed ledger technology")
Cellular networks	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("cellular networks")
Drones	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("drone" OR "drones" OR "UAV" OR "unmanned aerial vehicle")
Expert systems	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("expert systems")
Health informatics and EHRs	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("electronic health record" OR "electronic medical record" OR "health informatics")
Image and signal processing	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("image processing" OR "signal processing")
Lab-on-chip (LOC)	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("lab on chip" OR "lab on a chip")

Natural language processing	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("natural language processing")
Parallel computing	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("parallel computing")
Robotics	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("robot" OR "robotics")
Telemedicine	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("telemedicine")
VR/AR	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("virtual reality" OR "augmented reality" OR "VR" or "AR")
Wireless sensor networks	(infection OR "infectious disease" OR disease OR outbreak OR "antimicrobial resistance" OR "communicable disease") AND (epidemiology OR screen OR diagnose OR surveillance OR monitor OR forecast OR signal OR detection OR validation OR response OR communication OR collaboration OR prevention OR control) AND ("wireless sensor networks")

Annex D. Inclusion and exclusion criteria

Table D1. High-level information on types of articles and decisions made for inclusion/ exclusion after pilot screening

Nature of articles	Include/exclude	Rationale for inclusion/exclusion	Example articles
Articles on infectious diseases not in the list of 56 diseases monitored by ECDC	Include	Emerging communicable diseases which are not part of ECDC's list of 56 diseases to be considered when relevant to the scope of the study.	Balashankar, A., et al. (2019). Reconstructing the MERS disease outbreak from news, Association for Computing Machinery, Inc.
Articles on established digital technologies (e.g. mobile phones, Internet) where their use is novel in a specific context	Include	Novel uses of established digital technologies to be considered when relevant to the scope of the study.	Barde, P. V., et al. (2018). "Timely diagnosis, use of information technology and mosquito control prevents dengue outbreaks: Experience from central India." J Infect Public Health 11(5): 739-741
Articles on point-of-care-testing if they incorporate emerging digital technology	Include	The use of digital technologies in contexts such as point-of-care testing to be considered when relevant to the scope of the study.	Barroso, T. G., et al. (2018). "Detection of BCG bacteria using a magnetoresistive biosensor: A step towards a fully electronic platform for tuberculosis point-of-care detection." Biosensors and Bioelectronics 100: 259-265
Articles discussing the use of social media, data analytics, or other similar digital technologies for disease prevention, control, and monitoring	Include	The use of social media in such contexts to be considered when relevant to the scope of the study.	Barros, J. M., et al. (2018). "Disease mentions in airport and hospital geolocations expose dominance of news events for disease concerns." J Biomed Semantics 9(1): 18; Bardak, B. and M. Tan (2017). Disease outbreak prediction by data integration and multi-task learning, Institute of Electrical and Electronics Engineers Inc; Bataille, J. and P. Brouqui (2017). "Building an Intelligent Hospital to Fight Contagion." Clin Infect Dis 65(suppl_1): S4-s11
Articles on internet-enabled hospital equipment that could be used to reduce infection	Include	Digital technology with the potential to monitor infectious diseases to be considered when relevant to the scope of the study	Bal, M. and R. Abrishambaf (2017). A system for monitoring hand hygiene compliance based-on Internet-of-Things, Institute of Electrical and Electronics Engineers Inc

Nature of articles	Include/exclude	Rationale for inclusion/exclusion	Example articles
Articles including generic descriptions of digital technology use without an indication of specific application or innovation or that contain very limited information on the actual technology use	Exclude	Insufficient information contained in the abstract to understand the actual use/application of digital technologies and thus lack of relevance to the objectives of the study	Beare, S., et al. (2019). "Rapid Integration of Zika Virus Prevention Within Sexual and Reproductive Health Services and Beyond: Programmatic Lessons From Latin America and the Caribbean." Glob Health Sci Pract 7(1): 116-127; Batallan, G. P., et al. (2015). "St. Louis Encephalitis virus mosquito vectors dynamics in three different environments in relation to remotely sensed environmental conditions." Acta Trop 146: 53-59; Basch, C. H., et al. (2019). "Escherichia coli on the internet: The power of YouTube to educate and influence consumer behavior regarding pathogenic bacteria." Infect Dis Health 24(2): 107-112.
Articles on digital technology aimed at broadening understanding of infectious disease causes but not specifically about surveillance, prevention, or control	Exclude	Developing infectious disease aetiology considered outside the scope of this study	Babayan, S. A., et al. (2018). "Predicting reservoir hosts and arthropod vectors from evolutionary signatures in RNA virus genomes." Science 362(6414): 577-580; Baddal, B. (2019). "Next-generation technologies for studying host-pathogen interactions: a focus on dual transcriptomics, CRISPR/Cas9 screening and organs-on-chips." Pathog Dis 77(6); Bal, M. and R. Abrishambaf (2017). A system for monitoring hand hygiene compliance based-on Internet-of-Things, Institute of Electrical and Electronics Engineers Inc.
Articles on digital technologies used to deliver behavioural change interventions	Exclude	Behavioural interventions are outside the scope of this study	Bailey, J. V., et al. (2015). "The Men's Safer Sex (MenSS) trial: protocol for a pilot randomised controlled trial of an interactive digital intervention to increase condom use in men." BMJ Open 5(2): e007552; Bayona, E., et al. (2017). "The Experiences of Newly Diagnosed Men Who Have Sex with Men Entering the HIV Care Cascade in Lima, Peru, 2015-2016: a Qualitative Analysis of Counselor-Participant Text Message Exchanges." Cyberpsychol Behav Soc Netw 20(6): 389-396

Nature of articles	Include/exclude	Rationale for inclusion/exclusion	Example articles
Articles identifying uses of emerging digital technologies to develop a treatment or vaccine	Exclude	Treatment/vaccine development is outside the scope of ECDC's remit	Basit, A. H., et al. (2018). "Training host-pathogen protein-protein interaction predictors." J Bioinform Comput Biol 16(4): 1850014; Bai, J. P. F. (2016). "Pharmacodynamics and Systems Pharmacology Approaches to Repurposing Drugs in the Wake of Global Health Burden." J Pharm Sci 105(10): 3007-3012

Annex E. Extraction template drop-down menus

In this annex, we present the drop-down menus that were available to researchers when using the extraction template to record data extracted from the included articles. The drop-down menus for high-level technology groups are not presented here, as they were added later.

Publication Year	Article type	Study type	Is it a comparative study?	Geographical context	Contributing Region	Disease Category	Public health key function(s) impacted	Implementation Phase
2015 2016 2017 2018 2019	Research article Commentary Conference proceeding Working paper Book chapter	Primary study Mathematical model/simulation Systematic review Scoping review Other literature review N/A Unclear	Yes No N/A Unclear	EU/EEA and UK Non-EU/EEA Both EU/EEA and non-EU/EEA N/A Not reported Unclear	EU/EEA and UK Non-EU/EEA Both EU/EEA and non-EU/EEA	Any infectious disease Related infectious diseases Specific infectious disease(s)	Screening and diagnostics Surveillance and monitoring Forecasting Signal/outbreak detection and validation Outbreak response Communication/collaboration	Implemented Proposed Both

Annex F. Articles excluded during full-text review

In this annex, we list the 44 articles that were excluded at the full-text review stage, presenting them in groups according to the reason for which they were excluded.

Not a novel use of digital technology (n=24)

- Bordonaro, S. F., D. C. McGillicuddy, F. Pompei, D. Burmistrov, C. Harding, and L. D. Sanchez. 2016. 'Human temperatures for syndromic surveillance in the emergency department: data from the autumn wave of the 2009 swine flu (H1N1) pandemic and a seasonal influenza outbreak', BMC Emerg Med, 16: 16.
- Chang, Hung-Ju, Peter L. Voyvodic, Ana Zúñiga, and Jérôme Bonnet. 2017. 'Microbially derived biosensors for diagnosis, monitoring and epidemiology', Microbial Biotechnology, 10: 1031-35.
- Flies, E. J., et al. (2016). "Improving public health intervention for mosquito-borne disease: the value of geovisualization using source of infection and LandScan data." Epidemiol Infect 144(14): 3108-3119.
- Gardy, J., et al. (2015). "Real-time digital pathogen surveillance - the time is now." Genome Biol 16(1): 155.
- HabibiSaravi, R., et al. (2019). "Communicable diseases management in disasters: an analysis of improvement measures since 2005, Islamic Republic of Iran." East Mediterr Health J 25(4): 269-281.
- Harding-Esch, E. M., et al. (2015). Can Remote STI/HIV Testing and eClinical Care be Compatible with Robust Public Health Surveillance? Proceedings of the 5th International Conference on Digital Health 2015. Florence, Italy, ACM.
- Mahato, K., A. Srivastava and P. Chandra (2017). "Paper based diagnostics for personalized health care: Emerging technologies and commercial aspects." Biosens Bioelectron 96: 246-259.
- Mohapatra, C., S. S. Rautray and M. Pandey (2017). Prevention of infectious disease based on big data analytics and map-reduce, Institute of Electrical and Electronics Engineers Inc.
- Onischenko GG, Popova AY, Smolensky VY, Maletskaya OV, Taran TV, Dubyansky VM, et al. [Analysis of foreign experience of maintenance of biological safety of the Olympic Games]. Zhurnal mikrobiologii, epidemiologii, i immunobiologii. 2015(2):105-9.
- Parker, J. and J. Chen (2017). "Application of next generation sequencing for the detection of human viral pathogens in clinical specimens." J Clin Virol 86: 20-26.
- Pettengill, J. B., et al. (2016). "Real-Time Pathogen Detection in the Era of Whole-Genome Sequencing and Big Data: Comparison of k-mer and Site-Based Methods for Inferring the Genetic Distances among Tens of Thousands of Salmonella Samples." PLoS One 11(11): e0166162.
- Schaible, B. J., K. R. Snook, J. Yin, A. M. Jackson, J. O. Ahweyevu, M. Chong, Z. T. H. Tse, H. Liang, K. W. Fu, and I. C. Fung. 2019. 'Twitter Conversations and English News Media Reports on Poliomyelitis in Five Different Countries, January 2014 to April 2015', Perm J, 23.
- Seleznev, N. E. and V. N. Leonenko (2017). Boosting Performance of Influenza Outbreak Prediction Framework. A. V. Boukhanovsky, A. V. Chugunov, D. A. Alexandrov, Y. Kabanov and O. Koltsova, Springer Verlag. 745: 374-384.
- Senescau, A., T. Kempowsky, E. Bernard, S. Messier, P. Besse, R. Fabre, and J. M. Francois. 2018. 'Innovative DendrisChips((R)) Technology for a Syndromic Approach of In Vitro Diagnosis: Application to the Respiratory Infectious Diseases', Diagnostics (Basel), 8.
- Shafiee, H., S. Wang, F. Inci, M. Toy, T. J. Henrich, D. R. Kuritzkes, and U. Demirci. 2015. 'Emerging technologies for point-of-care management of HIV infection', Annu Rev Med, 66: 387-405.
- Sharma, M., et al. (2017). "Zika virus pandemic-analysis of Facebook as a social media health information platform." Am J Infect Control 45(3): 301-302.
- Singh, H., M. Shimojima, S. Fukushi, A. Le Van, M. Sugamata, and M. Yang. 2015. 'Increased sensitivity of 3D-Well enzyme-linked immunosorbent assay (ELISA) for infectious disease detection using 3D-printing fabrication technology', Biomed Mater Eng, 26 Suppl 1: S45-53.
- Singh, H., M. Shimojima, T. Shiratori, V. An le, M. Sugamata, and M. Yang. 2015. 'Application of 3D Printing Technology in Increasing the Diagnostic Performance of Enzyme-Linked Immunosorbent Assay (ELISA) for Infectious Diseases', Sensors (Basel), 15: 16503-15.

- Singh, H., T. Morita, Y. Suzuki, M. Shimojima, A. Le Van, M. Sugamata, and M. Yang. 2015. 'High sensitivity, high surface area Enzyme-linked Immunosorbent Assay (ELISA)', Biomed Mater Eng, 26: 115-27.
- Tang, L., B. Bie, and D. Zhi. 2018. 'Tweeting about measles during stages of an outbreak: A semantic network approach to the framing of an emerging infectious disease', Am J Infect Control, 46: 1375-80.
- Tom-Aba, D., A. Olaleye, A. T. Olayinka, P. Nguku, N. Waziri, P. Adewuyi, O. Adeoye, S. Oladele, A. Adeseye, O. Oguntimehin, and F. Shuaib. 2015. 'Innovative Technological Approach to Ebola Virus Disease Outbreak Response in Nigeria Using the Open Data Kit and Form Hub Technology', PLoS One, 10: e0131000.
- Wei T-Y, Cheng C-M. Synthetic Biology-Based Point-of-Care Diagnostics for Infectious Disease. Cell chemical biology. 2016;23:1056-66.
- Wheeler, N. E., P. P. Gardner, and L. Barquist. 2018. 'Machine learning identifies signatures of host adaptation in the bacterial pathogen Salmonella enterica', PLoS Genet, 14: e1007333.
- Willis, S. J., et al. (2019). "Electronic Health Record Use in Public Health Infectious Disease Surveillance, USA, 2018-2019." Curr Infect Dis Rep 21(10): 32.

Not focused on infectious disease (n=6)

- (2016). 2016 International Conference on Computing Technologies and Intelligent Data Engineering, ICCTIDE 2016, Institute of Electrical and Electronics Engineers Inc.
- Aarathi, S., et al. (2019). "Trends and techniques of handling big health data." International Journal of Engineering and Advanced Technology 8(3 Special Issue): 798-804.
- Gong, Y. and M. Zheng (2018). The effect analysis of critical subgroup based on K-core on public outbreak as big data, Institute of Electrical and Electronics Engineers Inc.
- Pham, C. V., et al. (2017). Limiting the Spread of Epidemics within Time Constraint on Online Social Networks. Proceedings of the Eighth International Symposium on Information and Communication Technology. Nha Trang City, Viet Nam, ACM.
- Pisano, J., et al. (2016). "Social media as a tool for antimicrobial stewardship." Am J Infect Control 44(11): 1231-1236.
- Valdes Angues, R., A. Suits, V. S. Palmer, C. Okot, R. A. Okot, C. Atonywalo, S. K. Gazda, D. L. Kitara, M. Lantum, and P. S. Spencer. 2018. 'A real-time medical cartography of epidemic disease (Nodding syndrome) using village-based lay mHealth reporters', PLoS Negl Trop Dis, 12: e0006588.

Not focused on human health (n=3)

- Bagcioglu, M., et al. (2019). "Detection and Identification of Bacillus cereus, Bacillus cytotoxicus, Bacillus thuringiensis, Bacillus mycoides and Bacillus weihenstephanensis via Machine Learning Based FTIR Spectroscopy." Front Microbiol 10: 902.
- Shah, N., H. Shah, M. Malensek, S. L. Pallickara, and S. Pallickara. 2016. "Network analysis for identifying and characterizing disease outbreak influence from voluminous epidemiology data." In, edited by R. Ak, G. Karypis, Y. Xia, X. T. Hu, P. S. Yu, J. Joshi, L. Ungar, L. Liu, A. H. Sato, T. Suzumura, S. Rachuri, R. Govindaraju and W. Xu, 1222-31. Institute of Electrical and Electronics Engineers Inc.
- Valdes-Donoso, P., et al. (2017). "Using Machine Learning to Predict Swine Movements within a Regional Program to Improve Control of Infectious Diseases in the US." Front Vet Sci 4: 2.

No abstract or full text available (n=5)

- (2017). International Conference on Smart Health, ICSH 2017. E. Karahanna, I. Bardhan, H. Chen and D. D. Zeng, Springer Verlag. 10347 LNCS: 1-291.
- (2018). 12th International Conference on Evaluation of Novel Approaches to Software Engineering, ENASE 2017. E. Damiani, G. Spanoudakis and L. Maciaszek, Springer Verlag. 866.
- (2019). 13th International Conference on Data Integration in the Life Sciences, DILS 2018. M. E. Vidal and S. Auer, Springer Verlag. 11371 LNBI.
- (2019). 2019 International Conference on High Performance Big Data and Intelligent Systems, HPBD and IS 2019, Institute of Electrical and Electronics Engineers Inc.
- (2019). Session details: Innovation for Global Health: From Wellbeing to Epidemics and Outbreaks. Proceedings of the 9th International Conference on Digital Public Health. Marseille, France, ACM.

Duplicate of another included article (n=6)

- Chuchra, K., and A. Chhabra. 2015. 'Evaluating the performance of tree based data mining for Ebola dataset', International Journal of Applied Engineering Research, 10: 177-81.
- Erikson, S. L. 2018. 'Cell Phones not equal Self and Other Problems with Big Data Detection and Containment during Epidemics', Med Anthropol Q, 32: 315-39.
- Flahault, A., A. Geissbuhler, I. Guessous, P. J. Guérin, I. Bolon, M. Salathé, and G. Escher. 2017. 'Precision global health in the digital age', Swiss Med Wkly, 147.
- Nsoesie EO, Kluberg SA, Mekaru SR, Majumder MS, Khan K, Hay SI, et al. New digital technologies for the surveillance of infectious diseases at mass gathering events. Clinical Microbiology and Infection. 2015;21(2):134-40.
- Papadakis G., Friedt J. M., Eck M., Rabus D., Jobst G., Gizeli E. 2017. "Optimized acoustic biochip integrated with microfluidics for biomarkers detection in molecular diagnostics. Biomedical Microdevices, Issue 19/3, 2017, ISSN 1387-2176.
- Santillana M, Nguyen AT, Louie T, Zink A, Gray J, Sung I, et al. Cloud-based Electronic Health Records for Real-time, Region-specific Influenza Surveillance. Scientific Reports. 2016;6(1):25732.

Annex G. Data tables of all countries and infectious diseases discussed in the included articles

In this annex, we present data tables of all countries and infectious diseases discussed in the included articles.

Geographical context of the proposed/implemented digital technologies

Table G1. Number of included articles discussing each country context (2015-2019)

Countries included	
Country	No. Articles
USA	73
India	26
China	19
Brazil	17
Canada	13
Sierra Leone	12
South Korea	12
Nigeria	11
Liberia	9
UK	9
Guinea	8
Japan	8
Thailand	8
Taiwan	7
Australia	6
France	6
Indonesia	6
Italy	6
Mexico	6
Singapore	6

Countries not included			
Country	No.	Country	No.
Colombia	5	Uganda	2
Malaysia	5	Venezuela	2
Germany	4	Cameroon	1
Greece	4	Chile	1
Iran	4	Cook	1
Sri Lanka	4	Côte	1
Argentina	3	Czech	1
Hong Kong	3	Democratic Republic of the Congo	1
Netherlands	3		
Pakistan	3	Denmark	1
Peru	3	Ecuador	1
Philippines	3	El	1
Portugal	3	Estonia	1
Saudi	3	Ethiopia	1
Senegal	3	Gambia	1
Sweden	3	Ghana	1
Turkey	3	Guatemala	1
Belgium	2	Honduras	1
Bolivia	2	Iraq	1
Burkina	2	Ireland	1
Cambodia	2	Israel	1
Egypt	2	Jordan	1
Guinea-	2	Kuwait	1
Haiti	2	Martinique	1
Kenya	2	Mauritius	1
Lebanon	2	Paraguay	1
Mali	2	South	1
Myanmar	2	Spain	1
Niger	2	Uruguay	1
South	2	Vietnam	1
Tanzania	2	Zimbabwe	1

Geographical context of the key contributing authors

Table G2. Number of included articles for which the first and/or last authors' organisational affiliations are based in each country (2015-2019)

Countries included	
Country	No. articles
USA	176
India	55
UK	39
China	31
Canada	22
Italy	21
Japan	17
Brazil	16
South Korea	16
France	15
Germany	14
Switzerland	13
Australia	12
Malaysia	12
Sweden	11
Saudi Arabia	9
Singapore	9
Greece	8
Netherlands	7

Countries not included			
Country	No.	Country	No.
Iran	6	Argentina	1
Nigeria	6	Austria	1
Portugal	6	Bahrain	1
South	6	Banglades	1
Spain	6	Botswana	1
Turkey	6	Cambodia	1
Hong	5	Cameroon	1
Mexico	5	Congo	1
Taiwan	5	Côte	1
Belgium	4	Czech	1
Kenya	4	Denmark	1
Pakistan	4	Dominica	1
Qatar	4	Ethiopia	1
Thailand	4	Finland	1
Colombia	3	Ireland	1
Egypt	3	Israel	1
Indonesi	3	Jordan	1
Oman	3	Mauritius	1
Russia	3	Senegal	1
Uganda	3	South	1
Burkina	2	Tanzania	1
Hungary	2	The	1
Norway	2	Trinidad	1
Philippin	2	UAE	1
Romania	2	Ukraine	1
Slovenia	2		
Sri Lanka	2		
Vietnam	2		

Individually named infectious diseases of interest

Table G3. Number of included articles discussing each specific infectious disease (2015-2019)

Infectious diseases included	
Infectious disease	No. articles
Influenza	70
Dengue	45
Ebola	36
Malaria	35
Zika virus	34
Tuberculosis	26
HIV/AIDS	20
Measles	14
Chikungunya	12
Hepatitis	11
Cholera	9
MERS-CoV	8
Pneumonia/pneumococcal disease	5
Schistosomiasis	5
Yellow fever	5
Chickenpox	4
Polio	4
Salmonella	4
West Nile virus	4
(Hand,) foot and mouth disease	3
Streptococcal infections	3

Infectious diseases not included	
Infectious disease	No.
Crimean Congo haemorrhagic fever	2
Escherichia coli	2
Lyme disease	2
Marburg	2
Meningitis	2
Mumps	2
Norovirus	2
Rubella	2
SARS-CoV	2
African swine fever	1
Bluetongue	1
Botulism	1
Campylobacteriosis	1
Chagas disease	1
Chlamydia	1
Echinococcosis	1
Enteric fever	1
Gonorrhea	1
Haemophilus influenzae type b	1
Human brucellosis	1
Human T cell lymphotropic virus	1
Kyasanur forest disease	1
Legionellosis	1
Leishmaniasis	1
Leptospirosis	1
Lymphatic filariasis	1
Pertussis	1
Respiratory syncytial virus	1
Scarlet fever	1
Schmallenberg virus infection	1
St Louis encephalitis	1
Staphylococcus haemolyticus	1
Syphilis	1
Trypanosomiasis	1
Typhoid fever	1
	1

Table G4. Number of included articles discussing each group of related infectious diseases (2015-2019)

Infectious diseases included	
Infectious disease type	No. articles
Vector-borne	15
Healthcare-associated	6
Sexually transmitted	6
Influenza-like	5
Antimicrobial-resistant	4
Food-borne	4
Tropical	4
Undifferentiated fevers	4
Bacterial	3
Zoonotic	3
Gastrointestinal	2
Respiratory	2
Water-borne	2

Infectious diseases not included	
Infectious	No.
Blood-borne	1
Climate-	1
Diarrheal	1
Emerging	1
Latent	1
Septicaemic	1
Spread by	1
Urinary tract	1
Vaccine-	1
Viral	1
Volatile	1