

Other Configurative Reviews (e.g. evidence maps or scoping reviews)

Title

Which public health actions are described as a response to pathogen detection in sewage? A scoping review protocol.

Citation:

Maarten de Jong, Jolinda de Korne, Ewout Fanoy, Gertjan Medema, Miranda de Graaf, Amrish Baidjoe, Maria Prins, Maarten Schim van der Loeff, Ana Maria de Roda Husman, Joost Daams. Which public health actions are described as a response to pathogen detection in sewage? A scoping review protocol.: a Other Configurative Reviews (e.g. evidence maps or scoping reviews).

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Keywords

Pathogen detection; public health actions; sewage analysis methods; sewage monitoring; sewage sampling methods

Background

Infectious disease surveillance and outbreak investigations have significantly benefited from sewage monitoring. Sewage monitoring is a method for tracking and analyzing the presence of various substances such as genomic material of pathogens in sewage (1). It has emerged as a promising and unconventional tool, offering a unique instrument for monitoring the health of communities. Since the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic there have been accelerated advancements in sewage monitoring. It has become a cost-effective, rapid and reliable source of information on the spread of SARS-CoV-2 and other human pathogens (2, 3). The pandemic also demonstrated that sewage monitoring can support public health actions by accurately tracking outbreaks in a community and that SARS-CoV-2 concentrations can be a leading indicator for surveillance systems compared to other commonly used epidemiology approaches such as test results and hospital admissions (4). Other public health actions can also be supported, such as the guidance of public health policy, linking what was found in sewage to measures of transmission or intervention evaluation (3). However, a comprehensive overview of public health actions served by sewage monitoring remains lacking in the current literature. We propose a scoping review to systematically explore reported public health actions as a response to sewage monitoring for detecting pathogens and provide an overview of sewage sampling and analysis strategies tailored to the specific described public health actions.

Theory of change or causal model

Not applicable, not relevant for this type of review.

Stakeholder engagement

No stakeholder engagement will be conducted.

Objectives and review question

Objective: assess the potential of sewage monitoring in infectious disease control by providing an

overview of public health actions taken in response to pathogen detection in sewage and corresponding sewage sampling and sewage analysis methods Specific sub-objectives: 1. To identify public health actions as a response to pathogen detection in sewage; 2. To identify sewage sampling strategies for pathogen detection in publications that describe public health actions; 3. To identify analysis methods for pathogens in sewage samples in publications that describe public health actions. Review question Which public health actions are described as a response to pathogen detection in sewage?

Definitions of the question components

We define 'pathogen detection in sewage' as the process of identifying genomic material of pathogens (bacteria, viruses, fungi and parasites) in sewage. We define 'public health actions' as the efforts aimed at strengthening infectious disease management and control, including improved response and surveillance, tailored interventions, targeted testing and contact tracing, transmission analyses, etc. We define 'sewage' as untreated wastewater containing a mixture of human waste, domestic and industrial wastewater, and other debris. 'Sewage sampling' is defined as the process of collecting sewage samples from one or more locations within a sewage system for analysis and testing purposes. We define 'sewage analysis' as the examination and assessment of the composition and characteristics of sewage to identify genomic material of pathogens, such as bacteria, viruses, fungi and parasites.

Search strategy

Our search will be conducted across 3 bibliographic sources. See the headings below for the detailed search strategy.

Bibliographic databases

We will conduct bibliographic searches in MEDLINE, Embase, and Web of Science using English language search terms via the Amsterdam University Medical Center library. Searches will be conducted on title, abstract and keywords and search language will be restricted to English. See Supplement 1 for a detailed search string.

Web-based search engines

Searches on web-based search engines will not be conducted.

Organisational websites

Searches on organizational websites will not be conducted.

Comprehensiveness of the search

During the scoping phase, search results were screened against a benchmark list of 22 articles with known relevance to the review (see Supplement 2). In cases where relevant articles from the benchmark list were not found with the present search strategy, the search strings were examined to identify why articles were missed and were amended accordingly. This process was iterative. The final search string captures all articles from the benchmark list.

Search update

Not planned.

Screening strategy

The screening will be done by two reviewers independently. After title and abstract screening, full texts of included literature will be retrieved. We will report which records could not be located or accessed. Retrieved records will then be screened in the full text, with each record being assessed by both reviewers.

Eligibility criteria

Public health actions as a response to sewage sampling and corresponding analysis methods that can be applied on sewage samples for pathogen detection are the main concept that this scoping review will focus on. All settings (high-, middle- and low-resource) are included. Literature with no explicit focus on public health actions will be excluded. Another exclusion criterion is literature dealing with sewage sampling and sewage analysis outside the field of human infectious diseases. All literature not written in English and all literature published before 1 January 2014 will be excluded since the field of sewage monitoring has developed significantly in the recent decade. Also (systematic) reviews and letters to the editor will be excluded.

Consistency checking

Before commencing screening, consistency checking will be performed on a subset of records at both title and abstract levels. Specifically, up to 300 titles and abstracts will be independently screened by the two reviewers for possible inclusion in the review. The results will then be compared between reviewers and all disagreements will be discussed in detail. Where the level of agreement among reviewers is low (below 90%), further consistency checking will be performed on an additional set of articles. This will be repeated until the agreement level reaches at least 90%.

Reporting screening outcomes

Screening outcomes will be reported using the ROSES flow diagram (5). The final report will also include a list of eligible articles and a list of excluded full-text articles with reasons for exclusion.

Study validity assessment

Formal quality assessment of the included literature will not be undertaken, as the aim of this scoping review is to summarize and interpret public health actions emerging from the body of literature, rather than to assess or compare the methodological quality or calculated measurements of the included literature.

Consistency checking

Not applicable, see above.

Data coding strategy

A form for data extraction and characterization will be used and will include: study title, first author(s), other author(s), publication year, journal, year of study, geographical context, aim(s) description, targeted pathogen(s), target population, clinical data (available Yes/No; and if Yes, which clinical data), sampling method(s), sampling location(s), sampling technique, type of analysis, analysis technique(s), analysis target, sample processing methodology, data normalization, analysis protocol(s), outcome measure(s), description public health action(s), public health action(s) as a response to the conducted sewage monitoring and recommendations. The form will be pre-tested and adapted as needed. Two reviewers will extract data independently and meet to resolve disagreements in the data extraction. For unresolved decisions two advisors of the project team will be consulted. Authors of articles will be consulted for additional information where necessary during the extraction process. The data extraction form will be refined during the review process and based on the emerging themes from the literature.

Meta-data to be coded

See the previous section.

Consistency checking

Consistency checks will be performed independently by the two reviewers on a subset of 5 full texts, before commencing data coding, to ensure the reliability of the coding process. All disagreements

will be discussed with two advisors of the project team, and the extraction sheet criteria will be clarified if needed.

Type of mapping

Not applicable.

Narrative synthesis methods

The review will employ narrative synthesis methods and show descriptive statistics, tables, and figures that summarize the evidence base. The descriptive table will include data extracted (as mentioned above) of included studies. The textual description will be thematically categorized to answer specific objective 1 by identifying public health actions as a response to pathogen detection in sewage. To answer specific objective 2, we will categorically summarize sewage sampling strategies for pathogen detection for specific public health actions. To answer specific objective 3, we will categorically summarize analysis methods for pathogens in sewage samples for specific public health actions. Finally, we will provide a summary of the diverse public health actions as a response to pathogen detection in sewage and describe suitable sewage sampling and analysis methods.

Knowledge gap identification strategy

Not applicable.

Demonstrating procedural independence

The review team will ensure that reviewers who have authored articles to be considered within the review have no role in decisions regarding the inclusion or data coding of their own work.

Competing interests

The review authors declare no financial or non-financial competing interests that could influence the objectivity or impartiality of the review process or findings.

Funding information

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Author's contributions

MJ, AMdRH, JH, MS and JK designed the study. MJ drafted the manuscript of this protocol. JD advised about the design of the scoping review. JD and MJ developed the search strategy. All authors contributed to revising the manuscript and all approved the final version.

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