

Popular Health, Environmental and Occupational Surveillance: an integrative literature review

Luiz Rons Caúla da Silva (<https://orcid.org/0000-0002-5807-3478>)¹
Saulo da Silva Diógenes (<https://orcid.org/0000-0001-8584-3936>)²
Michele Neves Meneses (<https://orcid.org/0000-0002-0933-7051>)³
Felipe Bagatoli Silveira Arjona (<https://orcid.org/0000-0001-6386-6352>)⁴
Carlos André Moura Arruda (<https://orcid.org/0000-0001-8145-1599>)⁵
Ana Cláudia de Araújo Teixeira (<https://orcid.org/0000-0003-2851-5260>)¹
Vanira Matos Pessoa (<https://orcid.org/0000-0003-3676-9607>)¹
Fernando Ferreira Carneiro (<https://orcid.org/0000-0002-6625-9715>)¹

Abstract *The objective is to identify concepts, experiences, methods, and techniques in Popular Health, Environmental and Occupational Surveillance (VPSAT). This is an integrative review that used the descriptors: Community Participation, Public Health Surveillance, Environmental Health, and Occupational Health, using five databases: Virtual Health Library, EBSCOhost, Embase, Scopus and Web of Science. The review selected 15 studies, based on the inclusion criteria: surveillance experiences with community protagonism; and exclusion criteria: research without primary data and developed only by the health service. The theoretical and methodological bases of the studies were identified as citizen science, popular education, and environmental justice; experiences such as participatory mapping and monitoring; methods such as action research, ‘do-it-yourself’, and community-based research; and techniques such as “Photovoice” and Community Journal. Low-income urban communities, indigenous peoples, young individuals, and workers stand out as the protagonists. The recognition of the VPSAT as an important source of data and intervention by public health systems and academia contributes to making health surveillance more dialogic and effective.*

Key words *Community Participation, Community-Based Participatory Research, Environmental Health, Occupational Health, Public Health Surveillance*

¹ Fiocruz Ceará. R. São José s/n, Precabura. 61773-270 Eusébio CE Brasil. fernandocarneirofiocruz@gmail.com

² Universidade da Integração Internacional da Lusofonia Afro-Brasileira. Redenção CE Brasil.

³ Prefeitura Municipal do Rio Grande. Rio Grande RS Brasil.

⁴ Escola Politécnica de Saúde Joaquim Venâncio, Fundação Oswaldo Cruz. Rio de Janeiro RJ Brasil.

⁵ Centro Universitário Ateneu. Fortaleza CE Brasil.

Introduction

At the turn of the 21st century, with the intensification of environmental conflicts, several social movements and populations affected by large enterprises, such as agribusiness and “hydrobusiness”; mining and the polluting industry, carried out territorial experiences to analyze and face the health impacts resulting from the transformations of their territories, degradation, environmental pollution and precarious work. This demonstrates that health is a sensitive dimension in their lives and goes towards the construction of resistance¹.

In response to conflicts, as well as the COVID-19 pandemic, experiences have been developed in popular health surveillance, which house initiatives of knowledges and practices that are born from territories and popular organization in defense of the right to health and life, but which, very often, are still disregarded, silenced and erased by the conceptions and institutional actions of surveillance in the Government health field^{2,3}. Currently, in the pandemic scenario, the Government’s response followed the same Health Surveillance model that has been practiced since the 19th century.

This model is mainly related to the control of diseases carried out by Government structures, anchored in the symbolic order of belligerent representations of the war against microbes and guided by the microbiology founded in the last third of the 19th century⁴. Terms such as “surveillance”, “control”, “sentinel event” and “campaign” belong to this military-inspired scenario, focused on the surveillance of patients and suspected cases, constituting an authoritarian, persecutory and punitive health policy, as elements that contribute to hinder popular participation in Health Surveillance⁴.

The term “Popular Health, Environmental and Occupational Surveillance” (VPSAT, *Vigilância Popular da Saúde, Ambiente e Trabalho*) is used by Carneiro and Pessoa³ to name surveillance practices that privilege the protagonism of communities and social movements in the setting of public health, the environment and workers’ health. It may involve different degrees of action by the Government, the academia and health workers, as long as they acknowledge the actors and popular knowledges and are involved in the participatory processes of a dialogical nature³.

However, according to Rigotto and Aguiar⁵ in “a scenario of scientific controversy, permeated

by conflicts of interest and by strong and powerful economic interests, which actively affect the Government and its public policies” (p.50), a chronic difficulty in the SUS working process regarding surveillance can be identified in the health, environmental and occupational areas.

In this scenario, the need to structure new conceptual and methodological bases for health, environmental and occupational surveillance is reinforced, developing territorialized strategies and participatory methods that facilitate the autonomy of the population and prevent segregation and exclusion in the processes, incorporating different knowledges and dimensions, such as economic, social, cultural, spiritual and ethical ones. In this sense, the Ecology of Knowledge framework developed by Boaventura de Sousa Santos⁶ contributes to the VPSAT, as this concept promotes a dialogue between different types of knowledge that can be considered useful for the advancement of social struggles by those who intervene in them⁷.

The VPSAT emerges as a participatory process of alert and call to action related to the guarantee of both universal and constitutional human rights to health, an ecologically balanced environment and the defense of life. The “thinking and doing with” the communities becomes, in the VPSAT processes, a creative and innovative possibility to strengthen the SUS in the defense of life^{3,8}. Therefore, this article aims to identify existing conceptions, experiences, methods and techniques in popular health, environmental and occupational surveillance at national and international levels.

Methodology

Method

The integrative literature review method was used, which, according to Mendes *et al.*⁹ “allows the synthesis of multiple published studies and overall conclusions regarding a study area” (p.759), in six steps: 1) identification of the research hypotheses or problem; 2) establishment of the inclusion and exclusion criteria for the studies; 3) retrieval of information from the selected studies; 4) evaluation of the studies included in the review; 5) interpretation of results; and 6) presentation of the review¹⁰. The items present in the checklist for systematic reviews and meta-analyses¹¹ were adapted to report this study.

To apply the method, a group of eight researchers with academic and practical experience in the subject of the review was formed to discuss and decide on the creation of the research question, the definition of the search descriptors, the selection and evaluation of the studies, and the analysis and interpretation of results. The group met between August 2021 and June 2022, in which a pair was divided into peers (independent reviewers) to select and evaluate the studies. Peer review is an important step in deciding which publications should or should not be included in review studies.

Research question and data collection

To create the research question, the PICO strategy was used – an acronym for Population (P), Interest (I) and Context (Co)^{12,13} –, in which: (P) - community participation; (I) - conceptions, experiences, methods and techniques in popular surveillance; and (Co) - health, environmental and occupational surveillance. Thus, the following question was defined: What is there of scientific production, considering community participation, related to conceptions, experiences, methods and techniques associated with popular health, environmental, and occupational surveillance?

In this context, in September 2021, a literature search was carried out in five databases: Virtual Health Library (VHL), EBSCOhost, Embase, Scopus and Web of Science (WOS) without restrictions regarding the year of publication and using the following language filters: Portuguese, English or Spanish. In the case of the VHL and EBSCOhost, full-text filtering was also used. With the exception of the VHL, the databases were accessed through the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES, *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*).

Indexed descriptors were used for the literature search, according to the DeCs/MeSh terms system: “community participation”, “public health surveillance”, “environmental health” and “Occupational Health”, and their respective descriptors in English and Spanish. Chart 1 shows the search strategies adapted for each database. The identified studies, after filtering by language and full text, were exported to, organized and stored in Excel® spreadsheets for identification of duplicates and for the inclusion or exclusion of studies.

Study eligibility and selection

The inclusion criteria comprised studies that addressed community/popular protagonism in an experience of surveillance in workers’ health and/or in health and the environment. The research group established four attributes that were considered as community/popular protagonism: 1) the initiatives arise from communities/territories through popular knowledges, not originating exclusively from health services; 2) the community generates its own data; 3) the surveillance occurs with the population as a protagonist through social technologies/simplified monitoring; 4) the community’s articulation/relationship with the health service and the academia should occur from a participatory perspective (emancipatory and dialogical).

As exclusion criteria, the following were considered: 1) the collection of information was carried out only by the health services; 2) the study does not have primary data; 3) the unavailability of the full text in Portuguese, Spanish or English.

Considering these criteria, the study selection took place in two phases. In phase 1, two independent reviewers selected the studies by reading the titles and abstracts of all studies, according to the eligibility criteria. In case of disagreement, a third reviewer carried out a new reading to select or not the studies.

In phase 2, the reviewers independently read the full texts according to the eligibility criteria. In cases of disagreement, a third reviewer once again analyzed the studies to reach a final decision. The selection of the studies included in the review was carried out independently and “blindly”.

To assist in the analysis, the extraction of data and information from the studies was performed using instruments adapted and proposed by Ursi¹⁴ and Sousa *et al.*¹⁰. Data extractions were carried out by two independent reviewers and were later compared.

Assessment of methodological quality

The studies were evaluated according to the levels of evidence developed by Melnyk¹⁵ and Schenkman and Bousquat¹⁶, namely: I) high: meta-synthesis (qualitative studies) or meta-analysis (quantitative studies); II) medium-high: evidence from a single qualitative or quantitative study; III) medium: synthesis of descriptive studies; IV) medium-low: evidence from a single descriptive study; and V) low: expert opinions, theoretical studies or essays.

Chart 1. Characterization of the search strategies used in the databases to obtain the study sample of the integrative review.

Database	Search strategy
Virtual Health Library (VHL)	("Participação da comunidade" OR "Community Participation" OR "Participación de la Comunidad") AND ("vigilância em saúde" OR "vigilância da saúde" OR "Vigilancia en Salud Publica" OR "Public Health Surveillance" OR "saúde ambiental" OR "Salud Ambiental" OR "Environmental Health" OR "saúde do trabalhador" OR "Occupational Health" OR "Salud Laboral")
EBSCOhost	TI "Community Participation" AND TI ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")
	AB "Community Participation" AND AB ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")
	SU ("Community Participation") AND SU ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")
Embase	'community participation':ab,ti AND ('public health surveillance':ab,ti OR 'environmental health':ab,ti OR 'occupational health':ab,ti) AND ([english]/lim OR [portuguese]/lim OR [spanish]/lim)
	'community participation'/exp AND ('public health surveillance'/exp OR 'environmental health'/exp OR 'occupational health'/exp) AND ([english]/lim OR [portuguese]/lim OR [spanish]/lim)
Scopus	TITLE (("Community Participation") AND ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish"))
	ABS (("Community Participation") AND ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish") OR LIMIT-TO (LANGUAGE, "Portuguese"))
	KEY (("Community Participation") AND ("Public Health Surveillance" OR "Environmental Health" OR "Occupational Health")) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Portuguese") OR LIMIT-TO (LANGUAGE, "Spanish"))
Web of Science	TS=(("participação da comunidade" OR "Community Participation" OR "Participación de la Comunidad") AND ("vigilância em saúde" OR "vigilância da saúde" OR "Vigilancia en Salud Publica" OR "Public Health Surveillance" OR "saúde ambiental" OR "Salud Ambiental" OR "Environmental Health" OR "saúde do trabalhador" OR "Occupational Health" OR "Salud Laboral"))

Note: Estimated time: all years. Search performed in September 2021.

Source: Authors.

The Joanna Briggs Institute (JBI)¹⁷ tools were used for critical assessment of the included studies. Two reviewers independently assessed the methodological quality, using two checklists corresponding to the design of the included studies: for qualitative research and for cross-sectional analytical studies. Disagreements were resolved by consensus and, when necessary, a third review author was consulted.

The selected articles were evaluated against the criteria of their respective checklists and the answers were classified using the parameters "yes", which corresponded to high quality; "no", to low quality; and "uncertain" for unknown quality. Based on this evaluation, it was possible to verify the possibility of bias in the study design,

conduction and analysis, and the level of bias was classified according to the score obtained in these tools, as follows: A (06 to 10 points) are studies with good methodological quality and reduced bias; and B (up to 05 points) are those with satisfactory methodological quality, but increased potential for bias¹⁸.

Interpretation and analysis of bibliographic material

For purposes of the processing and analysis of the articles included in this review, the thematic analysis technique was used, in which each article was submitted to floating and exhaustive reading of the content, which was coded and

categorized¹⁹. After this initial stage of processing the bibliographic material, the set of topics, already categorized, were discussed, problematized and interpreted in the light of theoretical references related to the object, defined here, namely: Popular participation^{8,20}, Popular Education²¹, Participatory Monitoring^{22,23} and Ecology of Knowledges^{6,24}. After critical reading and systematization of the data, two categories were identified: Theoretical bases and concepts in popular surveillance; and Experiences, methods and techniques in VPSAT.

Results and discussion

Study characteristics and synthesis

Initially considering the search by title, abstract and descriptors, 908 publications were identified in the databases, including articles, theses, abstracts, reports and a video, of which 786 were eliminated after the reading of the title and the abstract, because they were duplicates or not related to the topic of interest. The full reading of the 122 pre-selected studies was then carried out, of which 107 were excluded and 15 articles were included in the review, as they met the inclusion criteria and answered the research question. Figure 1 shows the flowchart related to the publication selection process.

The synthesis of the publications included the author, year, level of evidence, place/country where the experience took place, method, theoretical basis, surveillance concepts/ terms, and is depicted in Chart 2.

It can be observed that the first publication was in 2000²⁵, which demonstrates that it is a recent topic in national and international literature, followed by two (2006)^{26,27}, one (2010)²⁸, one (2012)²⁹, one (2015)³⁰, two (2017)^{31,32}, two (2018)^{33,34}, one (2019)³⁵, two (2020)^{36,37} and two (2021)^{38,39}, increasing after the year 2015, which reflects the fact that it has been an expanding topic in the world's literature. As for the origin of the studies, eight countries stand out, with most of the studies being from the United States of America (USA), with nine publications, followed by Brazil with two, and other countries with one publication only: Mexico, Canada, Israel/Palestine, Spain and USA and Zimbabwe and South Africa.

It can be observed that, as of 2017, there is a higher number of studies related to VPSAT, with an average of two per year. Another highlight is

that of the fifteen selected studies, nine are from the US, while the other countries have an average of one article in this review. This may indicate that the topic has become emergent in recent years, but at the same time, it may have a limited academic visibility, especially on the Global South side, which faces greater research funding difficulties and tensions with the neo-extractivism development model.

Additionally, as shown in Chart 2, the monitoring, participatory mapping and popular communication techniques were some highlights of the review. The innovation, in at least three studies, comprised the use of the "Photovoice" technique. The advancement of technologies developed for mobile phones allows this equipment to be strategic to the registration of social and environmental risk situations and decisively contribute to VPSAT actions and to demand actions by public agencies in the presence of the identified situations.

All studies are similar regarding the use of participatory research methodologies in the face of complex environmental problems, highlighting those related to air quality. This may indicate that even in the face of large-scale problems it is possible for the community to contribute with protagonism to the surveillance. It is noteworthy that vulnerable populations, especially those at environmental risk, such as urban communities, indigenous people, poor young individuals and workers, are the social groups that stand out in the research.

Assessment of methodological quality of the included studies

Chart 3, available in the Open Science Framework platform repository (<https://osf.io/5PTWJ>), under identification DOI 10.17605/OSF.IO/6JB7V, shows that all publications had bias level classification: A (06 to 10 points), which are the studies with good methodological quality and reduced bias. Of these, five studies^{25,26,29,32,38} (33.3%) reached the maximum score, meeting all the criteria of critical and methodological evaluation.

In the case of the publications that were evaluated with the qualitative checklist, Chart 3 shows that the Criteria of Ethical Approval (Q9) was absent in five studies^{33,34,36,37,39} and was not clear in two publications^{30,31}; that is, of 13 publications that were evaluated with this instrument, seven (54%) did not state their process of ethical approval. Additionally, Chart 3 clearly shows that in two studies^{37,39} the relationship between the re-

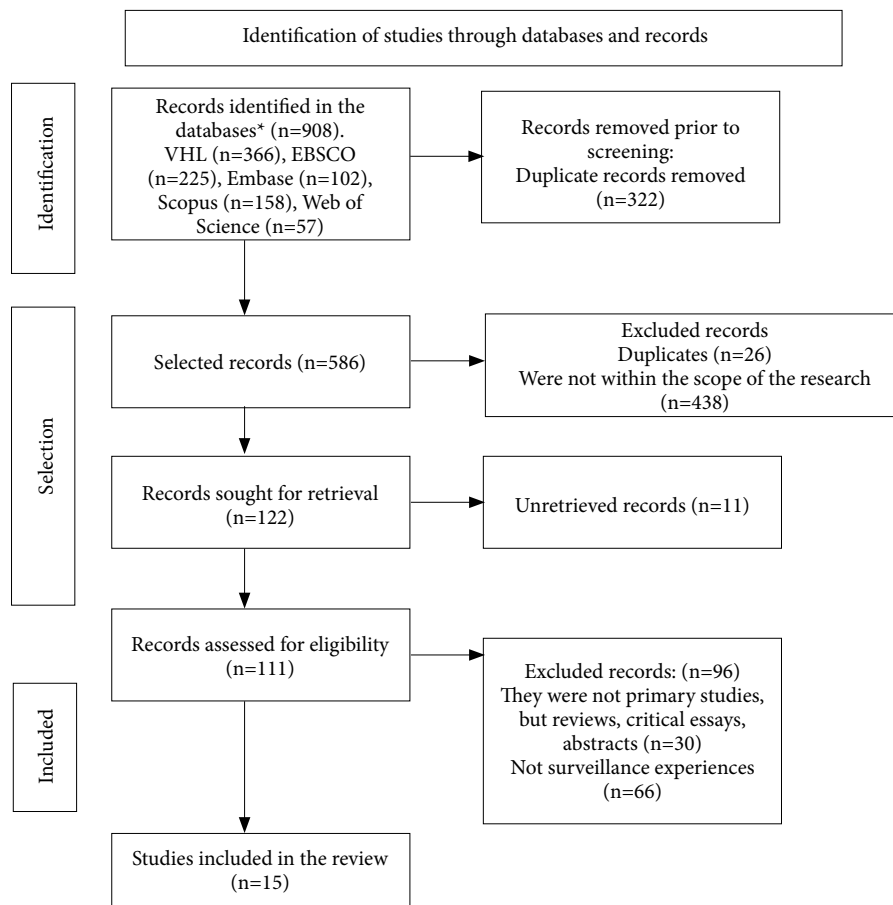


Figure 1. PRISMA flow diagram disclosing the searches in databases and records.

Note*: Consider, if possible, reporting the number of records identified in each database or searched register (instead of the total number in all databases/records).

Source: Authors.

searcher and the participants was not addressed and in another two^{31,36} it was not clear (Q7).

Regarding the assessment of the methodological quality instrument for cross-sectional analytical studies, two studies were evaluated. In both^{27,36}, of the eight answered questions, it was not possible to identify the confounding factors (Q5) or whether strategies were established to deal with these factors (Q6). One confounding factor is the difference between comparison groups and it might influence the direction of study results¹⁷.

Theoretical bases and conceptions in popular surveillance

This category seeks to dialogue with the concepts, foundations and principles that support the studies included in this review and which are closely related to VPSAT. Prado *et al.*³⁹ highlight the importance of participatory mapping for decision-making on the uses of soil and development processes. A community engaged in the mapping of Environmental Justice produces local knowledge that generate environmental indicators of territory evaluation and identify cases of environmental injustice, key elements for the surveillance process³⁹.

In this sense, health research gains power with community involvement/engagement, in-

Chart 2. Synthesis of the selected studies for the integrative review organized by: author, year, level of evidence, place, VPSAT experiences, methods, theoretical bases and terms/concepts in popular surveillance.

Health, Environmental and Occupational Surveillance (VPSAT)					
Authors (year)	Level of Evidence	Place and experiences in popular surveillance	Methods	Theoretical bases	Terms and/or concepts in popular surveillance
Quigley et al. ²⁵ (2000)	II	Nevada, Utah and Southern California, USA. Experience: A community-based team exposed to radioactive waste conducted, transcribed and analyzed more than 71 interviews with indigenous people who understood community experiences of nuclear waste contamination	Community-based investigation or Participatory Research through a descriptive case study	Justice and environmental racism; and community-based risk management	Community-based research and education
Toledo ²⁶ (2006)	II	Iauaretê, São Gabriel da Cachoeira, Amazonas, Brazil. Experience: construction of knowledges in public and environmental health with local popular knowledge in 10 indigenous communities; community meetings, questionnaires, interviews, talking maps, photo panels, participatory observation and method triangulation	Mixed methods (quantitative and qualitative) and Action Research	Popular and environmental education; Theory of Social Representations	Participatory observation
Lambert et al. ²⁷ (2006)	II	<i>Whitney Pier, Ashby and North End of Sydney, Canada. Experience: developed in the community (residents living close to the coal and steel factory), responsible for applying 325 door-to-door questionnaires, collecting 15 stratified random samples of soil and dust, and conducting interviews during these collections. The observations of odor, smoke and ash deposition in the communities were compared and bivariate analyses were performed</i>	Mixed methods and cross-sectional study	Environmental justice	Local knowledge
Flum et al. ²⁸ (2010)	II	University of Iowa, USA. Experience: 16 volunteer janitors photographed occupational hazards, using the Photovoice technique, to which they were exposed; as a group, they categorized and prioritized the most important situations, making reports for the community and making decisions	Participatory action research	Popular education in occupational health	Participatory ergonomics
Toledo et al. ²⁹ (2012)	II	Iauaretê, Amazonas, Brazil. Experience: community surveillance with 30 indigenous people (teachers, health agents and community leaders, etc.) to understand disease prevention, basic sanitation and family health, solve problems in the territory and exercise citizenship	Mixed Methods and Action Research	<i>Critical, liberating and emancipatory pedagogy; Empowerment</i>	Popular participation, social mobilization and community journal

it continues

cluding several activities such as consultation, information dissemination, collaboration in decision-making, creation of partnerships with interested parties and seeking guidance from com-

munity leaders. This engagement must guarantee to the communities and researchers the respect to the sociocultural, political and economic context of the territory where it is conducted³².

Chart 2. Synthesis of the selected studies for the integrative review organized by: author, year, level of evidence, place, VPSAT experiences, methods, theoretical bases and terms/concepts in popular surveillance.

Health, Environmental and Occupational Surveillance (VPSAT)					
Authors (year)	Level of Evidence	Place and experiences in popular surveillance	Methods	Theoretical bases	Terms and/or concepts in popular surveillance
Wilson et al. ³⁰ (2015)	II	Charleston, South Carolina, USA. Experience: Community, academia and government agreed to implement a mitigation plan, addressing local environmental risks through research, community capacity building and action. The "Environmental Justice Radar", a Public Participation Geographic Information Systems (PPGIS), was created for residents of Charleston neighborhoods to share Photovoice data in real time and visualize environmental risks	Action Research	Environmental Justice, Public Participation Geographic Information Systems (PPGIS) and Community Based Surveillance	Community mapping
English et al. ³¹ (2017)	II	Imperial County, California, USA. Experience: partnership between academia, non-profit organizations, government and community, through a management committee; committee involvement in study design and implementation, providing feedback on actions and data reporting; the local community indicated the locations for the Dylos particulate, temperature and humidity sensors to be placed	Case study	Citizen science	Community environmental monitoring
Musesengwa and Chimbari ³² (2017)	II	<i>Gwanda, Zimbabwe and uMkhanyakude, South Africa. Experience: evaluation of the impacts of social, environmental and climate changes on diseases transmitted by vectors, particularly populations exposed to malaria, with the objective of developing action, adaptation and mitigation plans aimed at the community</i>	Qualitative research, case study and cross-sectional study	Eco-health, Citizen Science and Community-Based Participatory Research (CBPR)	Community engagement
Rey-Mazón et al. ³³ (2018)	IV	Israel/Palestine, Spain and USA. Experience: two cases of aerial mapping and one of water quality monitoring - which involved associations, local activists, children, young individuals and students - discussed civic science practices, using open source technology based on the "Do-It-Yourself" method and its diverse understandings and expertise; the development of technology in social and political contexts; critical perspectives and solutions to possible contradictions between transparency and the privacy and security of vulnerable communities.	Case series	Urban and Environmental Justice, Civic Science and PPGIS	Citizen Surveillance and Aerial Surveillance

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Community engagement and the use of the citizen science approach have been crucial for public health practices, such as establishing in-

dependent air quality monitoring networks. The big challenge remains the long-term funding of these initiatives³¹.

Chart 2. Synthesis of the selected studies for the integrative review organized by: author, year, level of evidence, place, VPSAT experiences, methods, theoretical bases and terms/concepts in popular surveillance.

Health, Environmental and Occupational Surveillance (VPSAT)					
Authors (year)	Level of Evidence	Place and experiences in popular surveillance	Methods	Theoretical bases	Terms and/or concepts in popular surveillance
Barzyk et al. ³⁴ (2018)	IV	<i>Newark and Newport News, USA. Experience: evaluation of urban pollution through portable sensors in two projects implemented with determined rites and systematic evaluations, involving communities, non-profit organizations, academic and government partners. There were over 100 meetings, where everyone had equal speaking time and comparison between evaluation records such as meeting notes, summary tables, data results and proposed approaches</i>	Qualitative research	Citizen Science and Environmental Justice	Risk Assessment in Environmental Health
Panikkar et al. ³⁵ (2019)	II	Merrimack in New Hampshire, USA. Experience: A group of residents developed the “Merrimack PFOA Concerns Health Survey” with 596 residents in 213 households exposed to PFAS in drinking water; use of Google Forms to report demographic data, sources of exposure and health conditions; Logistic regression analysis	Quantitative method with cross-sectional study	Community-led health research; and Criticism to Undone Science	Biomonitoring
Johnston et al. ³⁶ (2020)	II	Los Angeles, California, USA. Experience: participatory air monitoring program with 18 high school students of color; data collection combined with storytelling through digital media. Four phases: Popular Education Workshops; Measuring air quality; Reflection, Analysis and Interpretation; Youth Community Forum and Action	Mixed methods	Popular Education, Environmental Justice, CBPR and Environmental Health Literacy	Participatory monitoring
Wong et al. ³⁷ (2020)	II	<i>Imperial County, California, USA. Experience: Creation of a community air monitoring network (CAMN) with 40 low-cost particulate monitors by a community-based organization that brought together scientists, community advocates and local residents. The actors produced real-time information on the level of air quality in the community by establishing the CAMN</i>	Descriptive case study	Citizen and Community Science; Environmental Justice, CBPR, Environmental Health Literacy and Community Resilience	Community air monitoring

it continues

Positivist science based on the “biomedical model” and “hard science” considers community knowledge as “data contamination” during the investigation process. The limitations of methods

for evaluating exposure to risks in environmental health of positivist science fail to provide satisfactory subsidies for community-based studies. Moreover, quantitative studies are not enough to

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Health, Environmental and Occupational Surveillance (VPSAT)					
Authors (year)	Level of Evidence	Place and experiences in popular surveillance	Methods	Theoretical bases	Terms and/or concepts in popular surveillance
Nolan <i>et al.</i> ³⁸ (2021)	II	Richmond, California, USA. Experience: Collection of quantitative data with Ogawa monitors of airborne particulate matter and noise levels and qualitative data with Photovoice from 12 sites and supplemental skills development workshops; five paid young individuals participated	Mixed methods and youth participatory action research	Structural Violence, Racism and Environmental Justice, Community Science and CBPR	Community monitoring
Prado <i>et al.</i> ³⁹ (2021)	II	Tijuana, Mexico. Experience: community mapping, with the participation of the Collective for Environmental Health and Justice – consisting of community representatives -, interviews with key informants, application of a questionnaire with a Likert scale, use of Garmin eTrex Venture, ArcGIS, Photoshop and NVivo to prepare the maps	Mixed methods	Popular Education, Environmental Justice and PPGIS	Community mapping

Note1: Community Air Monitoring Network (CAMN); United States of America (USA); Frequently Asked Questions (FAQs); Low Country Alliance for Model Communities (LAMC); Nuclear Risk Management Project for Native Communities (NRMNC); Per and polyfluoroalkyl substances (PFAS); perfluorooctanoic acid (PFOA); Community Based Participatory Research (CBPR); Public Participation Geographic Information Systems (PPGIS); Public Laboratory of Open Technology and Science (PublicLab); Citizens' Network for the Improvement of Communities (RECIMEC); Statistical Package for the Social (SPSS).

Note2: Levels of evidence: I) high: meta-synthesis (qualitative studies) or meta-analysis (quantitative studies); II medium-high: evidence from a single qualitative or quantitative study; III) medium: synthesis of descriptive studies; IV) medium-low: evidence from a single descriptive study; and V) low: expert opinions, theoretical studies or essays.

Source: Authors.

account for the complexity of the impact assessment of health contaminants. From this perspective, some studies discuss that it is necessary to dialogue in the sense of effective risk communication, to meet the community of each territory that is affected by risk and is not restricted only to the academic sphere as a transfer of information to peers, but inaccessible to the community field²⁵.

According to Nolan *et al.*³⁸ the approach to structural violence and participatory research illuminate studies on the iniquities of exposures and refine the mitigation strategies. Promoting a more equitable relationship between communities and researchers in these types of studies is not simple and requires: the guarantee of community participation in all stages of the research process; the recognition of popular knowledges, so they are not treated as anecdotic or subjective; and the training of community members for conducting

community-based research³⁸. In this sense, popular education and the ecology of knowledges are important reference concepts that strengthen this path towards a more dialogical research^{21,24}.

The work by Lambert *et al.*²⁷ about industrial contamination, gives rise to the concept of environmental justice. In contrast to a traditional science that makes the community an "object" of research, environmental justice seeks to engage the population in actions, combining the methodological rigor of research with the action for community claim. Popular protagonism is necessary for the construction of a participatory science focusing on facing environmental injustices and their impact on human health.

The experiences of popular education inspired by Paulo Freire²¹ constitute influences in the process of interaction between traditional and scientific knowledges in the construction of VPSAT processes. For Gil Sevalho⁴, Civil Health

Surveillance is founded in local culture and popular education, becoming a health surveillance aspect that embodies popular participation and contributes to social transformation, complementing the traditional epidemiological surveillance. Paulo Freire sought to build a liberating education, in a dialogical proposal between leaderships and the population, in which the subjects meet to transform the world while collaborating²¹.

Among the studies analyzed in this review, it is clear how close they are to the thinking of Paulo Freire and Boaventura Santos, along with the methodological paths implicated with dialogue, based on the different knowledges and permeated with the experienced reality. Popular education is used as a methodological inspiration^{28,29,36,39}, being a useful instrument to analyze the local context through the knowledges and previous experiences to better understand the determinants of problem situations and the creation of proposals for solutions and actions^{29,36}. It is a process of materialization of the popular protagonism of communities, in which participatory means of sharing knowledge are provided for the construction of more effective public policies to promote and protect the health of these communities²⁸. Other studies have addressed the implementation of community education or education in health without mentioning the influence of the Freire method^{25,33,37}.

Therefore, the aspects of theoretical approaches identified in this review can be used as a theoretical basis of support for the structuring of the VPSAT concept that is being developed in Brazil. It has been observed, in participatory research processes, an interest by Brazilian popular movements in using this term to establish life promotion actions against the current Brazilian development model. The concept of Ecology of Knowledges is more contemporary compared to popular education, and has contributed, in epistemological terms, to justify this choice in research processes and VPSAT.

VPSAT experiences, methods and techniques

Popular participation comprises the multiple actions of different social forces to focus on the creation, performance, supervision and evaluation of public policies and/or services intended for the community²⁰. Thus, this concept houses the conception of “involvement of the community members in the tasks of this community”, that

is, to do it by and for themselves, which leads to the idea of community protagonism.

According to Santos²⁴, the combination of popular knowledge and community practices associated to surveillance techniques can be used as guidance for health care models and bring actions closer to the real needs and the reorganization of the relationship between subjects, professionals, users and the environment. In this context, VPSAT emerges, which, for Carneiro and Pessoa³ “is not intended to replace the role of the Government, but to be the expression of the need for greater community participation in surveillance, as highlighted in the National Health Surveillance Policy” (p.5).

Among the experiences in popular surveillance depicted in this review, it is observed that community mapping has been a practice adopted by the communities^{30,39}. Based on a Public Participation Geographic Information Systems (PPGIS), these mappings are ways that community members found to independently identify problems and solutions to participate and focus on decisions about their territories. These are techniques that allow the mapping of priorities related to indicators, such as radioactive waste²⁸; sewage disposal^{26,29}; diseases such as schistosomiasis and malaria³²; particulate materials, particularly the inhalable ones such as MP10^{31,37} and MP2.5³⁶; global warming gases, such as nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂)^{30,38}; noise³⁸; risk areas, for instance, abandoned places and clandestine dumps^{30,39}.

Rey-Mazon *et al.*³³ conducted a study involving three case studies on “citizen surveillance” based on the “Do-It-Yourself” (DIY) method, open source technologies developed by Public Laboratory of Open Technology and Science (PUBLICLAB). They presented ways to perform community monitoring using simple, easily accessible and low-cost techniques and materials, such as aerial mapping of risk areas using kites or balloons for photographic registration, exercising aerial surveillance with safety and ways to easily identify evidence of poor water quality through a monitor device designed by students, indicated, for instance, by the color of the fluid.

The authors remember that by using beautiful and flashy materials, such as a large red balloon in the air or a beautiful kite coupled to simple cameras, in addition to attracting the attention of those involved, generally young people, also demystifies the use of technology and stimulates participants to make suggestions and even assemble their own monitoring devices, which

would be unlikely to happen if drones or other specialized technology resources were used, for example³³. In the specific case of the study conducted in Israel/Palestine, special attention was paid to the type of device that would be used, given the constant military surveillance in the airspace that endangered the physical integrity of the local participants. The choice of kites allowed the greater engagement of young people and the exchange of knowledges with researchers who had no experience with the activity of flying kites in the region³³.

As for the mapping activities, the local knowledge of the community gave meaning to the photos, in addition to allowing the empowerment and problematization of the uses of urban space in Castellón, Spain, and the “surveillance of the surveilled” in the case of Israel/Palestine. The companies that perform these services charge for these data, and the possibility that the communities can autonomously generate their own aerial mapping data with an adequate resolution is an innovative one. Having a view beyond the walls and limits imposed by the Government and the private sector allowed the stimulation of what the authors called “civic imagination”, favoring the collective construction of more viable solutions that better meet the demands of the community. Another relevant issue concerns the safety of making data that can expose communities public, given that the areas of study are often areas of intense conflicts, which should be discussed, agreed on and respected by those involved³³.

In Tijuana, Mexico, the community monitoring results pointed to specific environmental challenges in this border town, including clandestine dumps. The results achieved from the surveillance of these areas contributed to the creation of the urban planning for the entire city by the identification of problems and land verification by the residents³⁹.

In Charleston, South Carolina, USA, from a mapping tool developed by community leaders in a community-university-government partnership, it was possible to address environmental risks in places where the communities were in danger through research, community training, and action plans. From this partnership, an “Environmental Justice” (EJ) radar was designed to help community members learn more about local environmental dangers and share information, using a website that acts as an online portal where the interested parties can visualize the areas of concern or environmental risks to the communities³⁰.

Moreover, the use of the photovoice technique in two studies involving community mapping and one on participatory ergonomics was observed. For Flum *et al.*²⁸ this technique is an important tool, as it is an effective way for workers to identify occupational risks and other dangerous or inadequate situations not recognized or valued by the leadership, allowing them to be more active in relation to health and safety. In addition, according to Wilson *et al.*³⁰, in addition to the workers, the residents and community organizations have also used this technique to identify and act on environmental risks not registered in their territories or that have consequences for other environmental health issues.

Similar to the Photovoice, in Brazil, Renata de Toledo²⁶ produced a community journal that aimed to socialize and discuss health and environmental issues with the participation of all (those who created it and other readers) in the construction of knowledges and skills aimed at empowerment. That is, here is an example of articulation/relationship of the community with the health service and academia from an emancipatory and dialogical perspective. The journal was a technique used to broadcast the wishes of the community for changes, as well as the work that had been developed by the students of a course, as well as being an opportunity to “translate” information previously made available in a technical report of that study, started in 2005, using a more accessible format and content to the entire local population²⁹.

In this sense, the authors dialogue with the proposal of “intercultural translation” of Santos⁶, which allows meeting the abyssal thinking, and results in epistemicide, embracing the ecology of knowledges, valuing and recognizing the existence of a multitude of types of knowledge beyond the scientific type, because “preference should be given to the types of knowledge that guarantee the greater participation of the social groups involved in the conception, performance, control and enjoyment of intervention”⁶(p.51).

From the perspective of building knowledge and skills focused on popular empowerment, the Nuclear Risk Management for Native Communities (NRMNC) project in Nevada, Utah, and southern California, has developed over a four-year period, several educational materials about nuclear risk issues: basic books on radiation, radionuclide data sheets, data sheets on health risk methodologies and visual guides on specific local contamination; in addition to several extensive toxicological profiles on contaminants²⁵.

The construction of these materials occurred with community engagement, in which community residents affected by nuclear contamination participated and applied interviews to develop a community exposure profile, constructed community maps, as well as attended workshops over a four-year period to construct educational materials. A pointed out risk management method is community-based research, which is a way to create knowledge that involves learning from research and applying what is learned to collective problems through social action²⁵.

High-quality studies on the consequences of environmental exposure for health are expensive and time-consuming, creating a situation of “undone science” that is, one that perpetuates the lack of information on these impacts³⁵. Considering this context, the community itself sometimes assumes the task of trying to prove their suspicions that harmful exposures can lead to diseases, by producing studies in a timely manner. In Merrimack, USA, a project assessed the local response to the contamination of the public water systems and water from local wells by per- and polyfluoroalkyl substances (PFAS), through a health research led and managed by a local defense group. The community-based health research aimed to define the risks and dangers faced by the residents, documenting the potential impacts of contaminants to reduce the risks to which they are exposed³⁵.

Community air monitoring in which community members play important roles in determining the study design, location and implementation of monitors and data collection was another technique adopted in surveillance research. In a study conducted at Imperial County, California, USA, young individuals were decisive actors in characterizing spatial variability of air pollutant concentrations and using technologies for data collection³⁸. They selected priority locations for monitoring and produced information on air quality in real time at community level by establishing a community air monitoring network (CAMN), which started having its information stored, processed, displayed and disseminated by the community itself in the virtual space called “Identifying violations that affect neighborhoods” (IVAN), which was used to denounce these violations on the internet³⁸.

Young individuals worked in the monitoring of air quality employing the Youth Participatory Action Research (YPAR) method, which emphasizes strength-based engagement, an equitable inclusion of the community in all aspects of the research, co-learning between researchers and

members of the community, equitable distribution of resources, local training, research and action, addressing local priorities and sustained engagement³⁸. Through YPAR, young individuals bring perspectives and new hopes, often marginalized ones, helping researchers and communities to transform their reality based on deeper understandings of how structural violence and eco-apartheid interact to probabilistically determine social and constructed environments that profoundly affect the health of the community members³⁸.

According to Wong *et al.*³⁷, although air monitoring projects with community involvement may require substantial funding, time and diversified experience of the team, they can result in better project results and strengthen the community's capacity, sustainability and resilience to deal with environmental and health conditions.

English *et al.*³¹ have shown that, with the community monitoring, there is increased knowledge and capacity by the community to organize and maintain monitors, and the community partners are now allowed to start and collect air data by themselves. For Wong *et al.*³⁷ these practices demonstrate that communities have experience and resources to substantially contribute to air monitoring projects when they have equitable leadership roles and several mechanisms for significant involvement.

Chart 4 shows a brief description of the main experiences, methods and techniques of VPSAT, identified in this integrative review.

Limitations

The review was performed according to the DeCs/MeSh terms system. However, because it does not contain the “Popular Surveillance” descriptor, some studies that employed this keyword, but did not use the descriptors that were selected for this review, may not have been selected. Thus, it is recommended to create some descriptors in the scope of surveillance, such as: “Popular Surveillance”, “Civil Surveillance”, “Citizens' Surveillance” and “Community Surveillance”, as it will contribute to the visibility of studies in the area.

Moreover, the study used only the descriptor “Community Participation” for the literature search, not appropriating other common terminologies such as “social participation” and “action research”, “empowerment” and “social control”, which may have limited the number of identified articles that were included in this review.

Chart 4. Description of the main experiences, methods and techniques in popular health, environmental and occupational surveillance.

Experiences	
Biomonitoring	Determination of pollutants and contaminants, such as perfluorooctanoic acid (PFOA), to assess environmental quality through exposed organisms.
Community engagement	It describes a range of activities that include disseminating information, consulting, collaborating in decision-making, capacity building, establishing partnerships with interested parties, and seeking guidance from community leaders.
Community Mapping	It allows residents to map environmental health data, environmental hazards and other stressors of locations that can tell their exposure stories. The communities can therefore become more involved in local environmental decision-making and help with enforcement by creating a popular surveillance system.
Community monitoring	Community members play important roles in determining study design, location and deployment of monitors, and data collection.
Participatory monitoring	It is based on principles of community-led, participatory research, which seeks to deconstruct traditional power dynamics, provide information about important environmental risks to residents, and democratize knowledge.
Participatory observation	Coexistence and direct participation of the researcher in the ordinary universe of the assessed community, which must be complemented by systematic collection of data and their interpretation.
Methods	
Do-It-Yourself	It develops or handles live data files, collected and produced in a decentralized manner, that is, by the community itself, without the need for specialists' help, using open source and publicly accessible technologies. In addition, there is a concern to incorporate collaborative and open source principles in the objects, tools, social formations and data sharing practices that emerge from these investigations, for example, performing aerial mapping with a camera attached to a balloon or a kite, or the monitoring of water quality in rivers using simple conductivity sensors, being used as an early warning system for mining pollution, for example.
Community-Based Investigation or Participatory Research	It produces knowledge based on the investigation and applies what is learned to collective problems through social action. It is, therefore, a systematic investigation with the collaboration of those affected by the issue being studied for purposes of education and effective social change or action. Thus, they are methods that will inform, improve and make equitable the science of determining environmental risks to health, promoting a co-learning and training process that facilitates the reciprocal transfer of knowledge, skills, capacity and power.
Action research	Method focused on the capacity to act, that is, to carry out social interventions aimed at solving a problem. It emphasizes the participation of social groups considered excluded from the decision-making for the solution of problems that concern them, thus having a highly politicized content.
Youth Participatory Action Research	With the support and experience of young individuals, this method helps, for instance, to solve challenges in the misalignment between the community's and the researcher's objectives. Thus, it prioritizes the centralization of impacted communities in building local capacity and expanding opportunities to improve their well-being through research, action and empowerment. If done well, the practice of community inclusion helps to erode the imbalanced power dynamics and socioeconomic inequalities, improves the long-term sustainability of actions within the affected communities, and strengthens the ability to move towards a healthier future.
Techniques	
<i>Photovoice</i>	Technique that gives voice to those with low social and/or economic status, who tell their own stories, through photos they take themselves, which allows reflecting on the strengths and problems of their community, promotes dialogue on important issues through group discussion and photographs, and provides participatory means of knowledge sharing.
Community journal	It is the production of a group gathered around collective interests, going beyond the informative function and summoning the community to reflect/act on the addressed topics. Due to its characteristics, the community journal becomes an instrument of social transformation, through a dynamic and participatory construction process. Thus, it aims to contribute to the social development of a given location and must be produced by the community itself to socialize and discuss health and environmental issues.

Source: Authors.

Finally, no search for study publications was applied that used other methods, for instance, on websites, organizations, quotations and gray literature, using only the databases that are described in the methodology of this research. It is noteworthy that 11 studies selected for full-text reading were not recovered, as they were included in paid databases that cannot be accessed through the Capes Journal Portal.

Final considerations

This review identified theoretical and methodological bases (citizen science, environmental justice, popular education and community surveillance), experiences (community mapping and monitoring), methods (action research, “do it yourself”-DIY- and community-based research) and techniques (“photovoice” and community journal) that can be used as references for the VPSAT practices.

The research results suggest that this strong involvement of communities in popular surveillance projects generated greater awareness, knowledge, capacity to confront challenges, infrastructure and influence from a partnership between the community, health services and research institutions.

Moreover, the main findings of this study indicate the importance of the adopted experiences and methodologies in which the community is a protagonist in data generation from the collection and systematic production of information based on participatory and simplified monitoring strategies. This is considered one of the main characteristics of VPSAT proposed herein.

Therefore, the recognition of VPSAT as an important source of data and intervention by health systems and academia can contribute for the surveillance of institutional health to become more dialogical and effective. Overall, these studies reinforce the importance of popular participation as a way of enhancing the field of health surveillance in the defense of life.

Collaborations

LRC Silva contributed to the conception and design of the research; in the analysis and interpretation of data; in peer review; in the writing of the article and its critical review; and approval of the version to be published. SS Diógenes contributed to data analysis and interpretation; in peer review; in the writing of the article and its critical review; and approval of the version to be published. MN Meneses contributed to data analysis and interpretation; in the writing of the article and its critical review; and approval of the version to be published. FBS Arjona contributed to data analysis and interpretation; in the writing of the article and its critical review; and in the final approval of the version to be published. CAM Arruda contributed to data analysis and interpretation; in the methodological path; in the writing of the article and its critical review; and in the final approval of the version to be published. ACA Teixeira contributed to data analysis and interpretation; in the writing of the article and its critical review; and approval of the version to be published. VM Pessoa contributed to data analysis and interpretation; in the methodological path; in the writing of the article and its critical review; and in the final approval of the version to be published. FF Carneiro contributed to the conception and design of the research; in the analysis and interpretation of data; in peer review; in the writing of the article and its critical review; and approval of the version to be published.

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