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## A systematic review of water, sanitation and hygiene among Roma communities in Europe: Situation analysis, cultural context, and obstacles to improvement

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## ABSTRACT

**Background:** The Roma are Europe's largest ethnic minority. Their history has been shaped by marginalization, stigmatization, discrimination, slavery, persecution and murder, and to date, they continue to face prejudice and social exclusion. The Roma population is generally poor, living in crowded and low quality housing in segregated communities on the outskirts of cities, often lacking basic physical infrastructure, including adequate water, sanitation and hygiene (WASH). To better understand the obstacles the Roma are facing, we aimed to review and synthesize available peer-reviewed literature, and identify obstacles to improvement.

**Methods:** We conducted the first systematic review of peer-reviewed literature on water, sanitation and hygiene among Roma communities in Europe, published between 2000 and 2020. A total of 30 publications met the inclusion criteria. We extracted data relating to WASH conditions and services, associated risk factors, exposures and outcomes, examined the role of cultural norms in shaping health behaviors, and obstacles to improvement.

**Results:** Our review shows that across Europe, Roma communities face more challenges than the majority population with respect to access to WASH, waste management and environmental hygiene, appropriate housing and hygienic living environments. Prominent themes in the literature to describe WASH conditions about European Roma populations include limited access, affordability, and quality of WASH services; self-management of WASH as response and adaptive tactic; unsafe WASH as a reason for eviction; and health risks associated with substandard WASH services. The same factors determining the poor quality of WASH services and environmental health impede their improvement. Major barriers to WASH access and affordability among the Roma include discrimination, social exclusion, lack of formal education, poverty, geography, legal and social aspects, and cultural perceptions of health risks, political top-down approaches, lack of political will, and lack of involvement of the Roma community in planning. Besides, Roma are not well represented in national statistics, with data collection being complicated not only by difficulties of access and underfunding, but also by distrust and culturally distinctive health beliefs.

**Conclusions:** The situation and cultural context of WASH among Roma is challenging and complex. Our review demonstrates not only the urgent need for action for Roma communities in particular, but may have broader applicability to ethnic and social minorities in other parts of the world. Future research to overcome obstacles to improvement needs to be inclusive, and involve community members as key informants, with their participation enhancing the reliability of data, contributing to social justice and solidarity, disseminating information, contributing to feasible recommendations and implementation of interventions.

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1. Introduction

The Roma are a heterogeneous ethnic group originating in Northern India, who migrated westwards from around the 11th century (Parekh and Rose, 2011), passing the Black Sea and Constantinople (now Istanbul), entering Europe in Bulgaria, and settling there, in Romania, Hungary, Slovakia and Serbia (Ioviță and Schurr, 2004; Mendizabal et al., 2012). In Europe, the Roma now form the largest ethnic minority (numbering about 11 million, or 1.35% of the total population of Europe) (Parekh and Rose, 2011, Fig. 1), with the majority of Roma still residing in these countries of primary settlement (Fig. 2) in the south-eastern part of Europe. The term Roma encompasses diverse groups, including Roma, Gypsies, Travellers, Manouches, Ashkali, Sinti and Boyash (European Commission, 2020).

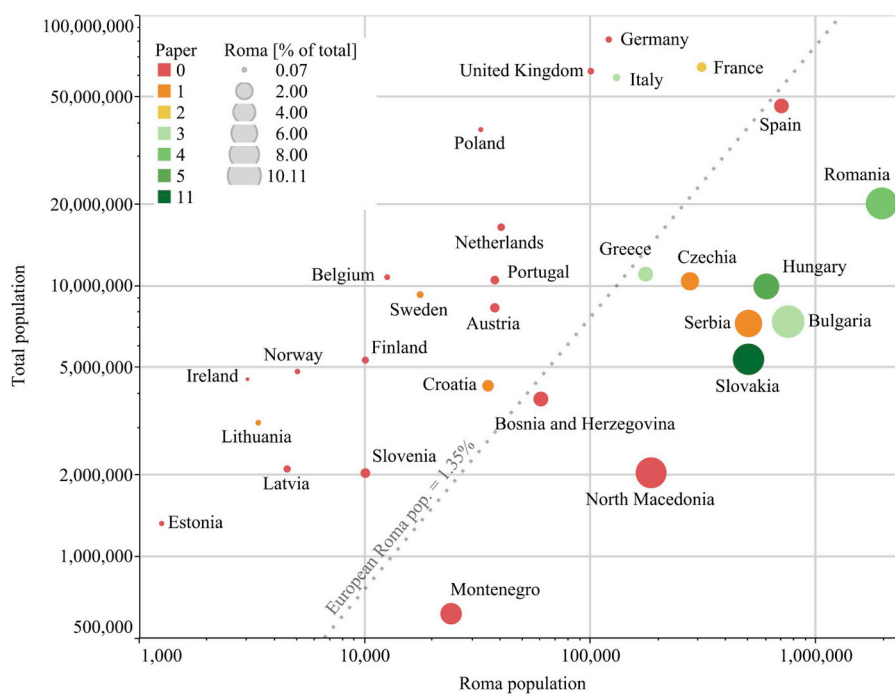
The history of Roma has been shaped by political, economic, and cultural marginalization, ethnic stigmatization, discrimination, and slavery and persecution, including the internment and murder of hundreds of thousands of people during the Holocaust (Parekh and Rose, 2011). Without a nation-state of their own and due to various social and economic pressures within diverse societies, the Roma were gradually fragmented into numerous, geographically dispersed and socially and linguistically divergent groups (Škarić-Jurić et al., 2007).

In modern times, Roma predominantly live in segregated communities geographically isolated from the host community's majority population. Many Roma settlements are located near industrial zones, waste disposal sites or agricultural cooperatives, and are disconnected from main roads (Chaudhuri, 2017; Filčák et al., 2018; Rosa, 2019). Disadvantaged by unemployment and poor housing at the outskirts of European cities (Koupilová et al., 2001), the living conditions of Roma differ, but are often substandard (Davis and Ryan, 2017). While some settle in localities that serve as permanent residences inhabited by sedentary Roma for several generations, others live in temporary accommodations of wood houses, self-made scrap metal shacks, tents, trailers or other structures (Filčák et al., 2018; Kozubik et al., 2018; Masseria et al., 2010; Monasta et al., 2008). Roma typically fit large

extended families into small spaces with somewhat fluid, changing household membership due to migration of household members (Koupilová et al., 2001; Pappa et al., 2015).

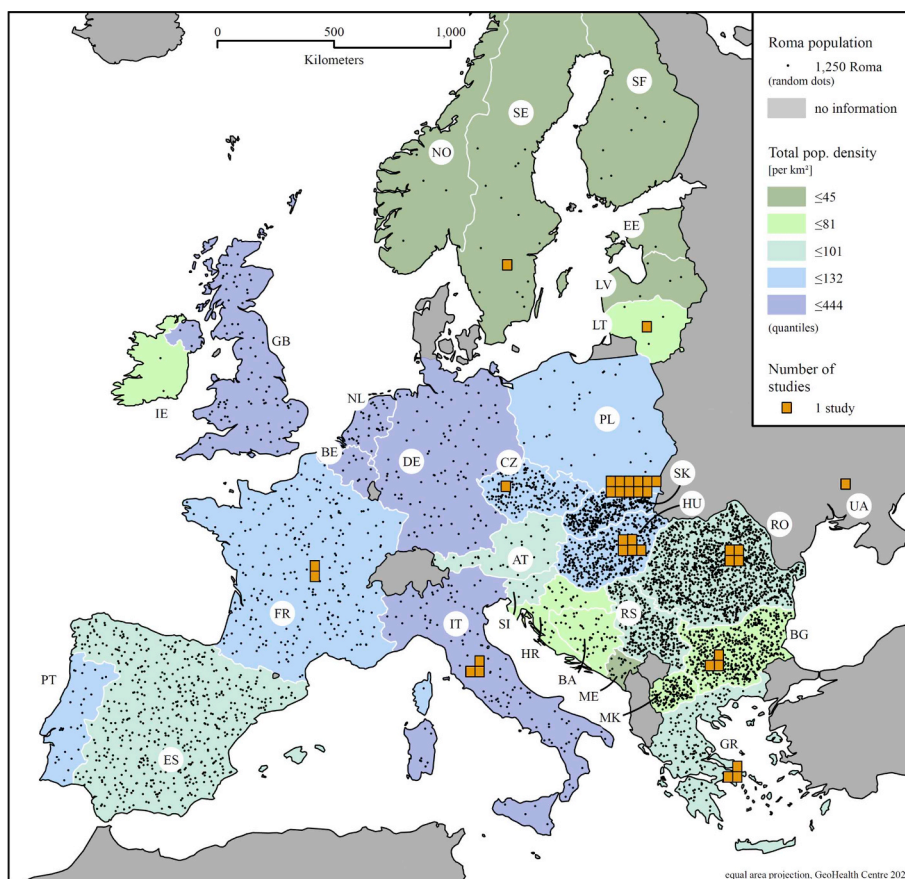
Roma housing often lacks basic physical infrastructure, including water, sanitation, hygiene (WASH) (Davis and Ryan, 2017; Filčák et al., 2018). Combined with accumulated waste, stray animals, rodents and insects, these conditions expose residents to environmental and fecal contamination (Chaudhuri, 2017), especially during the rainy autumn season, creating a favorable environment for the transmission of water- and excreta-related infectious diseases such as diarrhoea, typhoid, hepatitis, scabies and tuberculosis, which are more prevalent among the Roma than in majority populations (Chaudhuri, 2017; Koupilová et al., 2001; Parekh and Rose, 2011).

Albeit the lack of comprehensive statistics, some reports have evidenced that many Romani households experience significant difficulties in accessing adequate WASH services. According to the United Nations Development Programme (UNDP)'s *Regional Roma Survey* (2018), access to piped water is much lower for marginalised Roma than for neighboring non-Roma. Similarly, the United Nations Economic Commission for Europe (UNECE) country reports on *Equitable Access to Water and Sanitation* (2019) point out that the living conditions of Roma are still significantly worse than for the rest of the population. The *European Roma Rights Centre Report* (2017) found that discrimination was behind the marked disparities between the Roma's and non-Roma's access to safe and affordable drinking water and sanitation. Most recently, the *Atlas of Roma Communities* (2019) showed that only in 14% of Roma communities in Slovakia, households were connected to a public water supply. For sanitation, the situation was far worse: there was no public sewage system in 49% of Roma communities, and none of the households had a private on-site sanitation system (such as septic tank system, etc.) to treat human excreta. This clearly contradicts the European Urban Waste Water Directive that calls for ensuring that all agglomerations of more than 2000 population equivalent are provided with collecting systems for urban waste water (European Commission, 1991, 2014).



Data source: Berlin-Institut für Bevölkerung und Entwicklung (2010)

Fig. 1. Estimated Roma population in Europe.



\* n=6 studies included in this review were conducted in more than one European country. Therefore, the total number of studies according to this map exceeds n=30. Data source for the Roma population: Berlin-Institut für Bevölkerung & Entwicklung (2010)

**Fig. 2.** Spatial distribution of literature on water, sanitation and hygiene among Roma communities based on n = 30 publications (2000–2020), and estimated Roma population related to total population density in Europe.

These shattering figures, however, do not mean that no policies have been put in place to alleviate the water and sanitation burden the Roma population faces. In 2005, 12 European countries launched the “Decade of Roma Inclusion” initiative, with the aim of closing the gaps between Roma and non-Roma populations in four priority areas, welfare, housing, poverty and exclusion. Although the Decade plans did not succeed in “closing the unacceptable gaps between Roma and the rest of society”, they drew institutional attention on the situation of Roma (Brüggemann and Eben, 2017; Regional Cooperation Council, 2020). Inspired by the Decade Action Plans, the European Commission (2011) adopted an *EU Framework for National Roma Integration Strategies* in 2011, calling on Member States to design effective Roma inclusion policies and plans up to 2020. In terms of WASH access, most of the measures implemented focused on ensuring access to public utilities and infrastructure, supporting desegregation, and promoting urban regeneration (European Commission, 2019). A second initiative came in 2016, when the Regional Cooperation Council adopted the “Roma Integration 2020”, targeting European Union (EU) accession candidates, and pursuing, amongst other things, bridging the gap in access to housing and utilities such as water. And, more recently, the European Commission (2018) published a proposal for a recast of the Drinking Water Directive as a response of the Right2Water initiative, which calls for improving access to drinking water for everyone and ensuring access for vulnerable and marginalised groups, including minority cultures such as Roma, Sinti, Travellers, Kalé, and Gens du voyage. However, as Dugarova et al. (2017) highlight, there is still more room for a better alignment of European and national Roma inclusion

frameworks and SDG implementation agendas. In the context of WASH, this requires, inter alia, understanding the concerns for service delivery for Roma communities (Ezbakhe et al., 2019).

With the aim of better grasping the breadth and depth of obstacles the Roma are facing in WASH access, we conducted a systematic review to synthesize available evidence-based literature and identify obstacles to improvement. To our knowledge, this is the first in-depth review of Roma’s access to safe drinking water and sanitation.

## 2. Methods

This review and analysis of studies reporting WASH conditions among Roma communities was conducted in adherence with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher et al., 2009, Fig. 3) and sought to answer three questions:

1. What are the WASH conditions among Roma in Europe?
2. Which health risks result from WASH conditions among Roma in Europe?
3. What obstacles have impeded improvements in WASH among Roma in Europe?

### 2.1. Search and screening strategy

The search strategy for this systematic review was based on our research questions, using terminology associated with WASH among Roma in Europe. Search terms included WASH dimensions (water;

**Table 1**  
Exclusion criteria for the systematic literature review on water, sanitation and hygiene among Roma communities in Europe.

Exclusion criteria	Sub criteria
Not on water, sanitation, hygiene	-
Not in English	-
Wrong phase of displacement	
Wrong population	Study of population of Rome, Italy
Wrong publication date	Published before 2000
Wrong reason for water, sanitation conditions	Not WASH conditions (e.g. sanitation facilities), occupation as cleaner in general
Wrong setting	Outside of Europe
Wrong study type	Letters to the editor, opinion pieces, or newsletters

sanitation; hygiene; waste management; cleanliness); the specific population of interest (Roma); and country names in Europe. The term Roma encompasses diverse groups, including Roma, Gypsies, Travellers, Manouches, Ashkali, Sinti and Boyash. However, Roma is the term commonly used in the peer-reviewed literature and in policy documents (European Commission, 2020). Peer-reviewed literature was identified through the databases PubMed, Web of Science and Scopus in May 2019, and updated in January 2020. The retrieved articles were screened using Cochrane’s online systematic review software Covidence. Two reviewers screened titles and abstracts of each publication. Studies that were approved by two reviewers as meeting the inclusion criteria were included in full-text review. If necessary, a third reviewer

resolved conflicts. The same process was used for full-text review. Peer-reviewed literature written in English and published between 2000 and 2020 was included. Literature meeting one or more of the criteria shown in Table 1 was excluded.

2.2. Data extraction and analysis

The following information was extracted from each included study: country; setting details; study methodology; study population; focus; and all relevant quantitative data related to WASH (i.e., access to drinking water and sanitation facilities, personal hygiene, waste management, environmental hygiene, housing conditions, hygienic living environment, presence of stray animals in living environment, access to electricity). After extraction, data were tabulated to identify trends across studies and contextualize and synthesize results (Tables 2 and 3). Data was extracted independently by the lead researcher.

3. Results

3.1. Search results and study characteristics

The screening process used for this review is shown in Fig. 3. A total of 3089 peer-reviewed studies were identified, and after duplicates were removed, 2658 studies were included in title and abstract screening. Of these, 2621 studies were excluded for failure to meet inclusion criteria, and seven full texts were excluded. Thus, 30 studies were included in the final analysis.

Included studies reported information from 13 countries in Europe,

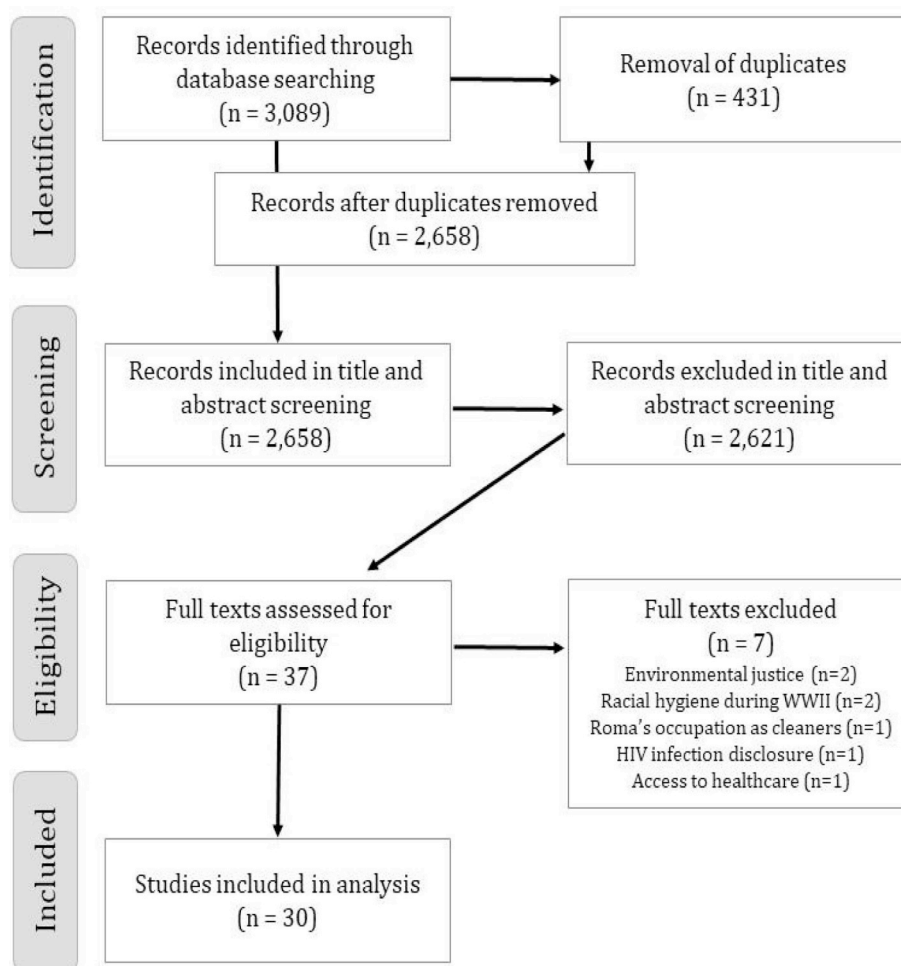


Fig. 3. PRISMA flowchart for the systematic literature review on water, sanitation and hygiene among Roma communities in Europe (Moher et al., 2019).

**Table 2**  
Description of included studies on WASH among Roma communities in Europe based on n = 30 publications (2000–2020).

Study	Country	Setting details	Methods/analysis	Population	Focus
Antolová et al. (2018)	Slovakia	informal settlements, healthcare facilities	quantitative, secondary data	community	<i>Toxoplasma gondii</i>
Chaudhuri (2017)	France	informal settlements, healthcare facilities	qualitative, intervention	community, stakeholders, decision-makers	Slum upgrading through sanitation
Davis and Ryan (2017)	Sweden	informal settlements, healthcare facilities	secondary data, overview	NA	Human rights
Djurovic et al. (2014)	Serbia	healthcare facilities	secondary data	children	Health status of children
Doherty et al. (2019)	Romania	urban and rural areas, informal settlements	quantitative, secondary data	community	Quality of life indicators
Filičák et al. (2018)	Slovakia	urban and rural areas, informal settlements, healthcare facilities	qualitative	community, stakeholders, decision-makers, healthcare providers	Inequality, local governance
Halánová et al. (2013)	Slovakia	NA	quantitative	children	<i>Entephalitozoon spp. &amp; E. bienersi</i> microsporidia
Hoffmann (2006)	Bulgaria, Hungary, Ukraine	NA	overview	NA	Right to water and sanitation
Hotez and Gurwirth (2011)	Europe	NA	review	NA	Neglected tropical diseases
Ioulia et al. (2019)	Greece	NA	quantitative	children	Human prarochoviruses
Klimovský et al. (2016)	Slovakia	NA	quantitative, qualitative, document review, spatial analysis	decision-makers	Policy approaches to settlements and poverty
Kósa et al. (2009)	Hungary	NA	quantitative, qualitative	community, stakeholders, decision-makers	Environmental health
Koupilová et al. (2001)	Czechia, Slovakia	NA	secondary data, review	NA	Health needs
Kováč and Gavurová (2017)	Slovakia	NA	secondary data, spatial analysis	NA	Infrastructure and mortality
Kozubik et al. (2018)	Slovakia	informal settlements	quantitative, qualitative	community	Housing and eating
Loewenberg (2010)	Italy	urban areas	overview	NA	Marginalization and health status
Masseria et al. (2010)	Bulgaria, Hungary, Romania	NA	secondary data	community	Socioeconomic determinants of health
Michos et al. (2011)	Greece	NA	quantitative	children	Allergic sensitization and infectious disease burden
Molnár et al. (2012)	Bulgaria, Hungary, Lithuania, Slovakia	urban and rural areas	quantitative, qualitative, secondary data, document review, impact assessment	community, decision-makers, healthcare providers	Housing policies
Molnár et al. (2010)	Hungary	rural areas	qualitative, secondary data, impact assessment, evaluation, review	community, stakeholders, decision-makers, school staff, healthcare providers	Housing
Monasta et al. (2008)	Italy	camps	quantitative, qualitative	community, children, stakeholders	Living condition and health among children
Pappa et al. (2015)	Greece	NA	quantitative	community	Quality of life
Parekh and Rose (2011)	NA	NA	review	NA	Health inequalities
Petrescu-Mag et al. (2016)	Romania	urban areas	quantitative, evaluation, review	community, stakeholders, decision-makers	Environmental equity, urban landfills
Pipitková et al. (2018)	Slovakia	urban and rural areas, informal settlements, healthcare facilities	quantitative	children	<i>Giardia duodenalis</i>
Pipitková et al. (2017)	Slovakia	rural areas	quantitative	NA	Risk for parasite infections
Pipitková et al. (2017)	Slovakia	urban and rural areas	quantitative	children	Helminth infections
Roman et al. (2013)	Romania	NA	qualitative	healthcare providers	Access to healthcare
Rosa (2019)	Italy, France	informal settlements, healthcare facilities	qualitative, secondary data	community, stakeholders, decision-makers	Self-care and vulnerability
Škaric-Juric et al. (2007)	Croatia	rural areas	quantitative	community	Living conditions and health



**Table 3**  
WASH, exposures and context among Roma communities in Europe based on n = 30 publications (2000–2020).

Study	WASH conditions											Exposures/outcomes															
	lack of safe water	lack of safe sanitation	lack of hygiene	lack of sewerage	lack of waste management	substandard housing	stray animals	lack of electricity	disease exposure	mental health	quality of life	health perceptions	risk behaviour	livelihood	Context	social status	unemployment	poverty	inequalities	schooling	tradition	health beliefs	health status	safety	eviction	conflict	environ-mental risk
Antolová et al. (2018)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Chaudhuri (2017)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Davis and Ryan (2017)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Djurovic et al. (2014)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Doherty et al. (2019)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Filčák et al. (2018)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Halánová et al. (2013)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Hoffmann (2006)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Hotez and Gurwirth (2011)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Ioulia et al. (2019)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Klimovský et al. (2016)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kósa et al. (2009)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Koupilová et al. (2001)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kováč and Gavurová (2017)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kozubik et al. (2018)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Loewenberg (2010)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Masseria et al. (2010)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Michos et al. (2011)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Molnár et al. (2012)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Molnár et al. (2010)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Monasta et al. (2008)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pappa et al. (2015)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Parekh and Rose (2011)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Petrescu-Mag et al. (2016)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pipiková et al. (2018)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pipiková et al. (2017)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pipiková et al. (2017)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Roman et al. (2013)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Rosa (2019)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Škarčić-Jurić et al. (2007)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

(continued on next page)

Table 3 (continued)

Study	Exposures/ outcomes		Context												
	livelihood	marginaliza- tion	social status	unemploy- ment	poverty	inequalities	schooling	tradition	health beliefs	health status	safety	eviction	conflict	environ- mental risk	
Kováč and Gavurová (2017)	x	x	x	x	x	x									
Kozubik et al. (2018)	x	x	x	x	x	x	x								
Loewenberg (2010)	x	x	x	x	x	x									
Masseria et al. (2010)															
Michos et al. (2011)															
Molnár et al. (2012)	x	x	x	x	x	x	x							x	
Molnár et al. (2010)	x	x	x	x	x	x									
Monasta et al. (2008)	x	x	x	x	x	x									
Pappa et al. (2015)	x	x	x	x	x	x									
Parekh and Rose (2011)	x	x	x	x	x	x									
Petrescu-Mag et al. (2016)	x	x	x	x	x	x									
Pipiková et al. (2018)															
Pipiková et al. (2017)															
Pipiková et al. (2017)															
Roman et al. (2013)															
Rosa (2019)															
Škarić-Jurić et al. (2007)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	

mostly in eastern Europe. Of the 30 studies reviewed, most were conducted in Slovakia (n = 11). An additional five studies were conducted in Hungary, four studies in Romania, three each in Bulgaria, Greece and Italy, two in France, and one each in Croatia, Czechia, Lithuania, Serbia, Sweden and Ukraine. Two publications included in this review did not specify where they were conducted. Of the studies that specified where they were conducted (n = 28), five covered more than one country in Europe (Table 2, Fig. 2).

Slightly more than half of the studies (n = 17) specified the setting in which they were conducted, and about one third of all studies (n = 9) covered more than one setting. The settings covered households in informal settlements (n = 8), rural (n = 8) or urban areas (n = 7), and camps (n = 1). Seven studies were conducted in health-care facilities.

Half of the studies adopted a quantitative approach to analyze primary or secondary data (n = 15), and one third used qualitative methods (n = 10). Five of the included publications were non-systematic literature reviews, and three were overviews. Eleven studies analyzed only secondary data. Few studies included document reviews (n = 2), spatial analysis (n = 2), impact assessments (n = 2) or evaluations (n = 2). One study was an intervention. Almost half of all publications (n = 14) used more than one method.

About half of the studies (n = 14) involved Roma community members and eight studies involved decision-makers or government representatives. Seven studies targeted other stakeholders, and an equal number of targeted Roma children (n = 7). Four studies involved healthcare providers, and one study involved school staff. Eight studies involved more than one respondent group, and another eight studies did not specify the study population.

The included studies were conducted by researchers from numerous disciplines, including Health Sciences (Community Medicine, Environmental Health, Epidemiology, Health Policies, Health Promotion, Medical Microbiology, Medicine, Public Health, Parasitology, Psychiatry, Social Medicine, Tropical Medicine), Natural and Environmental Sciences (Agricultural Sciences, Biology, Environmental Sciences and Engineering, Geography), Social and Political Sciences (Anthropology, Ethics, Ethnology, Public Policy, Political Science, Social Work, Labour and Family Research), Economy, Statistics, Human Rights and Romany Studies.

### 3.2. Overview mapping of WASH research themes among Roma communities in Europe

Across Europe, Roma communities face more challenges than the rest of the population with respect to access to safe drinking water and sanitation, adequate hygiene, good waste management and environmental hygiene, appropriate housing and hygienic living environments. Factors determining the WASH conditions include the Roma's marginalisation, isolation and social exclusion from the majority population, their low social status compared to the majority population, high rates of unemployment and poverty, inequalities, low levels of formal education and schooling, their distinct traditions and lifestyle, their distinct health beliefs and health perceptions. Moreover, their poorer health status than the majority population, less safe living conditions, the threat of eviction from their houses and communities, conflicts with the majority population, and environmental risks including animal wastes and flooding shape WASH (Fig. 4, Table 3).

In the past two decades, the topics most discussed with regard to WASH and Roma communities in Europe are the health risk arising from substandard housing and crowding, the lack of environmental hygiene and absence of waste management systems, the lack of accessible, affordable and available water of good quality, the lack of personal hygiene options including menstrual hygiene management, the lack of sanitation facilities and sewerage systems and disease exposure from animals in the living environment (Figs. 4 and 5, Table 3).

WASH	Context												
	marginalization	social status	unemployment	poverty	inequalities	schooling	tradition	health beliefs	health status	safety	eviction	conflict	environmental risk
water	22	16	12	20	17	13	9	7	17	4	3	3	4
sanitation	17	14	10	19	15	12	9	8	16	4	3	3	5
hygiene	16	13	9	19	15	12	9	7	17	4	2	2	4
sewerage	18	14	9	18	13	11	9	7	15	4	2	3	4
waste	18	13	11	19	17	13	8	8	19	4	3	2	5
housing	20	16	13	22	18	15	10	8	20	4	3	2	4
animals	9	5	4	10	8	5	3	2	9	3	1	2	4
electricity	13	11	8	14	12	9	7	4	11	2	1	1	3

Numbers represent relationships between WASH service and condition, and context, as reported in single studies that were reviewed (n=30).

Fig. 4. Frequency map of contextual factors determining WASH-related services and conditions among Roma communities in Europe.

The same factors are also commonly associated with a low quality of life among Roma community members, and to a lesser extent, with unhealthy lifestyle and risk behaviours. These factors are described as obstacles to improving livelihoods and socioeconomic development. In

the context of WASH conditions and their health implications, Roma-specific health-related perceptions, health beliefs and taboos are also commonly discussed. The topic receiving the least attention is mental health effects (Fig. 6).

WASH	Exposures					
	disease exposure	health perception	livelihood	mental health	quality of life	risk behaviour
water	23	6	12	4	15	8
sanitation	22	6	10	3	15	8
hygiene	22	7	8	4	14	7
sewerage	21	6	9	3	12	8
waste	24	6	9	4	13	8
housing	25	7	12	4	16	10
animals	11	2	4	3	5	2
electricity	14	3	7	4	8	8

Numbers represent relationships between WASH service and condition, and exposures, as reported in single studies that were reviewed (n=30).

Fig. 5. Frequency map of health exposures stemming from WASH services and conditions among Roma communities in Europe.



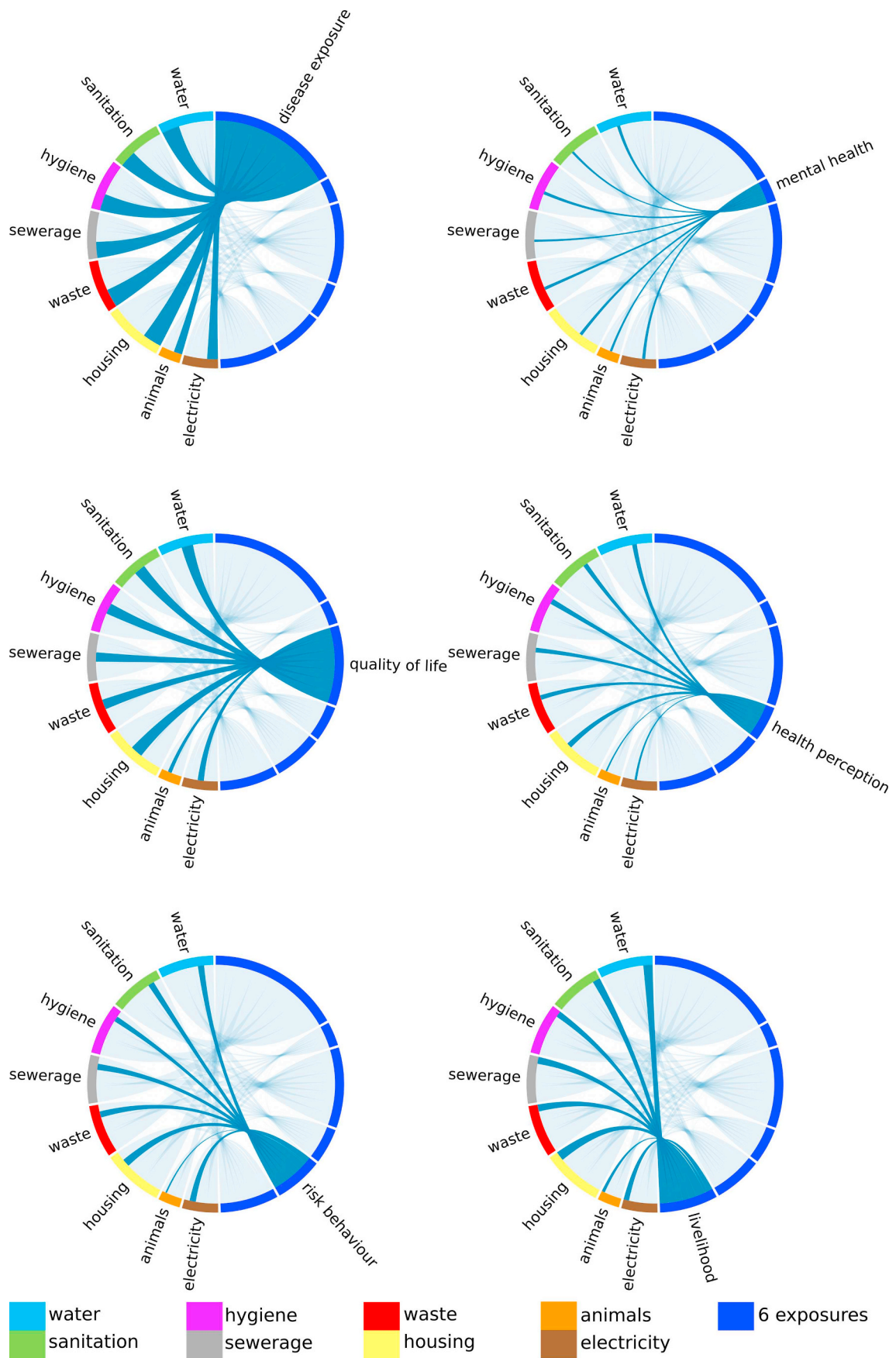


Fig. 6. Exposures and outcomes related to unsafe WASH conditions among Roma populations in Europe.

### 3.3. Water, sanitation and hygiene conditions among Roma in Europe

Prominent themes in the literature to describe WASH conditions about European Roma populations include (a) limited access, affordability, and quality of WASH services, (b) self-management of WASH as response and adaptive tactic, (c) unsafe WASH as a reason for eviction, and (d) health risks associated with substandard WASH services.

#### 3.3.1. Limited access, affordability and quality of WASH

Especially in informal settlements, Roma populations lack access to adequate drinking water (Davis and Ryan, 2017). In Romania and Croatia, a significant proportion of Roma (80% and 53%, respectively) lacks access to improved water sources (Doherty et al., 2018; Škarić-Jurić et al., 2007). According to Rosa (2019), 77% of informal Roma settlement sites in France do not have access to potable water, while 20% of Roma in Greece do not have access to any source of drinking water (Pappa et al., 2015). According to Filčák et al. (2018), in Slovakia, the majority of Roma neighbourhoods are not connected to piped water sources, and Pipiková et al. (2017a,b) report water pipes are unavailable in 17% of Roma settlements, and up to 7% of dwellings do not have direct access to drinking water. Water supply systems and networks in Europe often end where the majority neighbourhood ends and the Romani settlement starts. If covered by water networks at all, the water systems tend to be in a state of disrepair (Hoffmann, 2006). Where piped water systems exist, an entire settlement may have to share one tap, and water access is typically restricted to a few hours per day, inaccessible during the night and not sufficient for all residents to obtain at least a minimum amount of water for consumption and services. These issues force Roma inhabitants in France and Slovakia to spend significant amounts of time (up to 40 min one way) fetching water from public taps, or to unsafe sources such as distant shallow wells, streams or rivers (Filčák et al., 2018; Pipiková et al., 2017a,b), or a distant fire hydrant (Chaudhuri, 2017).

Roma households with access to water infrastructure mostly do not have individual contracts with water companies. Instead, as reported from Slovakia, the company makes one single contract with the municipality, which then charges the households with a uniform water rate (Filčák et al., 2018). These contracts do not differentiate between water used by the municipality's own buildings and households. They are based on a collective water metering instead of individual household consumption, and create connection fees and water rates which the households are often unable to pay, leaving the Roma heavily indebted. In case of damage or breakdown of pipes, the Roma are urged to pay, and if unable, they are disconnected from the water supply (Filčák et al., 2018).

Sanitation facilities are scarce or absent in most Roma settlements (Davis and Ryan, 2017). In Romania, 83% of Roma lack improved sanitation (an indoor toilet) (Doherty et al., 2018). Among Roma in Greece, 39% lack toilets (Pappa et al., 2015). In Roma camps near big cities in Italy, communal toilets are often in unusable conditions, rarely assigned to single families, and rarely divided for men and women. Plumbing in these settings is mostly set up by the families themselves, and not supported by appropriate drains (Monasta et al., 2008). Of Roma households in Croatia, only 2% have access to a public sewage system, and 24% have private septic tanks (Škarić-Jurić et al., 2007). In Slovakia, only 42% of Roma settlements have access to the public sewer system (Pipiková et al., 2017a,b). Where toilets are absent, open defecation near rivers is considered an alternative for Roma communities (Chaudhuri, 2017; Filčák et al., 2018; Rosa, 2019).

Access to sanitation facilities differs by gender, and is particularly difficult for females, as described in a Roma settlement in Paris. Households headed by women and female single-parent families are not typically allocated a toilet. As a result, women and adolescent girls often have no option but to defecate in the surrounding fields, which

poses public health, hygiene management, privacy and security challenges. The lack of toilets and water motivates women to reduce their drinking water intake in order to avoid urinating or defecating, particularly during inclement weather and darkness (Chaudhuri, 2017).

Similar to water supply systems, sanitation systems likewise often end where the majority neighbourhood ends and the Romani settlements starts, and are damaged, non-functional and/or unaffordable, which sometimes results in mass disconnections or even forced evictions (Hoffmann, 2006). Inadequate sanitation may even be used as the official explanation for relocation and forced eviction of Roma from their settlements, as found in Slovakia and Sweden (Filčák et al., 2018).

Poor personal hygiene among Roma due to the lack of access to safe water and sanitation, poor waste management infrastructure and poor living environment, is frequently reported in the literature. According to Filčák et al. (2018), river water is the main water source used for personal hygiene and bathing among Roma communities in Slovakia. Reported difficulties in meeting hygiene standards are due to the distance to the water source and the limited possibilities of heating water in settlements where electricity is largely lacking, or where electrical heating installations (e.g. in caravans) are expensive and do not meet safety regulations (Filčák et al., 2018; Pappa et al., 2015; Pipiková et al., 2017a,b). In some Roma camps in Italy, hot water is available only a few hours per day in the early morning, with half of the families lacking access (Monasta et al., 2008).

Seasonal challenges impede water and sanitation access during and after heavy rains and floods in autumn, during snow and ice in winter, especially in hilly terrains, or where rail tracks need to be crossed to fetch water. Where piped water systems exist, water is reported to frequently freeze in winter (Filčák et al., 2018; Ioulia et al., 2019; Molnár et al., 2012; Rosa, 2019). Sanitation and hygiene facilities may be inaccessible, especially in winter, as reported from Roma settlements in Italy (Monasta et al., 2008). Sanitation infrastructure is reported to be affected by storms and wind, where building materials (e.g. roofs) are displaced (Chaudhuri, 2017).

#### 3.3.2. Self-management of WASH as response and adaptive tactic

As a response or adaptive tactic to deal with the lack of WASH infrastructure, squatting and building self-managed sanitation or water systems by (illegally) connecting to water distribution systems in Roma communities in Italy and France is common (Rosa, 2019). Moreover, some Roma extract water from public places, or take care of their personal hygiene and washing of laundry and utensils at public fountains (Filčák et al., 2018; Rosa, 2019). Shifting WASH activities, corporal cleaning and bathing from the domestic environment to public urban spaces can create conflicts with authorities, as such practices are not allowed under municipal regulations and go against dominant social norms (Rosa, 2019). The use of public facilities is also costly. The use of public toilets by Roma in Sweden involves challenges as they may be located far away, and involve a recurring cost for use (5–10 SEK or 0.50–1 USD) (Davis and Ryan, 2017). Public showers used by Roma in Italy are considered unsafe, cold, dirty and costly (approximately 1.85 EUR or 2 USD per use) (Rosa, 2019).

#### 3.3.3. Unsafe WASH as a reason for eviction

The responsibilities for ensuring that residents in informal Roma settlements have access to water and sanitation are often unclear or ignored. Municipalities mostly exercise primary responsibility for water policy, which enables them to take concrete steps in implementing water, sanitation and hygiene improvements. However, municipalities across Europe control Roma settlements' access to water and sanitation infrastructure, and frequently use poor water, sanitation and hygiene conditions as an official explanation to discourage settlement, and as legitimization or justification to evict Roma communities from their settlements (Davis and Ryan, 2017; Filčák et al., 2018; Parekh and

Rose, 2011). Although there are no official statistics on the number of Roma evicted from their homes due to inadequate living conditions, the following cases shed some light on the extent of the issue. In Sweden, between 2013 and 2016, some municipalities initiated at least 80 evictions of informal Roma settlements on the grounds of sanitation hazards, littering and increased disease risk (Davis and Ryan, 2017). Most recently, in Italy, around 500 Roma people were forcibly evicted by local authorities on the basis of unhygienic and unsafe living conditions (Amnesty International, 2019). Such evictions violate obligations under both European and international human rights law (OHCHR, 2018) and ignore the recommendation of the Council of the European Union (2013) that member states “take effective measures to ensure equal treatment of Roma”, including “access to public utilities” (Anthonj et al., 2019a).

### 3.4. WASH-related health risks among Roma in Europe

Both communicable and non-communicable diseases are more common among Roma populations compared to the majority population. Numerous water- and excreta-related infectious diseases, e.g. diarrhoea, are reported to be more prevalent among the Roma as a consequence of poor access to water and sanitation, (environmental) hygiene and living conditions (Filčák et al., 2018; Koupilová et al., 2001; Masseria et al., 2010; Monasta et al., 2008; Parekh and Rose, 2011; Rosa, 2019). According to Doherty et al. (2018), in Romania, Roma suffer from a higher burden of diarrhoea compared to non-Roma, with Roma more than twice as likely to report at least one household member suffering from moderate to severe diarrhoea (lasting more than 3 days) (in the last year). In Croatia, ‘stomach pain’ is the second most commonly reported health complaint (16%, after frequent headaches 20%) among the Roma population (Škarić-Jurić et al., 2007).

Environmental exposures to pathogens and infectious diseases are mainly reported for children in Roma communities. A higher prevalence of protozoa and helminths in children in Roma villages with lower hygiene standards and highly contaminated environment was detected in Slovakia, where helminth ova were present in 53% of stool samples (52% *Ascaris lumbricoides*, 2% *Trichuris trichiura*, 1% *Enterobius vermicularis*, 0.5% *Hymenolepis diminuta*, 8% cysts of *G. duodenalis*). Playing in dirty public spaces, and ingesting infested soil during the play are major risk factors, as is the recontamination of the environment through children defecating in the open (Pipiková et al., 2017a,b). Of stool samples of Roma children in Slovakia, 31% had positive cases of spores of microsporidia (26% *E. cuniculi*, 4% *E. bienersi*, 1% other). Microsporidial spores are released into the environment via stools, urine and respiratory secretions, thus, infected persons or animals and a lack of safe sanitation pose high risk factors (Halánová et al., 2013). In Roma camps in Italy, mothers describe diarrhoea as one of the main health problems children face. One third of the children (32%) covered by a study by Monasta et al. (2008) suffered from diarrhoea in the 15 days prior to the assessment. Risk factors included the time spent living in those camps, with children of families that had spent more than 2 years in the camps having a higher risk of diarrhoea. Other risk factors included living in an overcrowded house (>2.5 people per room) and the presence of stagnant water near the house (Monasta et al., 2008).

A study from Serbia reported Roma children to have a higher rate of comorbidities, more malnutrition, more skin diseases (especially parasitic and fungal infections) and more frequent anemia, longer hospitalization times and require more medical attendance; further, Roma children were less commonly discharged as “completely cured” than non-Roma children (Djurovic et al., 2014).

Other water-related infectious diseases, dermatological infections including scabies, and hepatitis, are reported to be more prevalent amongst the Roma largely as a consequence of impoverished living conditions, poor environmental and personal hygiene and proximity to animal and insect vectors (Chaudhuri, 2017; Filčák et al., 2018; Koupilová et al., 2001; Loewenberg, 2010; Parekh and Rose, 2011).

In Czechia, France, Italy and Slovakia, acute respiratory illnesses, tuberculosis, bronchitis and pneumonia are more prevalent amongst the Roma community members as a consequence of poor (environmental) hygiene and living conditions (Filčák et al., 2018; Koupilová et al., 2001; Parekh and Rose, 2011; Rosa, 2019). In Italian Roma communities, coughing and respiratory difficulties are common among children. More than half of the children (55%) covered by the study had suffered from a cough in the 15 days preceding the 2001 survey, and 17% of all children had had episodes of respiratory difficulty or wheezing at least once in the year preceding the survey (Monasta et al., 2008). Acute respiratory illnesses were related to specific housing risk factors such as dampness and mold, lack of ventilation, heating and insulation problems, and faulty building materials, as well as lack of access to a toilet with a shower and use of wood-burning stoves for heating rather than electricity or gas (Monasta et al., 2008).

According to Masseria et al. (2010) and Roman et al. (2013), Roma are also more likely to have chronic diseases compared to the majority population. In a study conducted in Greece, 54% of Roma report chronic diseases (Pappa et al., 2015). Among Roma in Croatia, anxiety or insomnia (13%), hypertension (9%), and chronic obstructive pulmonary disease (COPD) (9%) make up many of the main health challenges (Škarić-Jurić et al., 2007). High rates of chronic diseases and associated risk factors in Roma compared to non-Roma are detailed in Masseria et al. (2010), such as increased levels of insulin, hypertension, cardiovascular diseases and metabolic syndrome, and decreased levels of vitamin C and other antioxidant vitamins. Inadequate diets, malnutrition, underweight and obesity are common among Roma populations as well, as reported from Bulgaria, Hungary, Romania and Slovakia (Kováč and Gavurová, 2017; Masseria et al., 2010). The level of education, socio-economic status and access to health insurance play a significant role in the occurrence of chronic diseases (Masseria et al., 2010; Škarić-Jurić et al., 2007).

## 4. Discussion

### 4.1. Challenges in improving WASH and environmental health among Roma

The same factors determining the poor quality of WASH services and environmental health impede their improvement. These include discrimination, stigmatization and exclusion, low socioeconomic status, low level of formal education and schooling, violence and vandalism, and a seminomadic lifestyle (Chaudhuri, 2017; Davis and Ryan, 2017; Doherty et al., 2018; Filčák et al., 2018; Hoffmann, 2006; Koupilová et al., 2001; Kozubik et al., 2018; Parekh and Rose, 2011; Roman et al., 2013; Rosa, 2019; Škarić-Jurić et al., 2007). Indeed, a recent study for the European Commission has emphasized that, in order to overcome some persistent challenges, future EU funding should focus on addressing “any form of structural *antigypsyism*, including all forms of segregation, forced evictions, environmental injustice and other manifestations of prejudice, including education, employment, health and housing” (Naydenoza and Matarazzo, 2019). Tackling these underlying social determinants would help to create an enabling environment for improving WASH and other health services.

Legal aspects, such as statelessness, lack of identification documents and illegal tenure and housing add extra obstacles to improvement of WASH and environmental health among Roma communities, as do their internal social structures (Chaudhuri, 2017; Davis and Ryan, 2017; Djurovic et al., 2014; Filčák et al., 2018; Klimovský et al., 2016; Koupilová et al., 2001; Molnár et al., 2012; Parekh and Rose, 2011; Petrescu-Mag et al., 2016; Roman et al., 2013; Rosa, 2019). Social factors include lack of a formal decision-making structure or social hierarchy, distrust in authorities, reluctance to accept interventions and the variable commitment by Roma community leaders and members. Gender roles that suppress involvement of women in decision-making presents another barrier to improvement (Chaudhuri, 2017; Filčák et al., 2018; Djurovic et al., 2014; Kósa et al., 2009; Koupilová et al.,



2001; Molnár et al., 2010, 2012; Monasta et al., 2008; Parekh and Rose, 2011; Rosa, 2019).

Major challenges are likewise created by authorities that could address the needs of the Roma, and include prejudices toward Roma, lack of political will to engage, political top-down approaches, absence of advocacy on behalf of the Roma and lack of involvement of the Roma community in planning (Davis and Ryan, 2017; Doherty et al., 2018; Filčák et al., 2018; Hoffmann, 2006; Klimovský et al., 2016; Koupilová et al., 2001; Molnár et al., 2010, 2012; Monasta et al., 2008; Petrescu-Mag et al., 2016; Roman et al., 2013; Rosa, 2019).

#### 4.2. Representation of Roma as a barrier to improvement

Our review included all literature published in the past two decades and while prior to 2010, there was a paucity of peer-reviewed literature, with only eight published papers, 22 papers were published since 2010. This increase in publications indicates an increase in attention to the water, sanitation, hygiene and environmental health situation among Roma communities in Europe. Attention to underserved populations may have been bolstered by the adoption of more expansive Sustainable Development Goals related to water and sanitation in 2015 (United Nations General Assembly, 2015).

However, more efforts are needed to better represent and target Roma in EU policies. The different European policy frameworks for Roma inclusion put in place over the past decades have failed to reach their objectives because they have not impacted the situation of Roma on the ground (ERGO Network, 2019). Inadequate and ineffective targeting of Roma communities, together with their lack of meaningful participation in EU policy-making, are only two of the shortcomings that need to be addressed for a better representation of Roma (Naydenoza and Matarazzo, 2019). Furthermore, in addition to the EU's current priority areas for Roma inclusion (i.e., education, employment, housing, and healthcare) others such as political participation must be explicitly included in national strategies (Mirga-Kruszelnicka and Skenderi, 2017).

Furthermore, numerous challenges relate to the representation of Roma in the literature. Their social history of prejudice and exclusion has created suspicion and distrust among Roma towards (non-Roma) authorities and reluctance to get involved in research activities or community interventions of any sort (Djurovic et al., 2014; Hoffmann, 2006; Kósa et al., 2009; Koupilová et al., 2001; Masseria et al., 2010; Molnár et al., 2010, 2012; Monasta et al., 2008; Parekh and Rose, 2011; Rosa, 2019). Conducting research among a population that is culturally apart from the majority, with strongly held but distinctive health beliefs, can be challenging. Classical risk factor epidemiology is complicated not only by difficulties of access and distrust, but also because many issues of interest, such as sanitation – a taboo topic not to be addressed, are traditionally regarded by Roma people as being within a private domain and thus not to be discussed with outsiders (Koupilová et al., 2001; Rosa, 2019).

Information on water, sanitation, hygiene and environmental health among Roma is patchy, and epidemiological studies on Roma health tend to suffer from poor, non-uniform methodologies. Roma studies are often restricted to one or two districts or settlements in one country, with small unrepresentative sample sizes (Masseria et al., 2010), lack of control groups, samples and other issues, combined with ethical and logistical obstacles to data collection (Klimovský et al., 2016; Kósa et al., 2009; Koupilová et al., 2001). Keeping ethnically segregated records is prohibited in many countries where Roma live (Chaudhuri, 2017; Davis and Ryan, 2017; Parekh and Rose, 2011). For example, since 1989, Czech and Slovak researchers have largely turned away from health research on particular ethnic groups, probably reflecting a growing sensitivity about stigmatizing Roma (Koupilová et al., 2001). Where studies address ethnicity, self-identification by Roma is widely used, or Roma are identified as such by the researcher or an observer (third person), which raises ethical questions and creates bias (Kósa

et al., 2009; Kováč and Gavurová, 2017; Masseria et al., 2010). This makes it difficult to understand to what extent Roma health disadvantages are linked to Roma ethnicity, or to broader issues such as poverty and lack of education affecting both Roma and other disadvantaged groups (Masseria et al., 2010).

Overall, literature remains limited in content and scale, and much of what has been published is unavailable in English or in major bibliographic databases. The widespread lack of relevant data, as well as the variety of political, cultural and linguistic settings and heterogeneity of Roma communities across Europe make any comprehensive study of the topic difficult (Chaudhuri, 2017; Hoffmann, 2006; Klimovský et al., 2016; Kósa et al., 2009; Koupilová et al., 2001; Kováč and Gavurová, 2017; Masseria et al., 2010; Molnár et al., 2010, 2012; Monasta et al., 2008; Pappa et al., 2015; Parekh and Rose, 2011; Pipiková et al., 2017a,b; Roman et al., 2013; Škarić-Jurić et al., 2007). Thus, research on health issues that affect Roma communities living in marginal contexts remains underfunded, understudied, and a neglected public health concern (Monasta et al., 2008). All of these factors have led to a relative paucity of data, published literature, and detailed understanding of the needs and inequalities among Roma, hampering research, interventions and advocacy to improve conditions (Chaudhuri, 2017; Koupilová et al., 2001; Masseria et al., 2010; Parekh and Rose, 2011).

#### 4.3. Cultural, historical and socioeconomic context: a challenge to health promotion and health-seeking behaviours

Water, sanitation, hygiene and environmental health conditions, and their implications for the health of Roma communities need to be considered in the cultural context of health-related perceptions, behaviours, practices, and health-seeking behaviour.

Roma populations commonly have a very distinct understanding of the meaning of health and health risks (Koupilová et al., 2001; Loewenberg, 2010; Roman et al., 2013), partly because they do not consider schooling to be a priority and often lack formal or informal health education (Chaudhuri, 2017). In Croatia, for example, 33% of Roma children are not enrolled in school because they are believed to be needed more to help sustain livelihood and work (Škarić-Jurić et al., 2007). As a consequence, they may neither be aware of all risks that living in an unhygienic environment poses, nor of the transmission pathways associated with unsafe WASH, thus unknowingly increasing their exposure to human waste and fecal pathogens. Doherty et al. (2018), for example, in their study in Romania, found perceptions related to water safety to determine the choice of a certain water source. In their study, the Roma community used a distant surface water source which they perceived as safer, rather than a piped water source located on the premise, which they perceived as more hazardous and contaminated. The same study found Roma community members use salt or lime to treat drinking water from personal wells (Doherty et al., 2018).

Distinct health beliefs among Roma communities also impact their health-seeking behaviour. Among Roma, a spiritual base exists for certain kinds of illness and belief in traditional curative remedies such as the power of spittle to treat wounds. Roman et al. (2013) found that the Roma communities are divided in terms of attitude towards illness and ill individuals. In some communities, patients fear to disclose their health status because a severe illness triggers shame, social rejection and stigmatization, such that disease may be treated as secret. Perception, acceptance or rejection of certain diseases may determine the willingness to seek medical help or support from the communities, affecting rehabilitation. In other Roma communities, ill individuals are accepted and supported, especially when they suffer from a severe or terminal disease. In Croatia, for example, seeking care with medical service providers is rare, and used only for giving birth and serious illness (Škarić-Jurić et al., 2007). This cultural context of perception of diseases, health, and health-seeking, combined with long-lasting negative attitudes and distrust in non-traditional health practices, in authorities and health professionals, and the reluctance to cooperate in

treatment and prevention by the Roma on the one hand, and the poor communication with Roma by healthcare providers on the other hand, often prevent Roma from seeking formal medical health services (Chaudhuri, 2017; Djurovic et al., 2014; Koupilová et al., 2001; Loewenberg, 2010; Rechel et al., 2009; Roman et al., 2013).

These factors are also major reasons for a lower immunisation coverage among Roma compared to the majority population (Hotez and Gurwirth, 2011; Ioulia et al., 2019; Koupilová et al., 2001; Kozubik et al., 2018; Loewenberg, 2010; Parekh and Rose, 2011; Rosa, 2019). According to Doherty et al. (2018), Roma are approximately 1.5 times less likely to report having an immunisation of any kind than non-Roma. The lack of medical identification and insurance, due to the lack of access to the formal labour market, adds to the low vaccination coverage (Djurovic et al., 2014; Doherty et al., 2018; Michos et al., 2011; Roman et al., 2013; Škarić-Jurić et al., 2007). Besides, many Roma face other major difficulties in accessing healthcare, including distance from roads and healthcare providers, absence of public transport, cost, and neglect by medical professionals based on discrimination, adding extra risks and challenges to disease prevention and health promotion (Chaudhuri, 2017; Filčák et al., 2018; Loewenberg, 2010; Molnár et al., 2010, 2012; Monasta et al., 2008; Parekh and Rose, 2011; Pipiková et al., 2017a,b).

Despite challenges and barriers to improvement of WASH among Roma in Europe, several European countries are undertaking initiatives to equip Roma settlements with chemical toilets, shower blocks and mobile health care services, or to repurpose existing water connections to serve informal settlements (Rosa, 2019). However, these measures provide temporary rather than permanent solutions. Koupilová et al. (2001) point out that an improved understanding will be obtained only with great sensitivity and only if purely top-down approaches are abandoned. The success of interventions depends on buy-in from decision-makers and good relations between natural leaders of Roma communities and “outsiders” (Chaudhuri, 2017). Any activity will critically depend on the involvement, support, commitment and participation of the Roma community Davis and Ryan (2017).

#### 4.4. Limitations of the review

Prominent search terms were limited to WASH themes to provide a more targeted review. While some synergies such as poverty, hunger, healthcare, and infrastructure were identified, this approach may have limited identification of synergies with other types of health and environmental health determinants, interventions, and outcomes, such as energy and solid waste management. Although some gray literature references were described to provide contextual information, the systematic search similarly excluded thorough evaluation of gray literature and non-English documents that may be available on the topic. We acknowledge the value of non-peer-reviewed literature (e.g. reports of the European Union, NGOs, etc.) in the introduction as they similarly add insight and value to the topic. Analyzing them in-depth, however, was outside of the scope of this literature review and meta-analysis.

We believe quality control and quality assurance were achieved via the review methods, and reporting was checked against the PRISMA criteria (Moher et al., 2009). Still, some resource limitations were applied for practicality, precluding forward and backward citation checking or contact with study authors.

Most literature reported on discrete disease-related outcomes rather than holistic assessments of health and wellbeing. Outcomes stemming from self-reporting or syndromic surveillance are subject to measurement bias. The number of included papers covering specific countries did not evenly represent the estimated percentage of Roma in those countries (Table 2, Figs. 1 and 2). Bulgaria, Romania, Slovakia and North Macedonia, though varying widely in terms of total population, have the highest percentage of Roma (>9%). However, while numerous studies (n = 11) addressed WASH among Roma in Slovakia, none were published for North Macedonia. And while most countries

with Roma populations lower than 0.5% were not represented at all in the literature (Fig. 1), a few publications described the WASH and environmental health situation in more sparsely populated countries such as Italy (n = 3), France (n = 2), Sweden and Lithuania (n = 1 each).

The study focused on the home environment in Roma settlements in Europe and did not obtain information on WASH conditions in non-household settings such as schools, healthcare facilities, workplaces (Cronk et al., 2015), or school- or community-based WASH health and education programs accessible to Roma children and families.

Finally, the data we use to illustrate Roma populations in Europe (Figs. 1 and 2) provide the latest available general overview, but are ten years old (Berlin-Institut für Bevölkerung und Entwicklung, 2010). More accurate and recent data is available only for a few selected countries, and even the more recent data are underlying ongoing changes due to migration of Roma populations. Therefore, our figures and maps serve as a general impression only, and shall be used with precaution.

## 5. Conclusions and recommendations

To our knowledge, this is the first systematic review of water, sanitation and hygiene amongst Roma communities in Europe. In this paper, we characterized WASH conditions among these often vulnerable and marginalised populations, described challenges in addressing such conditions, and examined the role of cultural norms in shaping health behaviours.

Our review provides evidence for substantive active and passive discrimination of Roma in Europe with regard to WASH, and uncovers challenges and the inequalities for Roma in Europe. Prominent barriers to WASH access and affordability among the Roma included social exclusion, poverty, geography, as well as distinct health beliefs and risk perceptions as compared to the majority population. These determinants manifest in widespread inadequacies in WASH services, which are associated with poorer health and mental health outcomes relative to the general European population.

Future research to overcome obstacles to improvement needs to be inclusive, and involve community members as key informants, with their participation enhancing the reliability of data, contributing to social justice and solidarity, disseminating information, contributing to feasible recommendations and implementation of interventions (Anthonj et al., 2019a,b; Kósa et al., 2009). Strategies to achieve inclusive WASH coverage among marginalised European Roma populations may have broader applicability to ethnic and social minorities in other parts of the world.

Our findings shall not distract from the fact that besides the big, heterogenic minority of Roma, which is dispersed across Europe, there are many other, smaller, and even more marginalised groups whose situation is just as difficult to assess and also underrepresented in national statistics. Based on the results and cultural context on WASH among Roma, it may be assumed that further situation analyses of other marginalised groups would likely uncover similar or even stronger disadvantages. Therefore, our review demonstrates not only the urgent need for action for Roma communities in particular, but can also be understood as an example for marginalised groups in general, regardless of the feature that determines their marginalization (ethnicity, language etc.).

### Declaration of competing interest

None to declare.

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Research Digest #14 WASH inequalities persist in vulnerable minority groups in wealthy countries (Anthonj et al., 2019a), coordinated by Clarissa Brocklehurst at the Water Institute at UNC. We thank the sponsors of the Digest for creating a forum to examine critical WASH policy concepts and drive advancement toward a more in-depth understanding of this topic.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijheh.2020.113506>.

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