

# Environmental health inequalities

## Fact sheet series

### Context

This fact sheet series documents the magnitude of environmental health inequalities within countries in the WHO European Region.

Environmental health inequalities relate to socioeconomic, sociodemographic or spatial differences in exposure to environmental health risk factors and to differences in health status caused by environmental conditions.

The noise fact sheet provides available data on the unequal distribution of self-reported noise annoyance within countries in the Region, updating earlier assessments.

An overview of environmental health inequalities covered by the fact sheets and earlier assessments is available at: <https://www.who.int/europe/activities/reducing-environmental-health-inequalities>

## Inequalities in self-reported environmental noise annoyance

### Key messages

1

Complaints about environmental noise from neighbours or from the street are a major problem, especially in western European countries.

2

In western Europe poorer households suffer more often from environmental noise annoyance than rich ones, while in central Europe and south-eastern Europe different equity patterns can be observed within countries.

3

In the last decade the inequality gap in environmental noise annoyance narrowed slightly in central European countries and remained stable in western European countries. However, it increased slightly in south-eastern Europe in the last year of reporting.

4

In most western and central European countries urban households in relative poverty are most affected by environmental noise annoyance. Rural households generally report fewer complaints than urban households.

Self-reported noise annoyance is linked to Sustainable Development Goals 3, 10 and 11, and supports the identification of national challenges to “leave no one behind”.



# Methodological notes

## Defining inequalities

Environmental health inequalities are the differences in environmental health conditions between population groups. They can be quantified as absolute and relative inequalities.

Absolute inequalities are quantified by differences in the prevalence of a risk factor or disease between population groups (e.g. between poor and rich households). Relative inequalities, in contrast, are quantified as ratios between population groups.

To provide an accurate assessment, absolute and relative inequalities are equally important. The data in this fact sheet thus aim (when possible) to provide information on both measures.

Further information on defining and assessing environmental health inequalities is available from WHO's environmental health inequalities resource package (7).

To provide an overview and compare inequality conditions by geopolitical subregion, countries were grouped into four subregions to provide population-weighted subregional averages (Table 1). Countries with available data are shown in **bold**.

**Table 1. European subregions used for the assessment**

Subregion	Coverage	Countries included
<b>Subregion 1 (21 countries)</b>	All countries belonging to the European Union (EU) before May 2004 and western European countries at comparable developmental level	EU countries: <b>Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands (Kingdom of the), Portugal, Spain, Sweden</b> Non-EU countries: Andorra, <b>Iceland</b> , Monaco, <b>Norway</b> , San Marino, <b>Switzerland, United Kingdom</b>
<b>Subregion 2 (13 countries)</b>	All countries joining the EU after May 2004	<b>Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia</b>
<b>Subregion 3 (12 countries)</b>	All countries belonging to the Commonwealth of Independent States, and Georgia and Ukraine	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
<b>Subregion 4 (7 countries)</b>	All countries that are part of the South-eastern Europe Health Network, and Türkiye	<b>Albania, Bosnia and Herzegovina, Israel, Montenegro, North Macedonia, Serbia, Türkiye</b>

Note: The EU-SILC data used for the indicator do not cover Euro 3 countries.

## Indicator data

This fact sheet uses data from the European Union Statistics on Income and Living Conditions (EU-SILC) (2020 data), based on self-reported data from households on their housing and social situation (2).

EU-SILC collects data on complaints about noise from neighbours or from the street.

No European data are available on inequalities in measured noise exposure levels.

Indicator
Self-reported environmental noise annoyance
Description
Population complaining about noise from neighbours or from the street
Source and variable code
EU-SILC: ilc_mddw01

## Inequality stratifications

To show inequalities within countries, prevalence data can be compared between population subgroups, stratified by:

- socioeconomic determinants (e.g. income, poverty, education or employment);
- sociodemographic determinants (e.g. age, gender, ethnicity or household type); or
- spatial determinants (e.g. place of residence).

Most data in this fact sheet rely on a comparison of prevalence of self-reported environmental noise annoyance: the proportion of households in a population complaining about noise from neighbours or from the street.

**Box 1** shows the inequality stratifications used in this fact sheet.

### Box 1. Inequality stratifications

#### Household type

This fact sheet differentiates between single-parent households and the general population.

#### Place of residence

The population is divided into three groups of urbanization (cities, towns and suburbs, and rural areas).

#### Poverty

Households are divided into those living at or above and those living below the poverty threshold of 60% of the national median equivalized income.

# Status of inequalities in self-reported environmental noise annoyance

## Introduction and health relevance

Environmental noise is one of the most important environmental risk factors for health. At least 100 million people in western Europe are affected by environmental noise, and 1 million healthy years of life are lost every year as a result of the effects of noise on health (3). Effects of noise on health can be both physiological and psychological (4). Evidence of the non-auditory effects of noise on adult health is also convincing (5), highlighting the substantial public health impact of this environmental pollution. A systematic review analysing the distribution of noise exposure between different social groups found mixed results, but studies using indicators of material deprivation or deprivation indices showed higher environmental noise exposure levels among

groups with lower socioeconomic positions (6).

Moreover, evidence indicates that more advantaged individuals are less likely to suffer from noise-related health impacts, even if they live in noisier areas (7). Health inequalities may therefore arise not only as a result of exposure differentials but also from differences in vulnerability, and have also been identified as an issue for implementation of the Sustainable Development Agenda (8).

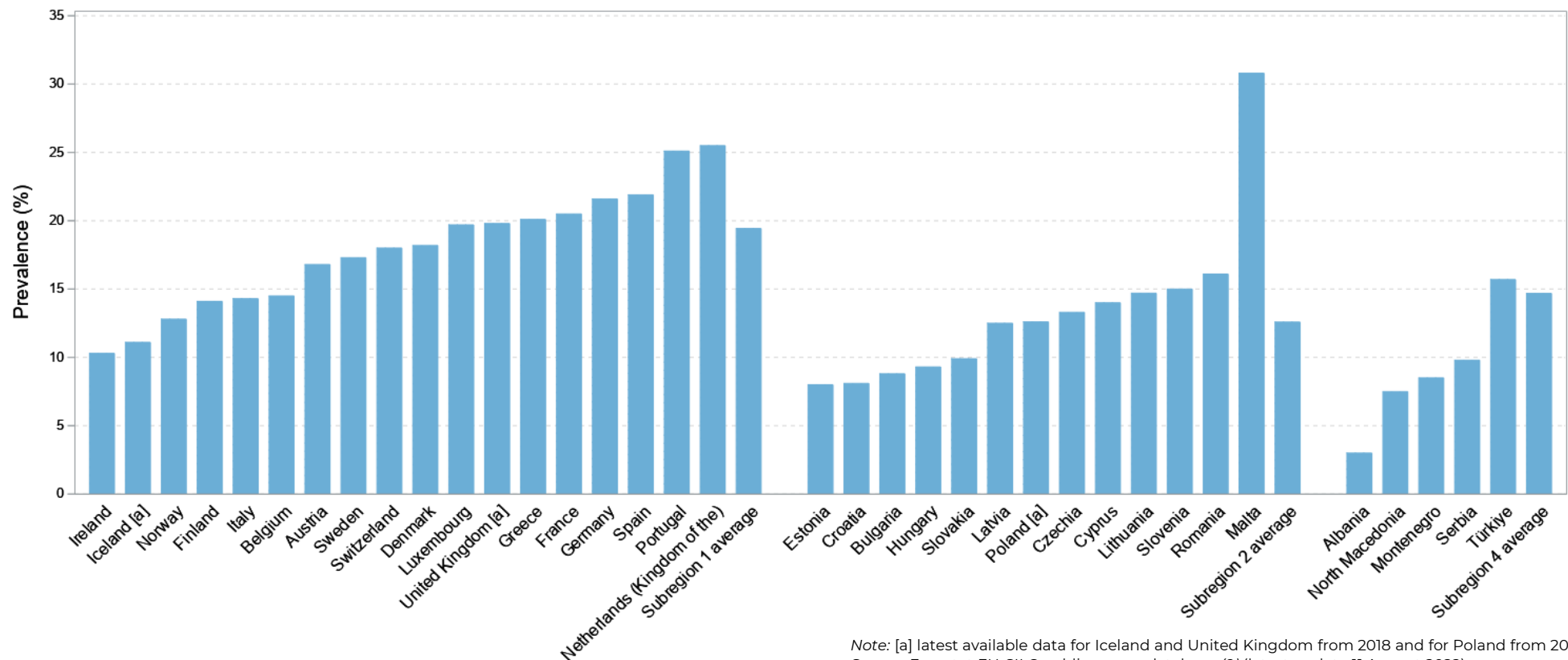
Within the WHO European Region, prevalence of complaints about noise from neighbours or from the street varied widely between subregions and countries in 2020, ranging from 3.0% in Albania to 30.8% in Malta. Households in Subregion 1 were

most often affected on average, with about one fifth complaining about noise (Fig. 1).

Furthermore, prevalence of self-reported environmental noise annoyance differed by socioeconomic, sociodemographic and spatial aspects. This fact sheet provides an overview of the status of inequalities in noise complaints by poverty and household type, and of the interaction between socioeconomic inequalities and place of residence.

This fact sheet uses the most recent data from 2020. It should be noted that this year saw the start of the COVID-19 pandemic, which resulted in many lifestyle and mobility changes that may also have influenced the prevalence of noise complaints.

**Fig. 1. Prevalence of self-reported environmental noise annoyance among the general population (2020)**



Note: [a] latest available data for Iceland and United Kingdom from 2018 and for Poland from 2019. Source: Eurostat EU-SILC public access database (9) (latest update 11 August 2022).

## Inequalities by poverty

Data on prevalence of self-reported environmental noise annoyance by relative poverty level show a diverse picture for the subregions and for individual countries in 2020.

In most Subregion 1 countries (except Austria and Greece) households below the relative poverty level reported a higher average prevalence of noise annoyance (24.0%) than those above it (18.6%).

In Subregion 2 on average households below and above the relative poverty level reported around the same prevalence in noise annoyance (about 13%).

In Subregion 4 households above the relative

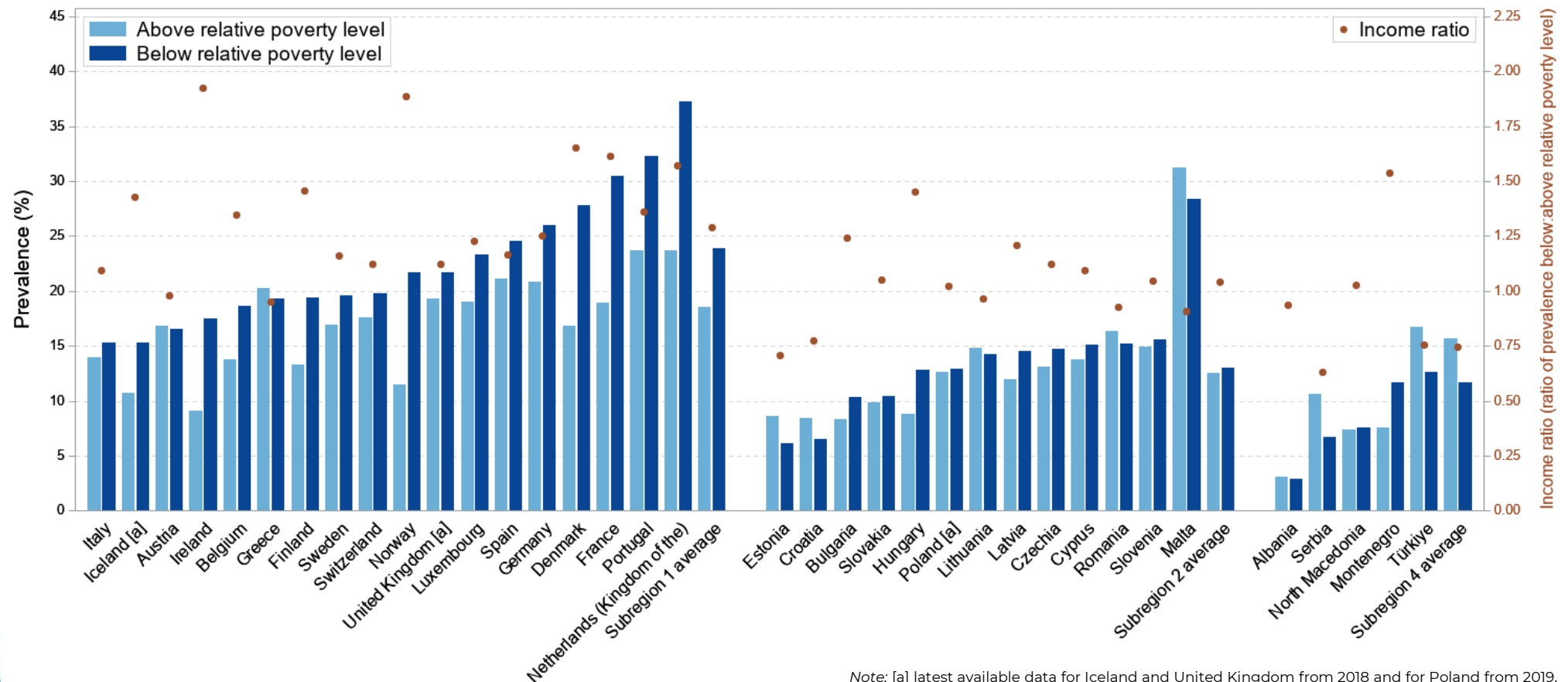
poverty level reported a higher average prevalence of noise annoyance (15.6%) than those below it (11.6%) (Fig. 2). This pattern is mainly driven by the data from Türkiye and Serbia, however, and is not seen in the other three countries in the subregion for which data are available.

Absolute inequalities between households below and above the relative poverty level varied widely within the WHO European Region, ranging from 0.2 percentage points in Albania and North Macedonia to 13.3 percentage points in the Netherlands (Kingdom of the).

The highest relative inequality ratios between households below and above the relative poverty level were observed in Subregion 1 – especially in Ireland and Norway (ratio of 1.9:1), followed by Denmark, France and the Netherlands (Kingdom of the) (at least 1.6:1). Relative inequality ratios were less strong in Subregion 2, and varied significantly by country, ranging from 0.7:1 in Estonia to 1.4:1 in Hungary.

In Subregion 4, relative inequality ratios also varied greatly by country, ranging from 0.6:1 in Serbia to 1.5:1 in Montenegro.

Fig. 2. Prevalence of self-reported environmental noise annoyance by relative poverty level (2020)



Note: [a] latest available data for Iceland and United Kingdom from 2018 and for Poland from 2019. Source: Eurostat EU-SILC public access database (9) (latest update 11 August 2022).

### Time trend of inequalities by poverty

In the last year of reporting (2020), noise complaints rose by around 1 percentage point in Subregion 1 for households both above and below the relative poverty level, following a steady decline in complaints over the preceding decade (Fig. 3).

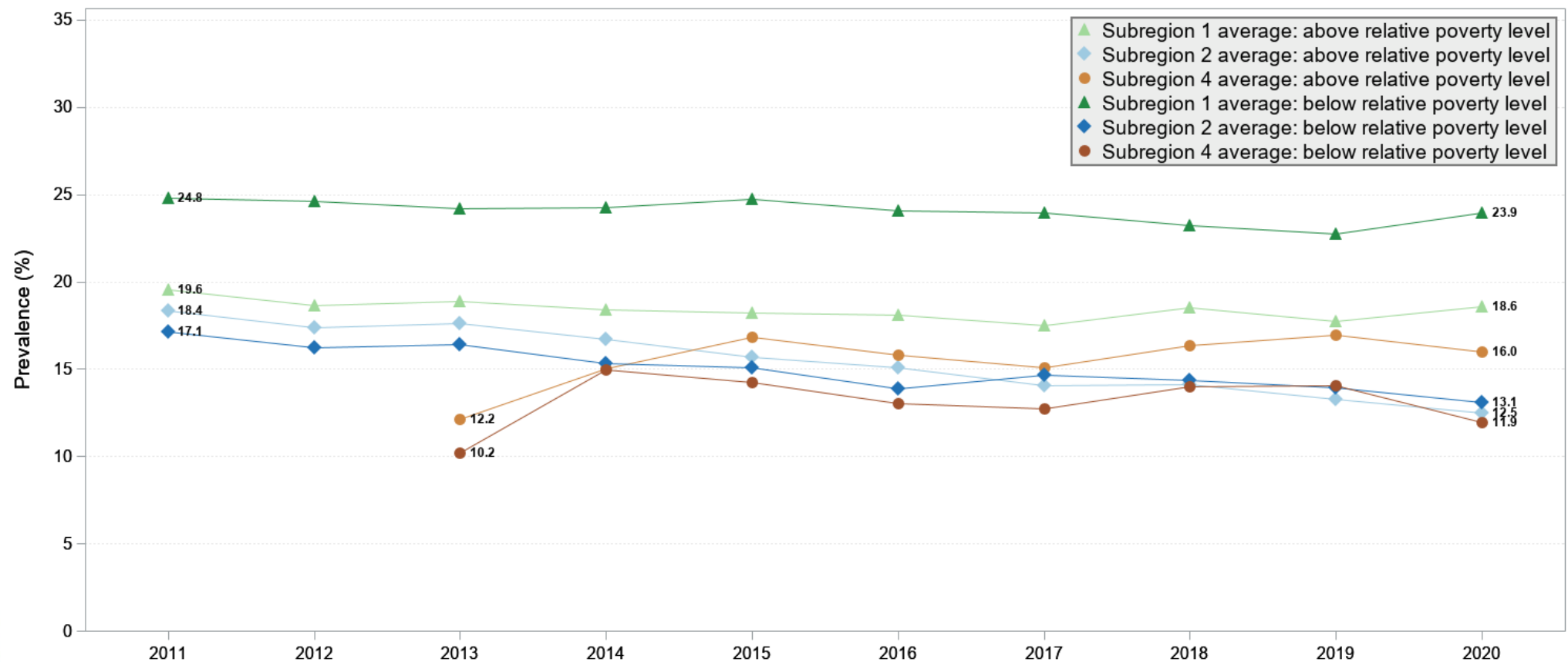
Throughout the period, prevalence among households below the relative poverty level remained about 5–6 percentage points higher than prevalence among those above it, indicating that inequalities in noise perception did not decline in the subregion.

In Subregion 2 noise complaints were slightly more frequent among households above the relative poverty level in most years. A small but steady reduction in prevalence of self-reported noise annoyance for all households can be observed between 2011 and 2020. For households below the relative poverty level prevalence decreased from 17.1% in 2011 to 13.1% in 2020, while for households above it prevalence decreased from 18.4% in 2011 to 12.5% in 2020. Thus, the inequality gap in noise perception narrowed in the subregion, but to the

disadvantage of households below the relative poverty level.

In Subregion 4 prevalence of noise complaints was 2–3 percentage points higher for households above the relative poverty level than for those below it between 2015 and 2019. In 2020 this difference increased to more than 3 percentage points, although the absolute prevalence decreased by 1 percentage point for households above and by 2 percentage points for households below the relative poverty level.

**Fig. 3. Time trend of prevalence of self-reported environmental noise annoyance by relative poverty level (2011–2020)**



Note: Owing to a lack of complete data for the period, Subregion 1 data exclude Iceland and United Kingdom, Subregion 2 data exclude Poland and Subregion 4 data exclude Albania. Data for more than two Subregion 4 countries are only available from 2013. Source: Eurostat EU-SILC public access database (9) (latest update 11 August 2022).

## Inequalities by household type

Single-parent households represent between 1% and 7.4% of all households, depending on the country, and are often socially disadvantaged. Prevalence of self-reported noise annoyance in single-parent households varied widely across the WHO European Region in 2020, ranging from 2.8% in North Macedonia to 41.3% in the Netherlands (Kingdom of the) (Fig. 4). In all subregions, higher average prevalence of noise annoyance was found among single-parent households than the general population. This was also the case for most countries.

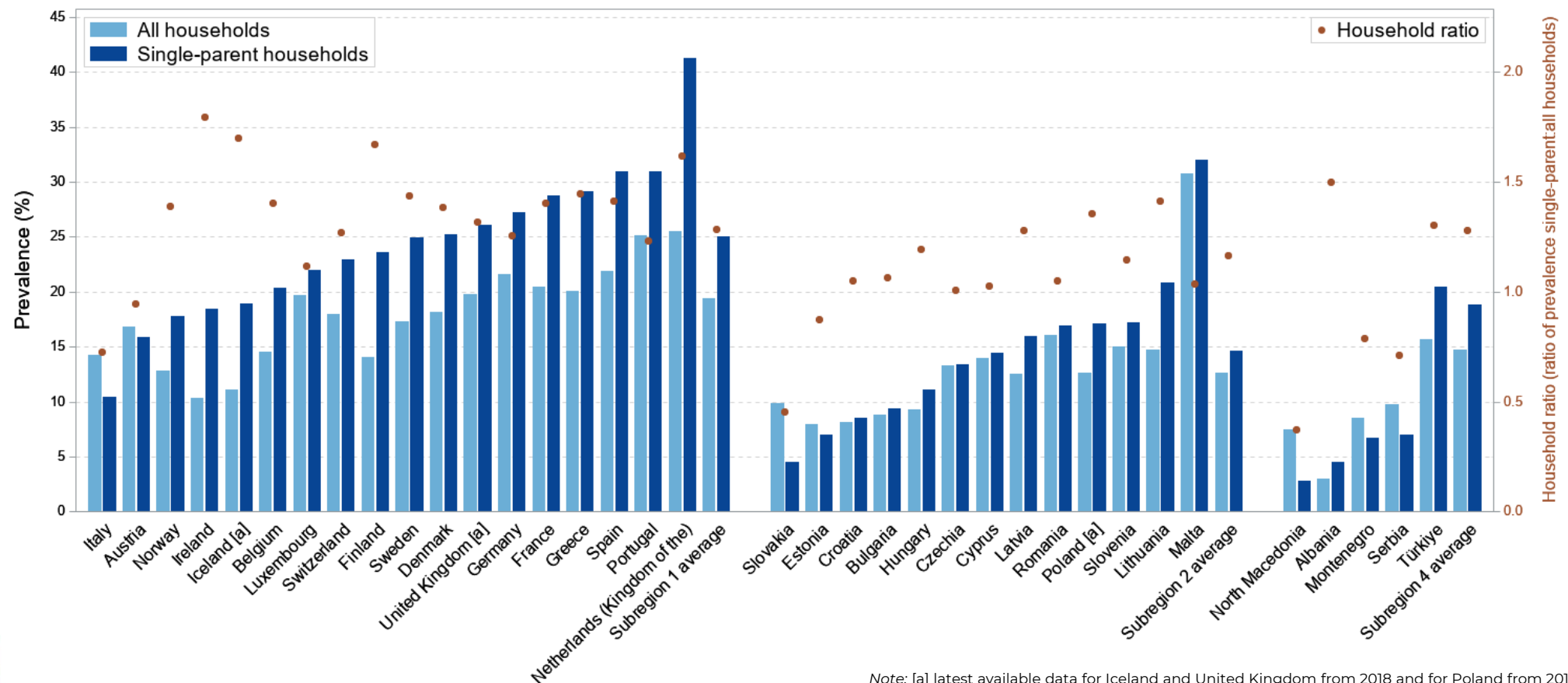
The absolute difference in self-reported noise annoyance between single-parent households and

the general population in Subregion 1 was 5.6 percentage points, with the widest gap found in the Netherlands (Kingdom of the) (15.8 percentage points). In Subregion 2 the difference was smaller, at 2.1 percentage points, with the widest gaps found in Lithuania (6.1 percentage points) and Slovakia (5.4 percentage points). In Subregion 4 the difference was 4.1 percentage points (mainly driven by Türkiye), with the widest gap found in North Macedonia (4.7 percentage points) to the benefit of single-parent households.

Relative inequality ratios between single-parent households and the general population were slightly

higher in Subregions 1 and 4 (1.3:1) than Subregion 2 (1.2:1). No inequalities were observed in Bulgaria, Croatia, Cyprus, Czechia, Romania and Malta (1.0:1). The greatest difference with a disadvantage for single-parent households was found in Ireland (1.8:1). Several countries (Austria, Estonia, Italy, Montenegro, North Macedonia, Serbia, Slovakia) had relative inequality ratios below 1.0, indicating that single-parent households were less affected by noise annoyance than the general population. The greatest inequality ratio among these countries was observed in North Macedonia (0.4:1), where single-parent households were 60% less likely to experience noise annoyance than the general population.

**Fig. 4. Prevalence of self-reported environmental noise annoyance among single-parent households versus the general population (2020)**



Note: [a] latest available data for Iceland and United Kingdom from 2018 and for Poland from 2019. Source: Eurostat EU-SILC public access database (9) (latest update 11 August 2022).

## Interaction between socioeconomic and spatial inequalities

Across all countries, households in cities tend to be affected by self-reported noise annoyance more often than those in towns, and households in towns more often than those in rural areas (Fig. 5).

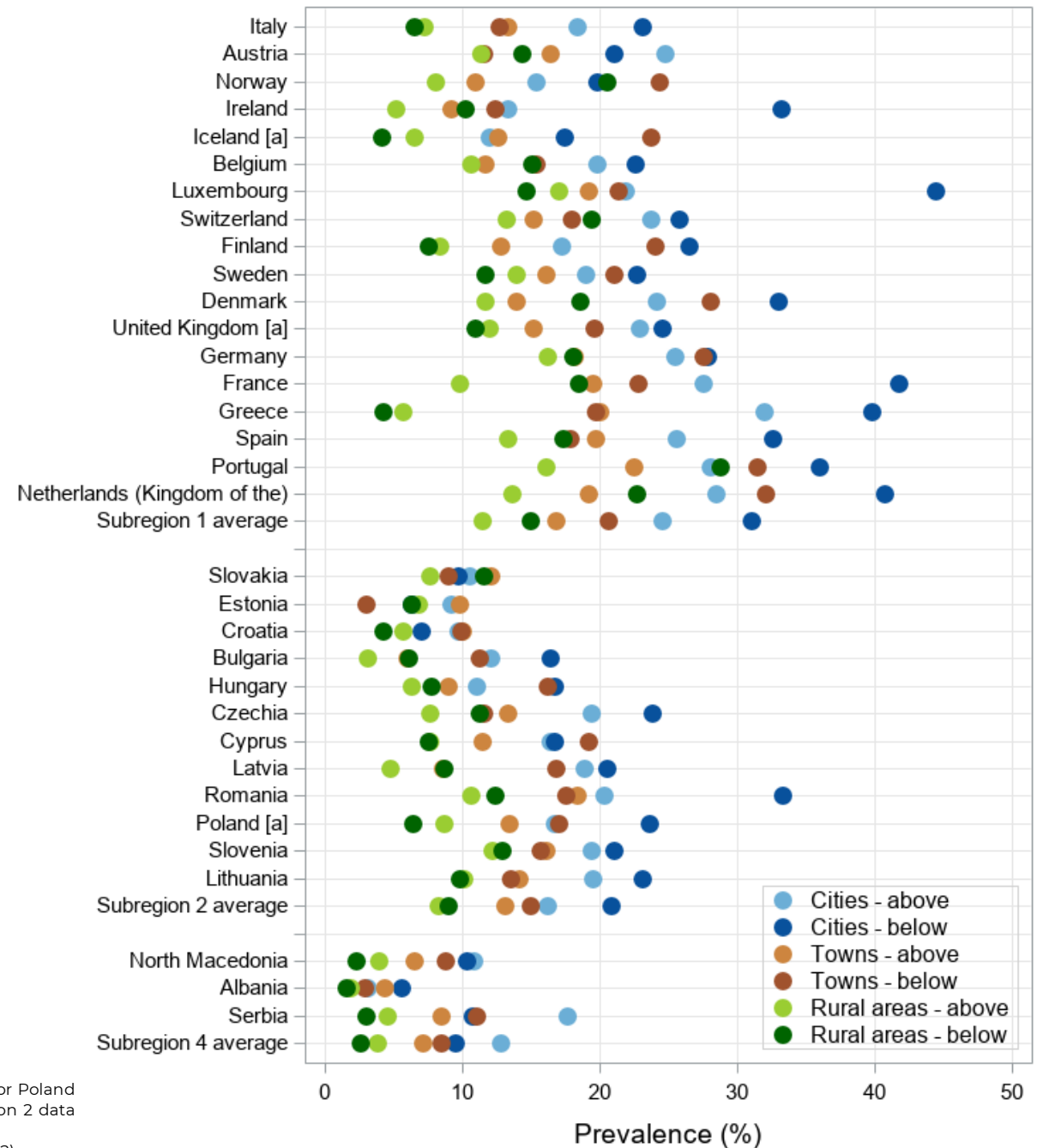
In Subregions 1 and 2, the highest prevalence was reported for city households below the relative poverty level and the lowest for rural households above the relative poverty level. In Subregion 4, by contrast, city households above the relative poverty level reported the highest prevalence and rural households below the relative poverty level reported the lowest.

Within countries, the highest prevalence levels were reported in Luxembourg (44.4%), France (41.8%) and the Netherlands (Kingdom of the) (40.7%) among city households below the relative poverty level. The lowest prevalence levels were observed among rural households below the relative poverty level in Albania (1.6%), North Macedonia (2.3%) and Serbia (3.0%).

Absolute inequalities were greater in Subregion 1 (prevalence ranging from 11.4% to 31.0%) than in Subregion 2 (prevalence ranging from 8.3% to 20.8%) and Subregion 4 (prevalence ranging from 2.6% to 12.9%). Within individual countries, Greece (prevalence ranging from 4.3% to 39.8%) and France (9.8% to 41.8%) had the greatest and Slovakia (7.7% to 11.6%) and Albania (1.6% to 5.6%) the smallest absolute inequalities.

Relative inequality ratios were twice as high in Subregion 4 (5.0:1) as in Subregion 1 (2.7:1) and Subregion 2 (2.5:1), but at a lower absolute level of noise annoyance. The highest relative inequality ratio can be observed in Greece (9.3:1), with city households below the relative poverty level reporting noise annoyance nine times more often than rural households below it. The lowest relative inequality ratios can be found in Slovakia and Slovenia (both 1.6:1).

Fig. 5. Prevalence of self-reported environmental noise annoyance by relative poverty level and urbanization level (2020)



Note: [a] latest available data for Iceland and United Kingdom from 2018 and for Poland from 2019. Owing to limited or no information on urbanization levels, Subregion 2 data exclude Malta and Subregion 4 data exclude Montenegro and Türkiye.  
Source: Eurostat EU-SILC public access database (9) (latest update 11 August 2022).

## Conclusions and suggested mitigation actions

Prevalence of self-reported noise annoyance varies considerably between countries. Irrespective of social differences, in many countries a relevant proportion of the population is affected by noise from neighbours or from the street. In Subregion 1, poorer households have a higher prevalence of noise complaints than richer ones. In Subregion 2, both population groups are almost equally affected, with marginal differences. In Subregion 4, richer households are on average more affected than poorer ones, although with significant differences between countries.

In Subregions 1 and 2, poorer households are more often affected by noise annoyance than richer ones at all urbanization levels, while the picture is less consistent in Subregion 4. Overall, poorer people living in cities in Subregion 1 countries report the highest noise annoyance levels.

In all subregions, socioeconomically disadvantaged population groups such as single-parent households are more often affected by noise

annoyance in many countries. This pattern is highly relevant in terms of health equity because unequal distribution of health risk factors like noise annoyance can result in unequal health outcomes.

Time series data show a slight and steady reduction in prevalence of noise complaints in Subregion 2 for both poorer and richer households. Data for Subregion 1 show a slight decrease in prevalence between 2011 and 2019, and an increase by 1 percentage point between 2019 and 2020 for all households, with consistently higher levels for poorer households. In Subregion 4, richer households reported higher prevalence in recent years, and the difference increased in 2020.

Vulnerable groups such as children, chronically ill people and elderly people should always be considered when monitoring social inequalities in noise exposure. Development of mitigation actions should specifically address those with increased vulnerability and those with poorer coping capacities because of their socioeconomic position.

### Suggested mitigation actions are:

- promoting and adopting more sustainable forms of transport to reduce both noise and air pollution;
- better and equity-sensitive reporting of objective noise exposure and subjective source-specific noise annoyance by socioeconomic dimensions as a prerequisite for efficient targeting of the most affected population groups or neighbourhoods;
- increased implementation of the EU Environmental Noise Directive and WHO's environmental noise guidelines for the European Region (5) to tackle the important public health issue of noise – particularly addressing socially disadvantaged groups in monitoring and mitigation measures;
- ensuring that action plans to address noise issues at a regional level take potential social inequalities in noise exposure and different vulnerabilities into account;
- targeted measures to reduce the vulnerability of socioeconomically deprived populations to the health impacts of noise exposure, to ensure that they are not subjected to greater risks because of higher exposure and a lack of resources and coping capacity.

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Further reading on the subject is available at: Universität Bremen: WHO Collaborating Centre for Environmental Health Inequalities [website]; 2023 (<https://www.uni-bremen.de/en/who-collaborating-centre-for-environmental-health-inequalities>, accessed 3 July 2023)

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The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves

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## Fact sheet series

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