

## PROPORTION OF CHILDREN LIVING IN HOMES USING SOLID FUELS

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### Percentage of children aged 0–4, 5–9 and 10–14 years living in households using coal, wood or dung as the main source of heating and cooking fuel

This summary presents the proportion of children living in homes where solid fuel is used for cooking and heating. It provides information about related health risks, the policy relevance and context and an assessment of the situation in the WHO European Region. Suggestions for further monitoring and information on underlying data are also provided.

#### KEY MESSAGE

☺ Solid fuel use for cooking in homes in the Member States of the WHO European Region in 2005 varied from nearly zero to nearly 50%. In some central Asian countries, use of solid fuels has fallen substantially compared to previous estimates. Children are more exposed to health hazards related to the use of solid fuel in rural than in urban areas. Studies suggest that the WHO air quality guideline level of 20  $\mu\text{g}/\text{m}^3$  for annual  $\text{PM}_{10}$  (1) is exceeded in most homes where solid fuel is used, pointing to a substantial public health problem in the Region.

#### RATIONALE

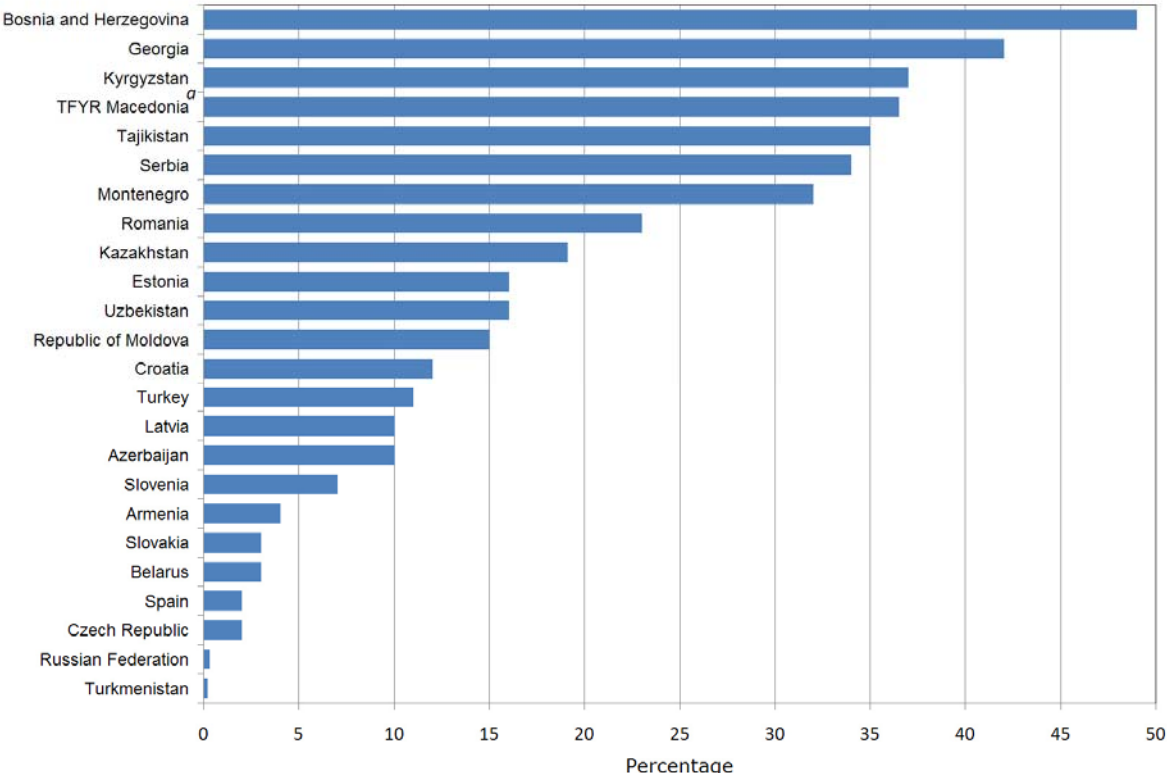
The indicator provides a general measure of exposure to pollutants from indoor combustion sources, in particular with respect to fine particles. In terms of children's health, epidemiological studies demonstrate that the risk for child morbidity and mortality due to pneumonia is higher in households that use solid fuel than in those using liquid or gaseous fuels.

#### PRESENTATION OF DATA

Fig. 1 presents the value of the indicator for the latest available year for 25 European Member States. It is assumed that exposure to solid fuel combustion among children is equal to the exposure among the total population. Only countries for which data are available from surveys are presented in the figures.

Fig. 2 shows data covering 23 countries for indicator value distribution in urban and rural areas.

**Fig. 1. Percentages of children aged 0–14 years living in homes using solid fuels for cooking, WHO European Region, 2005**

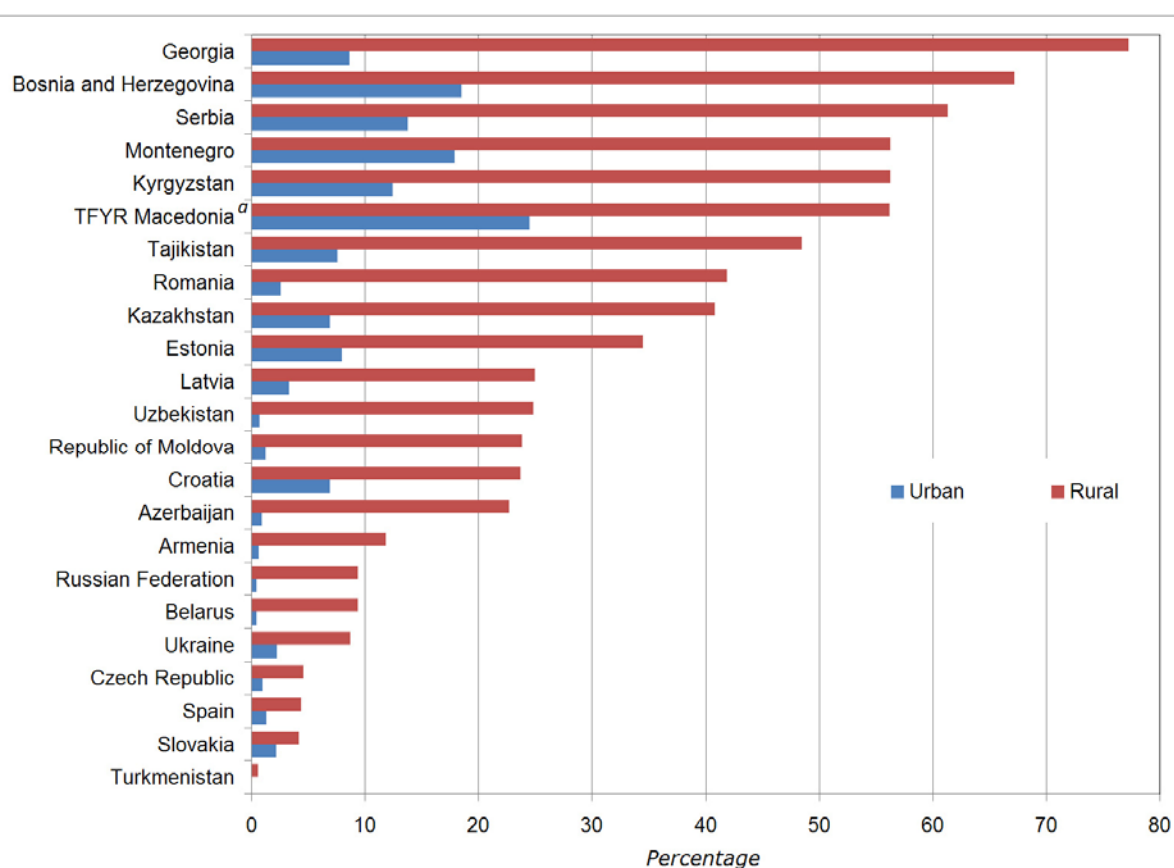


<sup>a</sup> TFYR Macedonia = The former Yugoslav Republic of Macedonia.

*Note.* Data for Azerbaijan, Kazakhstan, Kyrgyzstan and Uzbekistan are for 2006; data for Croatia, the Czech Republic, Estonia, Georgia, Latvia, Slovakia, Slovenia and Spain are for 2003; data for Romania are for 2002; data for Turkey are for 1999; data for Turkmenistan are for 2000; data for Ukraine are for 2007.

*Source:* Multiple indicator cluster survey (2); Demographic and health survey (3); World health survey (4).

**Fig. 2. Proportion of children aged 0–14 years living in homes using solid fuels for cooking in urban and rural areas, WHO European Region, 2005**



<sup>a</sup> TFYR Macedonia = The former Yugoslav Republic of Macedonia.

Note. Data for Azerbaijan, Kazakhstan, Kyrgyzstan and Uzbekistan are for 2006; data for Croatia, the Czech Republic, Estonia, Georgia, Latvia, Slovakia and Spain are for 2003; data for Romania are for 2002; data for Turkmenistan are for 2000; data for Ukraine are for 2007.

Source: Multiple indicator cluster survey (2); Demographic and health survey (3); World health survey (4).

## HEALTH AND ENVIRONMENT CONTEXT

Cooking and heating with solid fuels, such as dung, wood, agricultural residues, grass, straw, charcoal and coal, is a major source of indoor air pollution. The indoor smoke comprises a variety of health-damaging pollutants, such as particles (complex mixtures of chemicals in solid form and droplets), carbon monoxide, nitrogen oxides, sulfur oxides, formaldehyde, and carcinogens such as benzo[a]pyrene and benzene. Small particles with a diameter of 10 µm or less (PM<sub>10</sub>) are able to penetrate deep into the lungs. The smallest particles, with a diameter of 2.5 µm or less (PM<sub>2.5</sub>), appear to have the greatest health-damaging potential.

Combustion of solid fuels in inefficient stoves under poor ventilation conditions can result in large exposure burdens, particularly for women and young children, who spend most of their time in the home (5). Of the global total 1.6 million deaths annually related to indoor air pollution from the use of solid fuel, 52% are in children aged under five years. There is consistent evidence that exposure to indoor air pollution increases the risk of pneumonia among children in this age group, and of chronic respiratory disease and lung cancer (in relation to coal use) among adults aged over 30 years (6).

There is some evidence for associations between biomass smoke and lung cancer, asthma, cataracts and tuberculosis. On the basis of the few studies available, there is evidence to suggest a link between indoor air pollution and adverse pregnancy outcomes, in particular low birth weight. Tentative evidence exists for associations with ischaemic heart disease and cancers of the nose and throat (7).

While the precise mechanism of how exposure causes disease is still unclear, it is known that small particles and several of the other pollutants contained in indoor smoke cause inflammation of the airways and lungs and impair the immune response. Carbon monoxide also results in systemic effects by

reducing the oxygen-carrying capacity of the blood. Other components of indoor air pollution can cause healthy cells to mutate into cancerous ones.

## POLICY RELEVANCE AND CONTEXT

In September 2000, the World Summit of Heads of State established the Millennium Development Goals (MDGs) (8) with the overall objective of encouraging healthy and prosperous development around the world. The seventh MDG calls for environmental sustainability. Within this context, WHO has identified the "proportion of the population using solid fuels for cooking" as an indicator for assessing progress towards the integration of the principles of sustainable development into country policies and programmes. Although this indicator is not used in recent reports for monitoring MDG progress, it is still relevant in terms of reducing child mortality (Goal 4) and improving maternal health (Goal 5) owing to the known effects on health of indoor air pollution.

The WHO European Member States have declared that they will aim to substantially reduce morbidity and mortality from acute and chronic respiratory disorders (9). They plan to do so by developing indoor air quality strategies that take into account the specific needs of children and by improving access to healthier and safer heating and cooking systems.

Measures to reduce indoor air pollution and associated health effects range from switching to cleaner alternatives, such as gas, electricity, solar energy or modern biofuels, to improving stoves or hoods that vent health-damaging pollutants to the outside, to changing behavioural patterns. There is a need to further investigate the real scale of the problem in Europe and to promote successful and sustainable interventions accordingly.

## ASSESSMENT

According to the WHO national assessment of the burden of disease related to the use of solid fuels, carried out at WHO headquarters and published in 2007 with health data from 2002, the highest burden lies on children aged under five years living in Eur-B countries (7) (Table 1). The WHO epidemiological subregions are defined by geographical location and patterns of child and adult mortality (10). Assessment is based on the indicator: the percentage of the population using solid fuels. Not all countries have conducted surveys of energy use for cooking and heating. Where no data are available, the indicator is modelled; countries with a gross national income of more than US\$ 10 500 are assumed to have made an almost complete transition to cleaner cooking fuels (less than 5% solid fuel use). For these countries, burden of disease assessment was not undertaken as the method is not sensitive enough for making reliable estimates (7).

**Table 1. Estimated burden of acute lower respiratory infections in children aged under five years attributable to the use of solid fuels in the home, 2007**

WHO epidemiological subregion	Burden of disease study, 2006	
	No. of deaths (000s)	DALYs (000s)
<b><i>Eur-A</i></b> Andorra, Austria, Belgium, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, the Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland and the United Kingdom	0	0
<b><i>Eur-B</i></b> Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Montenegro, Poland, Romania, Serbia, Slovakia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan and Uzbekistan	11,6	319
<b><i>Eur-C</i></b> Belarus, Hungary, Kazakhstan, Latvia, Lithuania, the Republic of Moldova and the Russian Federation	<1	12,5

Note. Data are not available for all countries.

Source: National burden of disease estimates (7).

Taking into account the model that has been applied for estimation, findings would suggest that indoor air pollution from solid fuel combustion is a public health problem in some areas of the Region. The scale of the problem is difficult to ascertain owing to the fact that the data reported by many Member States, in particular those in the Eur-C subregion, do not show the use of solid fuel at household level. However, the estimates that take into account sociodemographic and economic parameters result in noticeable use rates. The projected use of solid fuels in households is higher in the eastern European countries than in the west or the Region.

This indicator should be interpreted with caution, owing to the inherent problems associated with the methodology and data used. The indicator does not take into account factors such as stove type, ventilation and behaviour, which are likely to affect exposures and health outcomes. Additionally, health outcomes may be confounded by other factors such as socioeconomic status and age.

## DATA UNDERLYING THE INDICATOR

### *Data source*

Multiple indicator cluster survey (2) for Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Montenegro, the Russian Federation, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia and Uzbekistan.

Demographic and health survey (3) for Armenia, Azerbaijan, the Republic of Moldova, Turkmenistan and Ukraine.

World health survey (4) for Croatia, the Czech Republic, Estonia, Georgia, Latvia, Slovakia, Slovenia and Spain.

Population data: EUROSTAT (11).

### *Description of data*

Data are based on international surveys, censuses and national energy statistics.

### *Method of calculating the indicator*

Percentage of the general population using solid fuels.

Average population by country and five-year age groups.

The indicator is computed as simple percentages:  $100 \times C_{\text{solid}}/C_{\text{tot}}$ , where  $C_{\text{solid}}$  is the number of children living in households using coal, wood or dung as the main source of cooking/heating fuel in a given age group, and  $C_{\text{tot}}$  is the total number of children in the same age group.

### *Geographical coverage*

Data are available for 25 countries of the WHO European Region.

### *Period of coverage*

A single year (based on current data).

### *Frequency of update*

Depends on availability of new data.

### *Data quality*

In recent years, reporting of the indicator has been improved by regular data collection through such international surveys as multiple indicator cluster survey (2), the demographic and health survey (3) and the world health survey (4), and disaggregation of household energy practices between urban and rural populations has begun (6). Nevertheless, to improve accuracy in estimating health and other impacts and to provide a better basis for designing interventions, limitations in the definition and reporting of the indicator must be overcome. At present, data are collected only on solid fuel used for cooking, compiled on a country-by-country basis from different sources. For most countries, this is done through various surveys and censuses. In other countries, data are obtained from models using parameters such as the proportion of people living in rural areas and the gross national income for the year corresponding to the data surveyed. Further efforts must continue to improve regular data collection through relevant international and national surveys, taking into account urban and rural differences and the use solid fuel for heating, and allowing estimation of progress in time. There is a need to promote epidemiological studies in developed countries to estimate the real use of solid fuels and, therefore, exposure to indoor air pollutants from the combustion of solid fuels (12).

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## FURTHER INFORMATION

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