ENVIRONMENTAL HEALTH MONITORING SYSTEM IN THE CZECH REPUBLIC

Summary report 2024

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1. INTRODUCTION

The Environmental Health Monitoring System is an established system of regular collection of exposure and health data, the aim of which is to assess health risks arising for the Czech population from the environment. The State Institute of Public Health (SZÚ) has been organizing it since 1994, while cooperating with a number of other organizations. The system is implemented on the basis of the Resolution of the Government of the Czech Republic 369/1991, as an activity of the healthcare sector in the protection of public health, it is enshrined in Act 258/2000 Coll., as amended, and is part of the tasks of the Strategic Framework Health 2030.

- **Health effects and risks of air pollution**

We study air quality in various urban and rural environments, particularly in terms of aerosol particle pollution, nitrogen dioxide and polycyclic aromatic hydrocarbons (benzo[*a*]pyrene). We estimate the public health impacts of exposure, expressed, for example, in terms of premature deaths or cancer risk due to long-term exposure to air pollution.

- **Health effects and risks of drinking and recreational water pollution**

This report provides a standard set of data on possible health effects from exposure to monitored substances, including pesticides, in drinking water from public water supply systems in the Czech Republic. Newly, we bring information about the presence of pharmaceuticals in drinking water. Included is an overall assessment of bathing water quality in the 2024 season.

- **Health risks from noise exposure**

Based on available data from Strategic Noise Mapping in the Czech Republic, we attempted to evaluate the risk of ischemic heart disease in people exposed to road traffic noise. It is considered sufficiently proven that road traffic noise increases the risk of developing this disease.

- **Dietary exposure**

In the section dedicated to dietary exposure, we present the results of another two-year period of assessing nutrient intake from the entire food basket, estimate the saturation of individual population groups, and compare the determined nutrient intake in the Czech population with recommended values.

- **Human biomonitoring**

The NIPH Prague has been monitoring toxic chemicals since the launch of the Monitoring System in 1994. In this report, we focused on the results of a biomonitoring study of the Czech child population, which was conducted in 2024 as part of the European project Partnership for Chemical Risk Assessment. Based on the data obtained, we assess the burden of children with cadmium and mercury.

- **Population health surveys**

This year, we used our study evaluating the Czech study in the frame of the EU School Fruit, Vegetables, and Milk Scheme to describe children's eating habits and their awareness of healthy eating. We focused on the consumption of fruit, vegetables and dairy products and its relationship to overweight in children.

- **Occupational exposure and health outcomes**

This report contains routinely processed data on numbers of employees exposed to harmful substances and factors in occupational environments, and the trend of occupational diseases.

2. HEALTH EFFECTS AND RISKS OF AIR POLLUTION

Air quality monitoring includes evaluation of the impact of selected outdoor air quality indicators. Outdoor air quality is evaluated for the most health relevant pollutants: suspended particles PM_{10} and $PM_{2,5}$, nitrogen dioxide (NO_2), metals (arsenic, cadmium, nickel, lead), benzene and benzo[*a*]pyrene (BaP). Basic information on ambient air quality is obtained from a core network of up to 150 measuring stations, most of which are managed by the Czech Hydrometeorological Institute (ISKO CHMI). The assessment included also data on the level of pollution in the national background, obtained primarily within the framework of relevant measurement programs at the EMEP stations (Co-operative programme for the monitoring and evaluation of the long range transmission of air pollutants in Europe), operated by the Czech Meteorological Institute in Košetice and Bílý Kříž, as well as from other located stations. To assess the impact of traffic load, data from extremely busy stations ("traffic hot spots") in Prague, Brno, Ústí nad Labem and Ostrava were used.

Key findings

In 2024, the concentrations of the monitored pollutants did not exceed the legislative limits, except for ground-level ozone and benzo[a]pyrene. However, the limit values recommended by the World Health Organization were exceeded in most of the measured locations for aerosol particles (fractions PM_{10} and $PM_{2.5}$) and nitrogen dioxide. In connection with the higher frequency of sunny, even tropical days, the number of days and areas with increased potentially health-significant concentrations of ground-level ozone increased.

The estimated proportion of premature deaths due to long-term exposure to aerosol particles in the total number of deaths ranged from zero in urban locations without traffic load to approximately 4% in locations with the highest industrial and traffic load. This corresponds to an estimate of between 0 and 4,200 premature deaths, with a median estimate of 1,100 deaths.

The attributable risk of death from respiratory diseases in people over 30 years of age due to ozone exposure for 2024, similar to the previous year, ranged between 1% and 3% with a median value being 2%.

The theoretical increase in the risk of cancer due to exposure to outdoor air pollutants has not changed significantly for several years and ranges for individual carcinogens between one case per 100 million and one case per 10 thousand inhabitants. The largest contribution in the long term is due to exposure to polycyclic aromatic hydrocarbons. Overall, the assessed carcinogenic substances could increase the risk of cancer with lifetime exposure by 2 cases per 100 thousand to 2 cases per 10 thousand inhabitants.

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3. HEALTH EFFECTS AND RISKS OF WATER POLLUTION

Since 2004, data on drinking water quality has been obtained using the drinking water information system (IS PiVo) which is administered by the Ministry of Health and includes all water systems and other public drinking water supply methods in the Czech Republic. The source of this data is mainly from analyses provided by operators. The implementation, frequency and scope of these analyses is prescribed by valid legislation; only a small part of the data has been provided by the public health service under national health supervision. Only analyses performed by validly accredited and authorised laboratories with correct operational procedures can be entered into the system. Processing of data on drinking water quality does not include data from emergency situations, which are minimal in the database. Water quality indicators are assessed according to Decree No. 252/2004 Coll., as amended, which establishes hygiene requirements for drinking and heated water, and the frequency and scope of drinking water control. This decree transposes the European Council Directive 98/83/EC.

According to the Czech Statistical Office, approximately 95% of the Czech population is supplied with drinking water from the public water supply. In 2025, a total of 4,182 public water supply systems were monitored. The majority (3,903) were small water supply systems supplying 5,000 or fewer inhabitants. Only 279 water mains belonged to the large water supply systems with more than 5,000 inhabitants supplied. However, these water supply systems supply the vast majority of the population of the Czech Republic (approx. 80%) connected to the public water supply system.

A total of 377 different indicators were monitored: 229 pesticide substances, 22 per- and polyfluorinated compounds (PFAS), 18 types of pharmaceuticals, 10 microbiological and 97 chemical and total indicators. It should be noted that the prescribed number of determinations is different for individual indicators and that not all indicators are monitored every year in all water supplies.

Key findings

The gradual improvement of the quality of drinking water from public water supplies according to indicators monitored between 2004 and 2015 stopped in the following years. The main reason is the monitoring of a wider range of pesticide substances with more frequent cases of exceeding limit values.

Of the contaminants assessed, nitrate intake is the highest; drinking drinking water from public water supplies accounts for an average of 8-10% of the total daily acceptable intake of nitrates (assuming a daily consumption of 1.5 litres of tap water). For chloroform, arsenic and nickel, the average intake from drinking water was found to be no more than 1% of the tolerable intake. The concentrations of other assessed contaminants in drinking water often do not exceed the limit of determination of the analytical method used, and therefore exposure to these substances cannot be quantified. However, it can be stated that the average exposure is less than 1% of the relevant exposure limit. This also applies to pesticide substances and their metabolites in drinking water.

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4. DIETARY EXPOSURE

The basic sub-project is a **food sampling system** based on methodological requirements for dietary exposure assessment based on the principles of the Total Diet Study (TDS) which is methodologically harmonised in the EU (EFSA). Sampling is carried out to represent the "usual Czech diet" and food sampling sites are continuously rotated to achieve proportional coverage of all regions of the Czech Republic.

Another part of the subsystem is devoted to monitoring **the occurrence of foods based on genetically modified organisms** (GMOs). In this case, the main concern is the implementation of the precautionary principle.

The essential project is long-term monitoring of **population dietary exposure to more than 200 harmful chemicals** and **saturation of the population by nutrients**. It differs from conventional food inspection in it covering the whole pattern of consumer behaviour (including culinary food preparation) and dealing with the whole range of foods normally consumed (not just the risk groups). In 2024, the saturation of nutrients was explored.

Key findings

The intake of a number of important minerals through the diet in the Czech population is lower than recommended. When comparing the estimated intake of selected minerals with international recommendations, the following was found:

• low calcium intake in all age groups, the lowest values in people over 60 years of age (low intake in at least 80% of people 60+),

• insufficient magnesium intake especially in women and seniors, the lowest values in the group of adolescent girls aged 15–17,

• lower iron intake than recommended in half of women of childbearing age and also in half of children aged 7–10,

• excessive sodium intake in men from the age of 11, in the group of 15–59 years of age over 90% of people have an intake higher than recommended.

In the Czech market network in 2024, no unauthorized genetically modified rice or products made from such rice were found during monitoring.

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5. HUMAN BIOMONITORING

The NIPH Prague has been monitoring chemicals with hormone-disrupting effects since the launch of the Monitoring System in 1994. Since then, the human monitoring program has regularly monitored toxic metals (metals with endocrine disrupting effects includes, for example, cadmium), polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT metabolites,

hexachlorocyclohexane, hexachlorobenzene). Based on the development of knowledge and laboratory methods, other substances with these effects, such as bisphenols, phthalates, per- and polyfluorinated compounds (PFAS) and flame retardants, have been included in the monitoring. In the current HBM study, we also focus for the first time on so-called modern pesticides.

In 2024, a human biomonitoring child study was conducted as part of the Partnership for the Assessment of Risks from Chemicals (PARC), which followed up on the previous national biomonitoring program of the Czech population.

Key findings

• In the study, we found lower levels of cadmium in urine and mercury in children's hair than the recommendations of the German Biomonitoring Commission and other used limit values.

• The decreasing burden of cadmium on Czech children is indicated by the fact that, unlike in previous monitoring stages, the majority of children in the study had undetectably low concentrations in their urine.

• A comparison with the results of previous monitoring stages shows that the burden of mercury on children is low and more or less stable over time.

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6. HEALTH RISKS FROM NOISE EXPOSURE

Data on noise exposure were obtained on the basis of Strategic Noise Mapping, the 4th round. Currently, it represent the best available source of information on noise exposure of the population. The aim of this analysis was to evaluate the risk of ischemic heart disease in people exposed to road traffic noise.

Key findings

• In the population with noise exposure identified within the Strategic Noise Mapping (SNM), we estimate an increase in the number of new cases of ischemic heart disease due to road traffic noise of 4.7% above the usual number of cases from other causes. This increase represents approximately 920 new cases of this disease annually due to noise exposure.

• The estimate was made for people with noise exposure determined in SNM. Since the effect of noise on the risk of CHD is only evident at higher noise exposures and due to the selection of areas with potentially high noise for SHM, it can be assumed that the number of new cases of ischemic heart disease due to noise exposure in the entire population of the Czech Republic will not be significantly higher than the estimate made.

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7. POPULATION HEALTH SURVEYS

The EU School Fruit, Vegetables, and Milk Scheme is a project aimed at improving children's eating habits, increasing the consumption of fresh fruit and vegetables, unflavoured milk and dairy products and strengthening knowledge in the field of healthy eating. The basis of the project in the Czech Republic is the free supply of fruit, vegetables and dairy products to children in primary schools. EU Member States are obliged to ensure that school projects are monitored and evaluated by an independent institution. In the Czech Republic, this task has been carried out by the State Institute of Public Health since 2019.

Two separate questionnaire surveys were conducted in selected elementary schools in 2020 and 2022. Both studies were conducted as online surveys of children, their parents, and school principals. Almost 9,000 4th and 8th grade students and more than 5,000 parents participated in the Evaluation Study in 1,082 schools.

Key findings

• The surveys shows that most children do not meet the recommended intake of fruit and vegetables – only 4% eat five portions a day. Both parents and children have low awareness of nutritional recommendations. Most believe that 2-3 portions of fruit and vegetables a day are sufficient.

• Parental habits also have a significant influence – children of parents who pay attention to a healthy diet have a lower risk of being overweight. The education and financial situation of parents play a crucial role – children from families with higher socioeconomic status have a healthier diet and a lower incidence of obesity. The results underline the need for prevention and greater awareness of a healthy lifestyle.

• A large proportion of children prefer unhealthy foods, especially sweetened drinks and flavoured dairy products, which increases the risk of being overweight. Regular consumption of fruit and vegetables reduces the risk, as do healthy habits in the family.

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7. OCCUPATIONAL HEALTH RISKS AND THEIR CONSEQUENCES

The data source for monitoring exposure to work-related risk factors and conditions is the Information System of Job Categorisation (IS KaPr). Within this system, every employer is required to assess the risks and classify the jobs performed at their workplaces into one of the 4 categories, depending on the occurrence and severity of the risk factors. According to the data from IS KaPr, as of December 31, 2024, there were 563,922 individuals registered in the risk occupation category (categories 2R, 3, 4). In category 4, which represents highly risky workplaces, there were 13,453 individuals categorised in the Czech Republic.

In the Czech Republic, in 2024, there was an increase in reported occupational diseases mainly caused by the COVID-19 epidemic. A total of 5,290 occupational diseases were diagnosed in 4,530 individuals. The incidence of occupational diseases was 108.7 cases per 100 000 employees in the civilian sector.

Key findings

- *As of December 31, 2024, over half a million employees were registered in the categories of risky work, of which more than 13 thousand people were in the category of high-risk work. The most common risk factor of work is excessive physical strain, inappropriate working position and noise. The largest number of employees in risky work is traditionally in the Moravian-Silesian Region.*
- *The dominant occupational disease in 2024 was again COVID-19, although compared to 2021/2022 and 2023, there was a decrease in this disease and thus in the total number of reported occupational diseases. Healthcare and social workers were the most affected by COVID-19, and for the fourth year in a row, women accounted for the majority of those affected. This changed the decades-long dominance of occupational diseases in the male population.*

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