

## Health

### Increased Danger of Infectious Diseases



The National Research University Higher School of Economics Institute for Statistical Studies and Economics of Knowledge (HSE ISSEK) presents the results of a human capital trends study. The study methodology included big data mining using the HSE ISSEK-developed iFORA system, expert sessions, and a Delphi survey of more than 400 leading international and Russian scientists specialising in human capital.

The project is being implemented by the World-Class Human Capital Multidisciplinary Research Centre and the UNESCO Futures Studies Chair (UNESCO Futures Literacy Chairs network). A complete list of trends is available in a unique open-access database at [https://ncmu.hse.ru/chelpoten\\_trends](https://ncmu.hse.ru/chelpoten_trends).

## The Trend's Structure

- **Increased pathogenicity and drug resistance of microorganisms, their more frequent transmission from animals to people**
- **Unequal access to effective treatments and prevention of infectious diseases**
- **Changing priorities in combating infectious diseases, development of an epidemiological safety monitoring system**

The WHO has named bacterial resistance to antibiotics among the ten global challenges humanity faces. Drug-resistant bacteria strains emerge through genetic mutations caused by inappropriate use of antimicrobial drugs (e.g., in self-medication), improper waste disposal by pharmaceutical companies and hospitals, and excessive use of antibiotics in agriculture. The reduced effectiveness of antibacterial therapies complicates not only the treatment of infectious diseases, but also complex surgical operations and chemotherapy. As a result, hospital treatment duration and costs increase, which in turn leads to higher healthcare costs. The problem is further aggravated by shortages of antibiotics in some countries and the lack of important antimicrobial drug innovations in recent years.

The demographic consequences of infectious disease widely vary across countries and world regions. According to pre-COVID-19 statistics, in high-income countries, only one in ten leading causes of death was attributed to infectious diseases (lower respiratory tract infections), while in low-income countries there were six. Also, certain chronic viral diseases can lead to malignant neoplasms. For example, more than 90% of cervical cancer cases are caused by the

human papillomavirus, while the hepatitis B virus accounts for more than 60% of liver cancer cases.

The growth of infectious agents' ranges is mainly caused by the human factor: insufficient population coverage with special antiparasitic measures and poor sanitary and hygienic standards. The spread of zoonoses (infections transmitted from animals to humans) is also facilitated by climate change. For example, WHO experts said the anomalous anthrax outbreak that occurred in Russia in July 2016 was caused by unusual weather conditions: high air temperatures led to the melting of the permafrost layer, resulting in anthrax spores penetrating the top layer of soil, and from there finding their way into the bodies of deer feeding on pastures.

Epidemics such as the Ebola, Zika, and swine flu viruses have revealed the crisis state of international anti-epidemic regulations. However, combating infectious diseases gained particular attention with the COVID-19 pandemic. To solve the problem, national epidemiological surveillance systems are being developed, in the scope of which programmes for the early detection of potential pathogens and controlling zoonotic human infections are being implemented as new vaccines and medicines are developed.

## Key Estimates

# 10 million people a year

may die from antibiotic-resistant infections by 2050

## The Trend's Characteristics



**Impact on human capital<sup>1</sup>**

1

2

3



**Weak signal<sup>2</sup>**

Antimicrobial drug resistance



**Strongest manifestation period**

2026–2030



**Wild card<sup>3</sup>**

Bioterrorism



**Effect of COVID-19 pandemic**

Strengthened the trend



**Consequences of the wild card event actually taking place**

Increased inequality of countries



**Presence in Russia**

Comparable with the global level

<sup>1</sup> 1 – weak, 2 – medium, 3 – strong.

<sup>2</sup> Weak signals are insignificant (rarely mentioned or discussed) events which indicate the trend may radically change in the future.

<sup>3</sup> Wild cards<sup>3</sup> are difficult-to-predict events which, if they do happen, can significantly affect the trend.

## Drivers and Barriers



### Drivers

- Vaccination of people and animals – zoonoses carriers
- Development of rapid tests for early detection of infections
- Advances in synthetic biology, cellular and genomic technologies, AI-assisted drug design
- Activities of international organisations to prevent the proliferation of infections (e.g., the United Against Rabies organisation strives for the complete elimination of rabies in African and Asian regions)
- Timely and high-quality sanitary treatment of medical institutions
- Development of contactless economy, transition to remote education and work formats



### Barriers

- Inadequate compliance with medical hygiene and sanitary standards
- Inappropriate use of antibiotics (including for viral infections or prophylaxis), self-medication
- Over-the-counter sale of antimicrobial drugs
- Lack of uniform global standards for the use of antimicrobial drugs and insufficient regulation of their market
- Excessive use of antibiotics in livestock breeding
- Global warming (in particular, the melting of permafrost and the spread of pathogens it contains)
- Improper waste disposal by pharmaceutical companies and medical organisations

## Trend Effects



### Opportunities

- Effectively dealing with infectious disease outbreaks
- Promoting new drug and vaccine development
- Efficient and sensible use of antimicrobial drugs in medicine, veterinary practice, and agriculture



### Threats

- Increased incidence of infectious diseases
- Proliferation of infections and pandemics
- Rising healthcare costs