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Population vulnerability to extreme heat and disease-related prognosis for Republic of Moldova

2024

the hottest year on record on the planet

was warmer than 2023, which was previously the warmest year on record

According to:

- ✓ National Centers for Environmental Information (NCEI) of the National Oceanic and Atmospheric Administration (NOAA),
- ✓ National Aeronautics and Space Administration (NASA),
- ✓ Copernicus Climate Change Service (European Union Earth Observation Program),
- ✓ United Kingdom Meteorological Department

NOAA NCEI

National Aeronautics and Space Administration U.S.A.

Copernicus Europe's eyes on Earth

Climate Change Service

climate.copernicus.eu

Met Office

The health–climate–impact–adaptation cycle

CONTEXT AND RELEVANCE FOR MOLDOVA

EUROPE AND THE REPUBLIC OF MOLDOVA

Study Area – Republic of Moldova

DIRECT VS INDIRECT EFFECTS OF EXTREME HEAT

DIRECT EFFECTS

EXTREME HEAT

- INCREASED MORTALITY
- INCREASED MORBIDITY
- INCREAESDENE EMERGENCY VISI'S

- INCREASED FOODBORNE DISEASS
- INCREASED VECTOR-BORNE DISEASES
- INCREEASED ALLERGIES

Climate change

Non-communicable diseases

Communicable diseases

Non-communicable diseases

- Heat waves: cardiovascular diseases such as stroke
- **Air pollution:** stroke, heart disease, asthma, chronic obstructive pulmonary disease (COPD), and lung cancer
- **Wildfires:** suffocation, burns, cardiovascular and respiratory problems, mental health issues, destruction of healthcare services and housing
- **Drought:** food insecurity, malnutrition, and psychosocial stress
- **Floods:** disruption of healthcare services, displacement and lack of safe drinking water, mental and physiological health impacts, food insecurity, and malnutrition
- **Extreme weather events:** injuries and mortality

Communicable diseases

- ✓ Water- and food-borne infectious diseases:
  - Vibrio infections,
  - campylobacteriosis,
  - salmonellosis,
  - E. *coli* infections,
  - shigellosis,
  - leptospirosis,
  - giardiasis,
  - cryptosporidiosis.

- ✓ Vector-borne infectious diseases:
  - Lyme disease,
  - malaria,
  - West Nile virus infection
  - Dengue fever
  - Tick-borne encephalitis (TBE)
  - Leishmaniasis
  - Chikungunya fever


VULNERABILITY
Demographic Structure (elderly, children)
Socio-Economic Level
Access to Healthcare Services
Physiological Adaptability
Proviological Adaptability
Public Awareness and Preparedness
Occupational Risks
Environmen-ntal Exposure
Public Awareness and Prepare-dness
Policy and Institutional Support

KEY VULNERABILITY FACTORS

Factor	Description
Factor	Description
Age	Elderly and children most affected
Health condition	Chronic diseases increase risk
Socio-economic status	Poverty limits adaptation
Urbanization	Heat island effect intensifies exposure
Infrastructure	Lack of green areas and cooling systems
Housing	Poor insulation, ventilation
Access to healthcare	Essential for risk reduction
Awareness	Knowledge and behavior adaptation
Occupation	Outdoor workers highly exposed
Nutrition	Affects thermoregulation and immunity

HEAT AND CLIMATE IMPACTS ON HUMAN HEALTH – CAUSE → EFFECT CHAIN

RISING TEMPERATURES

Increased body stress

↓

Higher mortality during heatwaves

LONGER POLLINATION SEASON

More airborne pollen

↓

Higher allergy and asthma rates

ALTERED FOOD AND WATER SAFETY

Growth of pathogens

↓

Higher incidence of diarrheal diseases

URBAN HEAT ISLAND EFFECT

Exacerbated heat stress in cities

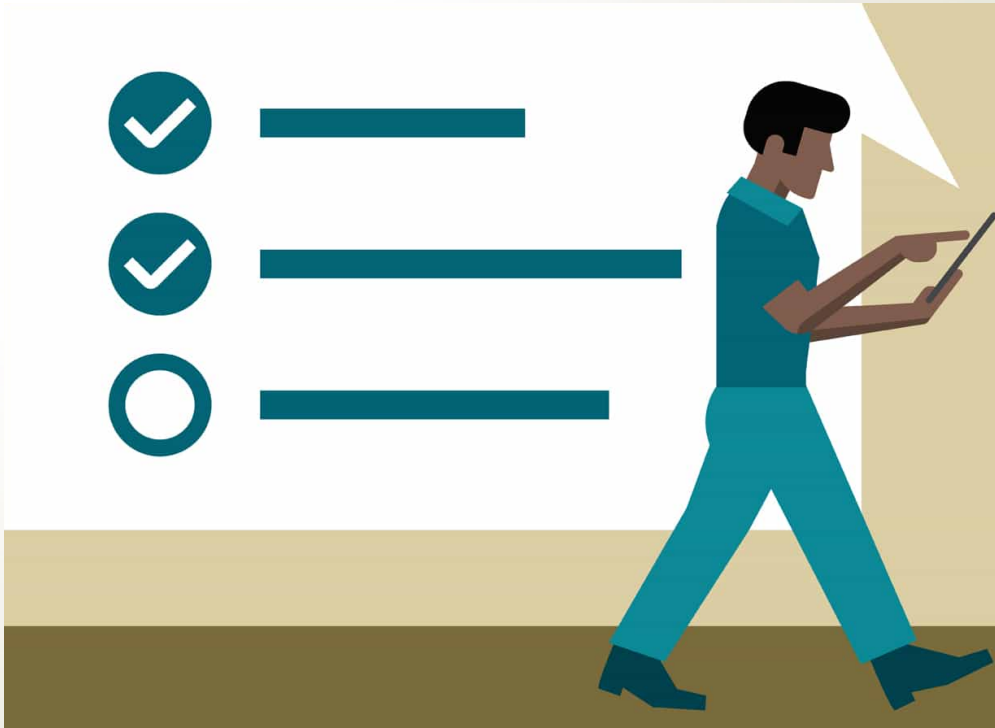
↓

Increased hospital admissions

Study Purpose

- Identify the determinants of population vulnerability.

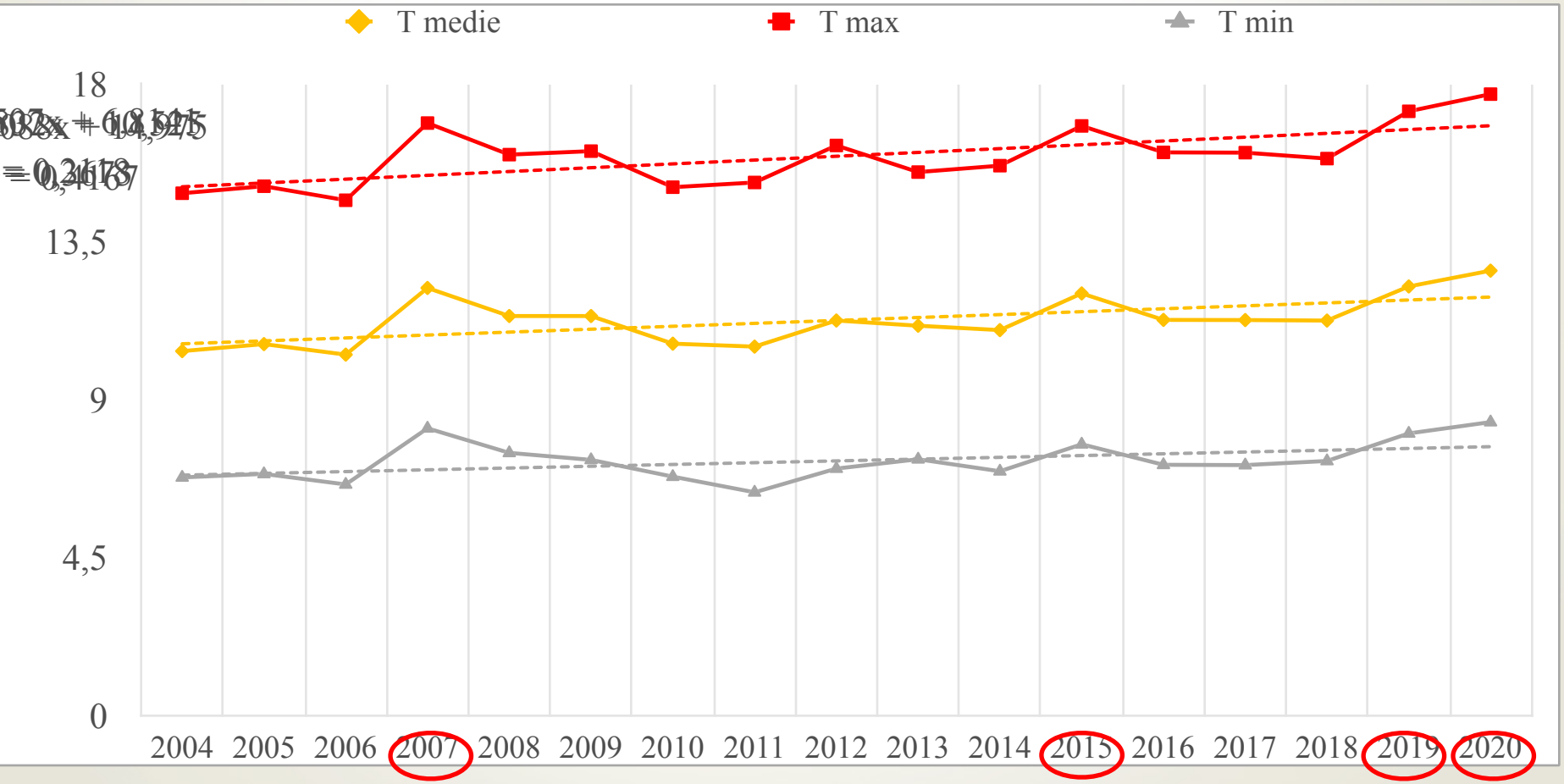
- Predict death risks due to disease in the Republic of Moldova.



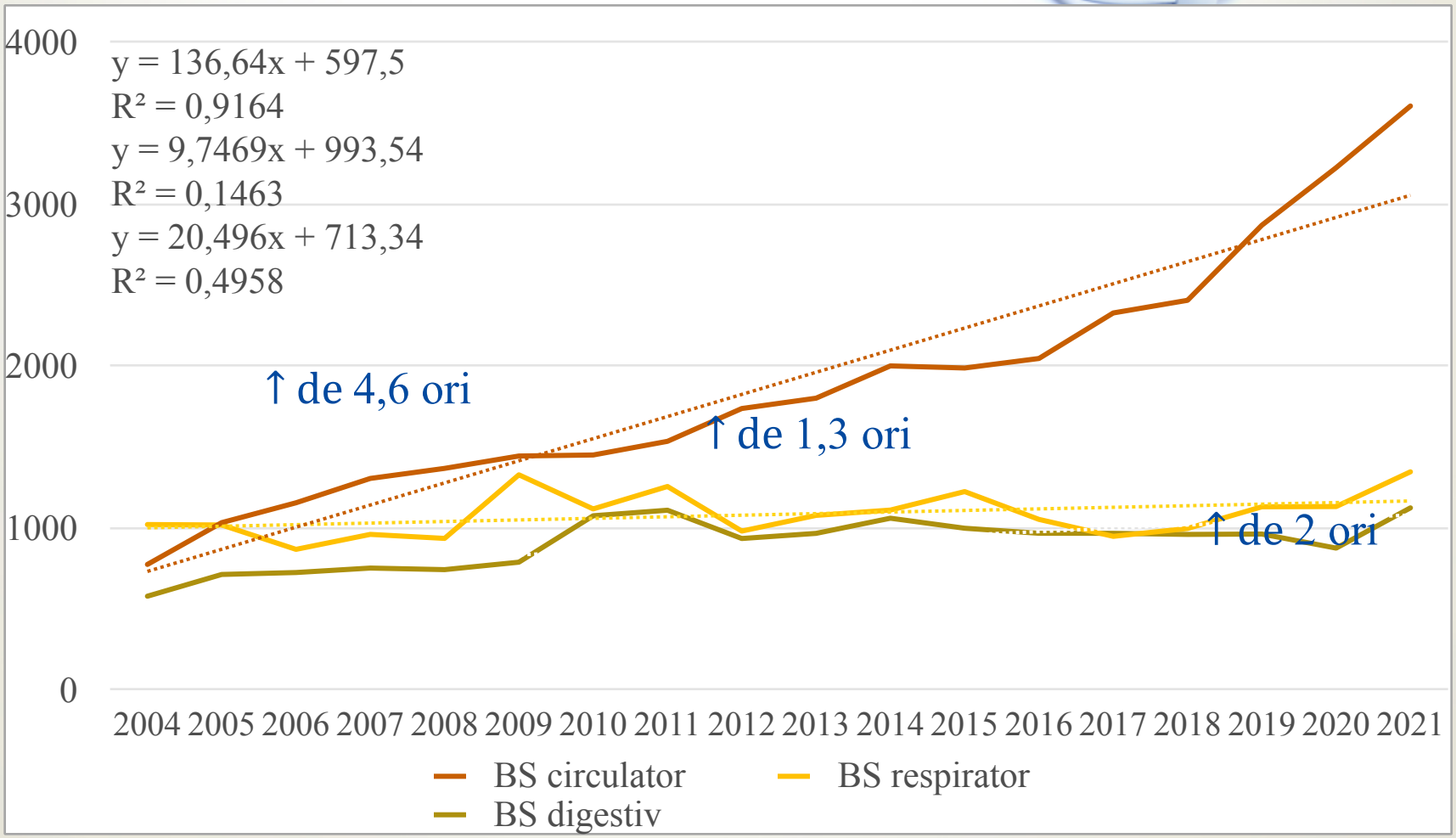
Materials and Methods

- 34 bibliographic sources studied; 9 key sources selected.
- 10 key vulnerability factors identified.
- Projection periods:
  - ❑ short (2016–2035),
  - ❑ medium (2046–2065),
  - ❑ long (2081–2100).
- Climate scenarios:
  - ❑ RCP8.5,
  - ❑ RCP4.5,
  - ❑ RCP2.6.

Temperature of average, maximum and minimum dynamics



Dynamics of morbidity prevalence recorded in adults (per 10,000 population)



Dynamics of morbidity incidence recorded in adults (per 10,000 population)

= 1,1864x + 164,17
R² = 0,0481

y = 4,5082x + 793,98
R² = 0,0383
y = -2,0511x + 200,12
R² = 0,0135

↑ de 1,5 ori

↑ de 1,3 ori

↑ de 1,6 ori

1100 825 550 275 0

500 375 250 125 0

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

BS circulator
BS respirator
BS digestiv

COMPARATIVE IMPACT OF CLIMATE SCENARIOS ON HEALTH

(REPUBLIC OF MOLDOVA)

RCP2.6 LOW EMISSIONS optimistic scenario	RCP 4.5 MODERATE EMISSIONS stabilized scenario	RCP 8.5 HIGH EMISSIONS severe scenario
Minimal increase in diarrheal diseases	Noticeable increase in diarrheal cases (July–Sept)	Major increase in diarrheal cases (July–Oct, up to 232)
Slight rise in circulatory mortality	Moderate increase in mortality	Strong rise in circulatory disease mortality

RCP2.6

PROJECTED HEALTH IMPACTS – RCP2.6

(Republic of Moldova)

SHORT TERM

2016–2035

Diarrheal Cases (Children): Minor increase (–30–40)

Mortality Stable

MEDIUM TERM

2046–2065

Limited increase (July–Sept)

LONG TERM

2081–2100

Diarrheal Cases (All Pop.): Moderate rise (–60–80)

Mortality: Slight increase (Summer period)

RCP4.5

PROJECTED HEALTH IMPACTS – RCP 4.5
(REPUBLIC OF MOLDOVA)

SHORT TERM
(2016–2035)

Slight increase in diarrheal cases among children (~45–50)

Minor summer mortality increase due to circulatory diseases

MEDIUM TERM
(2046–2065)

Noticeable increase in diarrheal incidence (july–Sept.)

Moderate mortality rise during heatwaves

LONG TERM
(2081–2100)

Higher number of diarrheal cases in general population (~150–180 cases)

Significant summer mortality due to circulatory system diseases

RCP8.5

PROJECTED HEALTH IMPACTS BY ANALYSIS PERIOD (REPUBLIC OF MOLDOVA)

Short Term (2016–2035)	Medium Term (2046–2065)	Long Term (2081–2100)
DIARRHEAL CASES (Children)* **- 45-57 cases** (Sept.)	**DIARRHEAL CASES (Childenn)** **increased** (July–Sept.) esp. RCP8.5	**DIARRHAEL CASES (ALL POP.)** **-186-232 cases** (July–Oct.) RCP8.5 peak
MORTALITY (Circulatory Diseases) **slight increase** (summer period)	**MORTALITY** (Circulatory Diseases) **high increase** due to circulatory diseases	**DIARRHAEL CASES (Children)** **-176-215** (Sept.-Oct.) **high increase** due to circulatory

The need to integrate climate change knowledge into medical curricula

- Considering climate change as the defining issue of our time, medical education is undergoing a period of transformation in which medical universities represent the key link in raising awareness about the role of healthcare professionals in preventing the adverse effects of climate change and adapting to new living conditions.

- A climate change–focused medical curriculum has the greatest potential to reach large cohorts of professionals and to promote standardization across institutions.

CONCLUSIONS

- Global warming increases public health risks.
- Public health institutions must ensure timely and effective responses.
- Adaptation measures should rely on scientific evidence.

Recommendations

- Develop monitoring and early warning systems.
- Educational campaigns for disease prevention during heat waves.
- Adapt medical infrastructure to future climate conditions.

Thank You