The impacts of climate change on health and mortality of the population

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Aims for the year 2020:

- increase the average life expectancy of people in Russia to 75 years, i.e. more than 10 years
- raise the level of health closer to the Central European level
Climate change is one of the biggest international problems of the XXI century, which goes beyond the scope of scientific problems.

It presents a complex and interdisciplinary problem, covering environmental, economic and social aspects of sustainable development of the Russian Federation.
Climate is one of the most crucial factors affecting the overall health, life expectancy and longevity of the population.
Climatic factors of the Far North, affecting health

- Low temperature
- Sudden changes in temperature
- High humidity
- Frequent changes in air masses
- Sudden changes in atmospheric pressure
- Specific photoperiodicity
- Changes in biological rhythms
- Changes in the geomagnetic intensity
- Insufficient UV-radiation
- Increased level of non-ionizing cosmic radiation
- Specifics of the radiation
Additional negative factors affecting health in the city of Arkhangelsk

- Air pollution (allergies)
- Low content of minerals in drinking water (osteoporosis, anemia, dental caries, and others)
- Insufficient consumption of fruit and vegetables (lack of vitamins)
- Low wages
- Others
Implementation of the project:
The impact of climate change on health
and assessment of options for adapting in the north of the Russian Federation

Project of the Ministry of Health Care of the Russian Federation and European Bureau of WHO
Years 2009 – 2012

Aim: To protect health of the citizens from climate change in the Arkhangelsk Region and the Nenets Autonomous Okrug
Tasks:

1. Evaluate vulnerability of health of the population in the north in relation to climate change.
2. To deliver comparative characteristics of the morbidity of Arkhangelsk, depending on weather conditions during the (1999 - 2008).
3. To deliver comparative characteristics of mortality in Arkhangelsk.
4. To deliver a detailed analysis of the early diagnosis of infectious diseases that are sensitive to climate change.
5. Evaluate the possibilities of the health care system of the Arkhangelsk region and the Nenets Autonomous Okrug (NAO) in relation to climate change.
6. Strengthening the capacity of the local health system in co-operation with other regional agencies to adapt to climate change, including emergency situations.
7. Develop a Regional Action Plan in the Arkhangelsk region and the NAO, aimed to minimize the impact of climate change on public health, as a model for other regions of the Russian North.
Implementation of the project

Climate and diseases sensitive to climate change

Connection between temperature changes and mortality of the population

Connection between infectious diseases and climate factors

Climate change and its impact to public health in NAO

Emergencies, natural anomalies and health of the people in Arkhangelsk region

Connection between the tick-borne encephalitis and climate change
Collaboration with HydroMetCenter of the Northern Department of Hydrometeorology and Environmental Monitoring

Providing a database of accurate information on meteorological parameters (data from 24 weather stations located in the Arkhangelsk Region and NAO (1999 - 2008)

- In Arkhangelsk and Novodvinsk (daily)

- In Mezen, Holmogory, Kargopol and Naryan-Mar were presented seasonal temperatures in winter (December-February), spring (March-May), summer (June-August), autumn (September-November) and the whole year
Average air temperature *(all seasons)* in Arkhangels region and NAO *(in 10-year periods)*

(I. V. Grishchenko, 2011)
Temperature fluctuations: Mortality and health of the population of the North

Outcome of the research
Relation of mortality of population in Arkhangelsk and temperature fluctuations (years 1999-2008)

Temperature is known to impact almost all causes of mortality.

The impact of changes of temperature on external causes of mortality has been much stronger than on mortality from all natural causes.
The number of excess deaths in Arkhangelsk caused by heat waves and extreme cold

<table>
<thead>
<tr>
<th>Cause of death, age</th>
<th>Extreme cold</th>
<th>Heat waves</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infarcts (30-64)</td>
<td>24</td>
<td>-</td>
<td>24</td>
</tr>
<tr>
<td>Infarcts (65+)</td>
<td>26</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>Cerebral infarction (65+)</td>
<td>43</td>
<td>73</td>
<td>116</td>
</tr>
<tr>
<td>Natural cause (30-64)</td>
<td>47</td>
<td>-</td>
<td>47</td>
</tr>
<tr>
<td>Natural cause (65+)</td>
<td>102</td>
<td>66</td>
<td>168</td>
</tr>
<tr>
<td>External cause (30-64)</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>External cause (65+)</td>
<td>-</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
Collaborate with emergency room in Arkhangelsk

Development of a database of morbidity in Arkhangelsk based on the visits to the emergency medical care due to diseases related to weather with a description of each call, the call date (day, month, year), call time, gender, age, diagnosis during the period 2000 – 2008.
The effects of climatic factors on turning to emergency medical care in the city of Arkhangelsk (increase t °)

Increase of the daily average temperature by each degree above the threshold of 15.5°C results in an increased number of calls concerning the following incidents:

- Injury, poisoning, and consequences of external causes among men (all ages) by 1.6% (95% CI: 0.2% - 3.0%)
- Respiratory diseases among children by 2.5% (95% CI: 0.7% - 4.3%)
- Respiratory diseases among the population (both sexes) in the age group 60 years and over by 3.0% (95% CI: 0.6% - 5.5%)
- Increase of the daily average temperature by each degree above the threshold of 16.1°C results in an increased number of calls, concerning respiratory diseases in the age group 60 years and over by 3.7% (95% CI: 0.2% - 7.2%)
The effects of average daily temperature decrease on the turning to emergency medical care (decrease $t^\circ$)

Fall of the average daily temperature each degree lower than $-12.8^\circ$C is followed by:

1. 1.6% increase in the number of calls concerning the health problems caused by external causes in the age group of 60 years and over

2. 1.7% decrease in the number of calls concerning the respiratory diseases in the age group of 18-59 years (both sexes)

3. 1.5% decrease in the number of calls concerning respiratory diseases among all women (of all ages)

4. 0.9% decrease in the number of calls concerning the circulatory diseases on the next day
Morbidity rate of skin melanoma years 1990-2008

(Levit, Rahmankulova, 2009)
Incidences of tick-borne encephalitis in the Russian Federation and the Arkhangelsk region

Morbidity to 100 000

Russia
Arkhangelsk obl.
The number of people affected by ticks in Arkhangelsk Oblast

Number of victims: 1 – 0-10 (blue), 2 – 10-100 (green), 3 – 100-1000 (yellow), 4 – >1000 (pink) for 100 000 population
Impact of climate change on the incidences of salmonella in the Arkhangelsk Region

There is a correlation between the monthly incidences of salmonella and increase in the average temperature in the previous month (whole range of temperature without thresholds).

In Arkhangelsk, temperature increase of 1°C resulted in increased number of cases of salmonella in the next month, on average, by 1.9%.
Risks of biological or social emergencies in the territory of Arkhangelsk oblast

- Changes in the frozen ground in circumpolar zone opens the risk of exposure of the mortuaries of cattle carrying anthrax

- Costs caused by infectious diseases are over 18 billion RUB a year

- There are nearly 40 million cases of infectious diseases reported annually in Russia.
Cattle mortuary in Mezensky district of Arkhangelsk oblast
In 2009 in the Arkhangelsk oblast there were registered 6340 parasitic diseases, of which 85.4% helminthiasis.
Morbidity from diphyllobothriasis people living in NAO during the period 1980 - 2009 (by decades)

- 80’s
- 90’s
- 2000’s

Linear (80’s)
Linear (90’s)
Linear (2000’s)
### Morbidity rate from endoparasites of white fish from Pechora pool

*(Novoselov A. P. 2009)*

<table>
<thead>
<tr>
<th>Period of sampling</th>
<th>Diphyllobothriasis*</th>
<th>Tetracotiliosis**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vendace</td>
<td>White -fish</td>
</tr>
<tr>
<td>1980’s</td>
<td>16,4</td>
<td>-</td>
</tr>
<tr>
<td>1990’s</td>
<td>37,8</td>
<td>17,5</td>
</tr>
<tr>
<td>2000’s</td>
<td>50,0</td>
<td>56,1</td>
</tr>
</tbody>
</table>
The indicators of average answers to the following question:

«How many times a week, seasonally, do You eat:
- reindeer (1),
- fish (2) ?»

Kanin peninsula:
4-5 times reindeer
4-6 times fish
From the research resulted:

- Intervention strategies on adaptation mechanisms to climate change in the Arkhangelsk Region and Nenets Autonomous District

- Adaptation plan for impacts of climate change on public health for the Arkhangelsk Region and Nenets Autonomous District of the Russian Federation
From the research resulted:

The outcome of the research was included to the guidelines (MP 2.1.10.0057-12) “Assessment of risks and damage from climate change, affecting the increased morbidity and mortality in high-risk groups“ in the section 2.1.10., “The state of health of the population in relation to the environment and living conditions by the governmental sanitary-epidemiological norms” approved by the Chief State Sanitary Doctor of the Russian Federation G. G. Onischenko 17.01.12.
If you can not measure it, you can not heal it.

Lord Kelvin (1824-1907)

You don’t choose the weather, you choose the suitable outfit

It is extremely important to develop research in the field of climate risk assessment, to promptly take them into account when designing development programs, reducing the damage from some and using the others in the most effective way.
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