Climate change and infectious diseases in Arkhangelsjk region – a regional assessment

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by

Zhanna Varakina
WHO Regional Office for Europe

David Mercer, PhD, Area Coordinator, Surveillance
Division of Communicable Diseases, Health Security & Environment
WHO Regional Office for Europe, Copenhagen

BMU project - Protecting health from climate change

- A seven-country initiative
- A seven-country initiative focuses on taking action against the health effects of climate change in seven European countries: *Albania, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia and Uzbekistan*.

- funded through the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Why this initiative in 7 European countries

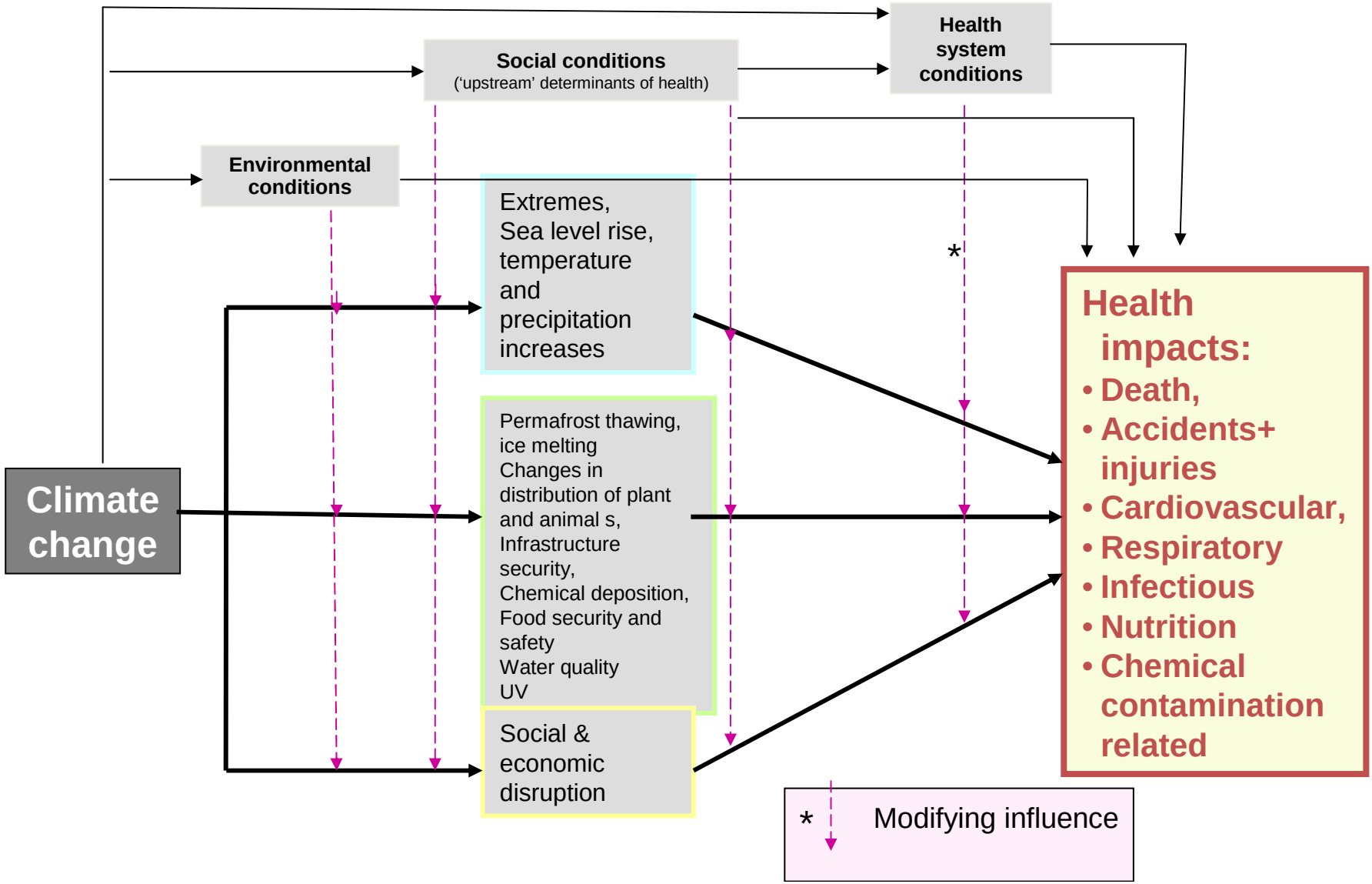
IPCC conclusions

- The Arctic is between the most affected Regions

Polar Regions	• The main projected biophysical effects are reductions in thickness and extent of glaciers and ice sheets and sea ice, and changes in natural ecosystems with detrimental effects on many organisms including migratory birds, mammals and higher predators; • For human communities in the Arctic, impacts, particularly those resulting from changing snow and ice conditions are projected to be mixed; • Detrimental impacts would include those on infrastructure and traditional indigenous ways of life; • In both polar regions, specific ecosystems and habitats are projected to be vulnerable, as climatic barriers to species invasions are lowered.

IPCC, Synthesis Report, 2007

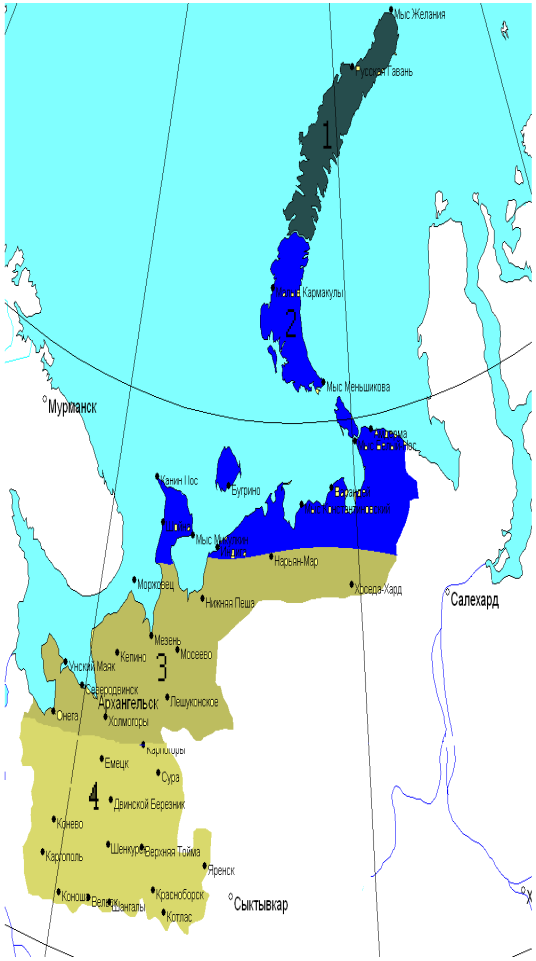
Potential climate change health effects in the Russian North?



Potential infectious disease changes in the Russian North (ACIA, 2005)

- Changes in zoonosis
  - Tularemia, rabies epidemics, brucellosis, echinococcus, an arctic strain of trichinella, cryptosporidium
- Changes in bird migration
  - E.g. West Nile fever
- Changes in tick distribution
  - Tick borne encephalitis
- Changes in Mosquitoe distributions

Project goals and target group of the BMU project



To protect health of population from climate changes in the North of Russia

- *Assessment of the health impacts of climate change and of the available adaptation capacity of the local health systems* in the pilot region of the Arkhangelsk Region including Nenets Autonomous Okrug;
- *Elaboration of an Action Plan to protect health of population from the impact of climate change on health, which could be extended to other Russian Arctic regions;*
- *Capacity building to improve adaptative capacity of local health systems and local populations; set up contingency plans for health facilities in close cooperation with other sectors in the pilot region;*
- *Information for decision makers, including early detection of infectious diseases*

Target group – population of the Arkhangelsk Region

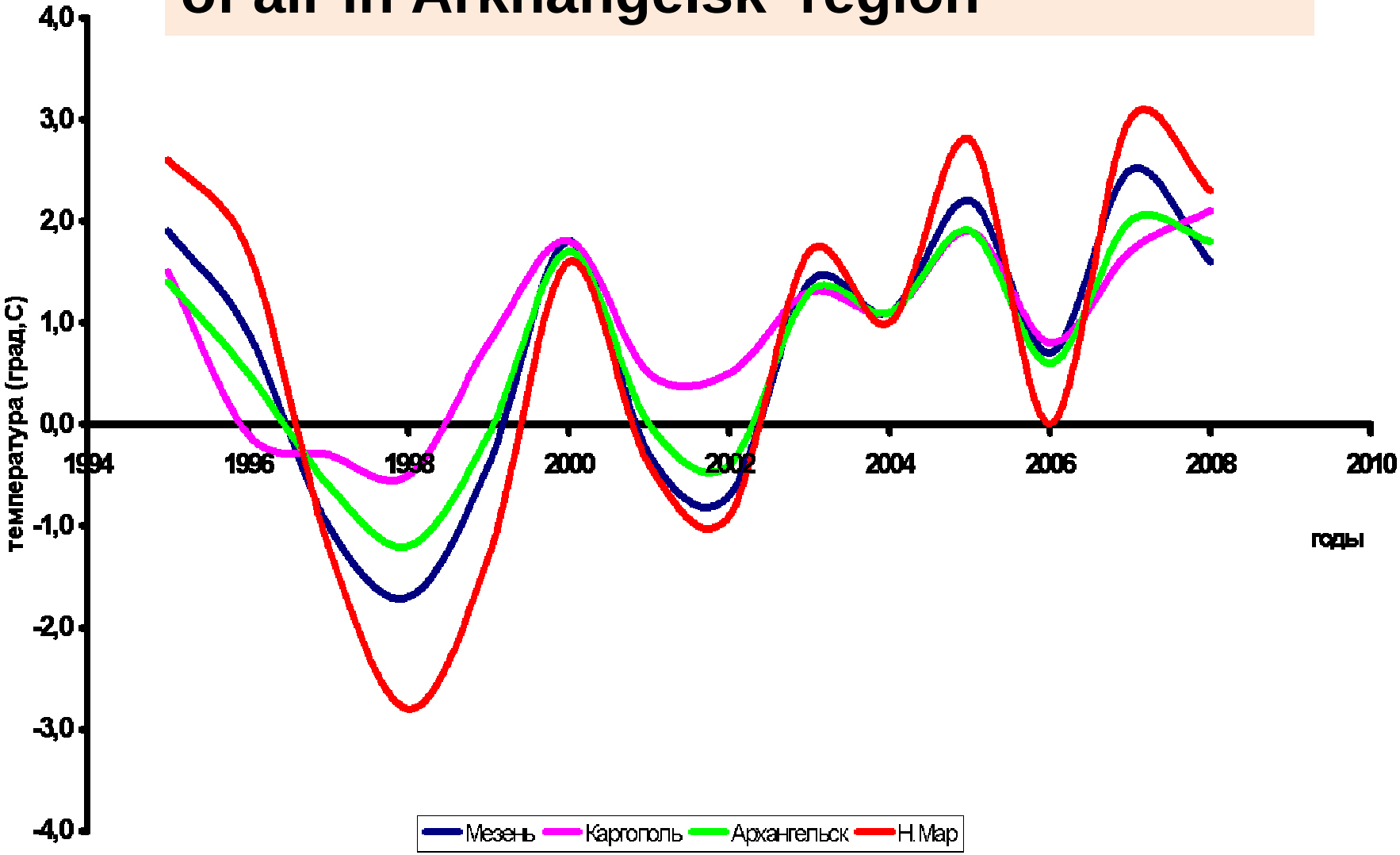
Methods

Working groups for conducting assessment have been identified:

- Impact of climate changes on mortality
- Impact of climate changes on morbidity (ambulance calls in Arkhangelsk)
- ***Impact of climate changes on vector-borne diseases (tick-borne encephalitis)***
- ***Impact of climate changes on infectious diseases (salmonellosis)***
- Climate and health in Nenets autonomous region
- Climate, emergency situations and health


Мыс Желания
Русская Гавань
1
Мальев Кармакулы
2
Мыс Меньшикова
Мурманск
Амдерма
Мыс Белый Нос
Канин Нос
Бугрино
Мыс Константиновский
Шойна
Мыс Микулкин
Индига
Нарьян-Мар
Моржовец
Хоседа-Хард
Нижняя Пеша
Салехард
Мезень
Кепино
Мосеево
3
Унский Маяк
Северодвинск
Архангельск
Лешуконское
Онега
Холмогоры
Емецк
Сура
4
Двинской Березник
Конево
Шенкурск
Верхняя Тойма
Яренск
Каргополь
Красноборск
Коноша
Шангалы
Котлас
Сыктывкар

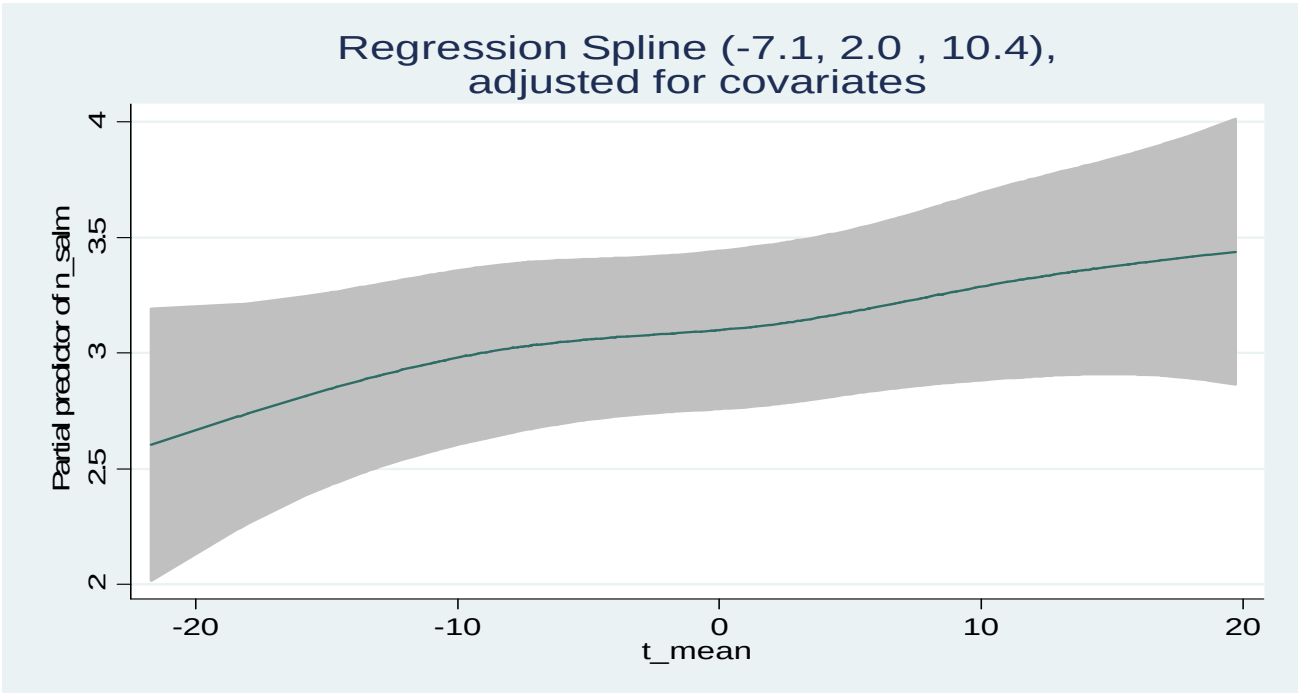
Anomalies of average city temperature of air in Arkhangelsk region



Impact of climate changes on infectious diseases (salmonellosis)

- **Aim:** To investigate associations between salmonellosis and ambient air temperature and precipitation in Northwest Russia.

- **Methods:**
- Data on all laboratory-confirmed cases of salmonellosis in the city of Arkhangelsk (64°32'N) from 1992-2008
- 1) negative binomial regression with adjustment for long-term trend by fitting a polynomial of time and seasonality modelled using trigonometric functions, 2) negative binomial model with dichotomous indicator variables for each year and month
- 3) linear regression model using logarithmically transformed, detrended and deseasonalized monthly counts of salmonellosis and deseasonalized values of temperature and precipitation.
- All models were adjusted for first- and second order autocorrelation.



- **Results:**
- An increase by 1°C was associated with a 2.04% (95% CI: 0.25-3.84), 1.84% (95% CI: 0.06-3.63) and 2.32% (95% CI: 0.38-4.27) increase in the number of cases in models 1, 2 and 3, respectively. Only one of the three models suggested an increase in the number of cases by 0.24% (95% CI: 0.02-0.46) with the increase in precipitation by 1 mm in the same month.

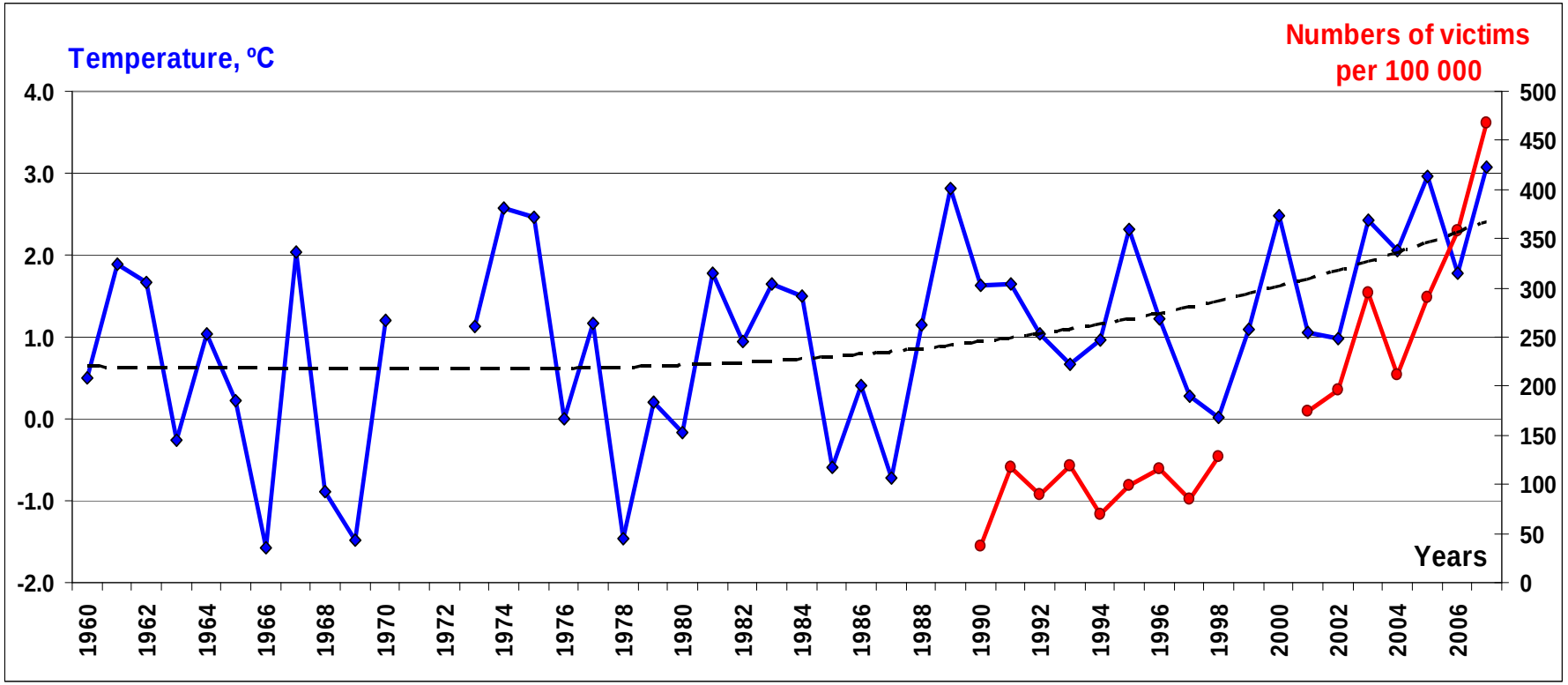
Impact of climate changes on vector-borne diseases (tick-borne encephalitis)

- **Aim:** To study associations between monthly air temperature and tick-borne encephalitis in Arkhangelsk region, Northwest Russia in 1980-2009.
- **Methods:**
- Mean monthly temperatures in 1980-2009
- number of the ticks victims, tick-borne encephalitis morbidity in 1980-2009.
- Statistical analysis: dispersive, correlation and regression analyses.

Impact of climate changes on vector-borne diseases (tick-borne encephalitis)

- **Results:**
- significant increase in morbidity - nearly 60-fold rise (2000-2009 in comparison with 1980-1989)
- The number of victims appears to increase with rising temperatures.
- A steep increase in the number of victims follows as annual average temperature exceeds 1.5°C.
- Northern districts suffered their first incidence of tick victims.
- Victims in central districts grew ten-fold and in southern districts grew three-fold.
- Tick proliferation is very rapid, and a few warm years are enough to create a sustainable population of Ixodes persulcatus ticks in northern territories.

Change of annual average temperatures and number of tick victims in Arkhangelsk region



Further research and international assistance requirements

- Improving methods of analysing impact of climate change on infectious diseases and scenario based studies when number of cases is small
- Monitoring of new patterns of enteric infections in the Northern areas related to climate change.
- Efficiency increase of the epidemiological monitoring over tick-borne encephalitis and effectiveness of the undertaken interventions
- International technical support on improving methodology and refining further outcomes of the first analysis on climate change impact on infectious diseases in order to improve advice to public health managers on steps required

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