Geography and climate sensitivity of northern infectious diseases

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Climate change effects on the epidemiology of infectious diseases and the impacts on Northern societies

Photo: Carl-Johan Utsi

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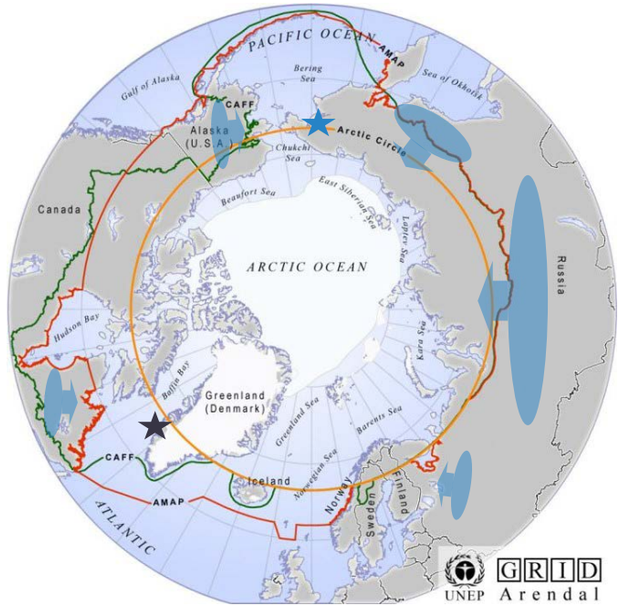
The geography of northern infectious diseases

The spatiotemporal variation of selected human diseases

A presentation of data, with manuscript in preparation

Authors (preliminary): Berggren C., Omazic A., Evengård B., Albihn, A., Thierfelder T.



- Eight potential human (zoonotic) CSI's covering six nations annually through the overall period 1985 – 2016 (31 years).
  - Borrelia, Brucellosis, Cryptosporidium, Leptospirosis, Q-fever, TBE, Tularaemia
  - Greenland, Iceland, Norway, Sweden, Finland, Russia (from Nuuk to Yakutsk)
  - All nations entirely spatially covered except Russia, where 16 oblasts (or equivalent) have been covered from St Petersburg to Sacha (former Yakutia). 86 report districts in total.
  - Case-by-case except in Russia, compiled to annual incidences and prevalence through the thirty year climate reference period
  - Hence, CLINF introduces the notion of a "CSI climate"!
- Whenever possible, cases are categorised with gender and age-group.
- CLINF is now working with depicting CSI interactions across space, time, gender, and age-group.
  - And test interactions for trends and anomalies

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The climate sensitivity of northern infectious diseases

Correlations across the geographic spread of diseases and climate

A presentation of data, with another manuscript in preparation

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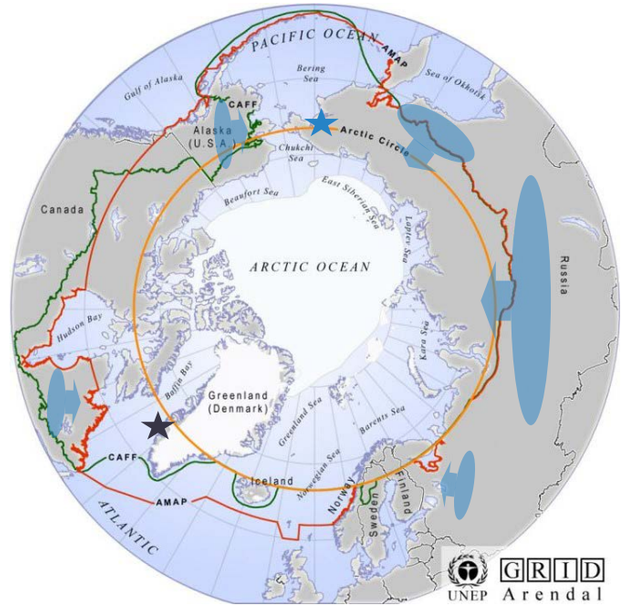
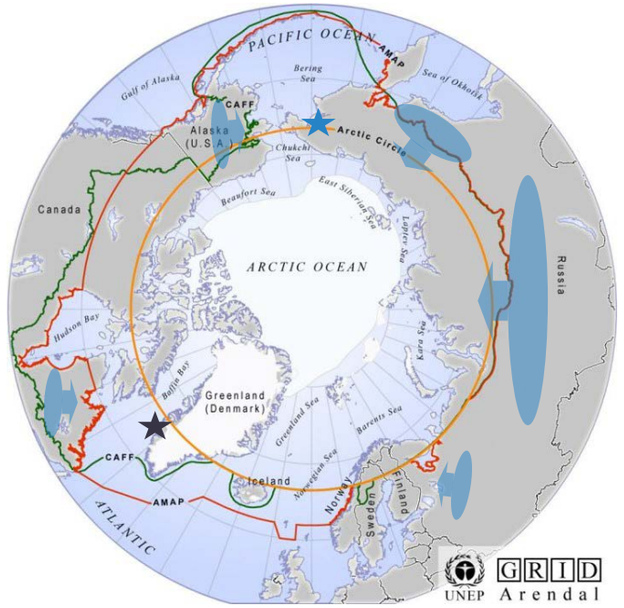


- Diseases data is complemented with climate data compiled to characterise the exact report districts of CLINF diseases data.
  - Remote sensing products covering the 30-year climate reference period (whenever possible) with monthly snapshots (principally) at km-wise spatial resolution (tera-bytes).
  - Boilt down to annual measures of central values and spreads (depending on scale-type) per diseases reporting district.
  - Land cover, photosynthesis, leaf area index, soil moisture, snow water equivalent, snow extent, snow depth, snowmelt, soil freeze/thaw, soil temperature, air temperature, precipitation, topography, evaporation, soil properties, solar/global radiation, U and W wind components, air pressure, sea-ice cover, run-off, plant functional type, length of vegetation period, temperature extremes, precipitation extremes, land-cover change, spring-flood start, geostrophic wind, etc.
  - CLINF's notion of a "CSI climate" is hence balanced with "climate per-se".
- Linear modelling facilitates inference regarding climate effects on the spatiotemporal pattern of diseases, including effects of gender and age.
  - Including general measures of uncertainty as well as basic tests concerning the climate sensitivity of observed infectious diseases.

CLINF experiences made so far

in the work with inventorying and collating diseases and climate data across national administrations



- International homogenisation of administrative routines concerning reporting, archiving, and disseminating of diseases data is largely lacking.
  - Confining the possibilities of performing international CSI monitoring
  - Confining the international transfer of acute (real-time) CSI information
  - Introducing societal risk
- Russia has an enormous CSI potential, the rest of the CLINF study area is relatively marginal
  - In principle, the total mass of a disease is confined by its habitat area
    - With the probability of eradication principally depending on the total mass
  - Therefore, an eventually thawing Siberia has CSI potentials of global concern
    - And must become a thorough partner in international CSI surveillance and red-alert information systems