Infectious diseases

Where are we 10 years from now?

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Nordic Cluster Medical Lead

To the Congress in 1969:

"The time has come to close the book on infectious diseases…"

William H. Stewart
Surgeon General 1965-69

Potential disease threats

- Antibiotic resistance
- New pathogen species; novel variants (e.g. SARS)
- Zoonotic diseases (Q-fever, anthrax, TBE, EHEC etc)
- HIV, TB & Malaria
- Climate change

Pathogens

- Chikungunya fever
- TBE
- Borrelia
- Tularemia
- Crimean-Congo Heamorrhagic Fever
- Dengue
- West Nile Virus
- Malaria
- MRSA, ESBL, PSP, NDM-1, etc…

Antibiotic resistance

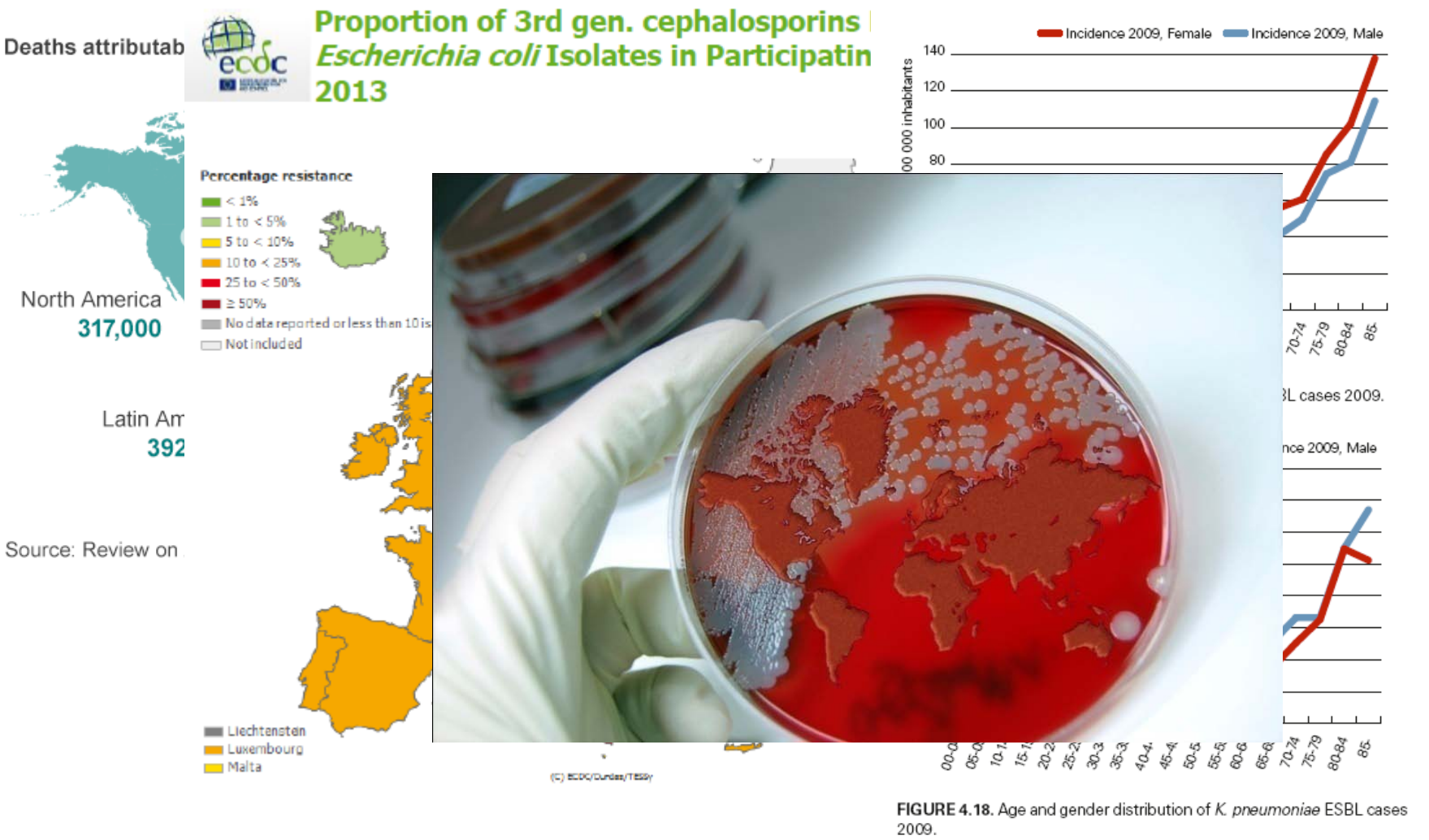
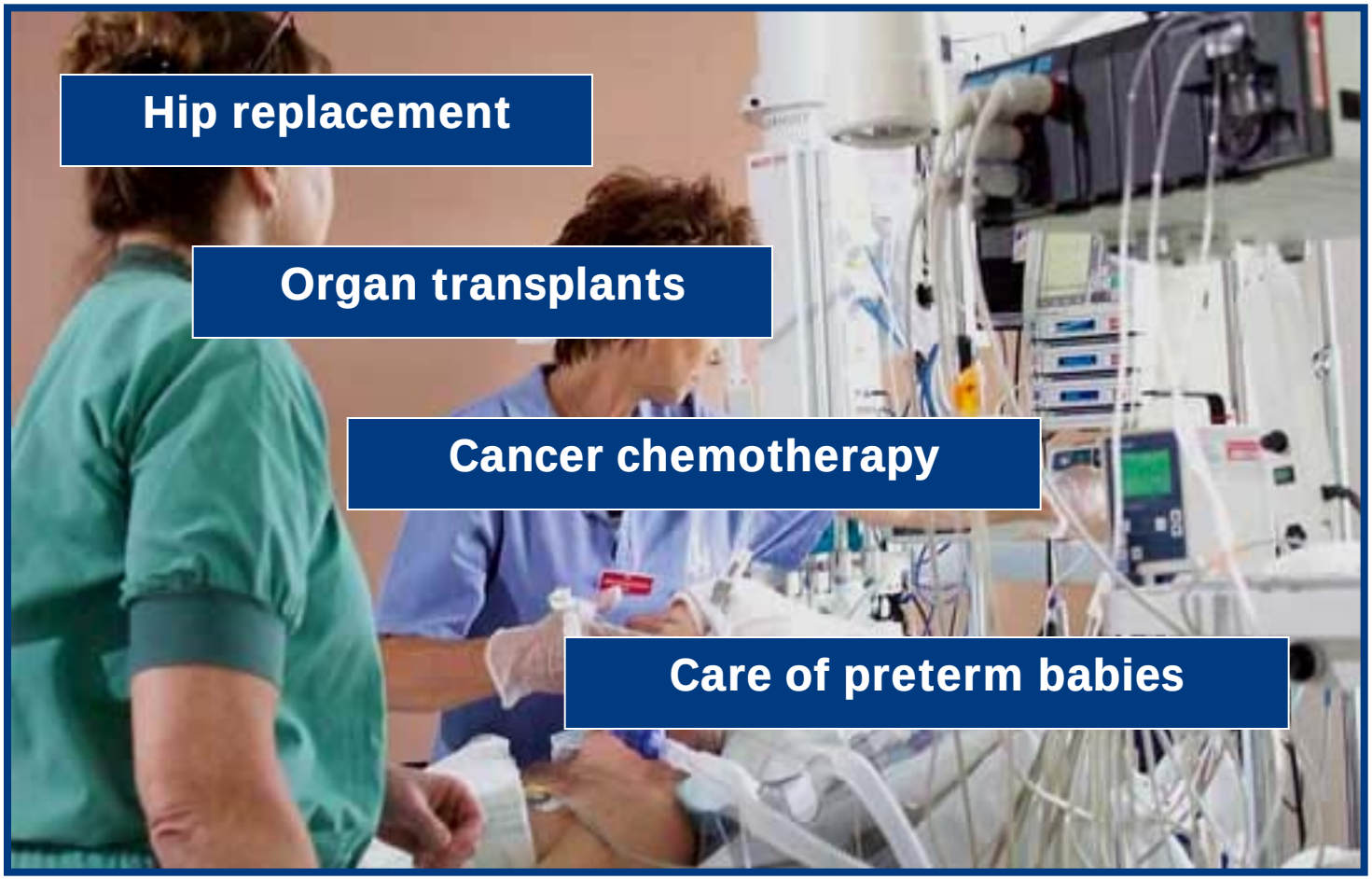


FIGURE 4.18. Age and gender distribution of *K. pneumoniae* ESBL cases 2009.

Source: ECDC, EARS surveillance report, accessed Sep 2015: http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/map_reports.aspx

What will the future look like…?

Modern medicine is not possible without effective antibiotics



Source: Action on Antibiotic Resistance, ReAct 2012, www.reactgroup.org

Vaccines in late phase trials/awaiting approval

- Malaria
- Dengue
- TB
- Ebola
- HCV
- NTHi
- HIV

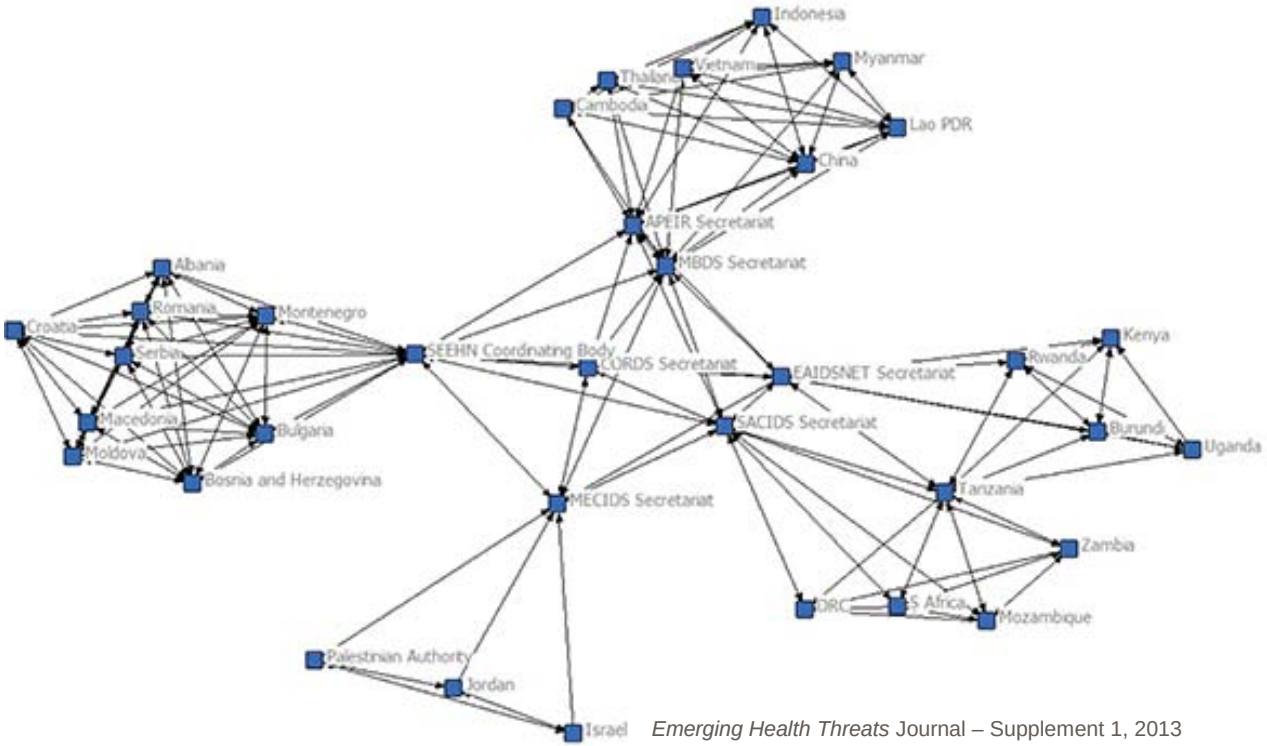
- Polio eradicated?? Hepatitis B potential to reduce dramatically

Surveillance and diagnostics

- The lack of simple point-of-care diagnostic tests are a major barrier for rational use of antibiotics (patient level)
- New technological development in this area would be very helpful
- The main advantages culture has over newer methods are its comparatively low cost and robust antimicrobial susceptibility testing
  - Better PCR-based tests
  - Mass spectometry (based on molecular weights of proteins and peptides; MALDI/TOF

Improved and connected surveillance networks

- CDC, ECDC, EARSNet
- Other
- Computerized detection systems
- E.g. CORDS (Connecting Organizations for Regional Disease Surveillance)



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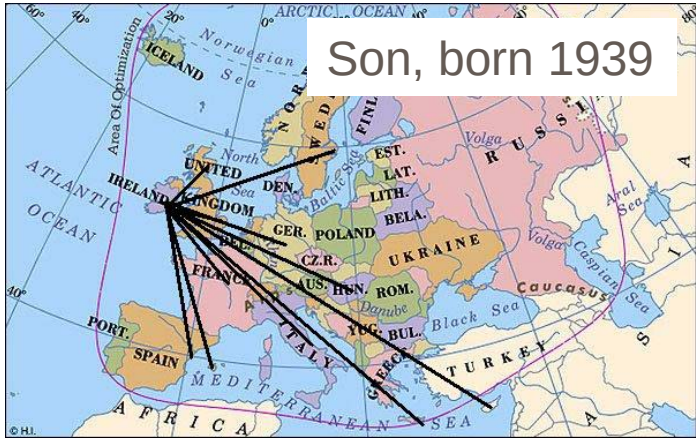
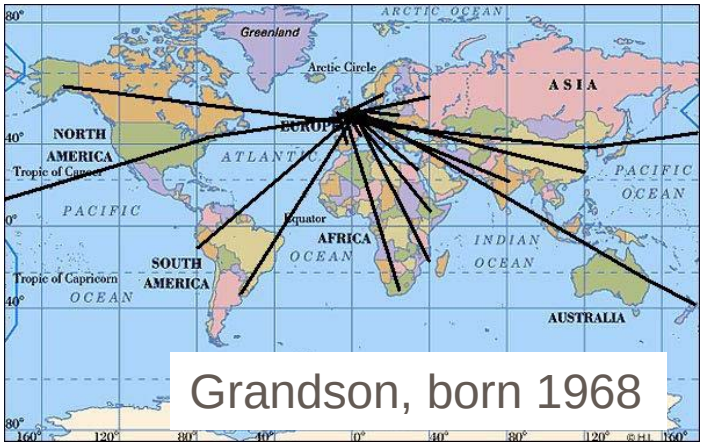
What will the future hold?

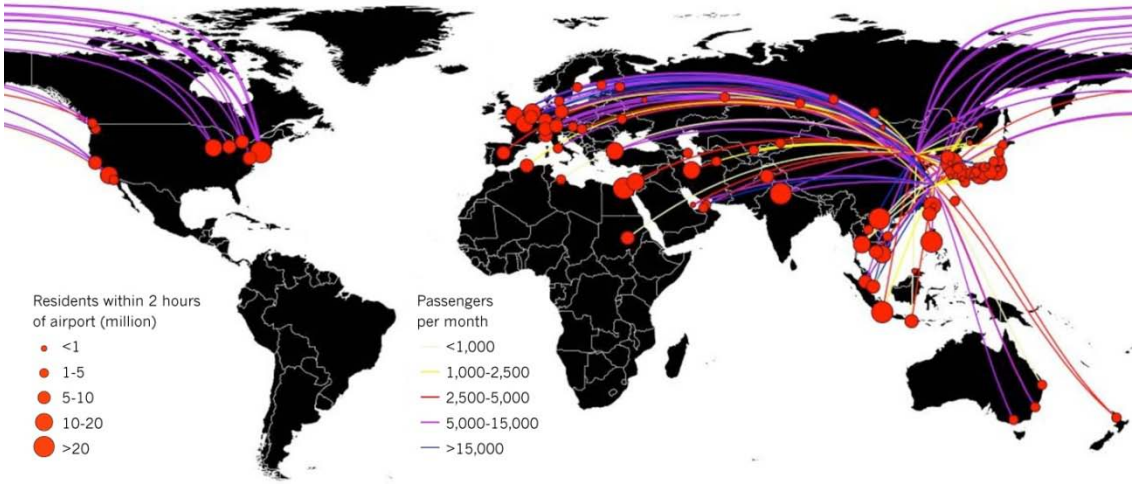
Our lives are changing…



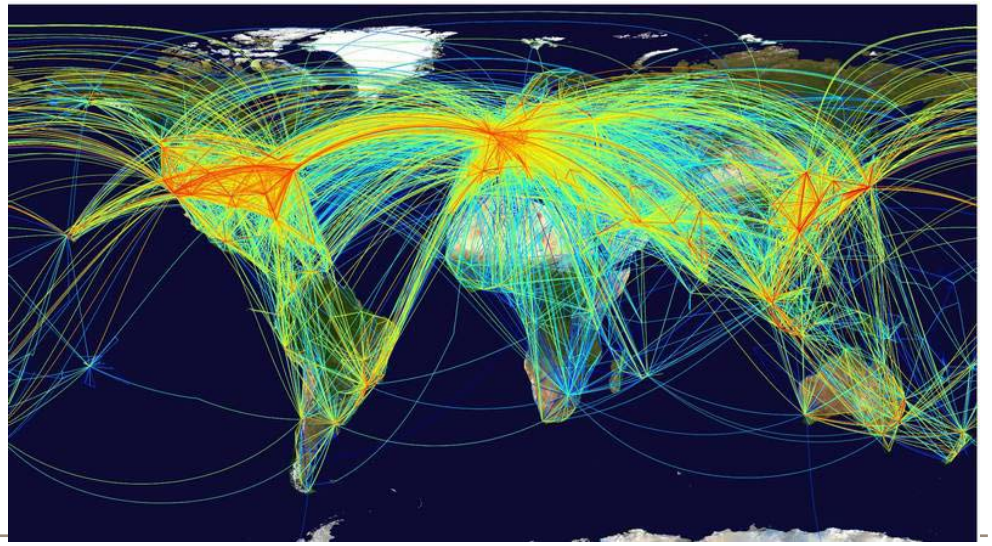


Adapted from Bradley et al. Geog. Ann. 1994

Influenza – transmission pattern



http://www.nature.com/news/mapping-the-h7n9-avian-flu-outbreaks-1.12863



Max Planck Institute for Dynamics and Self-organization

A new world

- In 1800; 3% of the world's population lived in cities
- Today >50%
- 2025 ~ 60%

1. WHO 2012. 2. Leon A, Int. J. Epidemiol. (2008) 37 (1): 4-8.

Urbanisation

- In 1950 there were only 2 cities with apopulation > 8 million
- 1990-1995 the number of inhabitants in poor countries increased with 260 million
- ”Megacities”

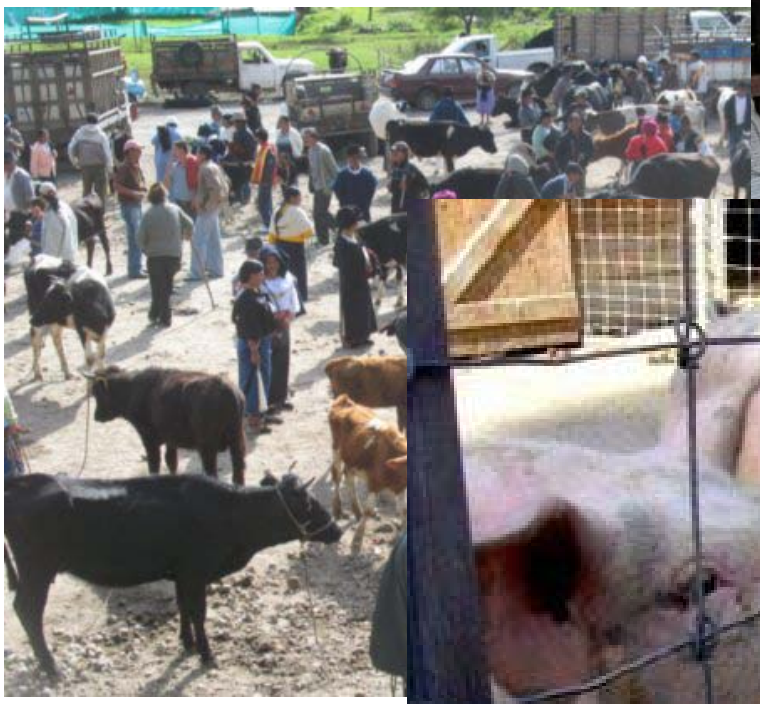
Christopher Watson, Trends in urbanisation; http://www.icup.org.uk/reports%5CICUP601.pdf?

Urbanisering och dess följder

- Today around 1 billion people live in peri-urban slums
- Opportunities for infectious diseases, poverty and social problems

Exposure

- Increased contacts between humans and animals
- Growing human population
- Likelihood ↑ for emergence of ”new” infectious agents



Climate change

- Global temperature increase
- Changes in biotopes and fauna
  - Changed distribution of vectors
  - Ticks, mosquitoes
  - Rodents
  - Birds
- Draughts, floods, increased precipitation

Changes in climate and travel patterns impact disease spread

- Summer-fall 2007
- Outbreak in Castiglione, Italy
- Index case – Indian visitor who arrived on June 21 and fell ill on June 23
- 197 cases regional outbreak
- Competent vector – *Aedes albopictus*

Source: ECDC 2007

Threat?

- Important to differentiate between increased import of single cases in travellers and that ”new” disease becomes endemic in e.g. Norway
- Vigilance inportant! New trends
- Travel means that you expose yourself to new risks
- Specific knowledge necessary
  - Big regional variations
  - Vaccination, advice
  - Knowledge of local health care infrastructure

Trends

- Increased travel (of humans, animals and goods)
- Increased attention to antibiotic resistance
  - Human use
  - Animal use
  - R&D efforts
  - Prevention – hygiene and vaccination
- Increased attention to climate change
- New and improved tools for surveillance and treatment
- New vaccines under development
- New infections do emerge!

Conclusions

- Antibiotic resistance
  - Increasingly tangible, new antibiotics & diagnostics under development
  - Worse before better!
  - Improvement in hospital hygiene?
- Changing disease patterns
  - Emerging new diseases
  - Climate change; vector-borne diseases: dengue, chikungunya, TBE, Borrelia
- Better surveillance
  - Able to detect outbreaks faster
- Some disease may disappear (polio) whereas new ones emerge