

Infektsioonhaigused 21. sajandil

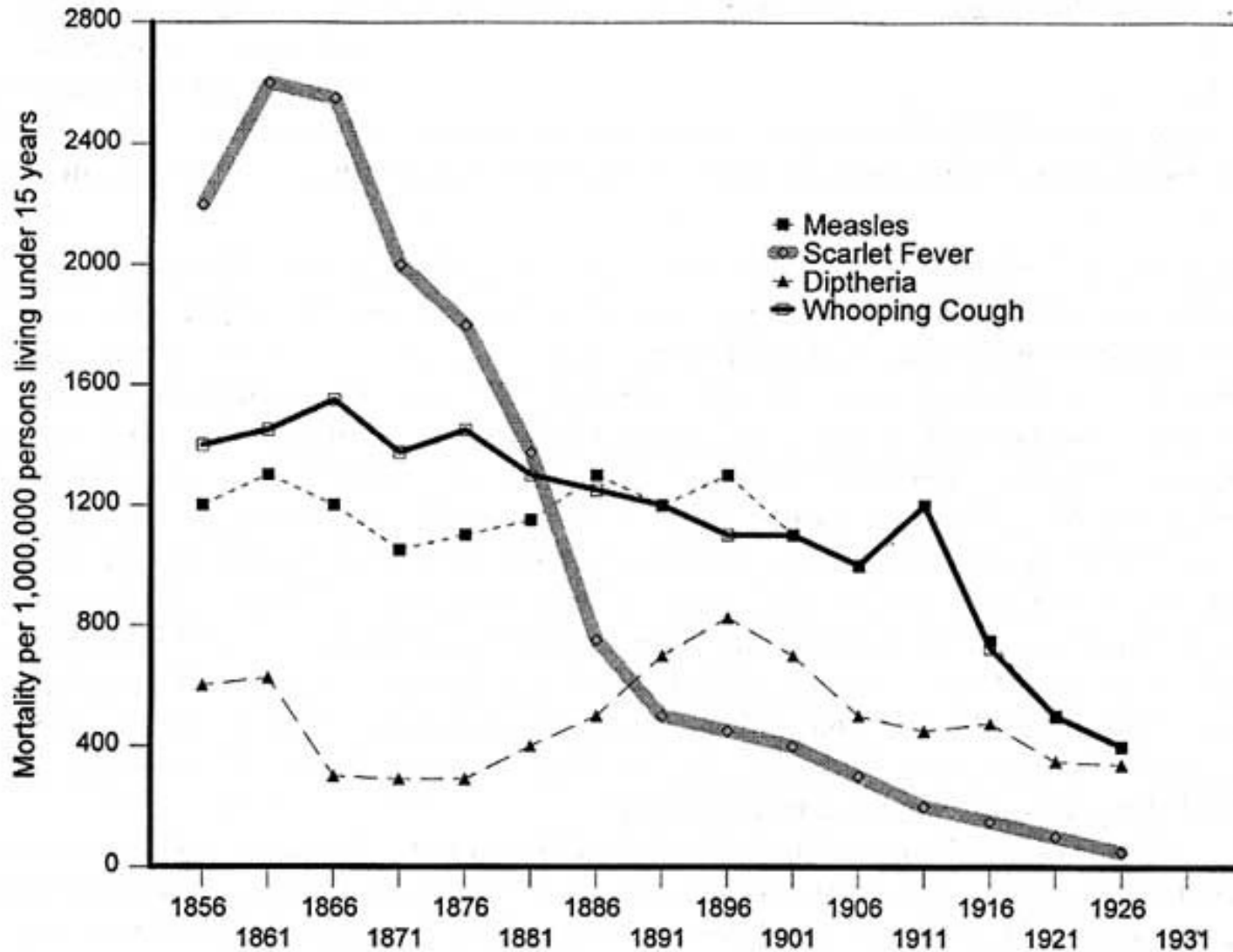
Irja Lutsar

Eesti Arstide Päevad

04. 04. 2014

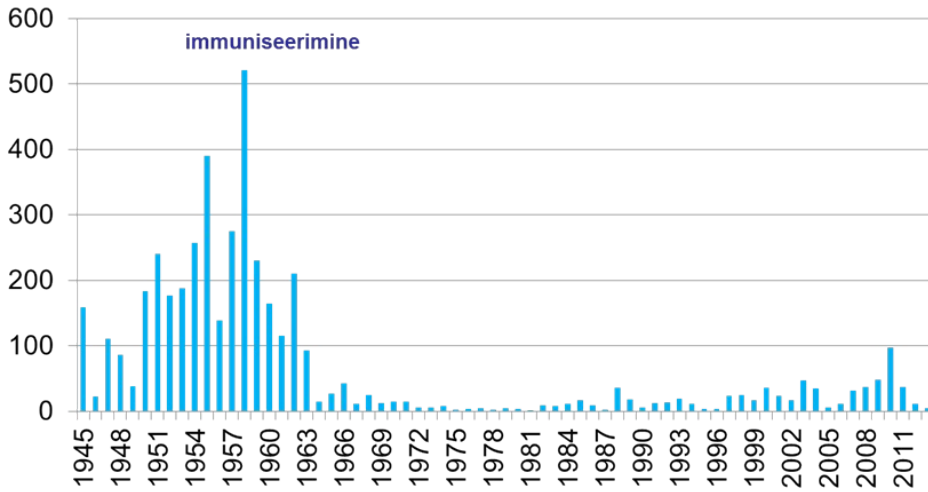
Infektsioonhaigused läbi aegade:

Inglismaa ja Wales

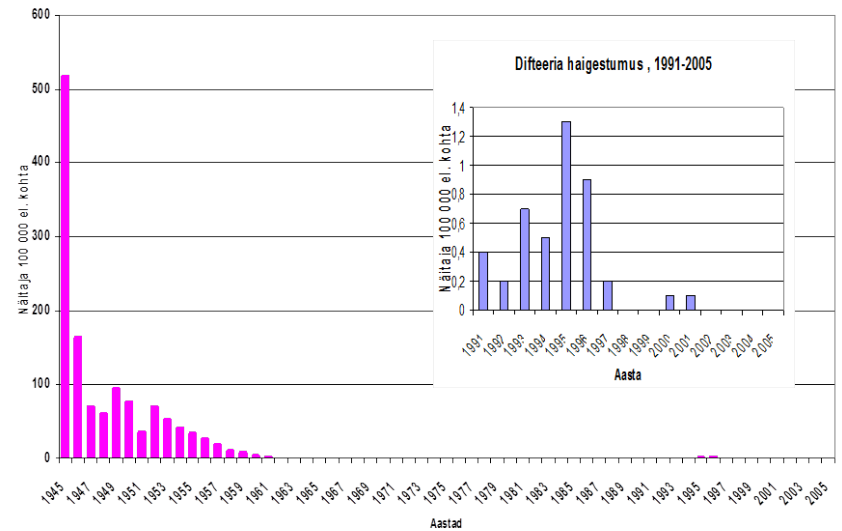


Infektsioonhaigused 20.sajandil

Läkaköha Eestis



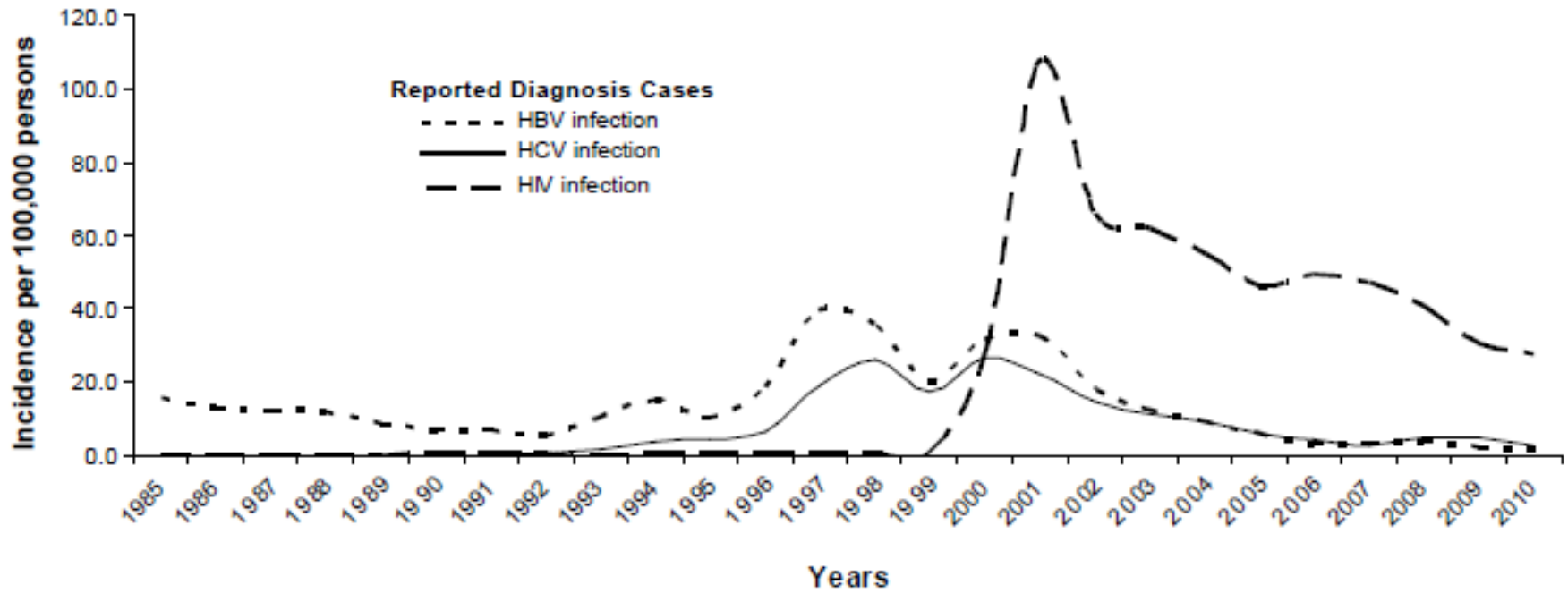
Difteeria Eestis



Mida toob 21. sajand?

- Inimeste ajutise või alalise ümberpaiknemise
 - Turism
 - Majanduslik/poliitiline migratsioon
 - Eneseharimine võõrastes maades
- Meditsiin muutub üha võimsamaks
 - Diagnostika
 - Intensiivravi
 - Pahaloomuliste kasvajate ravi
 - Organite, kudede, geenide, tüvirakkude siirdamised
- Lääneriikide ühiskonna vananemine

HIV, HCV and HBV in Estonia



Globaalne soojenemine



- Troopilised putukad on võimelised elama põhjapool
 - Dengue palavik
 - Malaaria?
 - Troopilised haigused?

Dengue palavik



Aedes aegypti

Dengue, countries or areas at risk, 2011

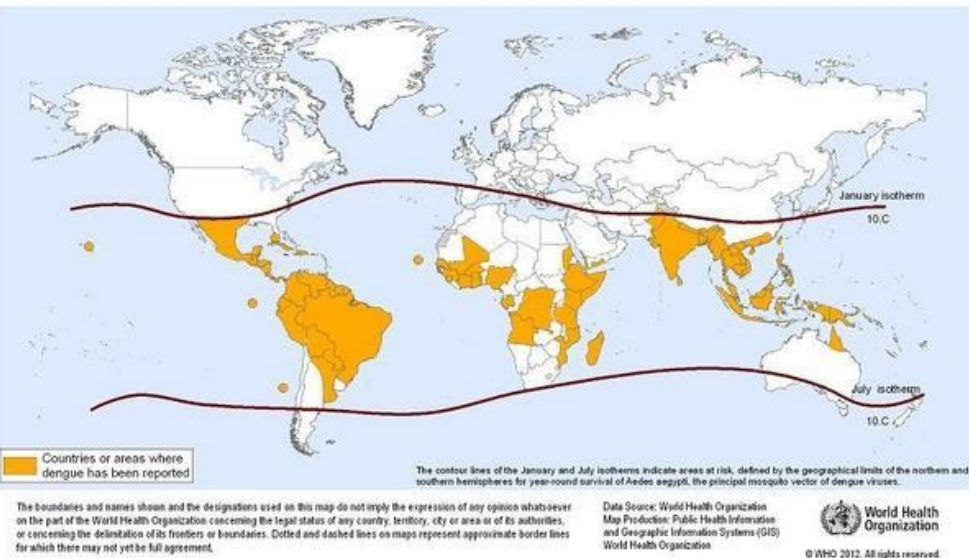
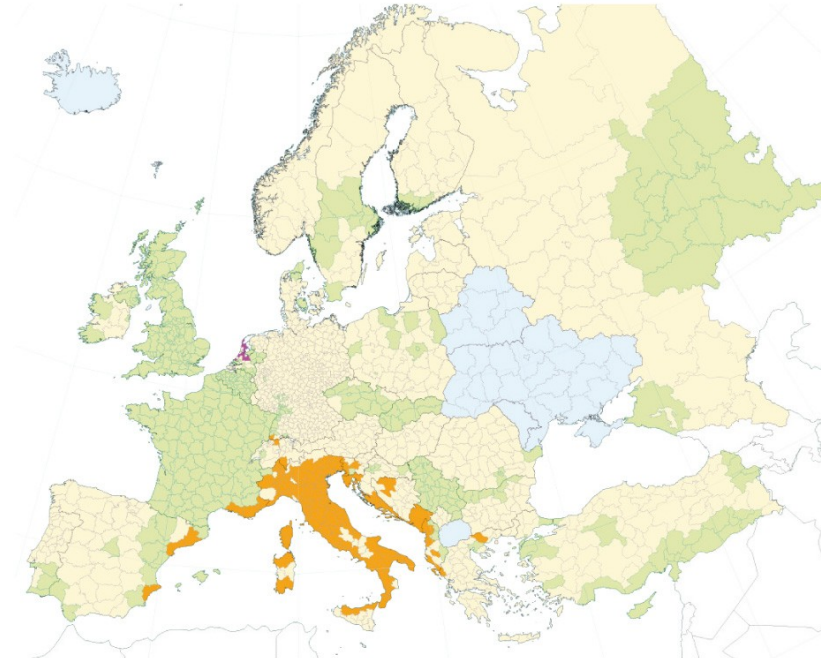


FIGURE 2

Current (2009) distribution of *Aedes albopictus* in Europe by administrative unit



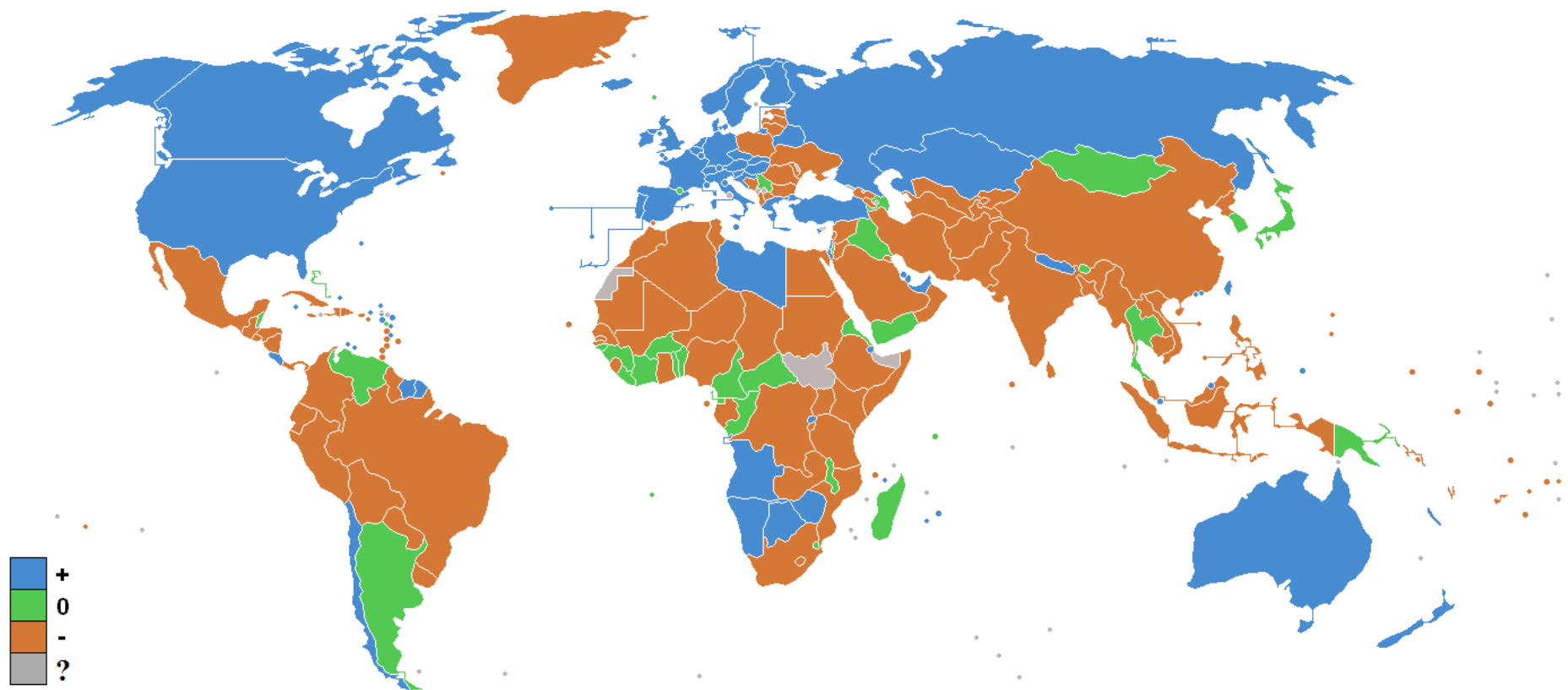
Orange: overwintering expanding populations; purple: populations only observed indoors (in glass houses); green: not detected in past 5 years; pale yellow: no recent data on mosquito fauna; blue: no information on any mosquito studies; white: not included in this study. Source: [10].

50-100 miljonit haigusjuhtu igal aastal

Inimeste käitumise ja keskkonna muutumine

- Migratsioon
 - Majandusmigrandid
 - Poliitilised migrandid
- Turism
 - Inimeste reisimine
 - Haigusvektorite reisimine
 - Mikroorganismide reisimine

Migratsiooni saldo 2013 aastal



2006 – 200 miljonit immigranti maailmas

Linnastumine

2013 - 47% maailma elanikest elab linnas
2030 - 60% maailma elanikest elab linnas

Ülerahvastumine

TB - levikuks tihedad kontaktid
Seksuaalsel teel levivad haigused
HIV/AIDS
Puhas vesi ja kanalisatsioon
Mega-koolid ja toiduga levivad infektsioonid
Puhta vee puudus



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Megapolis

Migratsioon ja infektsioonid

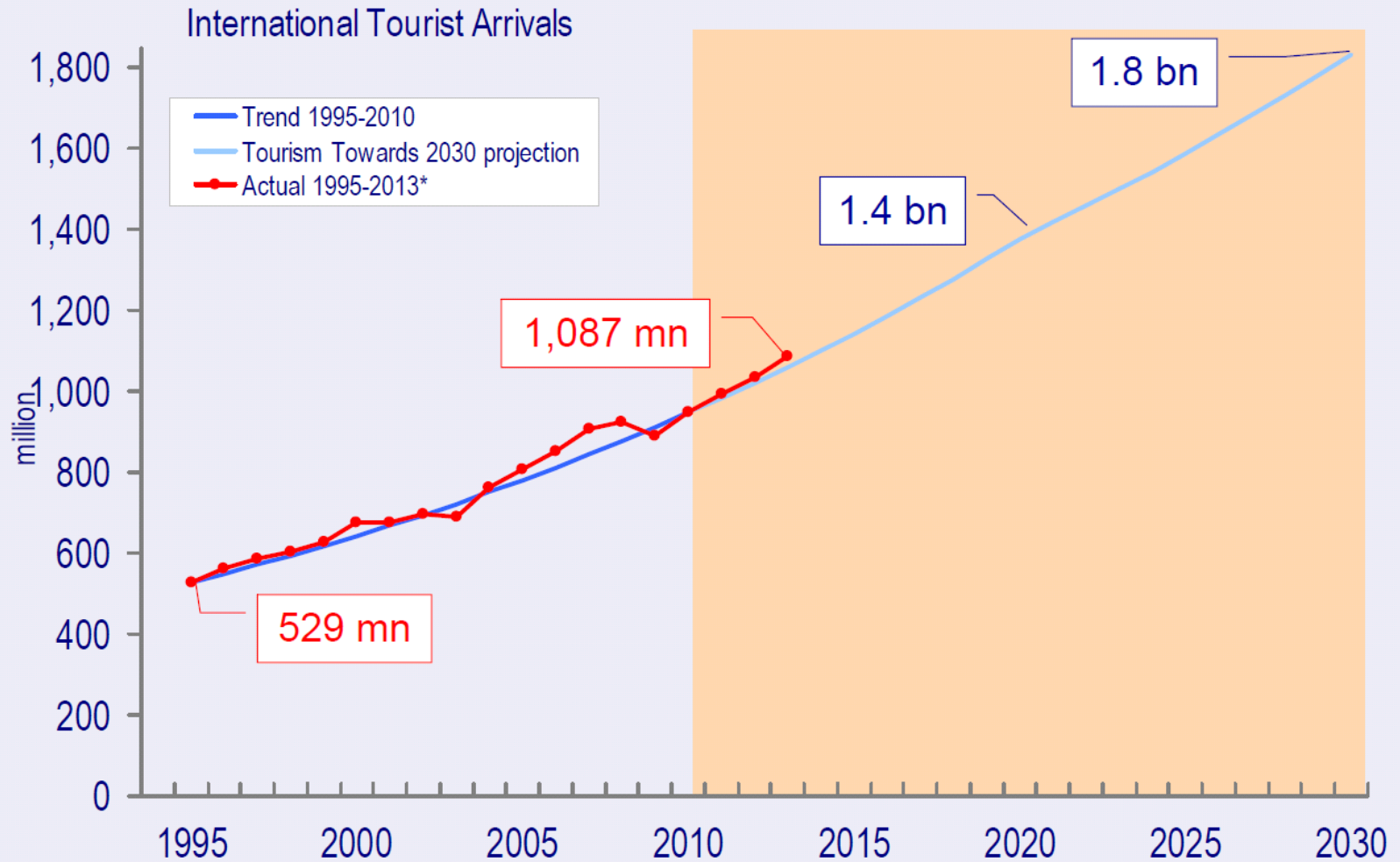
- Vaesemad kui põhielanikkond
- Kehvemad elu ja töötingimused
- Kehvem ligipääs arstiabile
- Puudub sotsiaalne võrgustik
- Erinevad toitumusharjumused

- Migrantidel
 - Enam STD
 - Enam HIV
 - Enam TB

Ülemaailmne turism suureneb aasta-aastalt



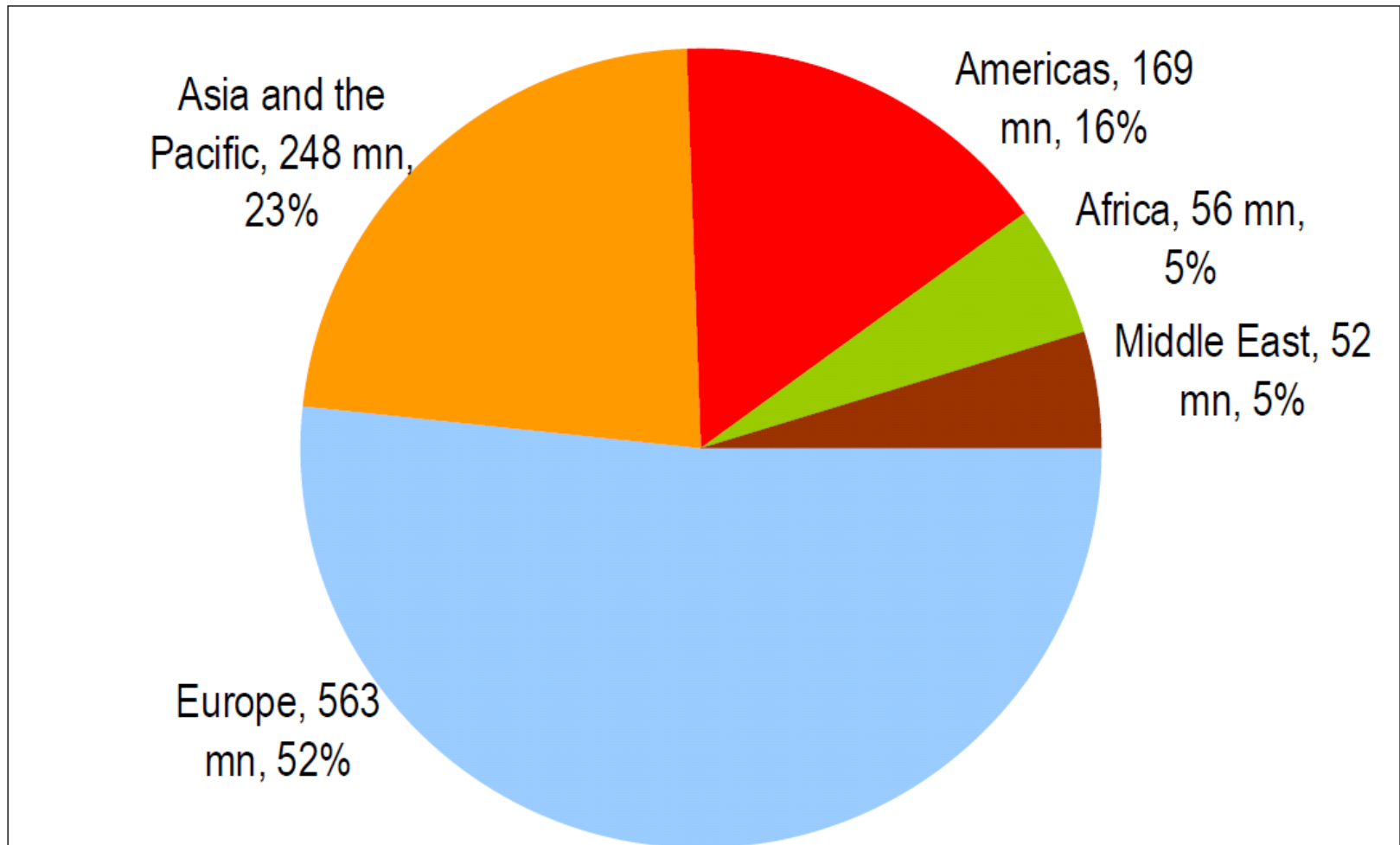
Actual Trend vs. Tourism Towards 2030 projection World



Source: World Tourism Organization (UNWTO)

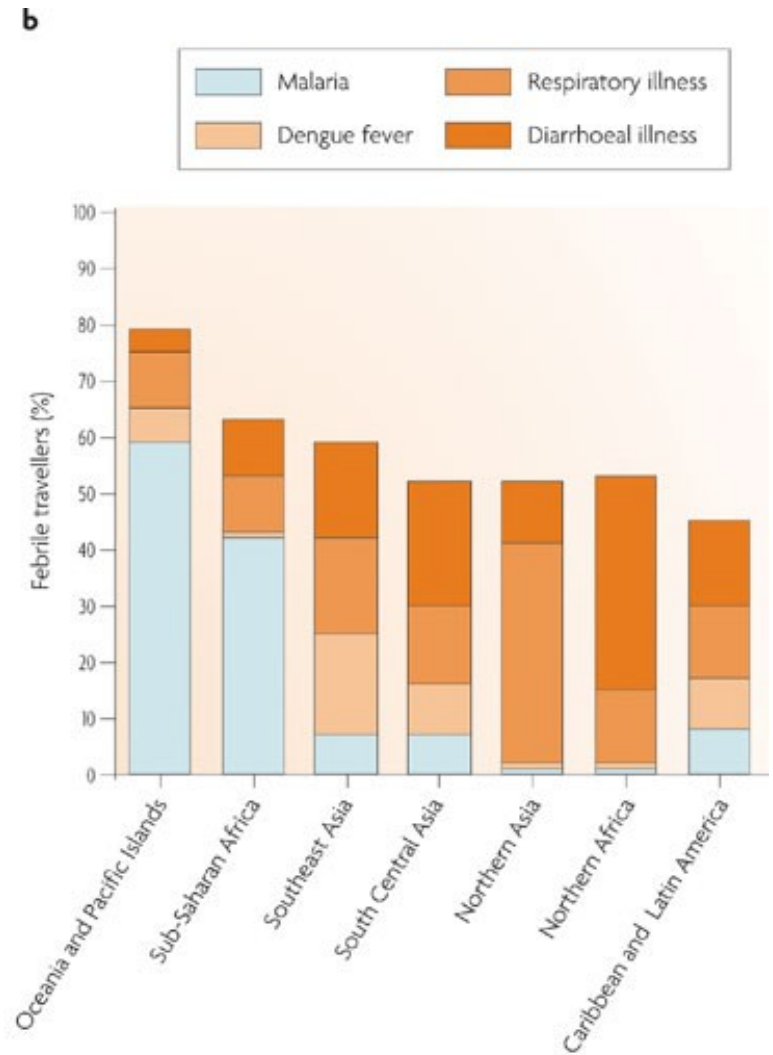
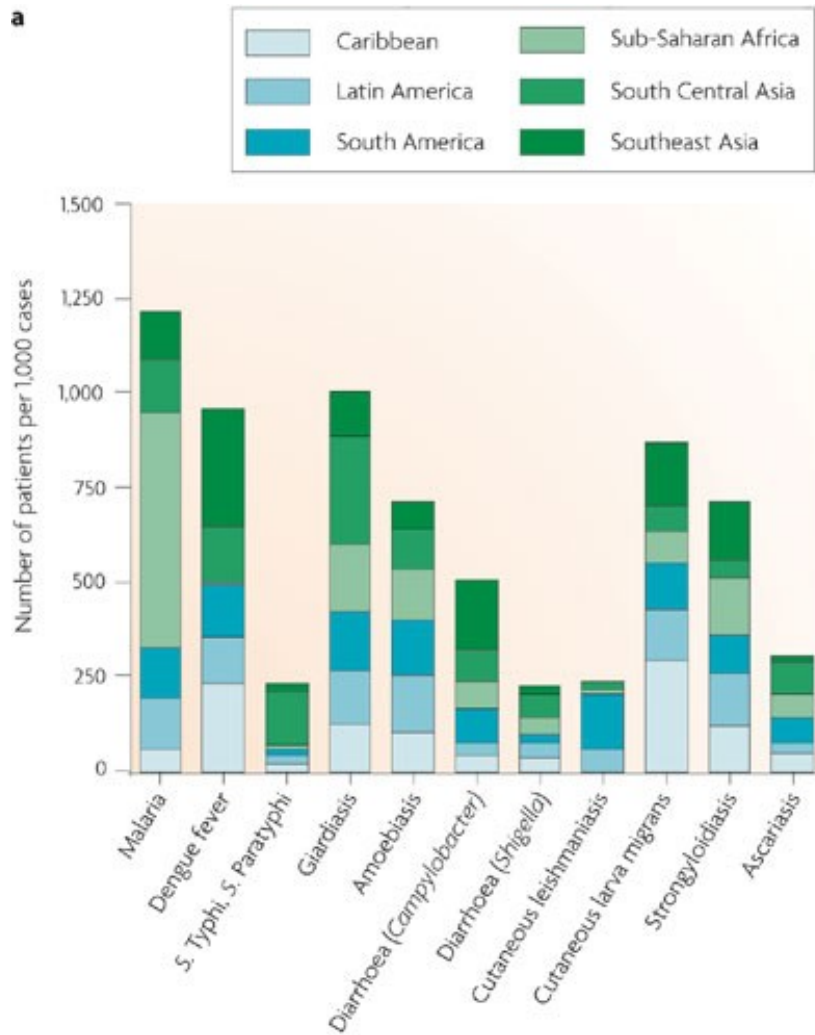
Absolute numbers 2013 by region

World Inbound Tourism: International Tourist Arrivals, 2013* (million)

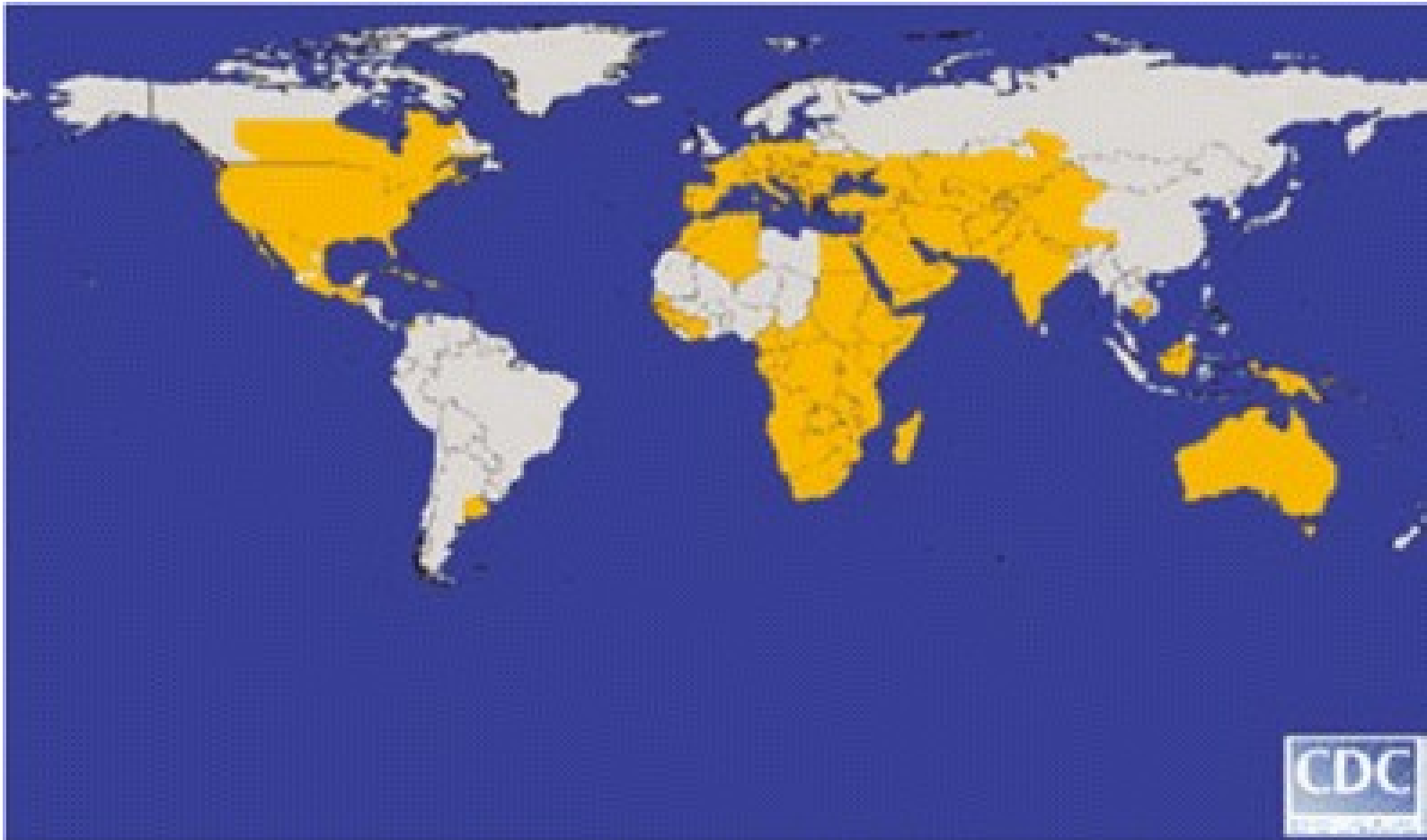


Source: World Tourism Organization (UNWTO) ©

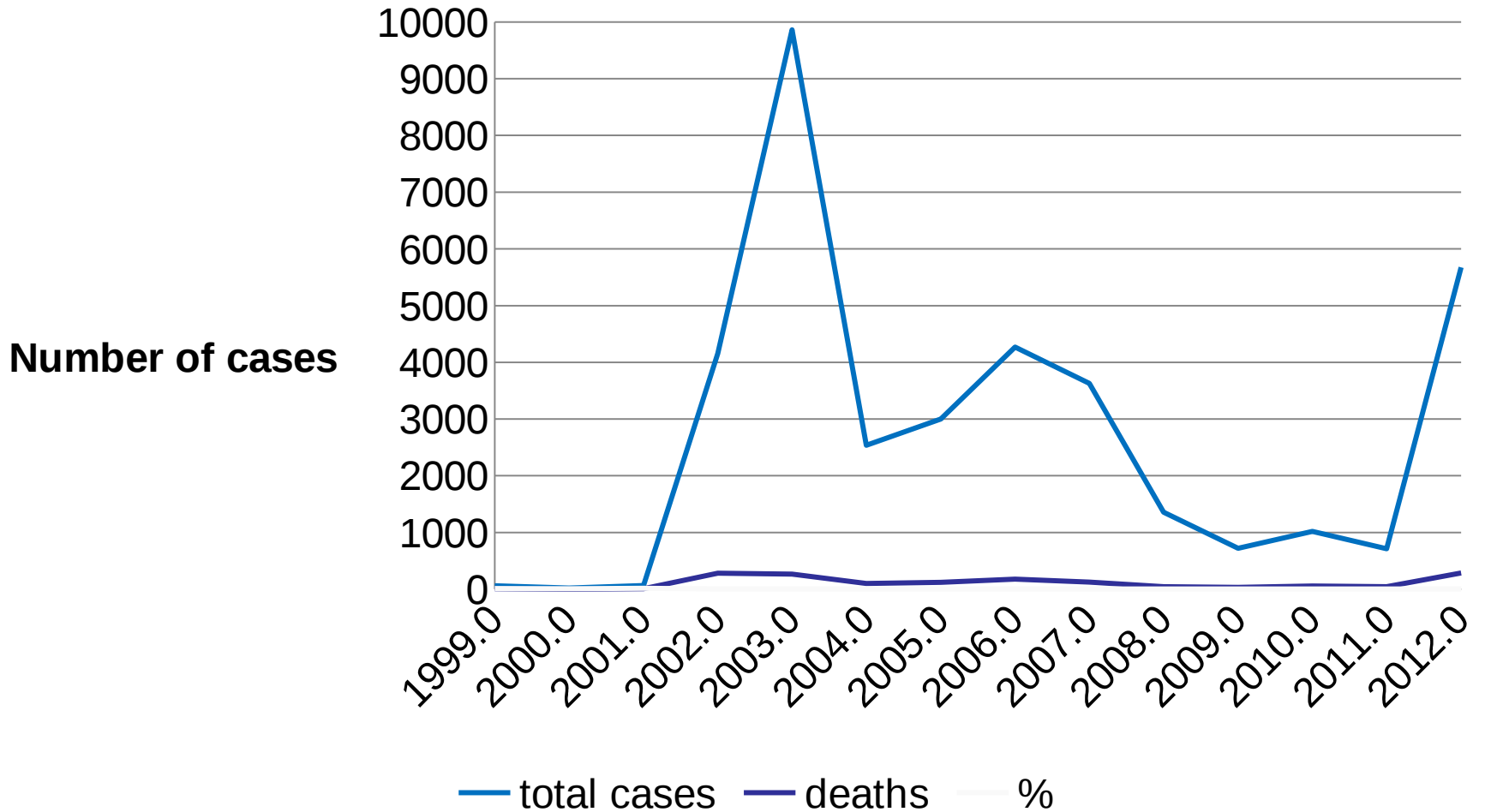
Infektsioonid reisijatel



Lääne Niiluse viiruslik entsefaliit



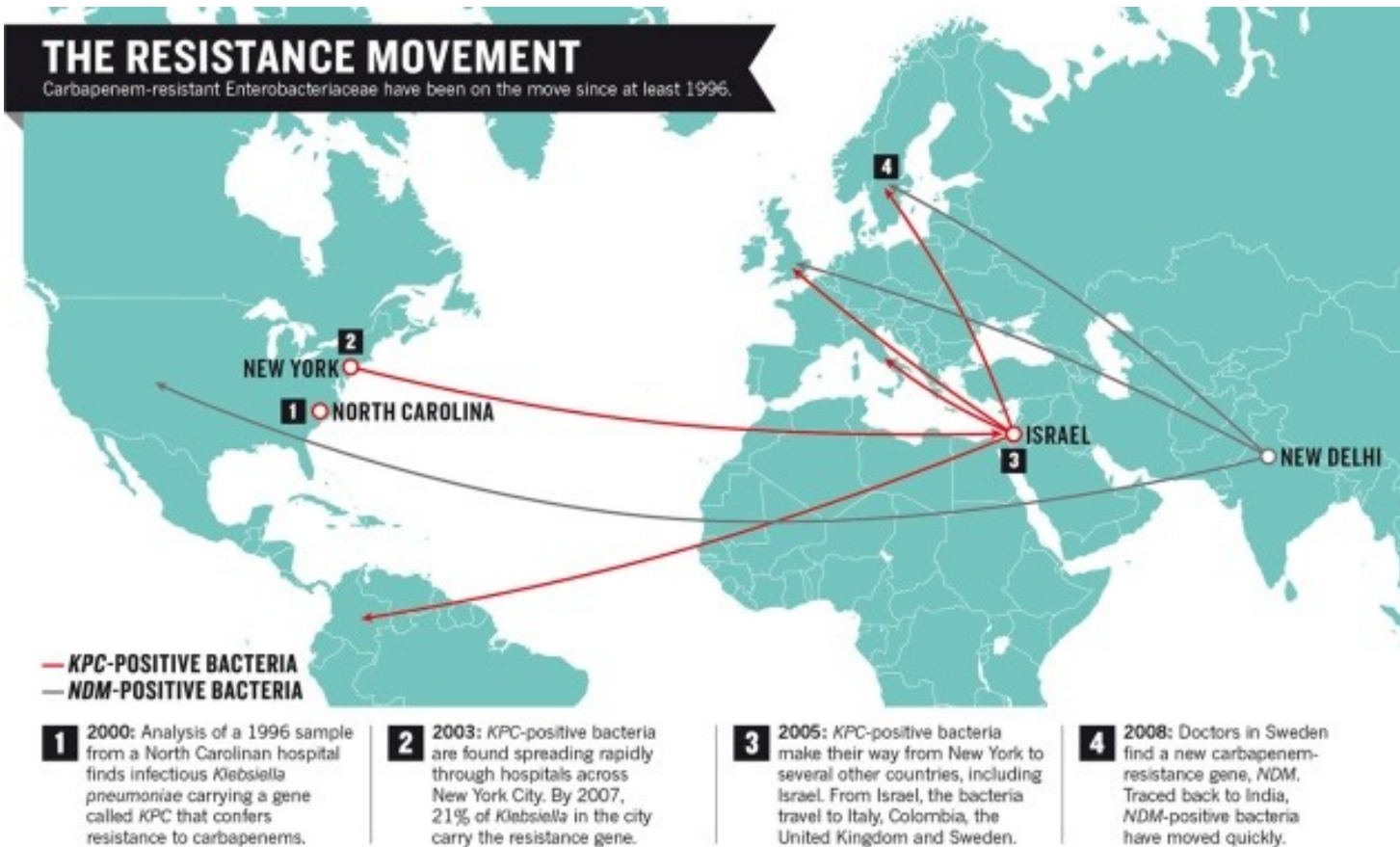
West-Nile encephalitis in US



Mitte klassikalised reisiinfektsioonid

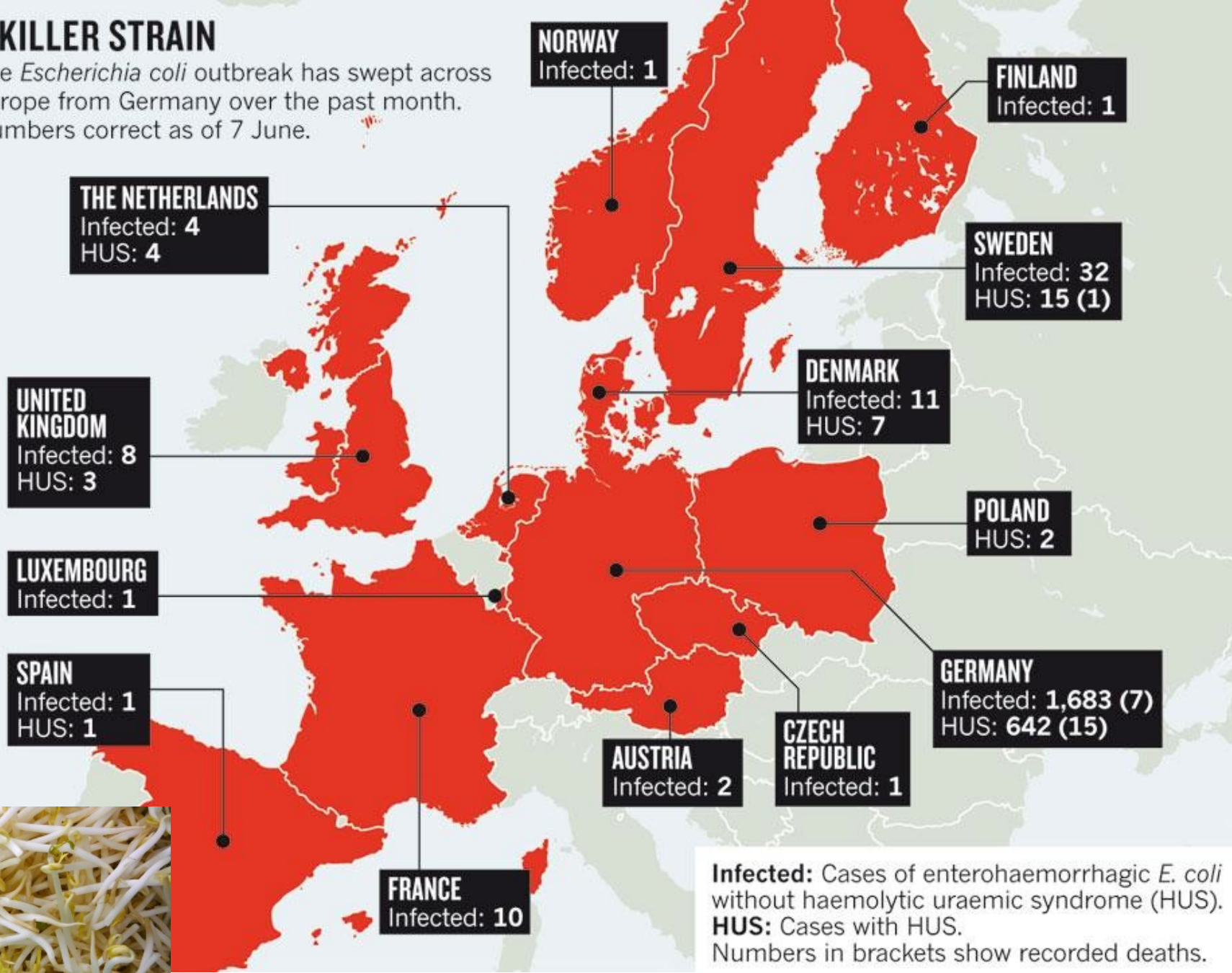
- Antibiootikum-resistentsuse levik
 - NDM enterobakterite levik
 - PRSP klonaalne levik Euroopas
- Uute infektsioonide levik
 - HIV
 - SARS koroonaviirus
 - MERS-koroonaviirus
 - Gripiviirus
 - Noroviiruse puhangud

Antibiootikum-resistentsuse migratsioon



A KILLER STRAIN

The *Escherichia coli* outbreak has swept across Europe from Germany over the past month. Numbers correct as of 7 June.



Infected: Cases of enterohaemorrhagic *E. coli* without haemolytic uraemic syndrome (HUS).
HUS: Cases with HUS.
Numbers in brackets show recorded deaths.

Number of NCoV Cases by Country of Residence - May 3, 2013

United Kingdom
NCoV Cases -
2 males died and
1 female
recovered

Jordan NCoV
Cases -
1 male and 1
female died

Qatar NCoV
Cases -
2 males (no
deaths)

United Arab
Emirates NCoV
Cases -
1 male dead.

father returns home to
United Kingdom after
stopping in Saudi Arabia
in January 2013

Saudi Arabia NCoV
Cases -
16 males (10 dead),
2 females (1 dead),
1 survivor of
unknown gender

Human to Human Transmission in the United Kingdom

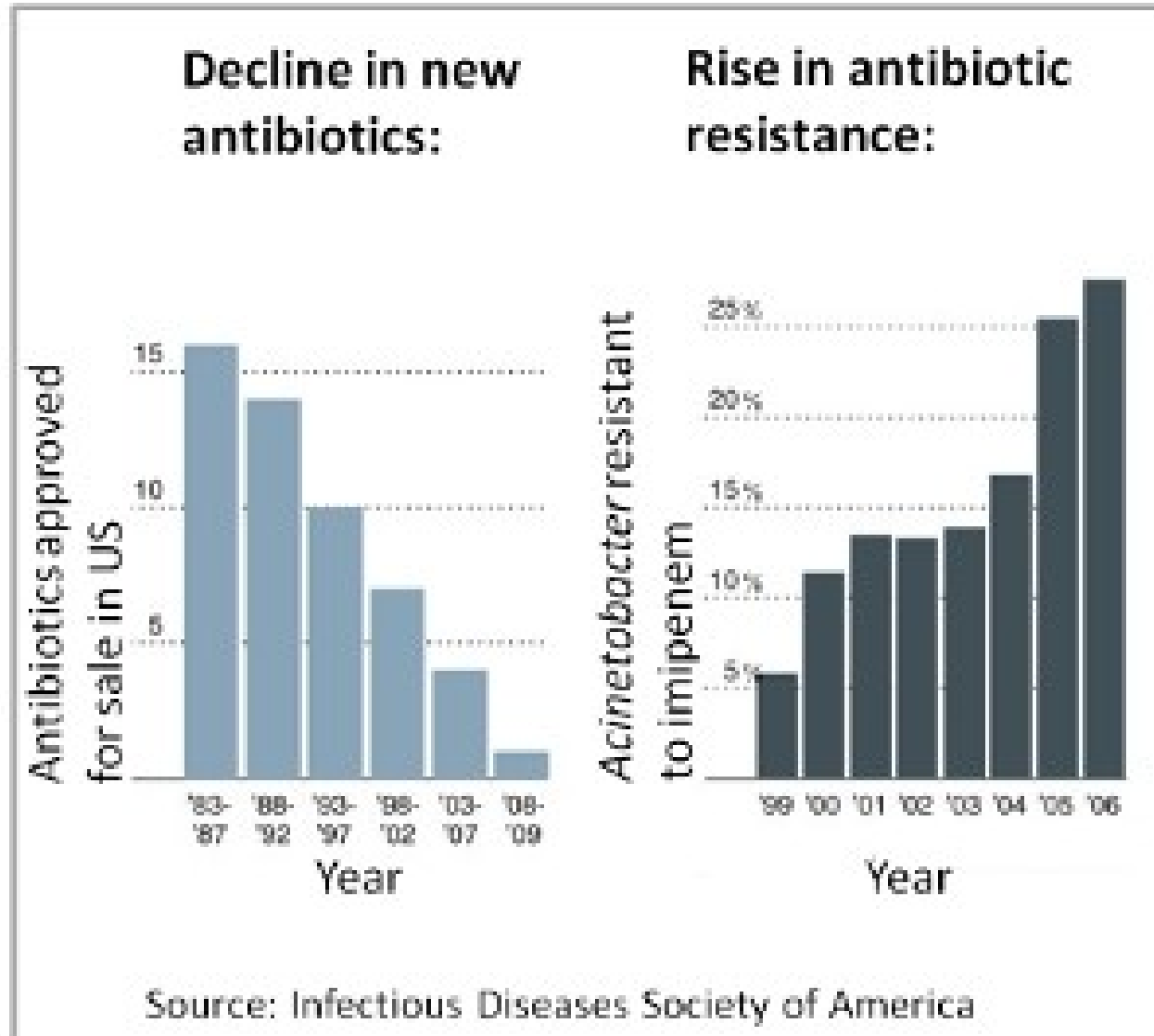
A father, returning to to
Birmingham, England from
Saudi Arabia, infects his son
and female relative in
January 2013. Both father
and son die, but the woman
recovered.



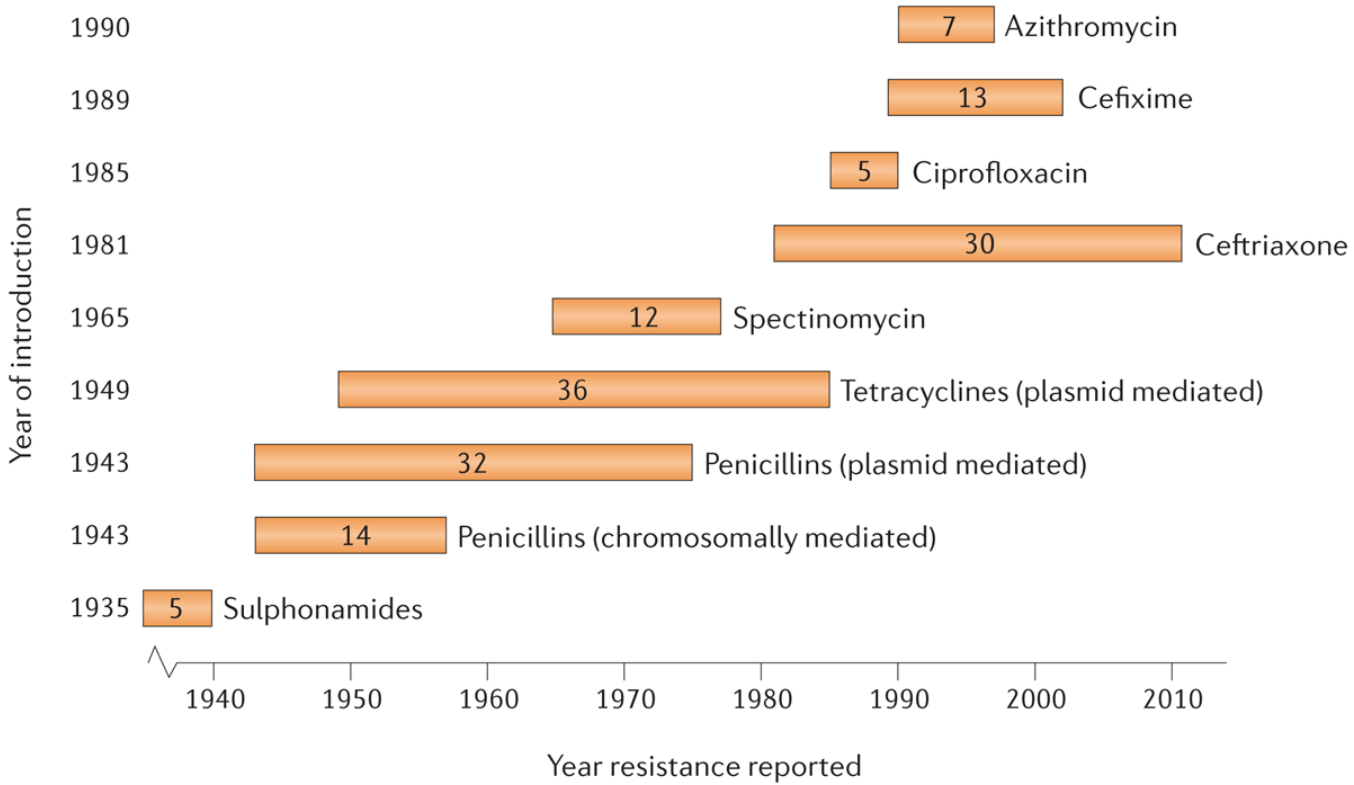
Moodne meditsiin ja infektsioonid

- Antibiootikum-resistentsuse epideemia
- HepC
- VAP/HAP
- Kateetrite/võõrkehade infektsioonid
- Immuunpuudulikkusega isikud
 - CMV, EBV
 - KNS krüptokokk-infektsioon
 - Tundmatud viirused - ülekanne

Antibiotikumresistentsus vs uued antibiootikumid

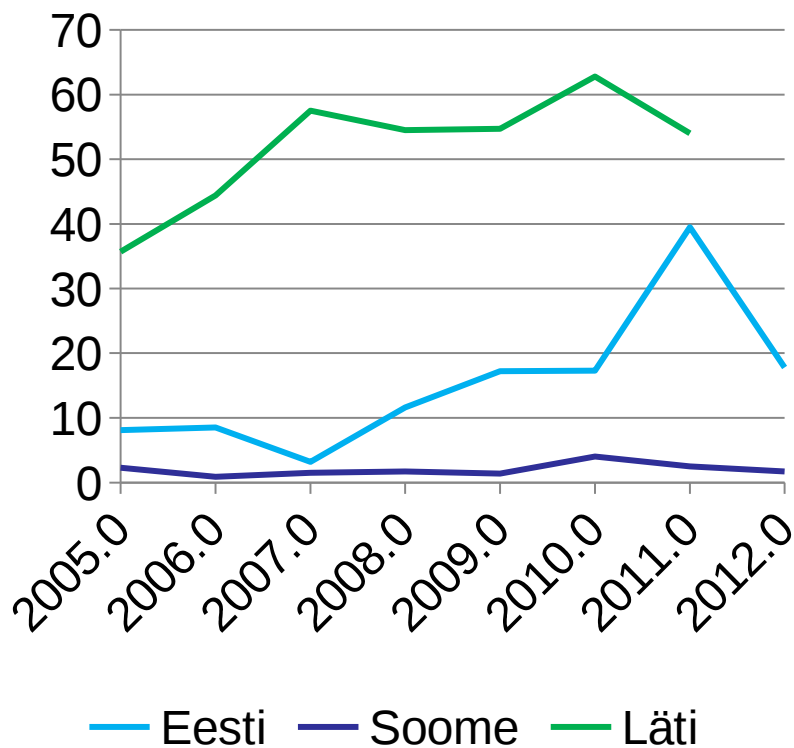


The history of *Neisseria gonorrhoeae* antimicrobial resistance

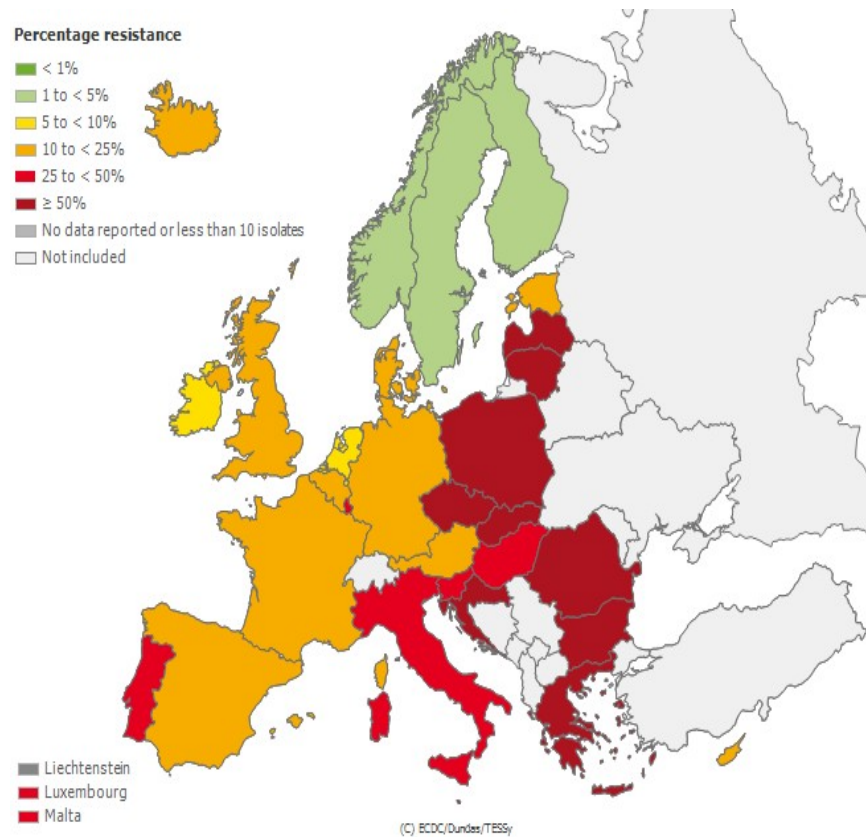


K.pneumoniae resistentsus 3. pk tsefalosporiinidele (%)

Eesti, Soome, Läti

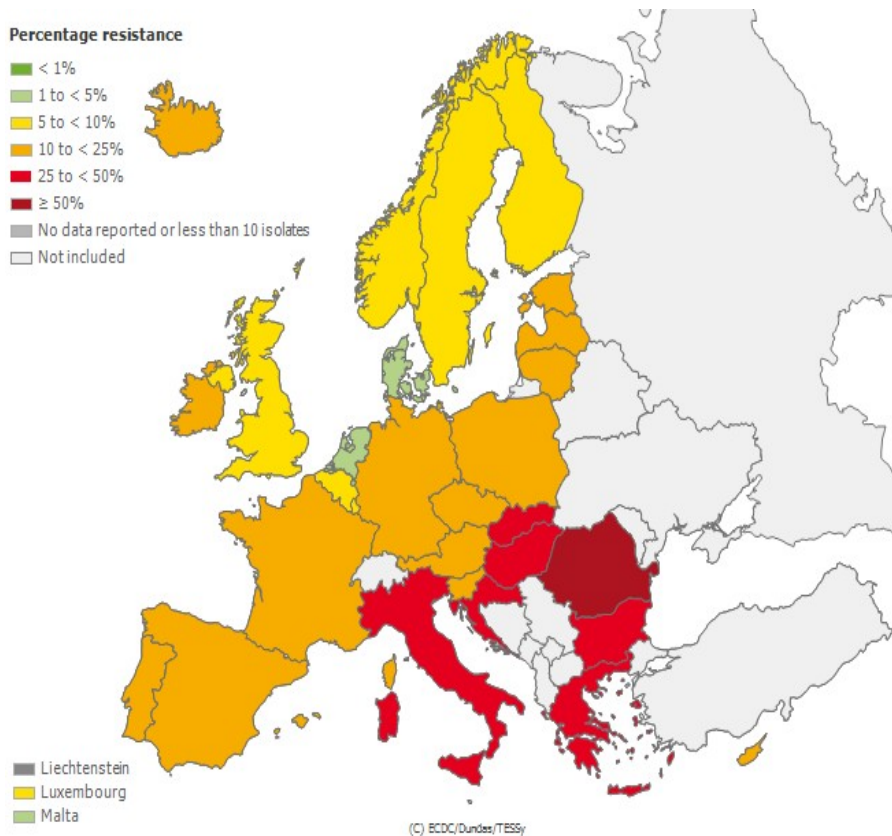


EARS-Net 2012

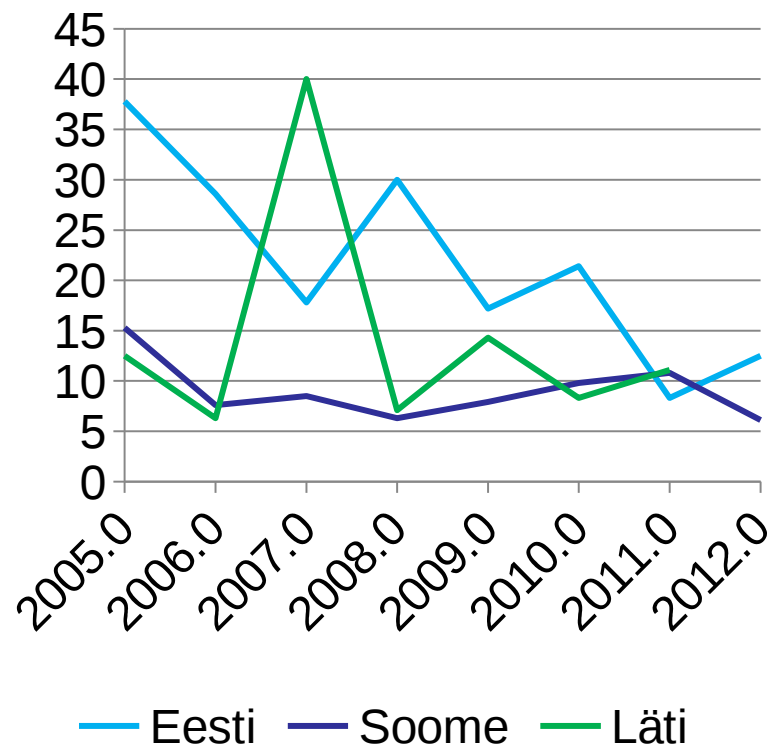


P.aeruginosa karbapeneem-resistentsus (%)

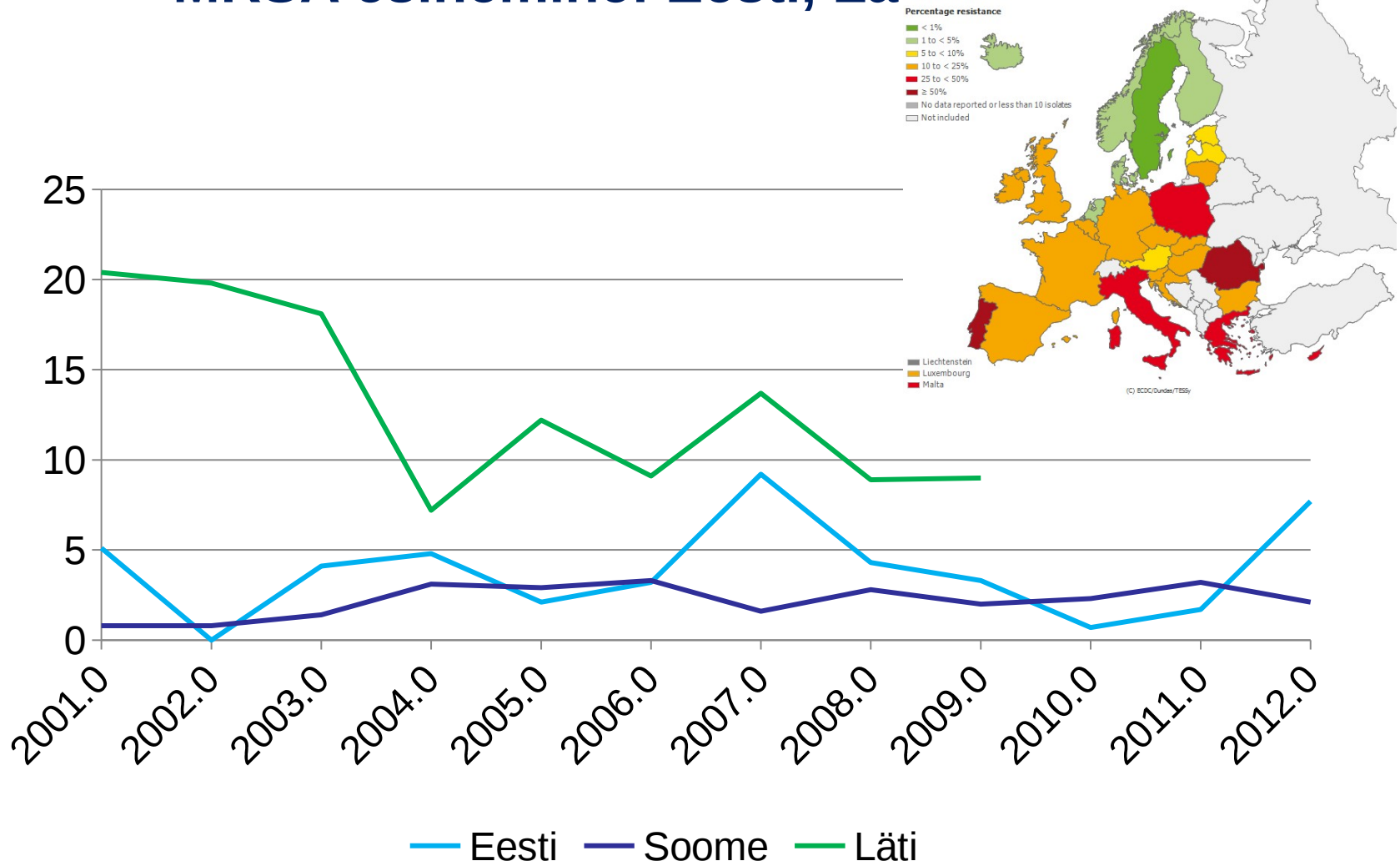
EARS-Net 2012



Eesti, Soome, Läti



MRSA esinemine: Eesti, Läti. Soome

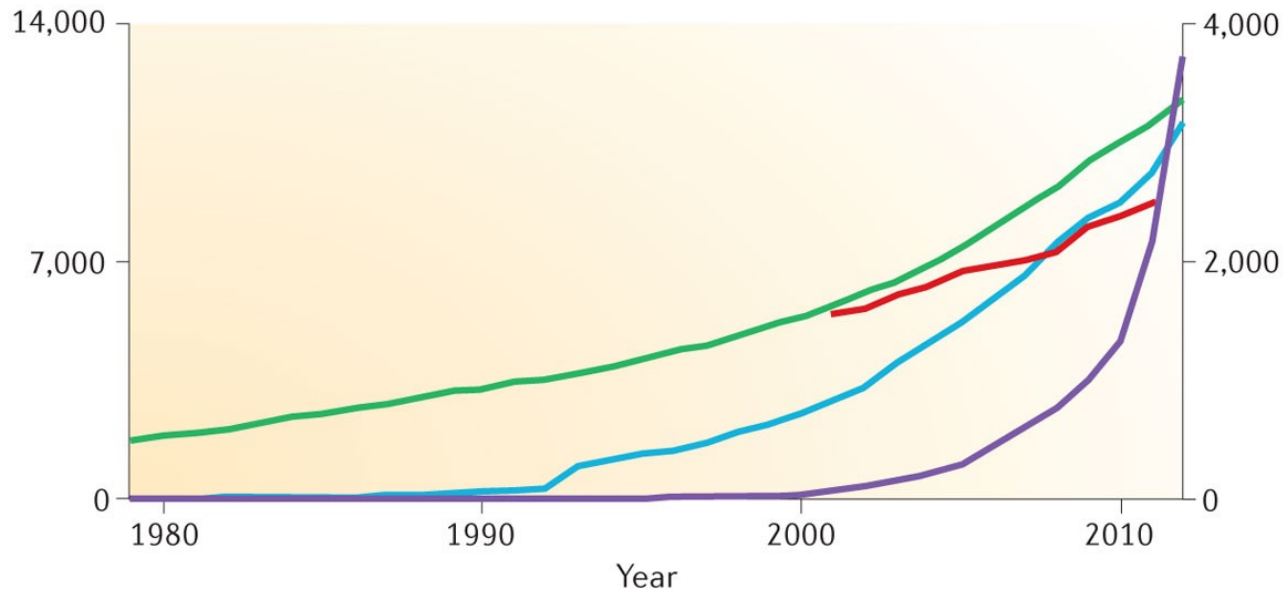


Infektsioonhaiguste diagnostika on oluliselt paranenud



Identifitseeritud mikroobiliigid

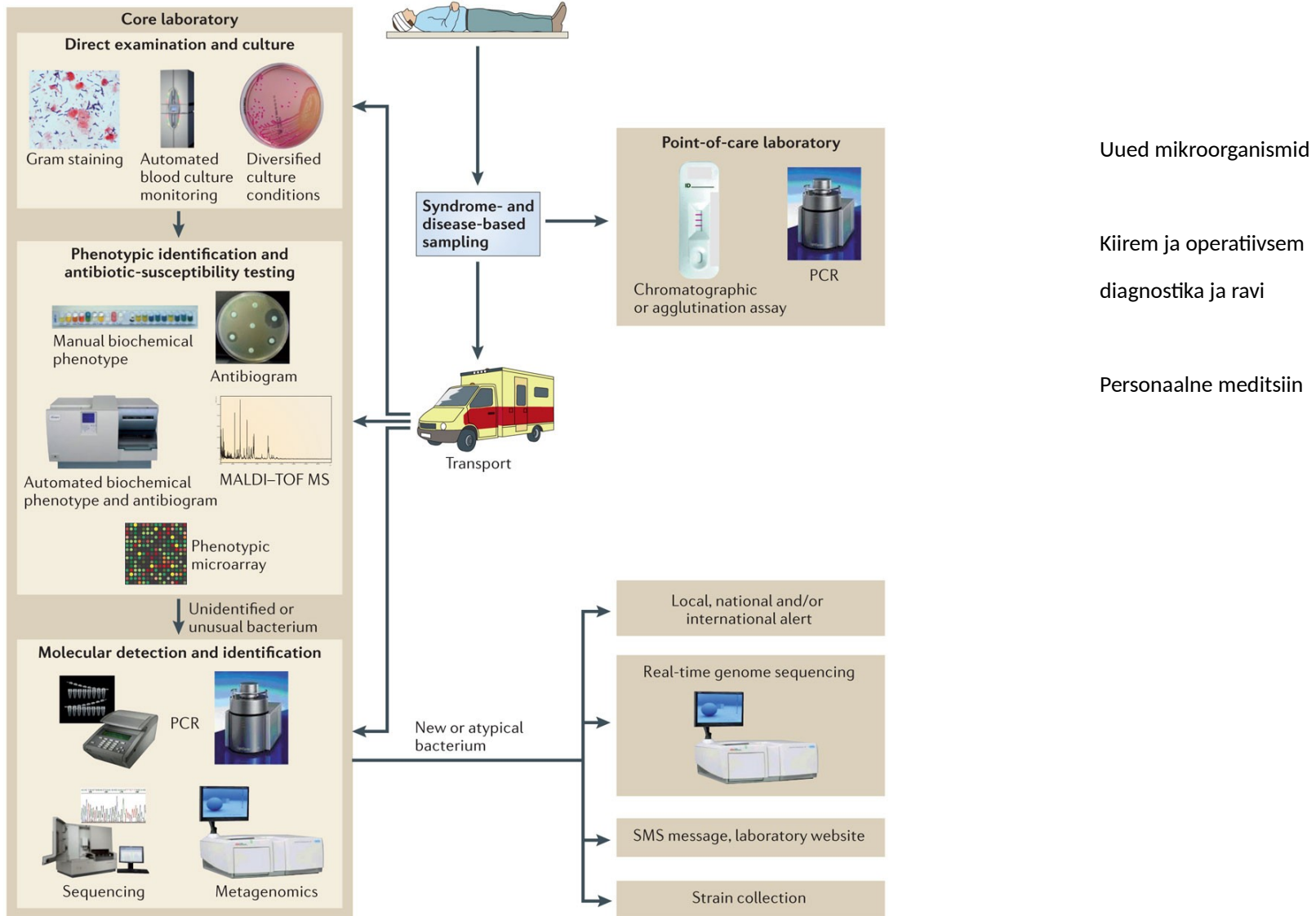
1979 - 2012



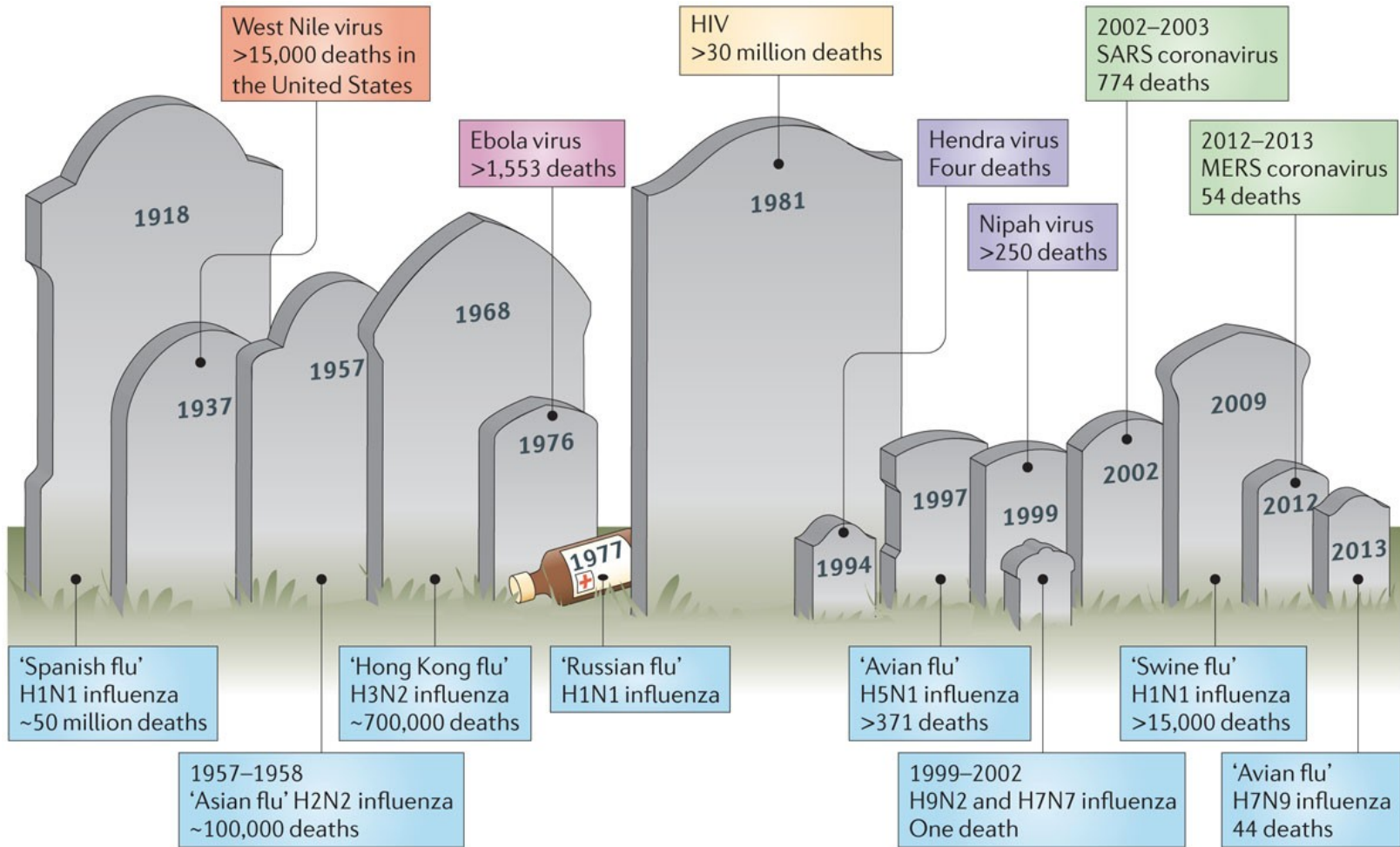
Left-hand axis
— Number of bacterial species with validly published names

Right-hand axis
— Number of sequenced bacterial genomes
— Number of viral species identified
— Number of sequenced viral genomes

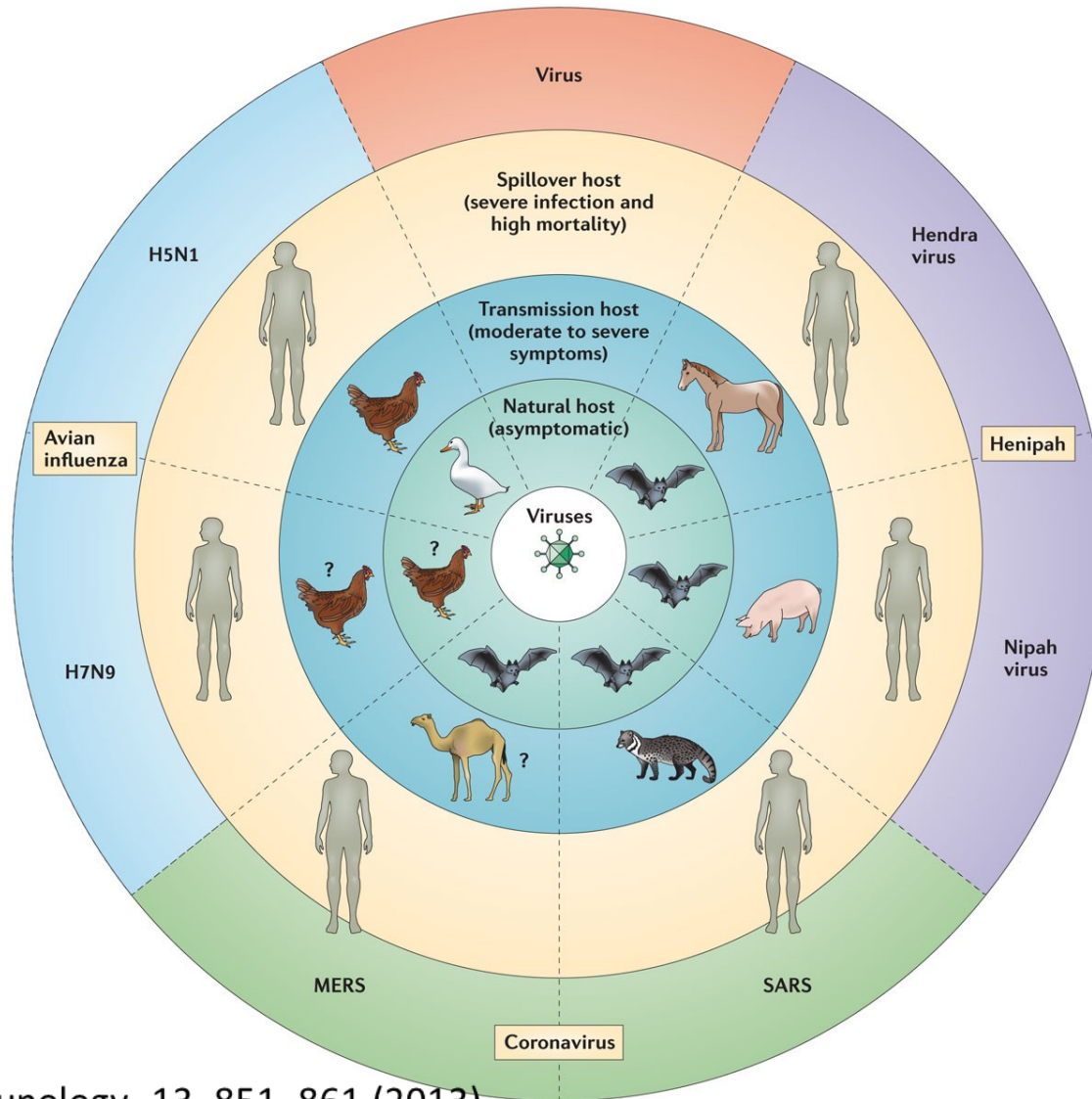
Moodne mikrobioloogiline diagnostika



Uued viirusinfektsioonid



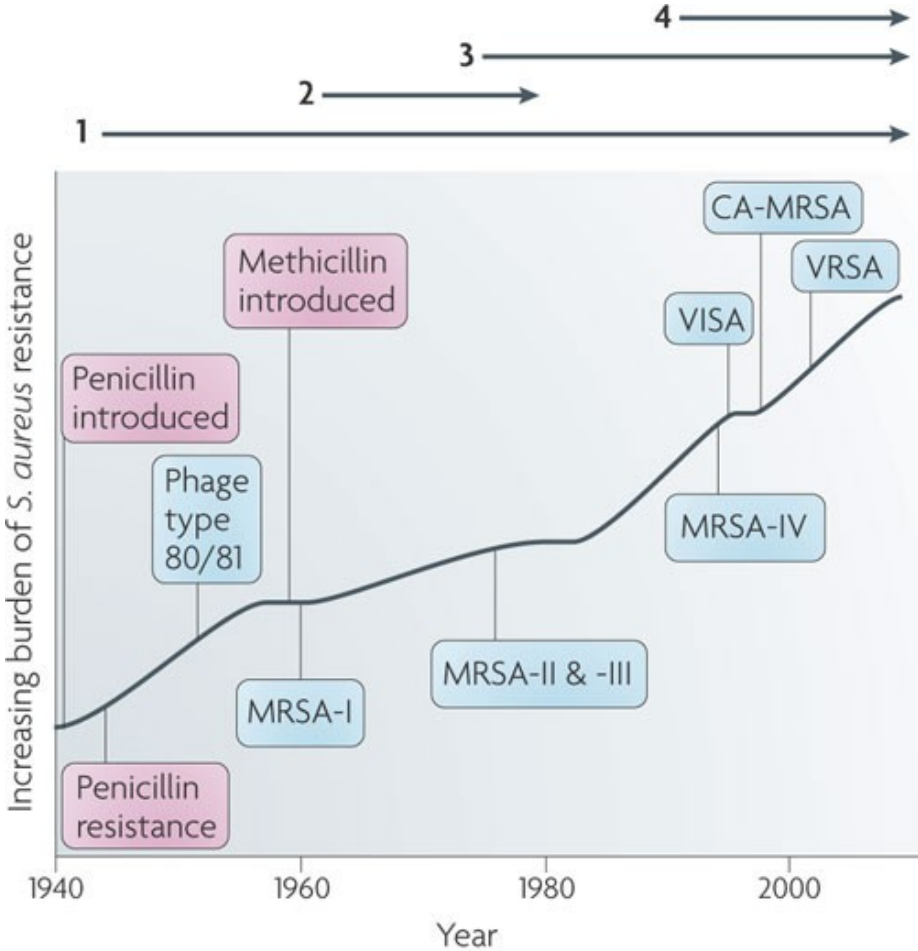
Enamus (uusi) viirusinfektsioone on zoonoosid



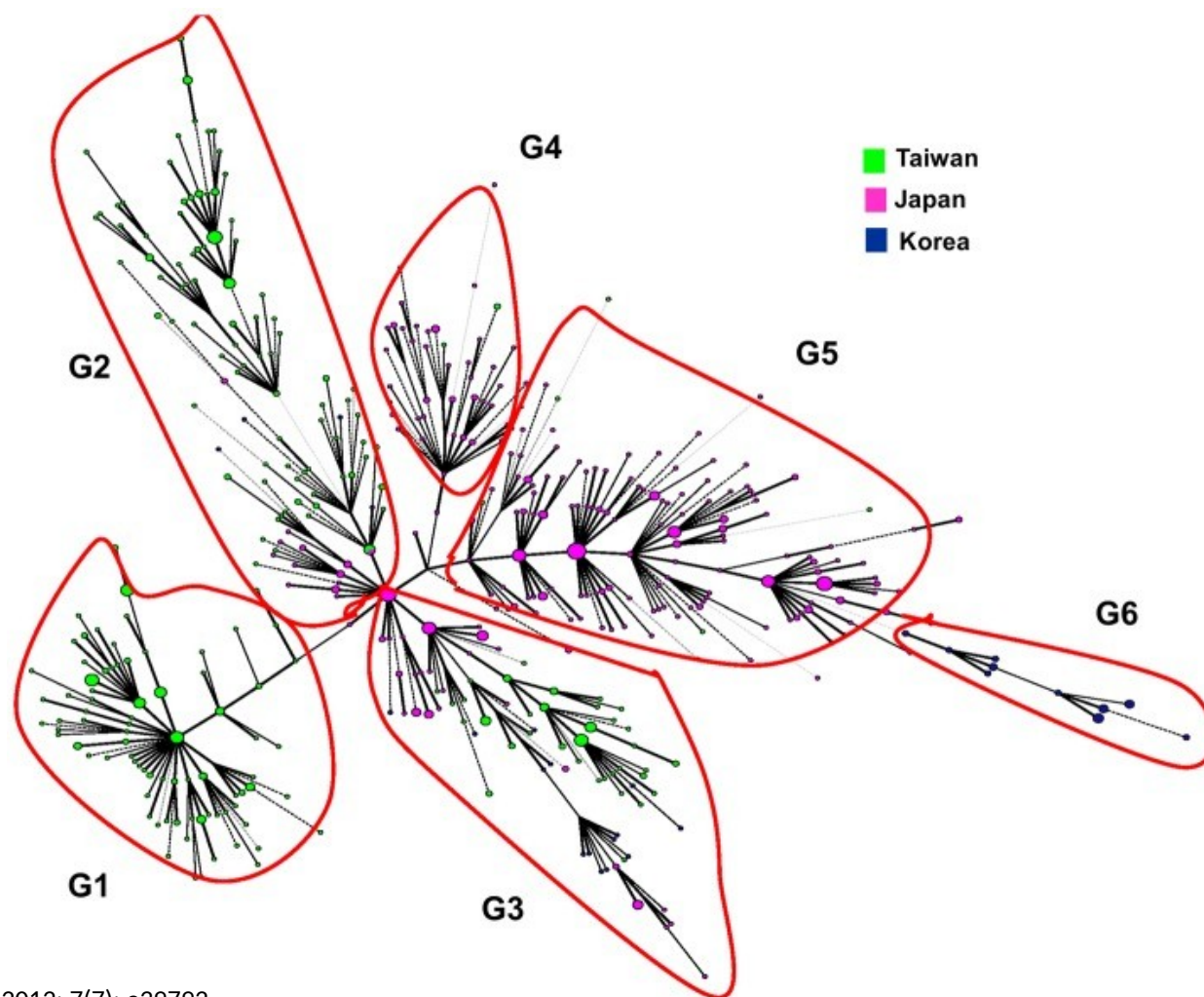
Kokkuvõtteks

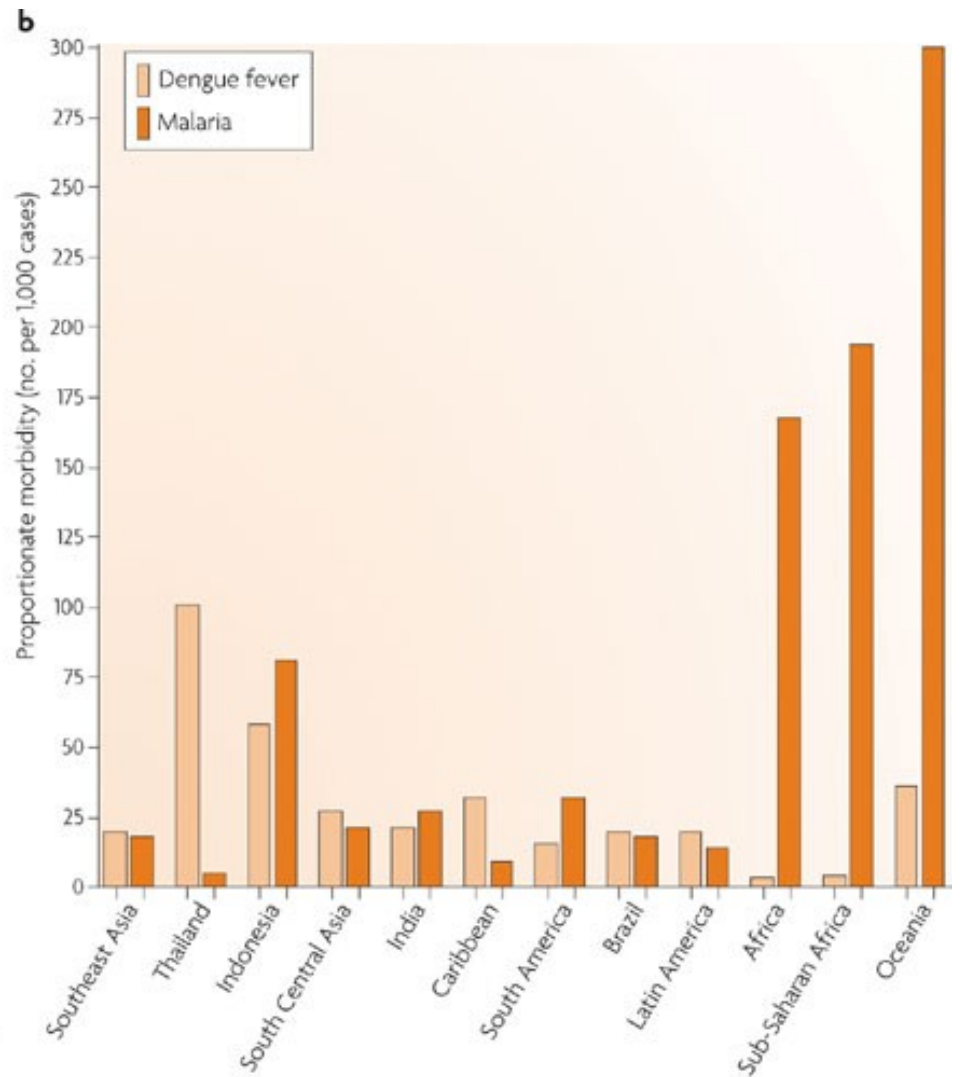
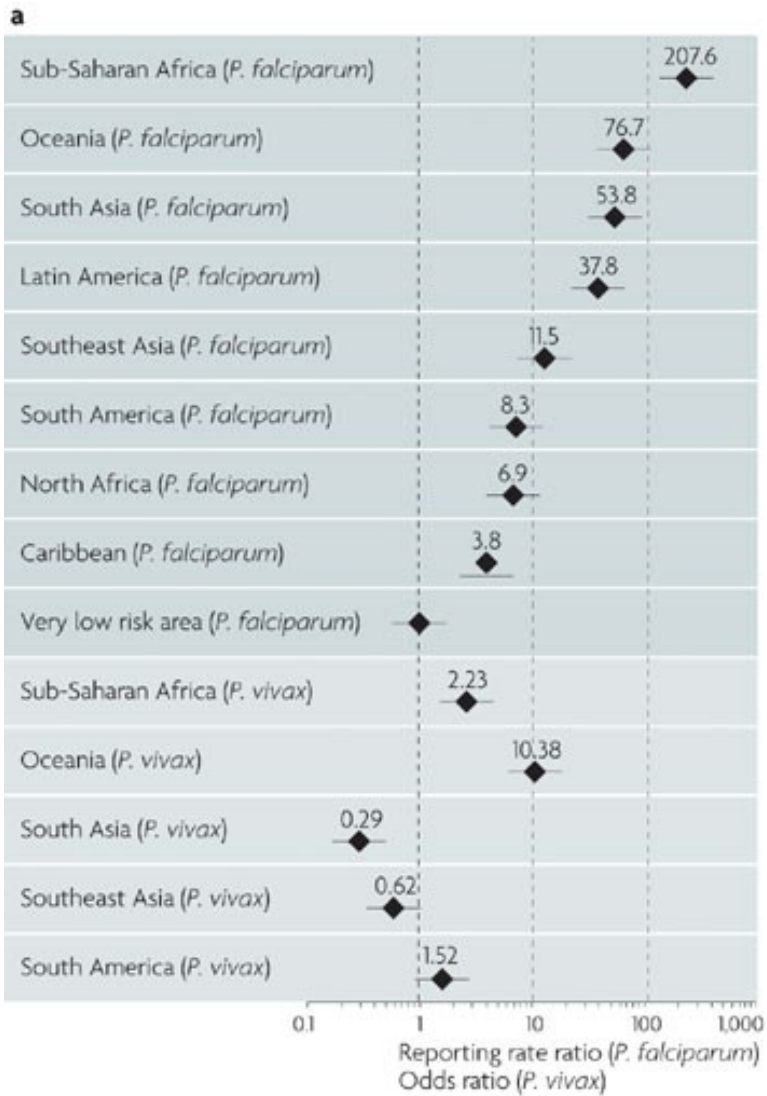
- Infektsioonhaigused muutuvad vastavalt sellele kuidas muutub maailm meie ümber
- 21 sajandil tuleb kohaneda
 - Kasvava turismi ja migratsiooniga
 - Moodsa meditsiiniga
 - Uute viiruste tekkega
 - Uute viiruste bakterite teke on ilmselt kiirem kui uute ravimimeetodite (sh. ravimite) turuletulek
- Diagnostika ja ravi muutuvad personaalsemaks

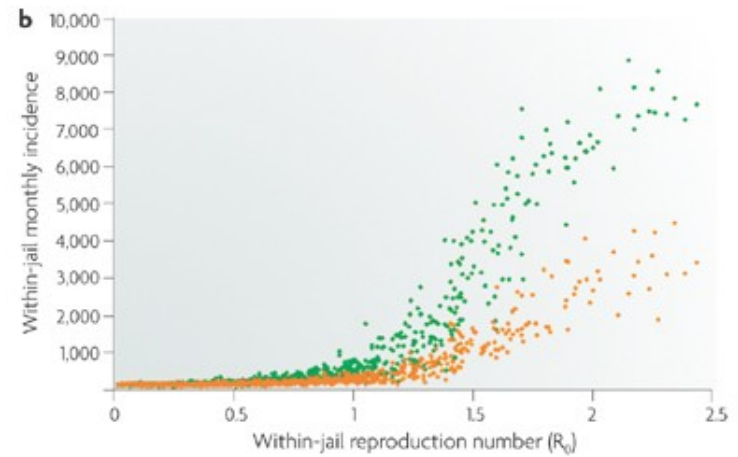
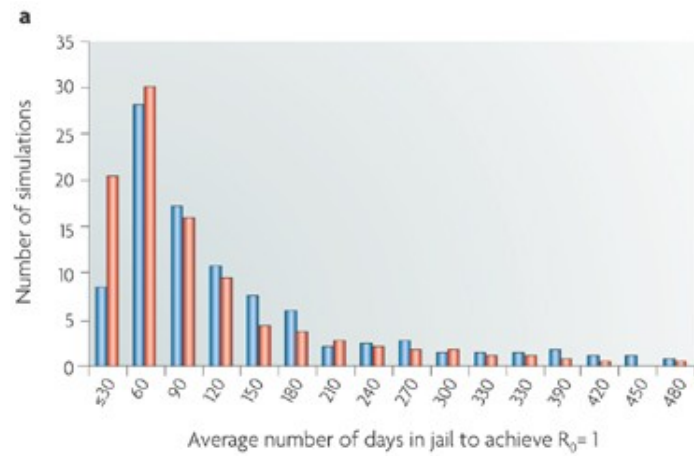
The four waves of antibiotic resistance in *Staphylococcus aureus*



A minimum spanning tree based on 21-MIRU-VNTR genotyping of MTB isolates from Taiwan, Japan, and South Korea

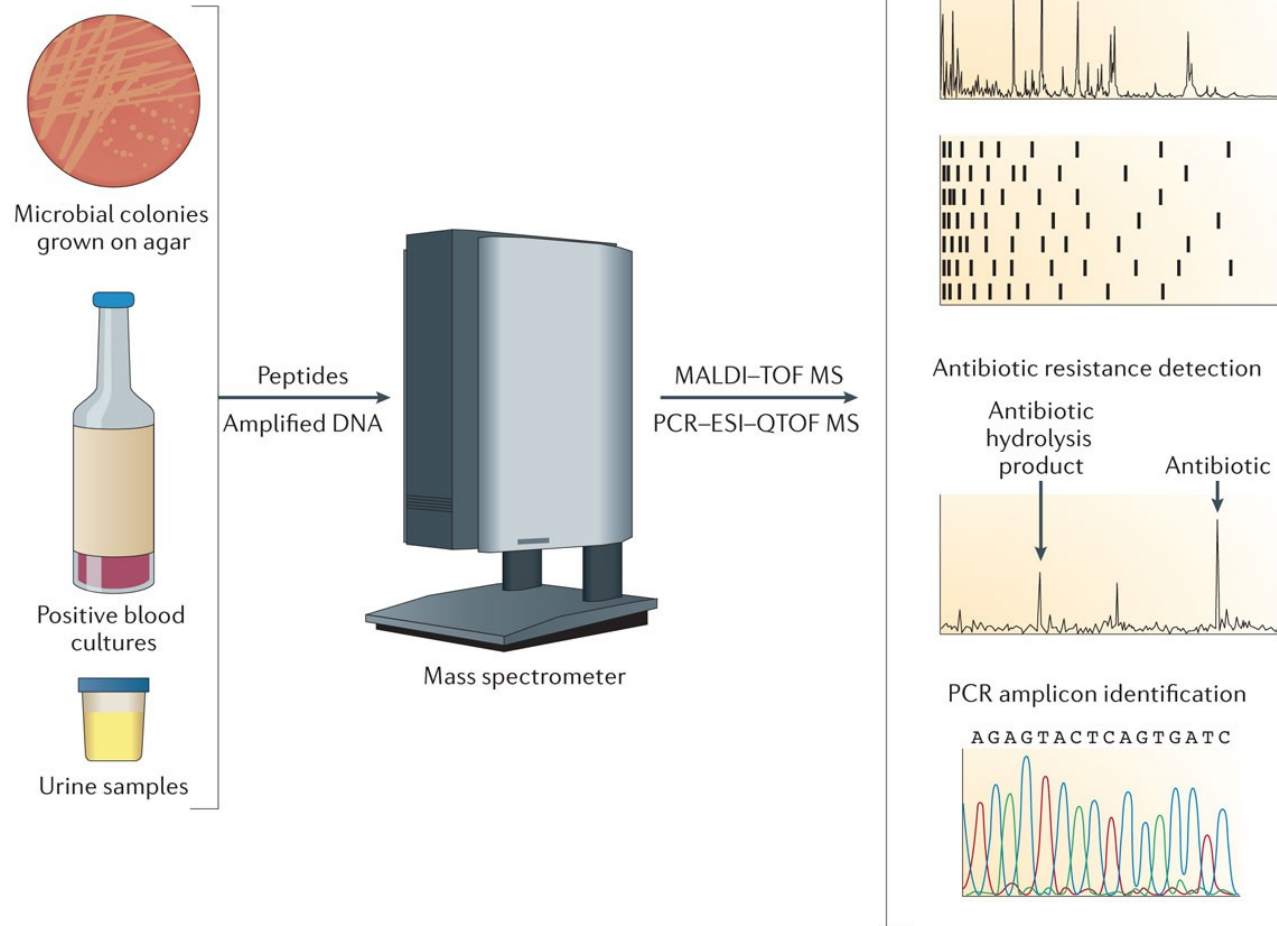






Nature Reviews | Microbiology


Current applications of MALDI-TOF mass spectrometry in the clinical microbiology laboratory



Examples of infectious disease outbreaks that were investigated using next-generation sequencing

| Microorganism | Location | Year | Reference |
|---|----------------------------------|-----------|-----------|
| Carbapenem-resistant <i>Klebsiella pneumoniae</i> | USA | 2011 | 112 |
| <i>Clostridium difficile</i> | Worldwide | 2013 | 113 |
| <i>Escherichia coli</i> O104:H4 | Germany | 2011 | 114,115 |
| <i>Legionella pneumophila</i> serogroup 1 | United Kingdom | 2013 | 116 |
| Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) | United Kingdom | 2009 | 117 |
| <i>Mycobacterium tuberculosis</i> | Canada | 2006–2008 | 118 |
| <i>Vibrio cholerae</i> O1 biovar El Tor | Haiti | 2010–2011 | 119 |
| Arenavirus | Australia | 2008 | 120 |
| Bas-Congo virus | Democratic Republic of the Congo | 2009 | 121 |
| Influenza A virus H1N1 | Worldwide | 2009 | 122 |

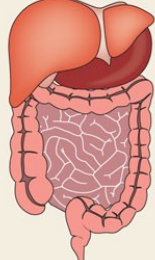
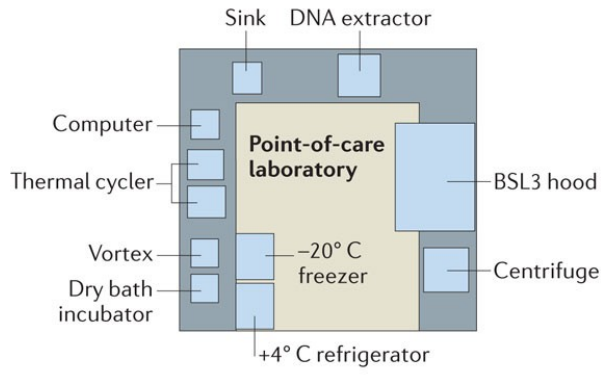
Pneumonia
 Influenza viruses
 Respiratory syncytial virus
Mycoplasma pneumoniae
Bordetella pertussis
Staphylococcus aureus
Pneumocystis jirovecii
Legionella urinary antigen
 Pneumococcal urinary antigen



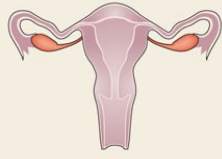
Fever in returning travellers
Plasmodium spp.
 Dengue virus



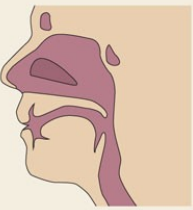
Gastroenteritis
 Rotavirus
 Adenoviruses
Clostridium difficile
Helicobacter pylori


Sexually transmitted diseases
Neisseria gonorrhoeae
 Herpes simplex virus
 HIV
Chlamydia trachomatis

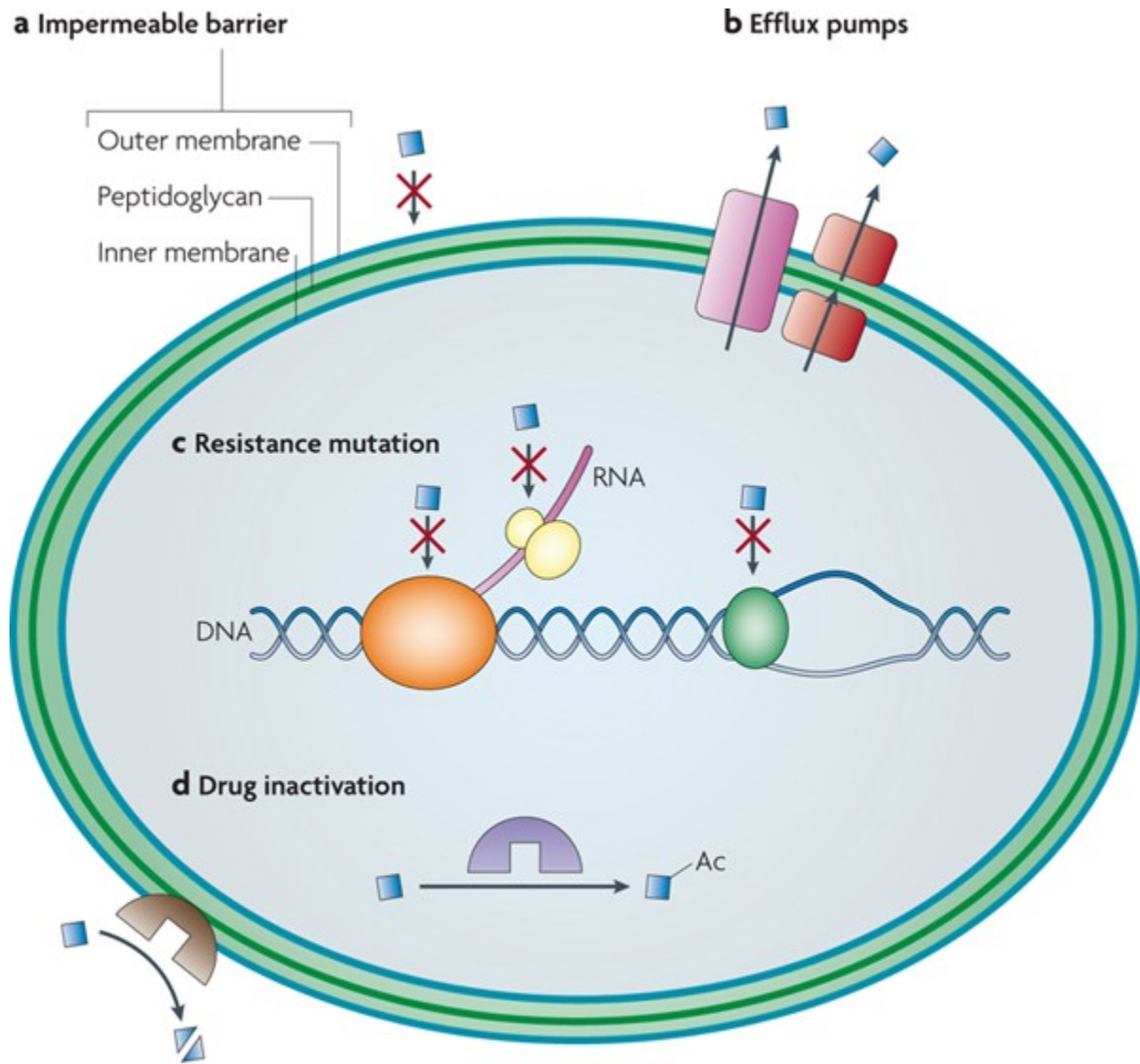


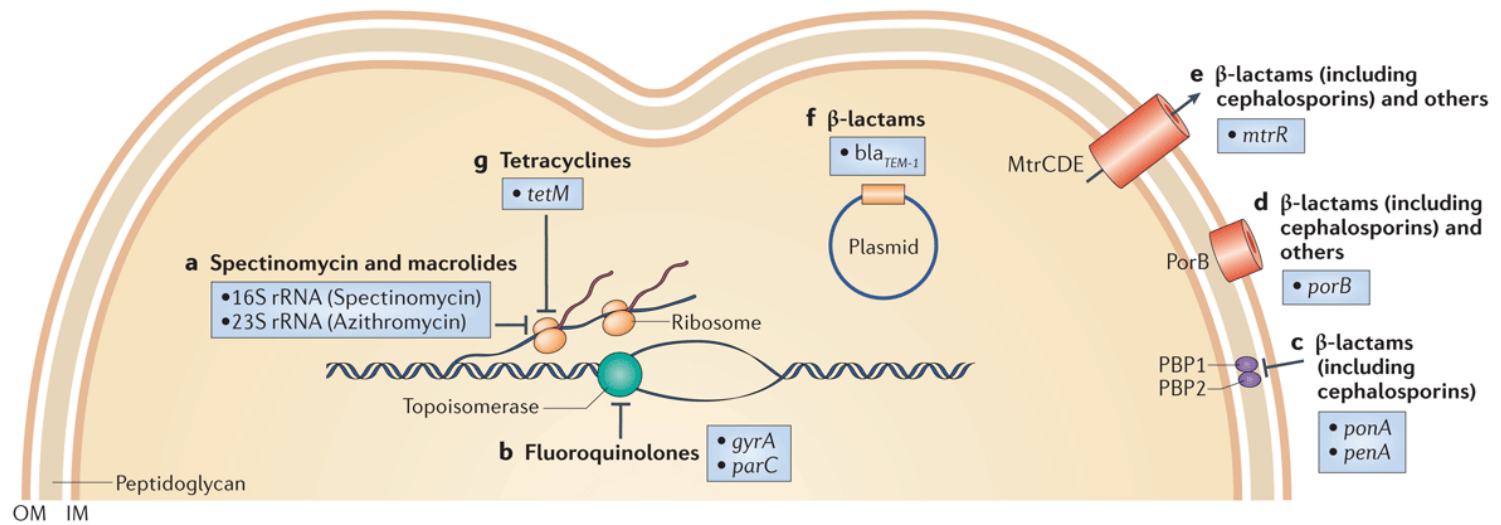
Pharyngitis
Streptococcus pyogenes
 Epstein-Barr virus



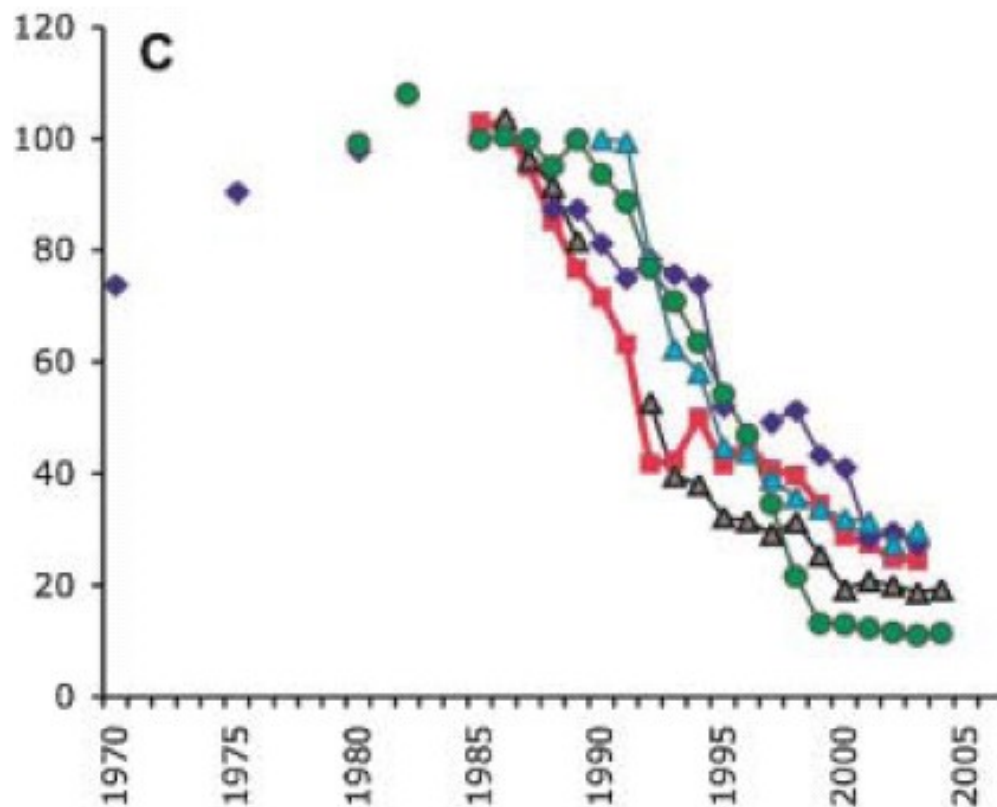
Meningitis
 Enteroviruses
 Varicella-zoster virus
Streptococcus pneumoniae
 Pneumococcal urinary antigen
Cryptococcus neoformans

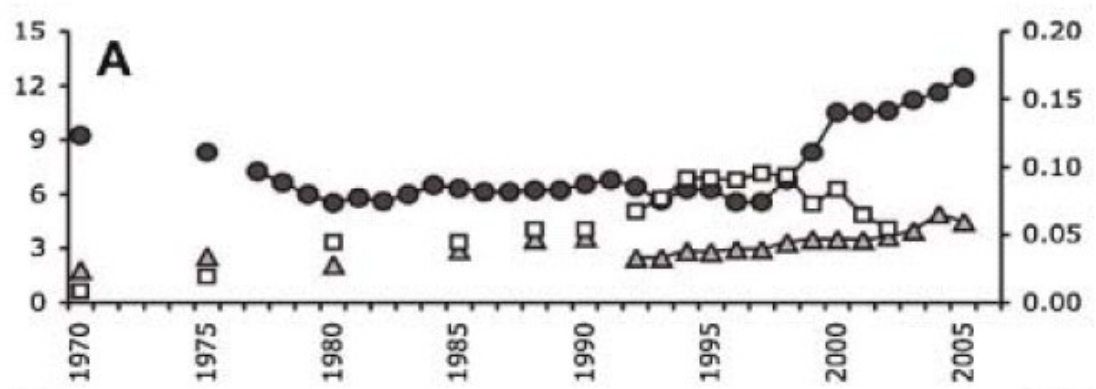




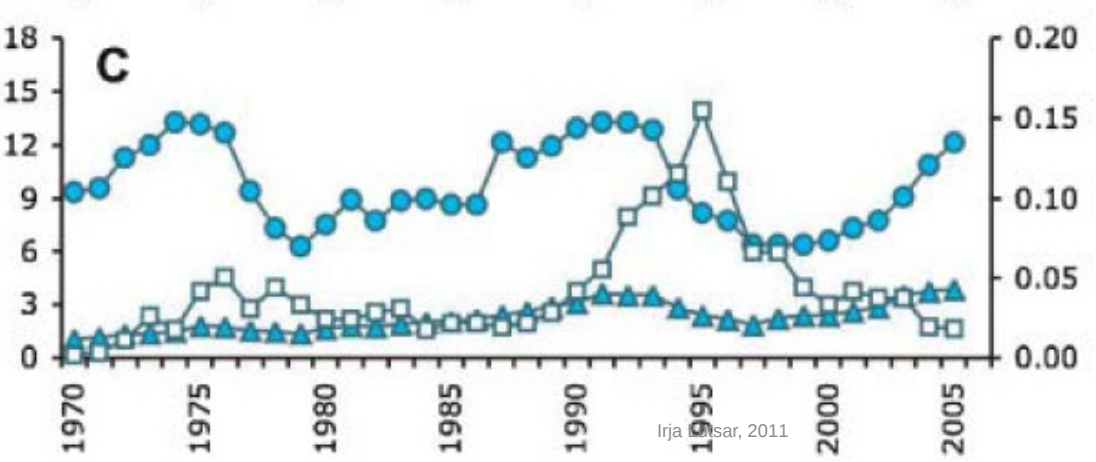
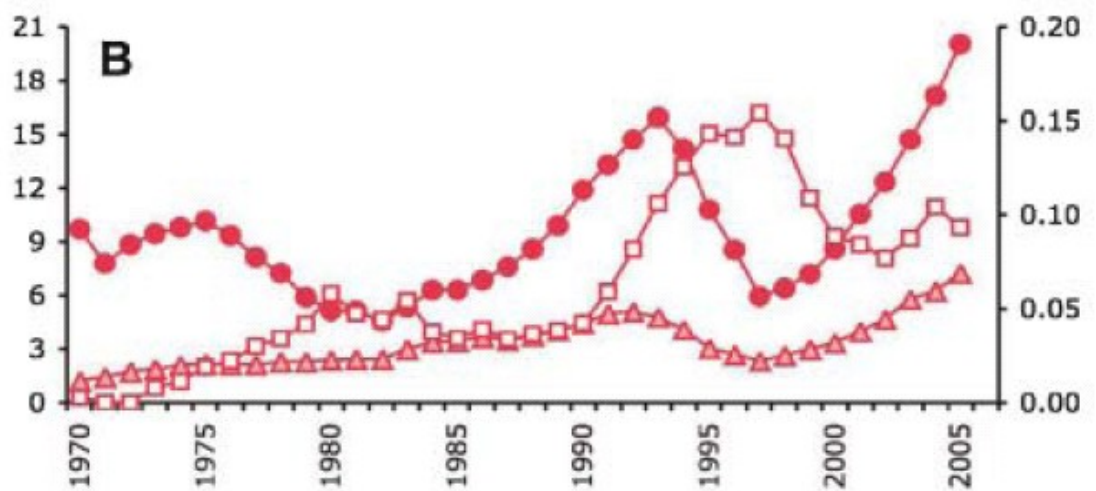


Pestitsiidide kasutamine Eestis (roosa), Lätis, Leedus, Tsehhis ja Sloveenias



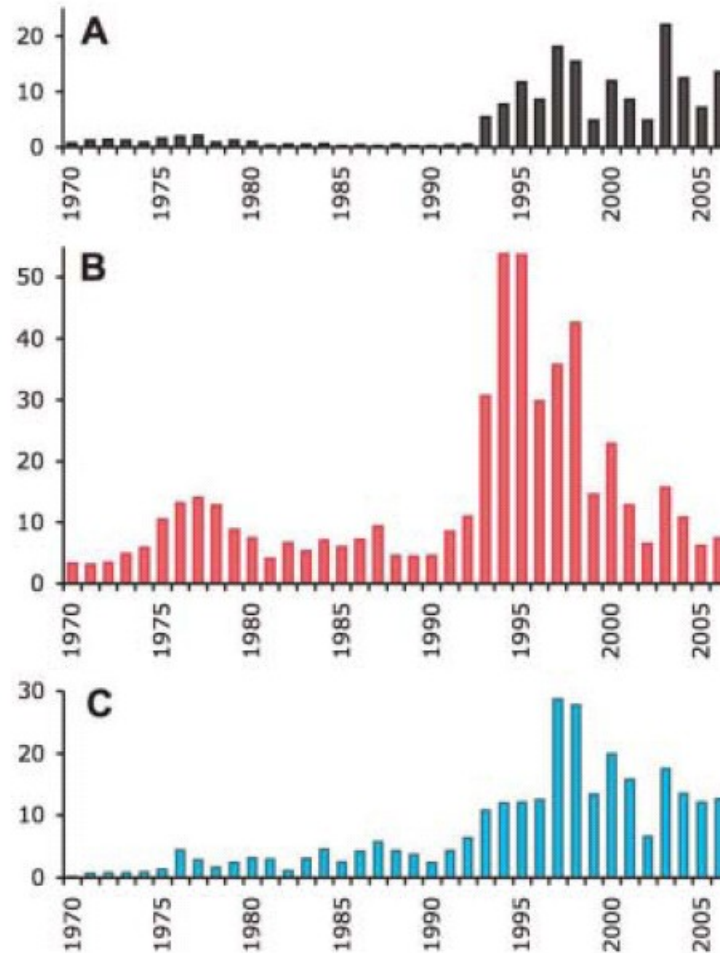


Metskitsed (●), metssead (Δ) ja hundid (□)
 Leedus (A), Lätis (B) ja Eestis (C)

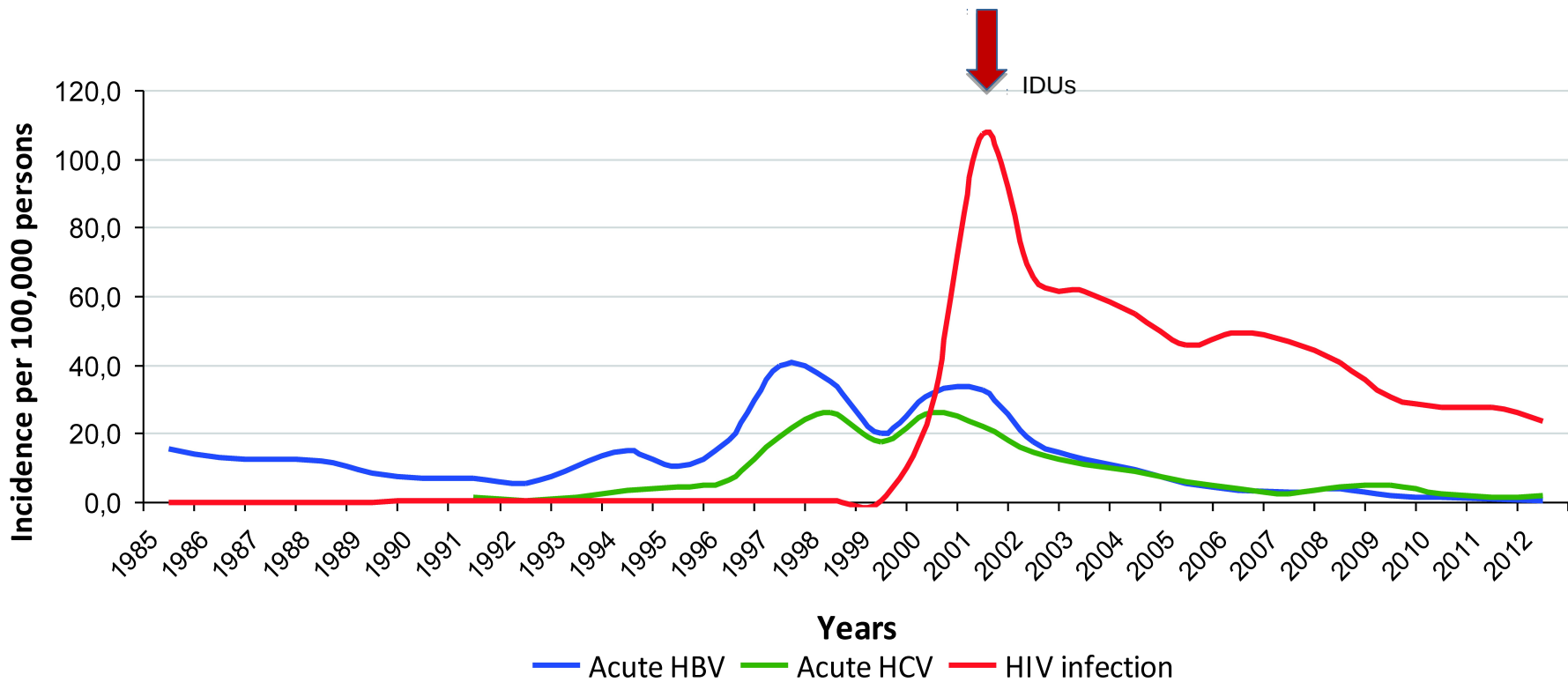


Mean national density of wolves per 1000 ha total land area

Puukentsefaliit Leedus (A), Lätis (B), Eestis (C)



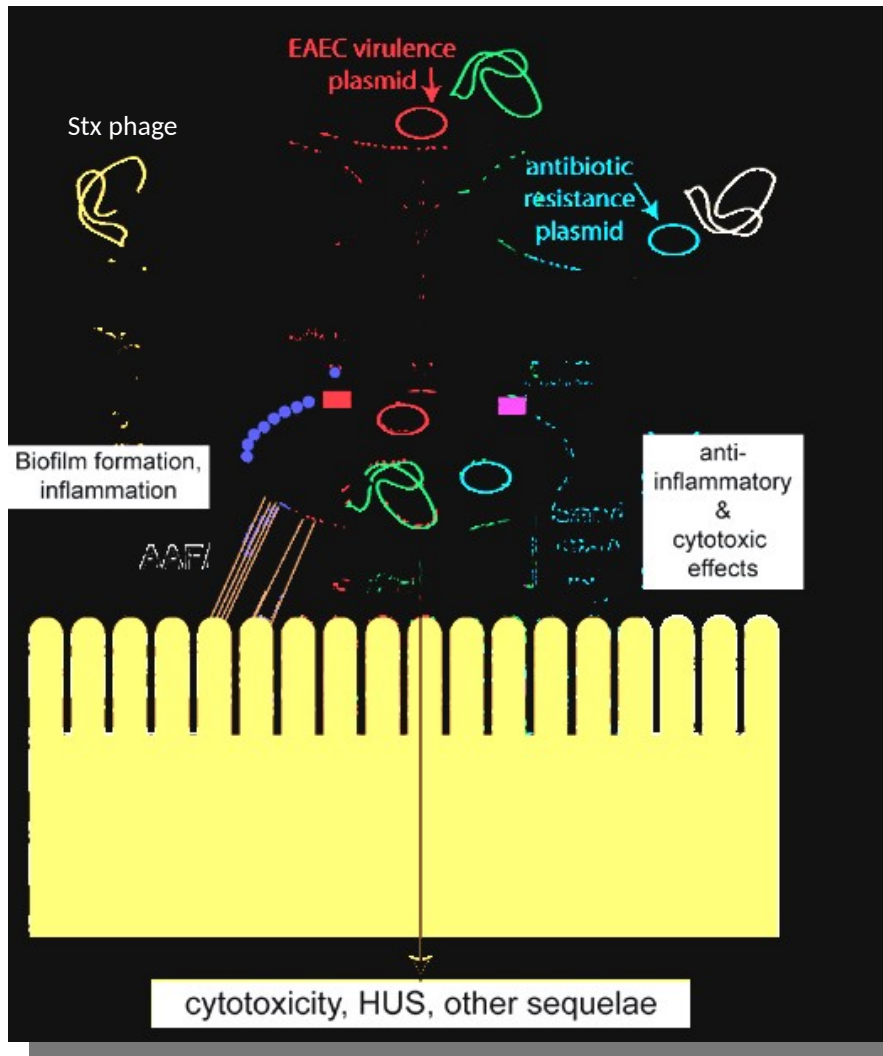
HIV, HCV and HBV in Estonia



HIV-1 alatüüp B

HIV-1 CRF06_cpx

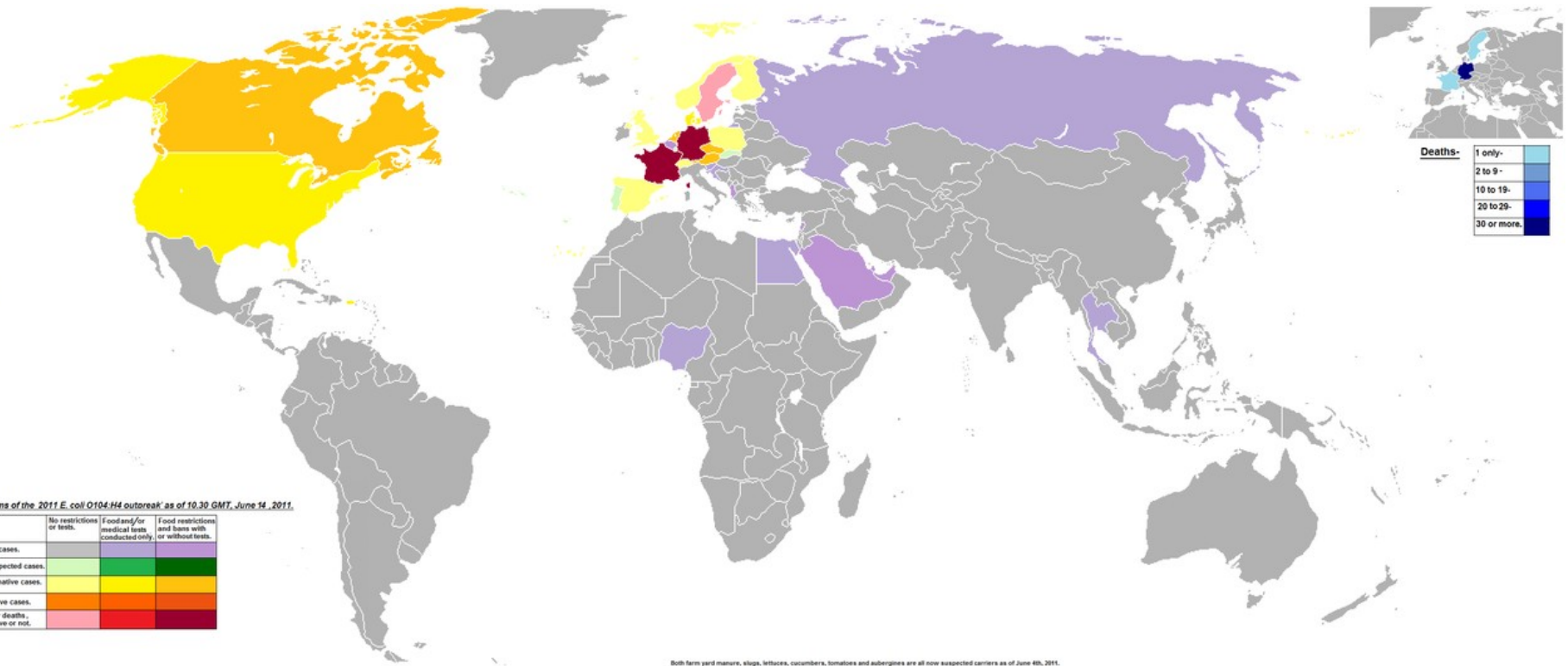
E.Coli O104:H4 (EAHEC)



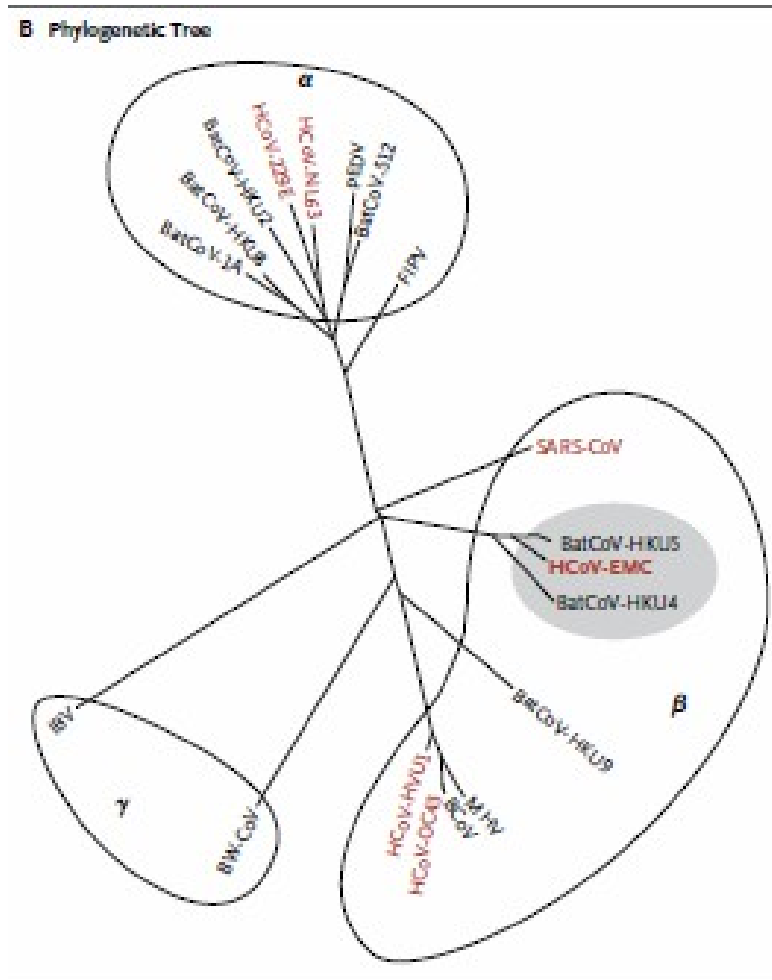
- EAEC
 - Esineb valdavalt inimestel
 - Puhangud kirjeldatud
 - Sorbitool-neg
 - *aggR* geen pos
- EHEC (STEC; VTEC)
 - Sageli loomadel (30%)
 - O157:H7
 - Non-O157 tüved
 - *stx2* geen pos
- *E.coli* O104:H4
 - Isoleeritud inimestelt
 - Levik inimeselt inimesele näidatud
 - Puudub kariloomadel (puhangu piirkonnas)
- Horisontaalne geenide ülekanne
 - 3816 haigusjuhtu; suremus 4,2%,
 - keskmine vanus 42 a



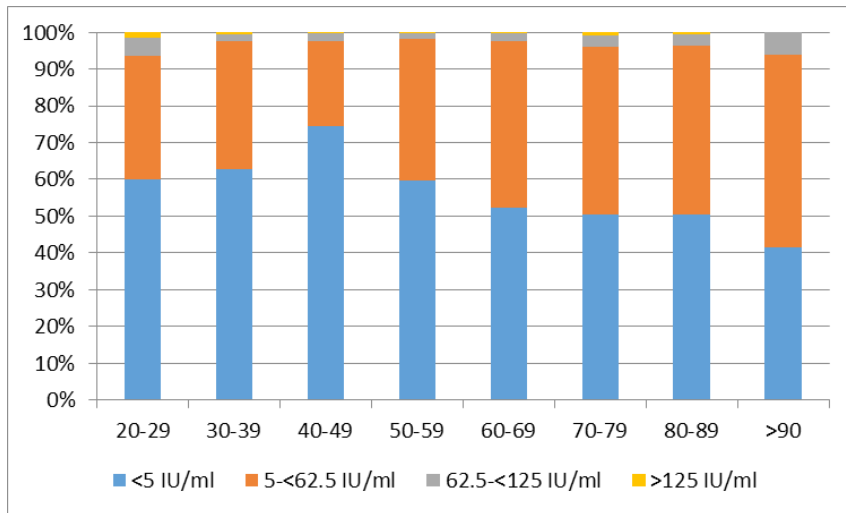
E.coli O104:H4



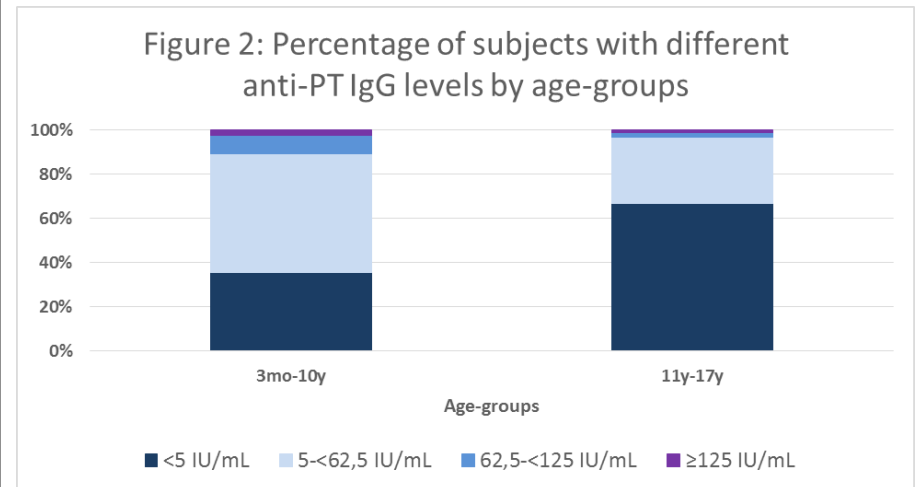
Novel coronavirus: phylogenetic tree



Täiskasvanud

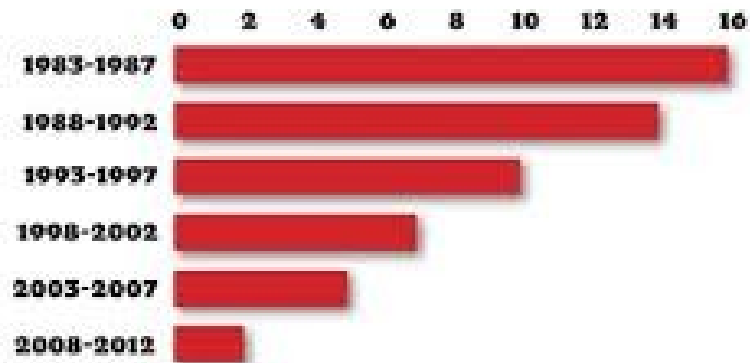


Lapsed



Dwindling Antibiotic Development

Number of new, FDA-approved antibacterial agents



Enamus uusi infektsioone pärinevad loomadelt/lindudelt



Wild animals
food markets

Open markets with
aquatic birds,
chickens, intensive
breeding of chickens
and pigs



Bush-meat
hunting of
non human
primates

Rendering of sheep
bones

