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University Medical Center Groningen

Control of hospital acquired infections and antimicrobial resistance in Europe: the way to go

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Netherlands

Webinar lecture 5-6-2020

Disclosure of Conflict of Interest	
Personal conflict of interest	None
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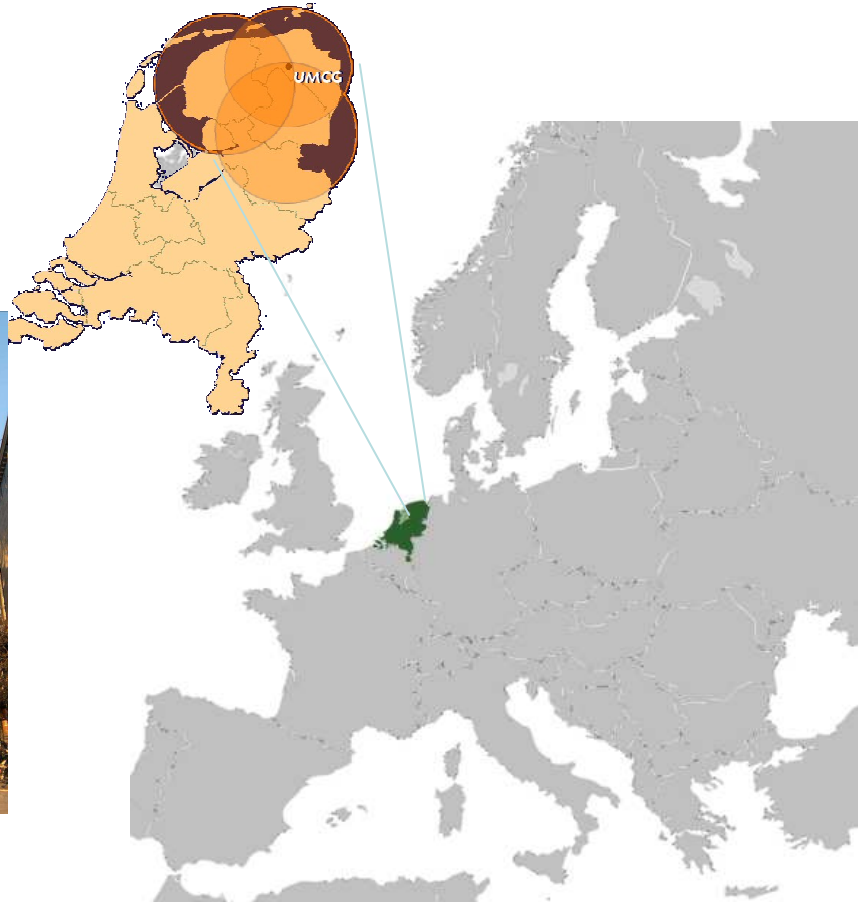
Groningen, the very North of the Netherlands

Academy Square in Groningen



The next 20 minutes…

- The challenge
- The hidden reasons
- Think across borders
- Roll back CRE

Specific infectious Diseases

-> Primary disease

Obligatory Pathogens

Natural transmission way

Defined incubation-, carrier time

Healthcare associated infections

-> Secondary disease

Facultative pathogens (e.g. CRE)

Healthcare generated transmission ways

Colonisation before infection

Infections depening on intervention

Epidemiology (TPP+species)

Public health medicine

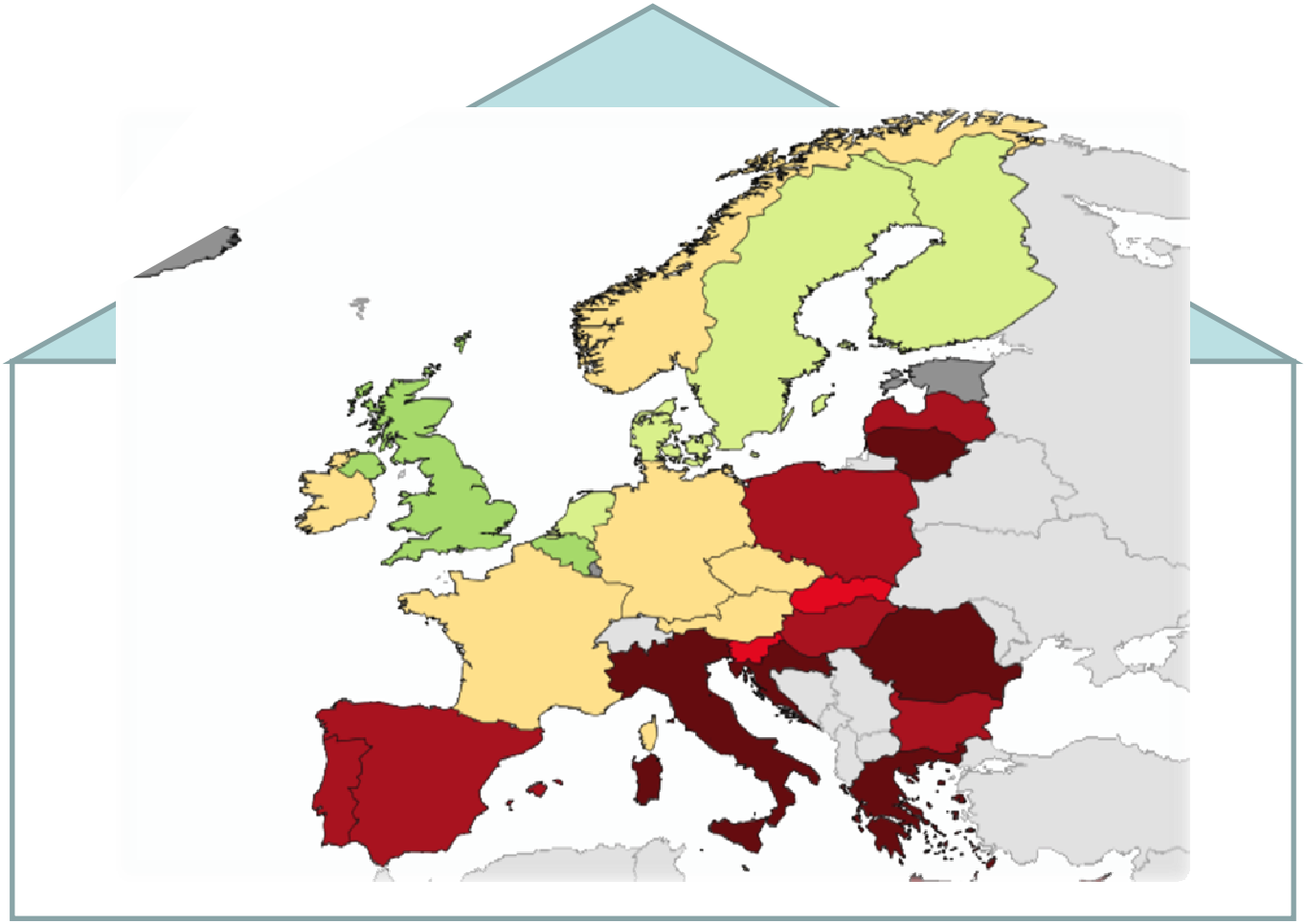
Molecular epidemiology

(TPP+species, resistance, subtype)

Network medicine

Imaging you’re living in the first-floor appartement of a house and it erupts a fire on the roof. What will you do?

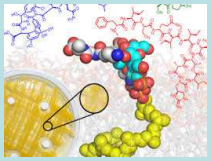
A. Close the door of your appartement
B. Close watersupply for the appartments at the roof
C. Protect your appartment and help the others

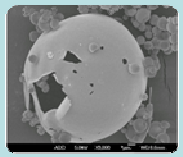


CR-*A. baumanii*, EARS-Net, 2017

Strategies against antibiotic resistentance

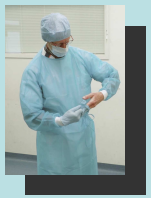
1. **New Antibiotics**
   - new compounds
   - smart antibiotics





2. **Antibiotics when needed (A-teams)**
   - resistance prevention

3. **Transmission-prevention**
   - standardhygiene/desinfection
   - isolation/cohorting



4. **Eyes for the invisible (diagnostics)**
   - rapid, responsive
   - personalised

5. **Network-prevention**

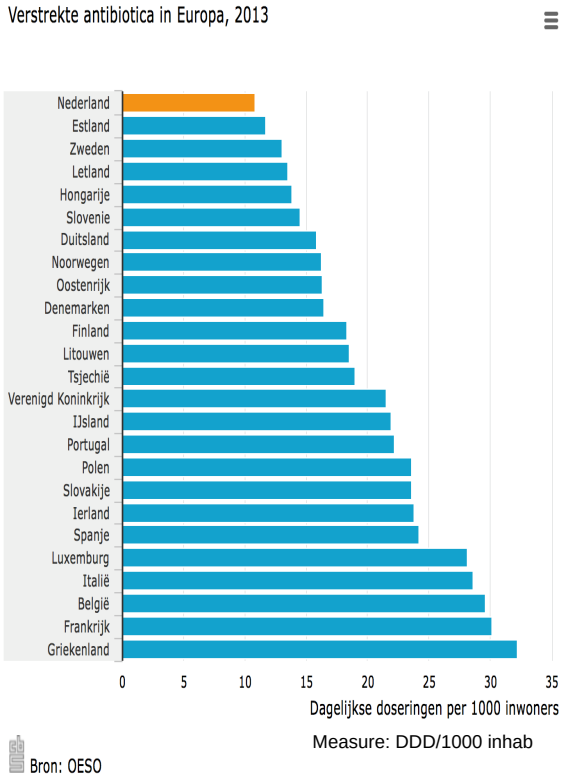
Reasons for spread of AMR

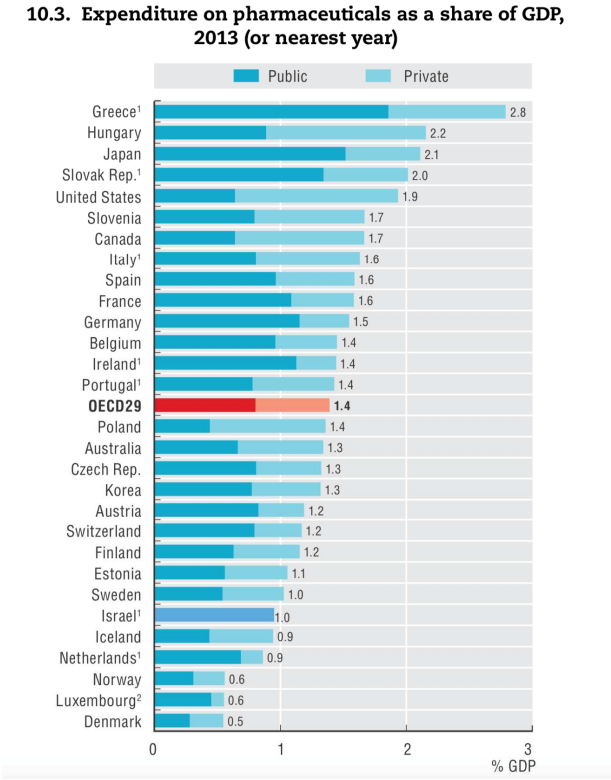
- Too many antibiotics
- Lack of hand hygiene
- Good guidelines, un-obedient HCW

…15 minutes…

- The challenge
- The hidden reasons
- Think across borders
- Roll back CRE

Comparison of rates of antibiotic prescription



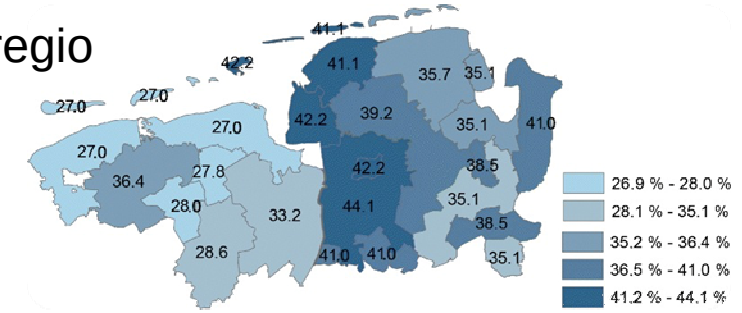


Eurobarometer 2015

On national level

Crossborder comparison of antibiotics in children

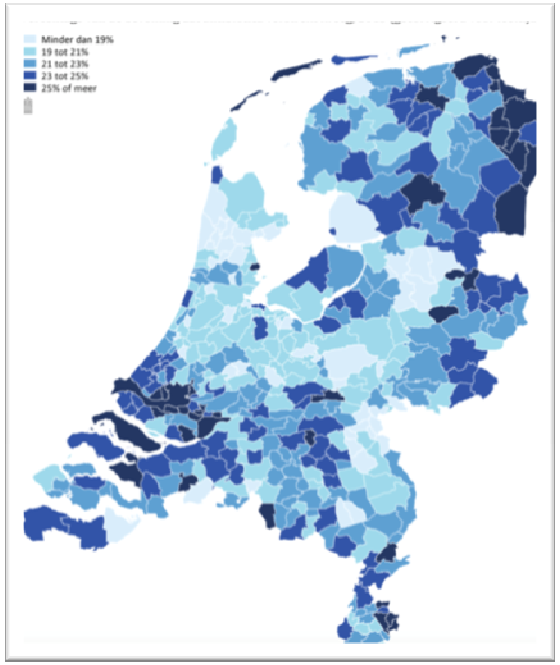
All prescriptions in children in Euregio
DE >> NL children
0-6 years old: NL: 37%
DE: 55%
2nd Gen. Ceph: DE: 25%
NL: 0,1%



Dik et al. 2015

Comparison of rates of antibiotic prescription

Netherlands



Niedersachsen

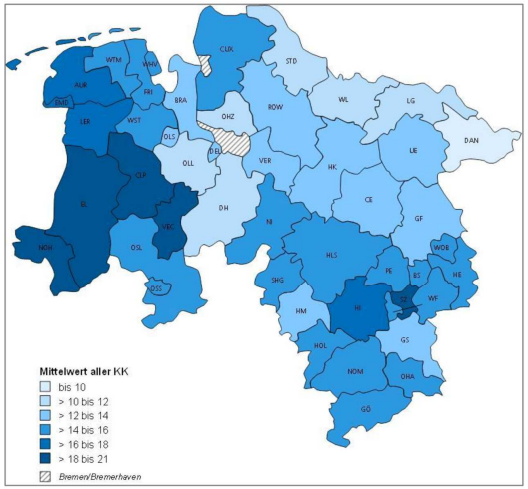
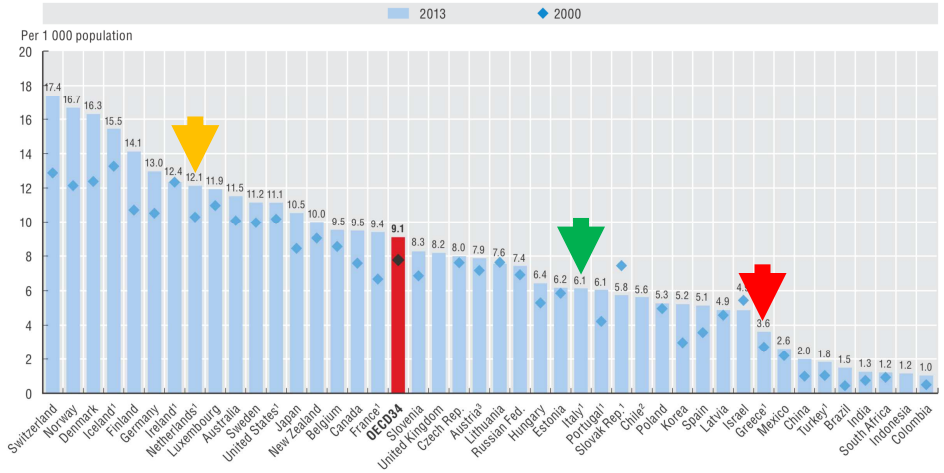


Abbildung 12: Verordnungsdichte(DDD/1000 Versichertentage) in den Landkreisen und kreisfreien Städten Niedersachsens 2015 über alle Alters-klassen und alle ATC-Codes.

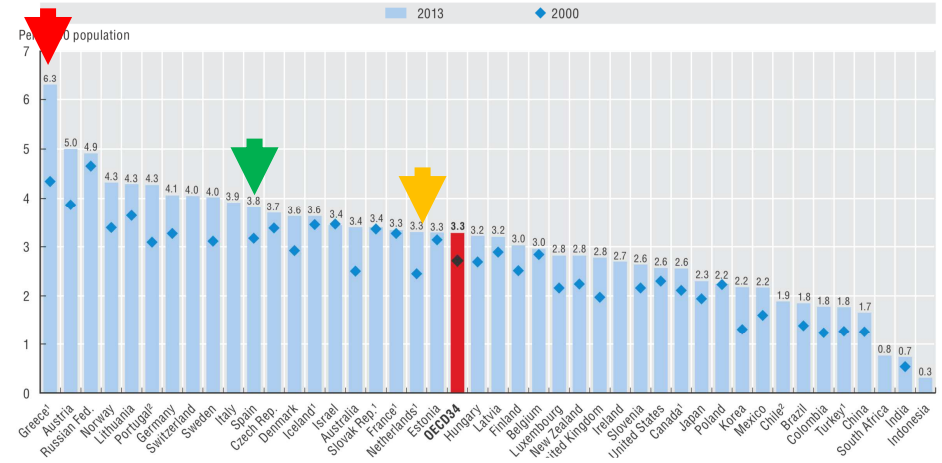
On regional level

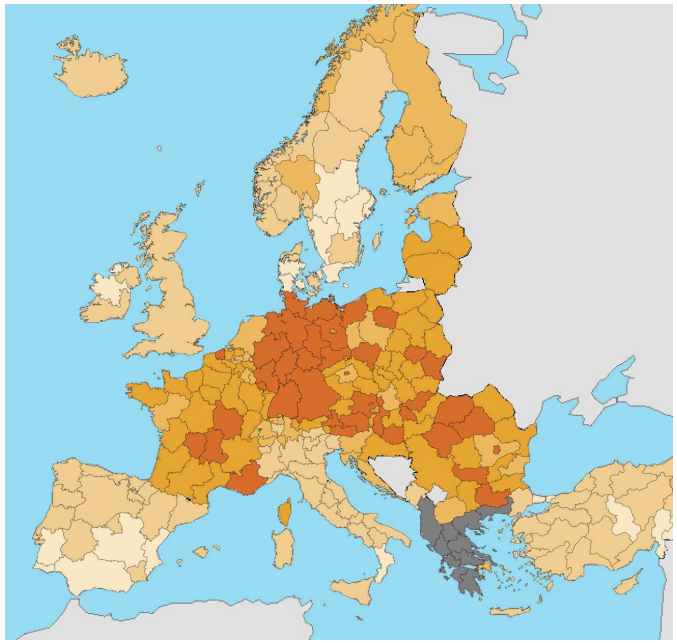
Measure: DDD/1000 inhab

5.13. Practising nurses per 1 000 population, 2000 and 2013 (or nearest year)



5.1. Practising doctors per 1 000 population, 2000 and 2013 (or nearest year)





3.3 Number of hospital beds

Number of hospital beds relative to population size, by NUTS 2 regions, 2015 (number per 100 000 inhabitants, EU-28 = 515)

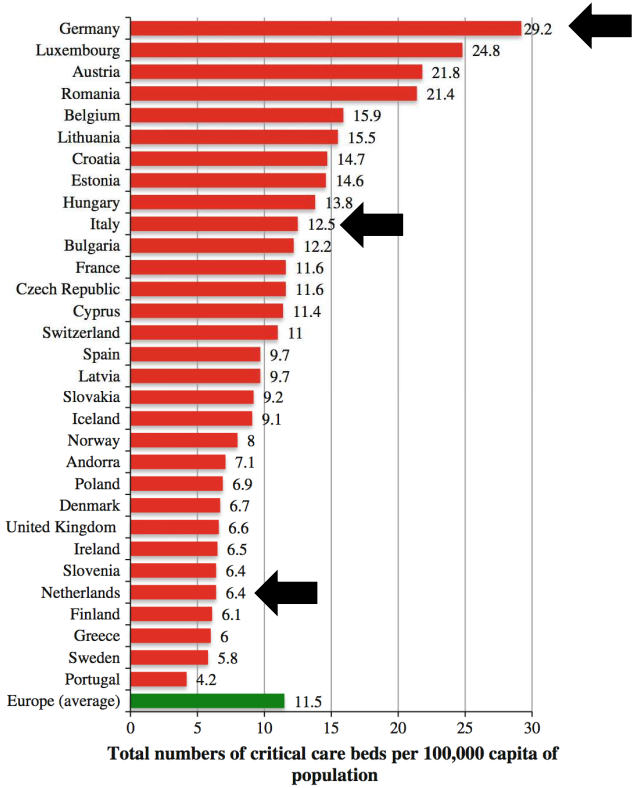
- < 250
- 250 - < 400
- 400 - < 550
- 550 - < 700
- ≥ 700
- Data not available

Intensive Care Med (2012) 38:1647–1653
DOI 10.1007/s00134-012-2627-8

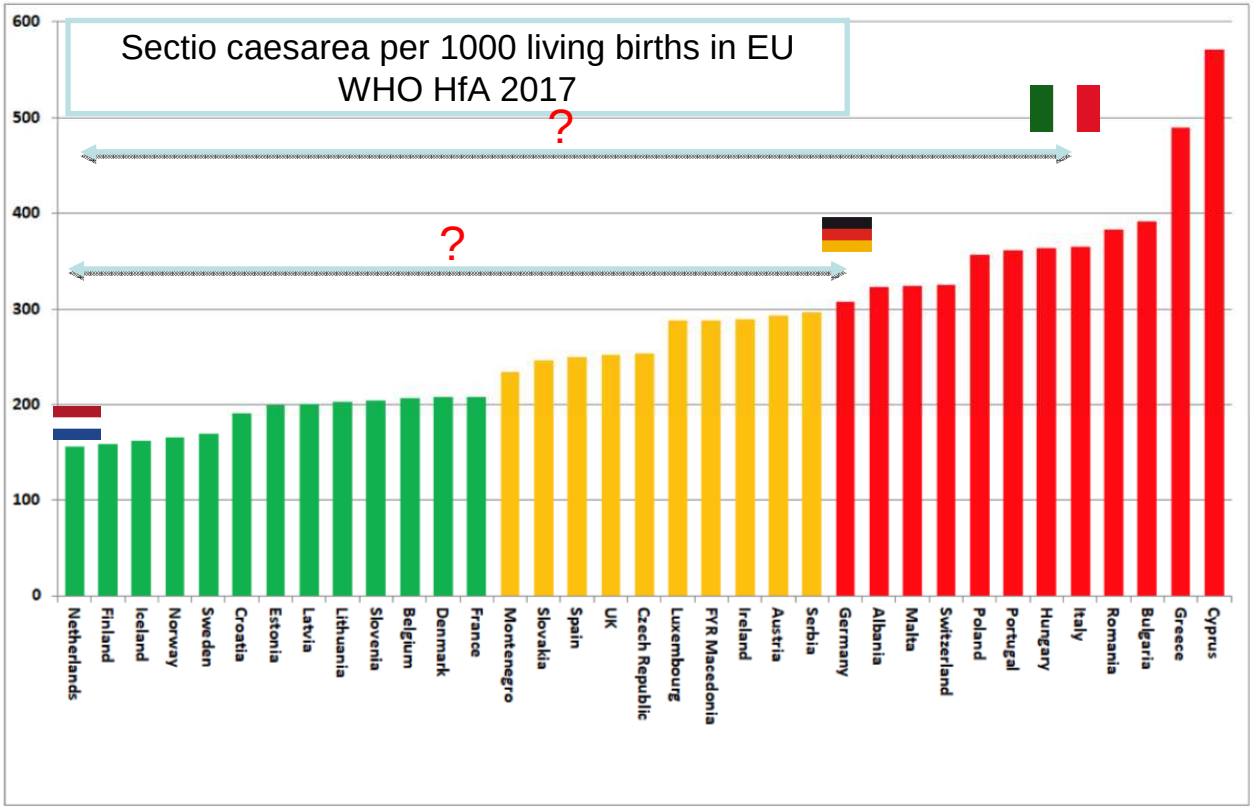
ORIGINAL

A. Rhodes
P. Ferdinande
H. Flaatten
B. Guidet
P. G. Metnitz
R. P. Moreno

The variability of critical care bed numbers in Europe

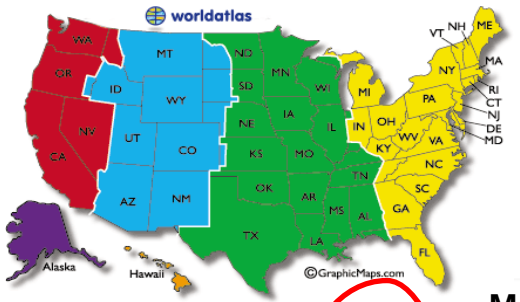


Differences unconfortable questions

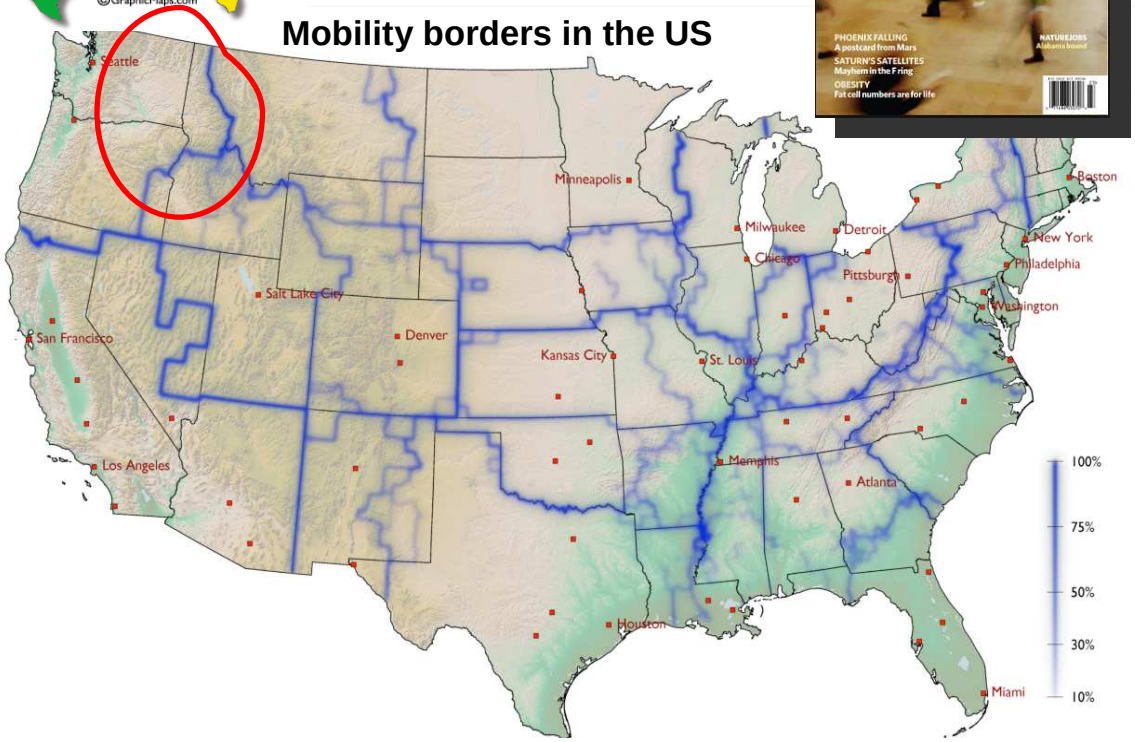


…still 10 minutes to go…

- The challenge
- The hidden reasons
- Think across borders
- Roll back CRE

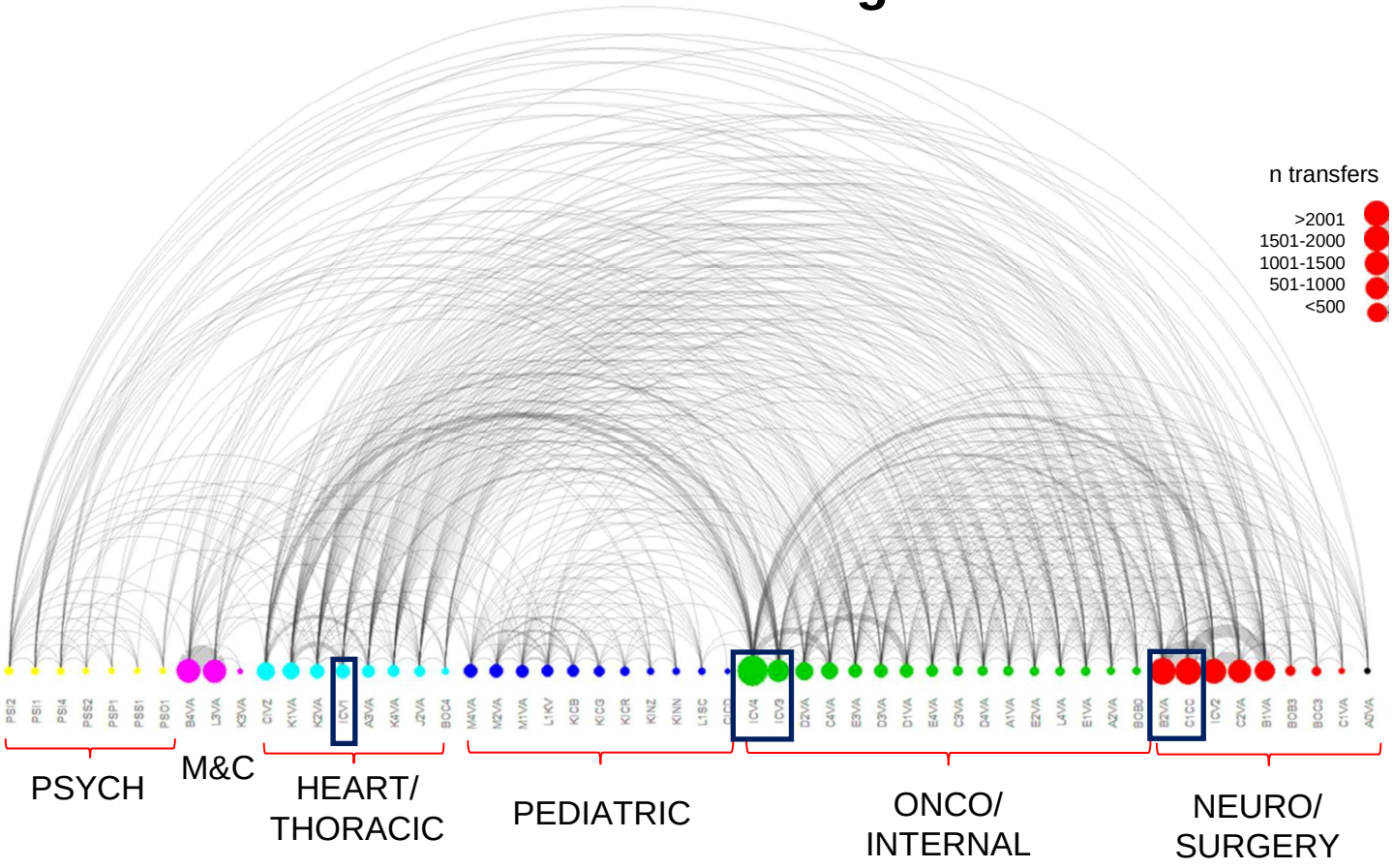


Mobility borders in the US

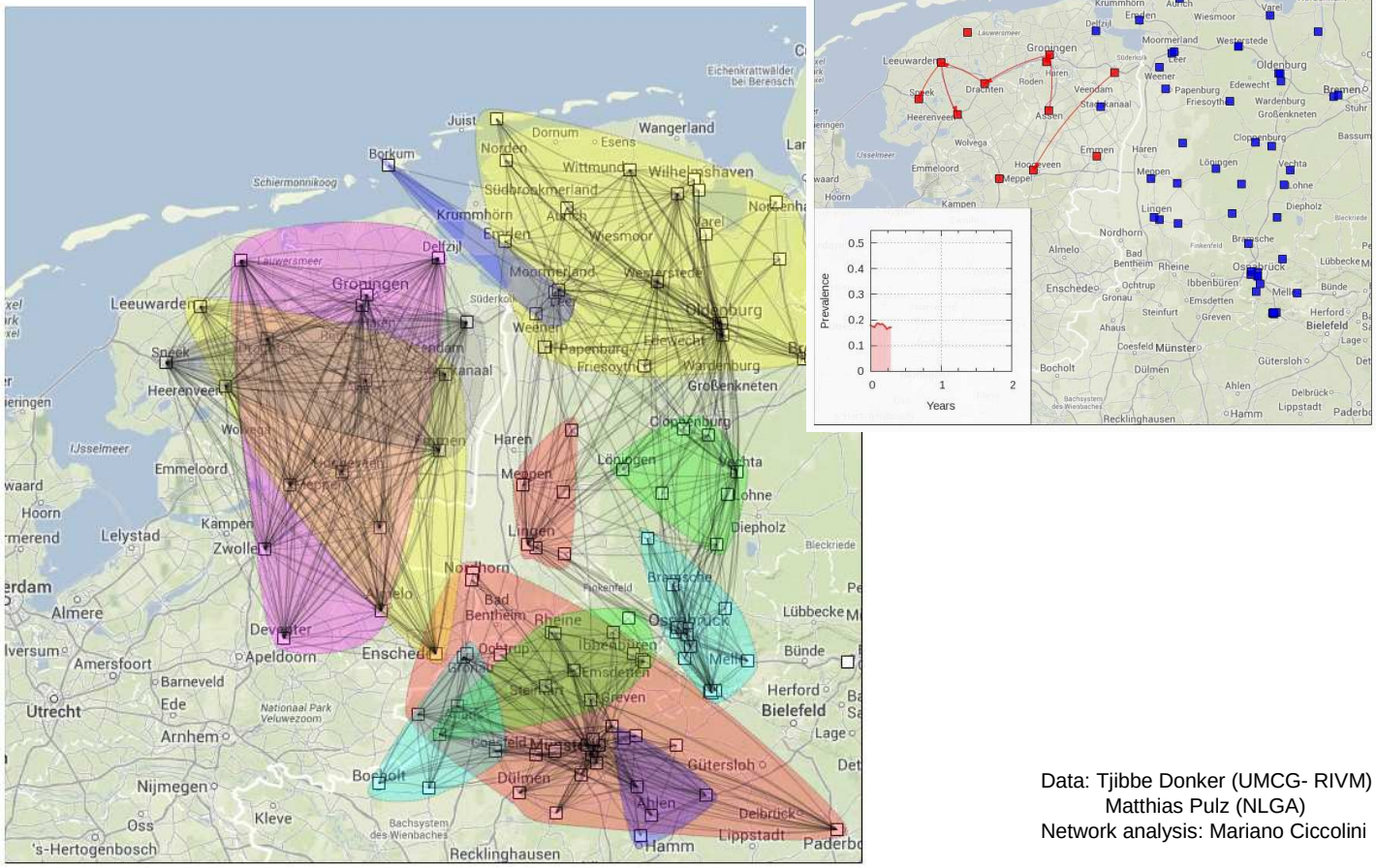


Courtesy: Dirk Brockmann, RKI

Patient transfer within hospitals show cluster forming



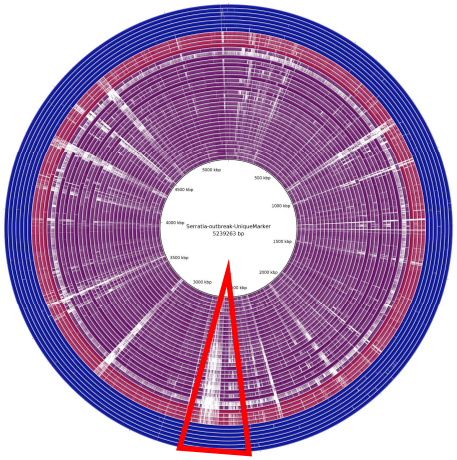
Data analysis: Frieso Coerts, UMCG



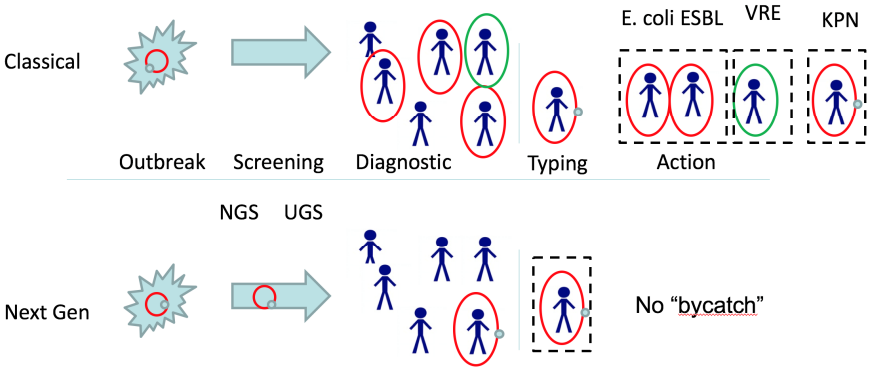
Data: Tjibbe Donker (UMCG- RIVM)
Matthias Pulz (NLGA)
Network analysis: Mariano Ciccolini

Using NGS for outbreak-specific screening test

- Next Gen sequencing
- Identifying **Unique Marker Signatures**
- **Ad hoc design** of Primers for outbreak isolate
- Appropriate infection control measures

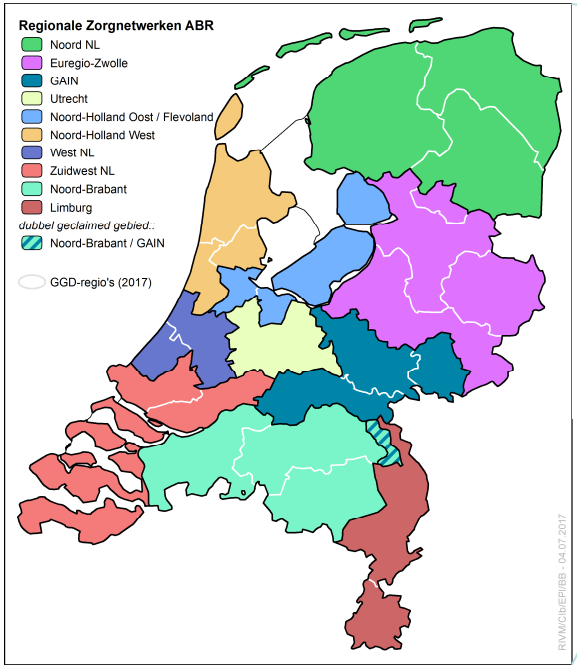


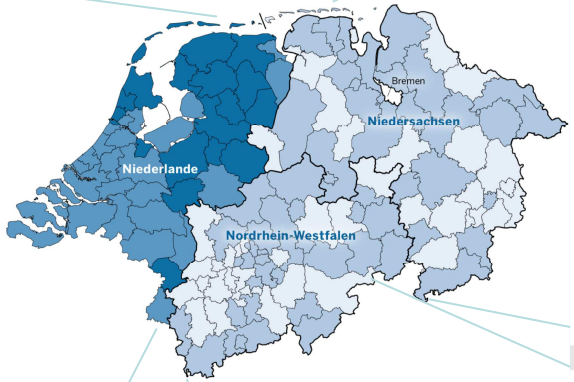
Comparative Genome analysis
during a *K. pneumoniae-outbreak*

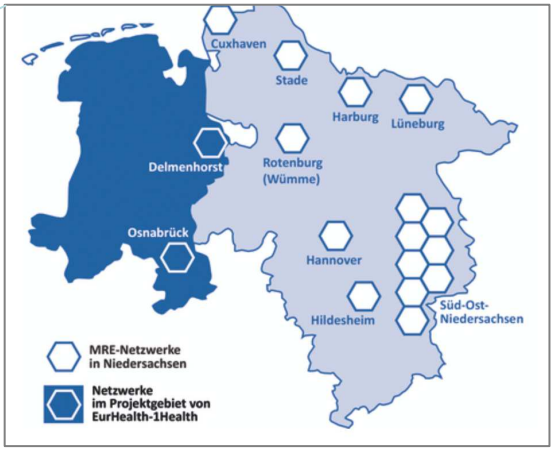


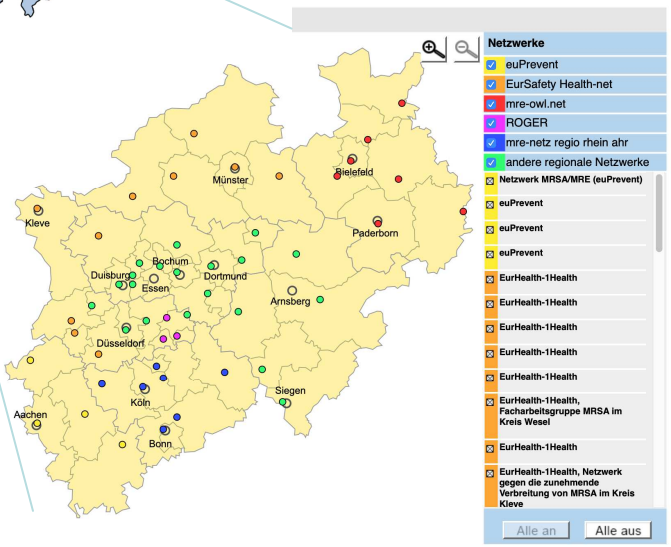
Zhou et al. Nat Scient Rep 2015

Crossborder network intervention





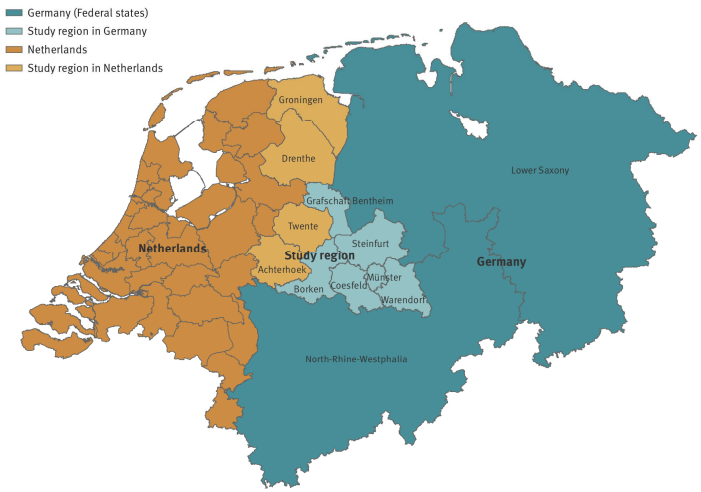




Glasner et al. 2018
Ciccolini et al. 2014
Jurke et al. 2019

Network-Intervention

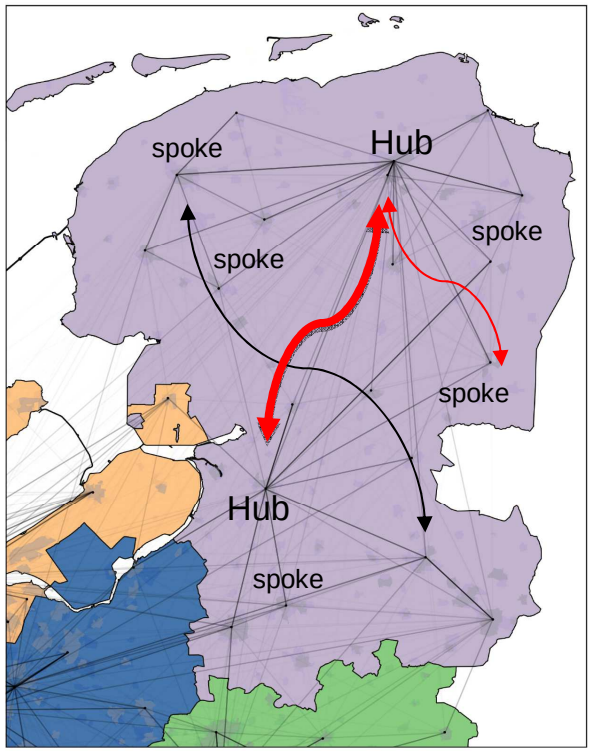
- 6 years follow up
- 42 Hospitals
- Area-wide Search&Follow-policy

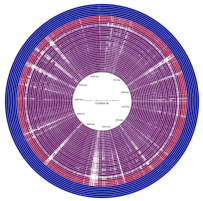


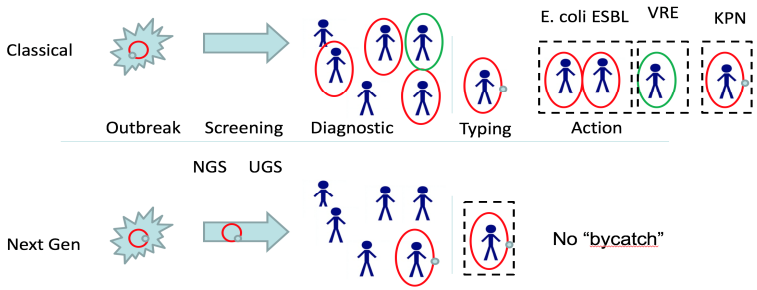
Region	MRSA parameter	Year(s)					
		2012	2013	2014	2015	2016	2012–16
		Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	p-value
DE	Nasopharyngeal swabs for MRSA screening per inpatients (%)	37.7	40.3	43.6	44.1	47.4	0.0006
	MRSA-cases/100 inpatients	1.1	1.0	1.0	1.1	0.9	0.0814
	MRSAB/SAB (%)	12.5	14.3	10.5	9.8	5.0	0.0959
	MRSAB/100,000 patient-days	1.3	2.6	1.7	1.2	1.5	0.4272
	Nosocomial MRSA cases/1,000 patient days	0.11	0.09	0.09	0.08	0.07	0.0184
NL	Nasopharyngeal swabs for MRSA screening per inpatients (%)	2.05	3.65	2.80	3.55	5.45	0.0188
	MRSA-cases/100 inpatients	0.11	0.13	0.12	0.13	0.17	0.0816
	MRSAB/SAB (%)	0.7	1.6	1.0	1.9	0.0	0.1679
	MRSAB/100,000 patient-days	0.3	0.6	0.6	1.0	0.0	0.0620
	Nosocomial MRSA cases/1,000 patient days	0.03	0.025	0.035	0.030	0.015	0.3532

Jurke et al. Eurosurveillance. 2019

Hub&Spoke Intervention







Spokes
- Regional screening and situation-adapted diagnostic
- "Swarm-diagnostic"

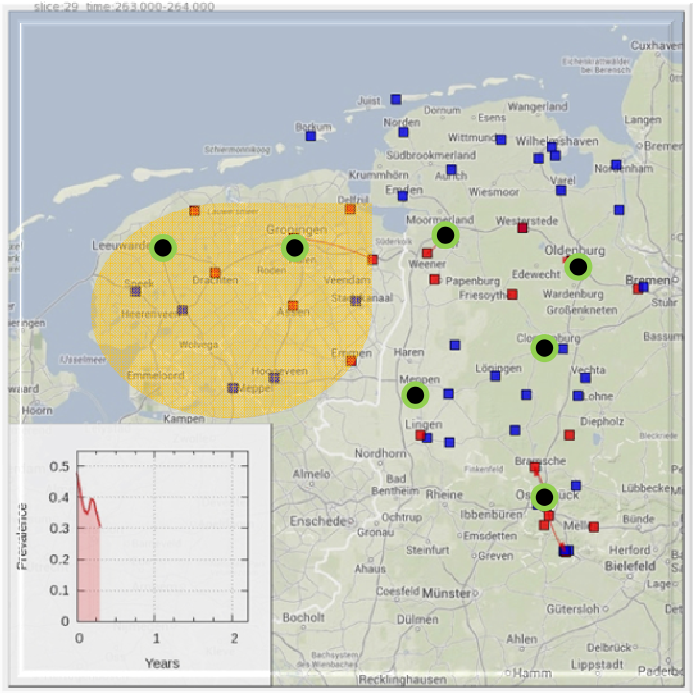
Hubs
- Tailor-made and outbreak-specific primer
- Regional sharing of primers

- **No attitude of competition within a region**
- **Network organization (buttom up)**
- **Rapid, responsive, relevant**
- **Regional AMR-prevention budget: 1 Euro/inh./y**

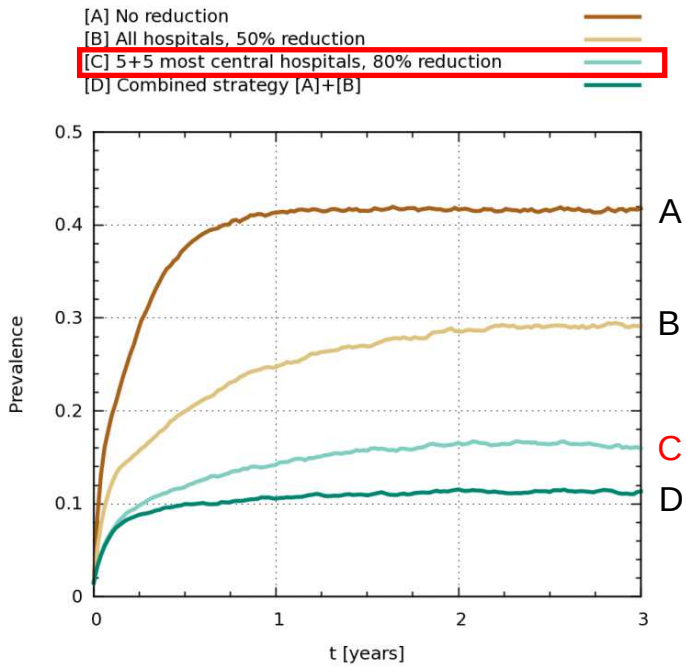
www.remis-plus.net

Hub&Spoke-intervention
in the Dutch-German Euregio

hub-hospital
spoke-hospital



Effect on outbreak dynamic



COVID-19: The underestimated role of healthcare workers and healthcare facilities in the spread

China

Table 1. Baseline Characteristics of Patients Infected With 2019-nCoV

	No. (%)			
	Total (N = 138)	ICU (n = 36)	Non-ICU (n = 102)	*P* Value[a]
Age, median (IQR), y	56 (42-68)	66 (57-78)	51 (37-62)	<.001
Sex				
Female	63 (45.7)	14 (38.9)	51 (37-62)	.34
Male	75 (54.3)	22 (61.1)	53 (52.0)	
Huanan Seafood Wholesale Market exposure	12 (8.7)	5 (13.9)	7 (6.9)	.30
Infected				
Hospitalized patients	17 (12.3)	9 (25.0)	8 (7.8)	.02
Medical staff	40 (29)	1 (2.8)	39 (38.2)	<.001
Comorbidities	64 (46.4)	26 (72.2)	38 (37.3)	<.001
Hypertension	43 (31.2)	21 (58.3)	22 (21.6)	<.001
Cardiovascular disease	20 (14.5)	9 (25.0)	11 (10.8)	.04
Diabetes	14 (10.1)	8 (22.2)	6 (5.9)	.009
Malignancy	10 (7.2)	4 (11.1)	6 (5.9)	.29
Cerebrovascular disease	7 (5.1)	6 (16.7)	1 (1.0)	.001
COPD	4 (2.9)	3 (8.3)	1 (1.0)	.054
Chronic kidney disease	4 (2.9)	2 (5.6)	2 (2.0)	.28
Chronic liver disease	4 (2.9)	0	4 (3.9)	.57
HIV infection	2 (1.4)	0	2 (2.0)	>.99

JAMA, Wang et al.

Italy

TOP NEWS

LA STAMPA

L'odissea in corsia di medici e infermieri: 2.000 fermati da contagi e quarantene

Spesso la colpa è di pazienti che non denunciano i contatti a rischio. Alle Molinette di Torino stop a 31 addetti

Philippines

DOH: 1,245 healthcare workers test positive for coronavirus; 27 die

By: Daphne Galvez - Reporter / @DYGalvezINQ

INQUIRER.net / 05:10 PM April 27, 2020

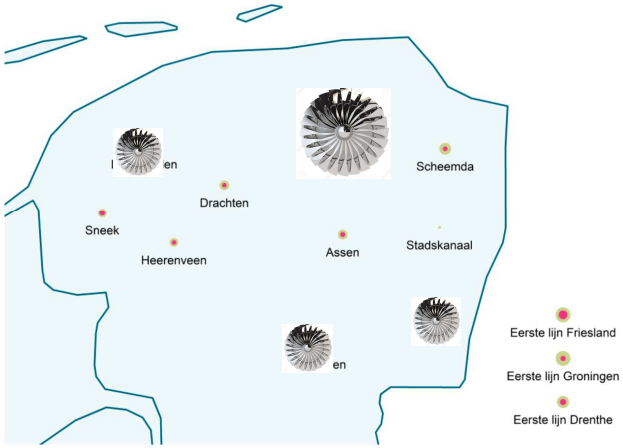
Click to listen now

00:54 Powered by Trinity Audio

MANILA, Philippines — A total of 1,245 health care professionals have so far been infected with the novel coronavirus or SARS-CoV-2 which causes the coronavirus disease 2019 (COVID-19).

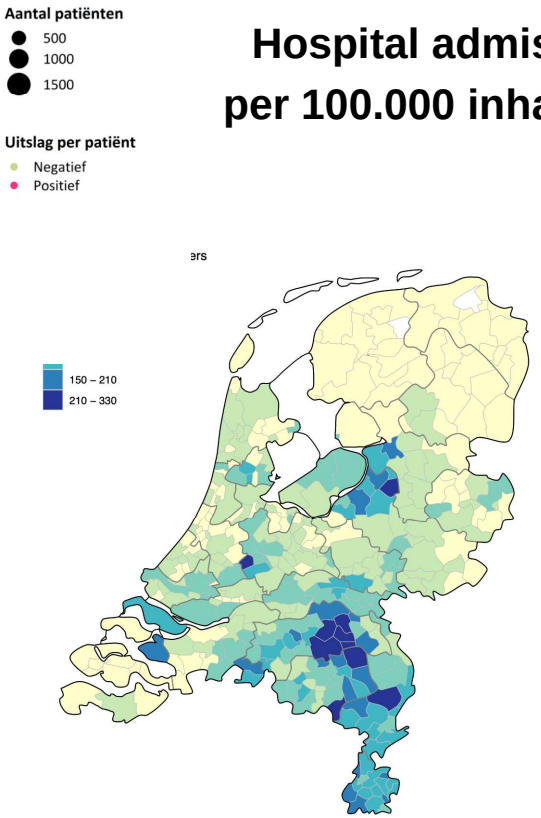
Of the number, 27 have succumbed to the disease — 21 of which are doctors, Health Undersecretary Maria Rosario Vergeire announced on Monday.

COVID-19: Regional Reality

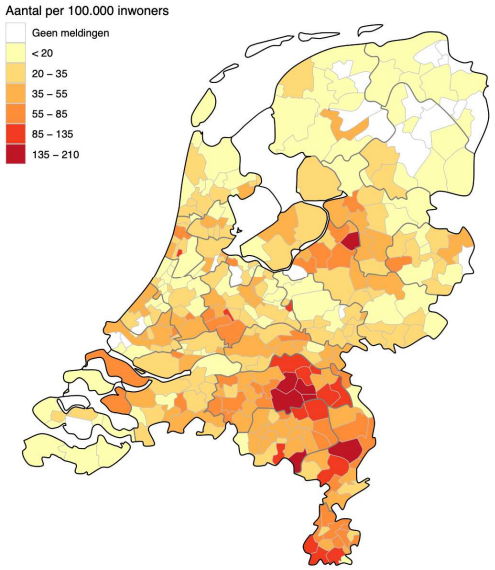


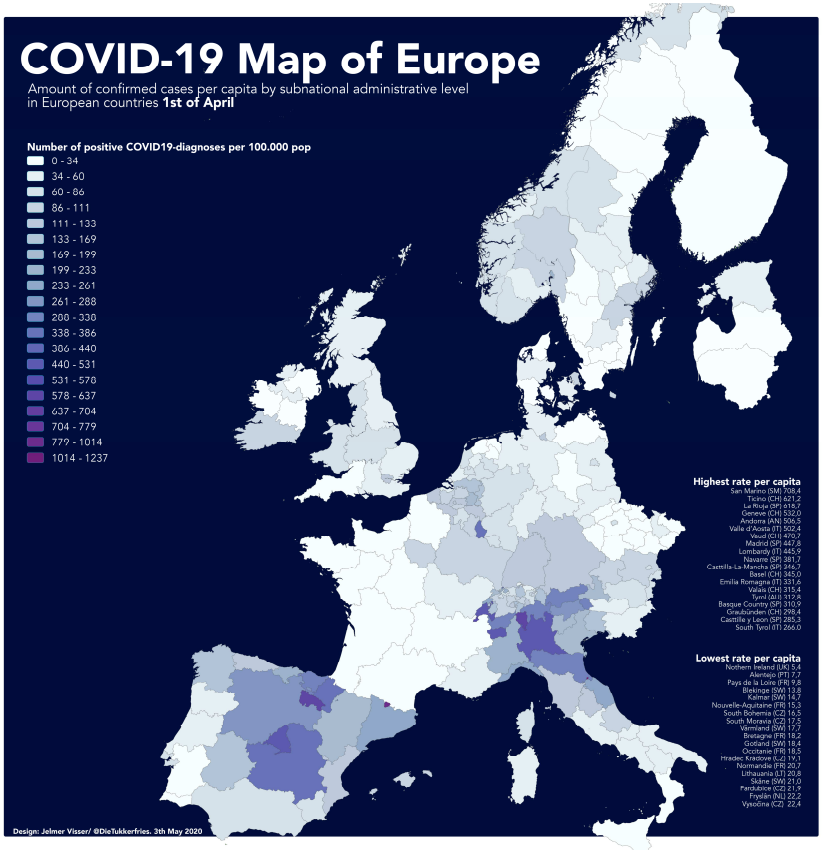
Risk of nosocomial transmission:
-From patient to HCW
-From HCW to HCW
-From patient to patient
-From hospital to hospital
- patient referral
- double appointments

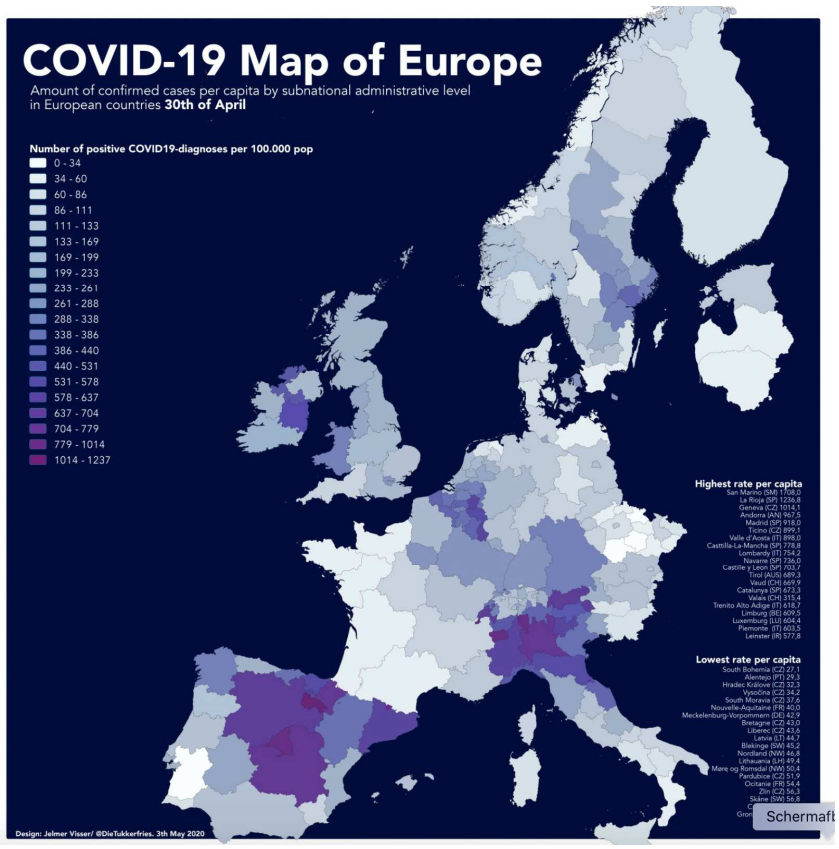
Hospital admissions per 100.000 inhabitants



Confirmed deaths per 100.000 inhabitants




COVID-19 Map of Europe
Amount of confirmed cases per capita by subnational administrative level in European countries 1st of April
Number of positive COVID19-diagnoses per 100.000 pop
0 - 34
34 - 60
60 - 86
86 - 111
111 - 133
133 - 169
169 - 199
199 - 233
233 - 261
261 - 288
288 - 338
338 - 386
386 - 440
440 - 531
531 - 578
578 - 637
637 - 704
704 - 779
779 - 1014
1014 - 1237
Highest rate per capita
San Marino (SM) 708,4
Ticino (CH) 621,2
La Rioja (SP) 616,7
Geneve (CH) 532,0
Andorra (AN) 506,5
Valle d'Aosta (IT) 502,4
Vaud (CH) 470,7
Madrid (SP) 447,8
Lombardy (IT) 445,9
Navarre (SP) 381,7
Castilla-La Mancha (SP) 346,7
Basel (CH) 345,0
Emilia Romagna (IT) 331,6
Valais (CH) 315,4
Tyrol (AU) 317,6
Basque Country (SP) 310,9
Graubünden (CH) 298,4
Castille y Leon (SP) 285,3
South Tyrol (IT) 266,0
Lowest rate per capita
Northern Ireland (UK) 5,4
Alentejo (PT) 7,7
Pays de la Loire (FR) 9,6
Blekinge (SW) 13,8
Kalmar (SW) 14,7
Nouvelle-Aquitaine (FR) 15,3
South Bohemia (CZ) 16,5
South Moravia (CZ) 17,5
Värmland (SW) 17,7
Bretagne (FR) 18,2
Gotland (SW) 18,4
Occitanie (FR) 18,5
Hradec Kralove (CZ) 19,1
Normandie (FR) 20,7
Lithuania (LT) 20,8
Skåne (SW) 21,0
Pardubice (CZ) 21,5
Fryslân (NL) 22,2
Vysočina (CZ) 22,4
Design: Jelmer Visser/ @DieTukkerfries. 3th May 2020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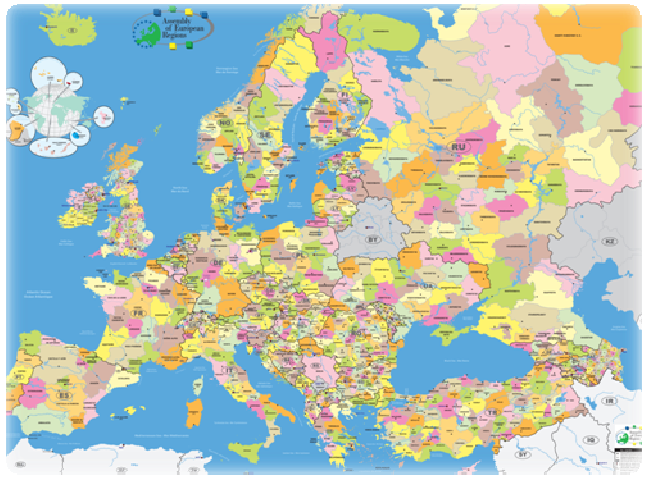
199 - 233
233 - 261
261 - 288
288 - 338
338 - 386
386 - 440
440 - 531
531 - 578
578 - 637
637 - 704
704 - 779
779 - 1014
1014 - 1237
Highest rate per capita
San Marino (SM) 1708,0
La Rioja (SP) 1336,6
Geneva (CZ) 1014,1
Andorra (AN) 967,5
Madrid (SP) 918,0
Ticino (CZ) 899,1
Valle d'Aosta (IT) 898,0
Castilla-La-Mancha (SP) 778,8
Lombardy (IT) 754,2
Navarre (SP) 736,0
Castille y Leon (SP) 703,7
Tirol (AUS) 689,3
Vaud (CH) 669,9
Catalunya (SP) 673,3
Valais (CH) 315,4
Trentin Alto Adige (IT) 618,7
Limburg (BE) 609,5
Luxemburg (LU) 604,4
Piemonte (IT) 603,5
Leinster (IR) 577,8
Lowest rate per capita
South Bohemia (CZ) 27,1
Alentejo (PT) 29,3
Hradec Králové (CZ) 32,3
Vysočina (CZ) 34,2
South Moravia (CZ) 37,6
Nouvelle-Aquitaine (FR) 40,0
Mecklenburg-Vorpommern (DE) 42,9
Bretagne (CZ) 43,0
Liberec (CZ) 43,6
Latvia (LT) 44,7
Blekinge (SW) 45,2
Nordland (NW) 46,8
Lithuania (LH) 49,4
Møre og Romsdal (NW) 50,4
Pardubice (CZ) 51,9
Occitanie (FR) 54,4
Zlin (CZ) 56,3
Skåne (SW) 56,8
Design: Jelmer Visser/ @DieTukkerfries. 3th May 2020

Schermafb

…still 10 minutes to go…

- The challenge
- The hidden reasons
- Think across borders
- Roll back CRE

From national statistics…



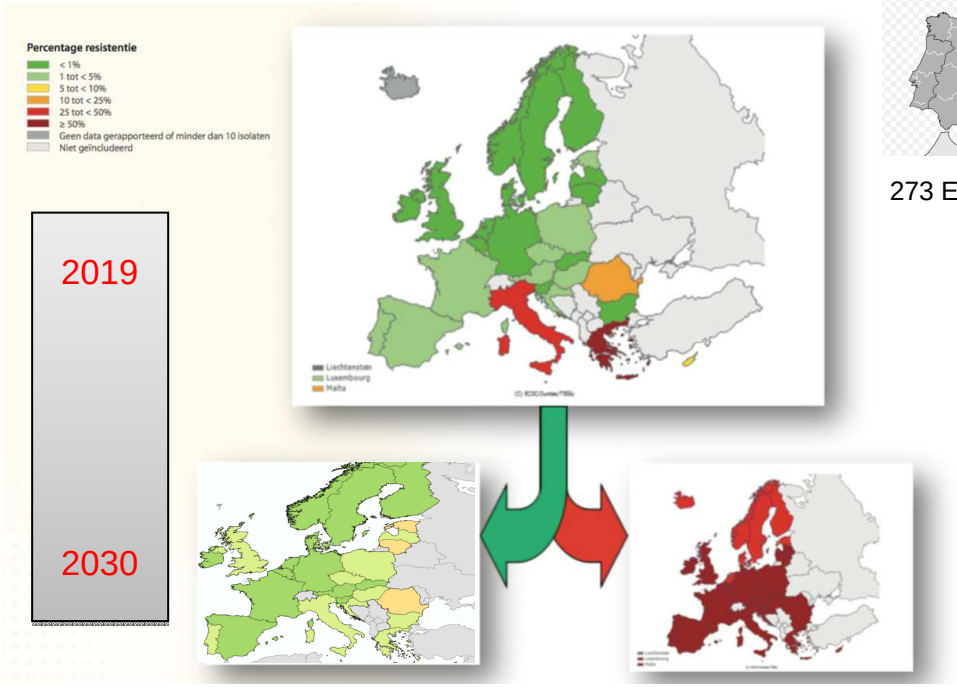
Roll-back MDRO!

…to regional intervention reality!

CRE-free in 2030

- 250 AMR Prevention Regions
- Inter-mural Network-forming
- Regional System-budget
- Inter-regional clustering and collaboration

273 European Prevention Regions (NUTS2)



Prevention-economic model

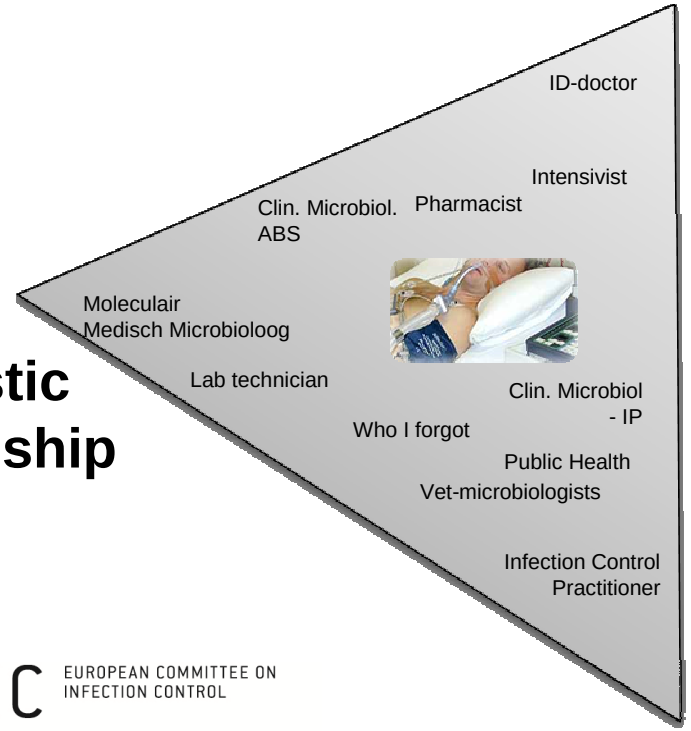
- Integrated cost models for diagnostics within the price of the antibiotics
- Regional prevention budgets (system allowance)

  A financial incentive for rapid diagnostic in acute- care hospitals (Euro-hour-model)

  Prevention-fostering reimbursement following an insurance model, whereby risk behaviour (e.g. high SSI, low hand hygiene) gets risk premium

From competence to meta-competence

Therapy
Antimicrobial Stewardship



Diagnostic Stewardship

Infection Prevention Stewardship

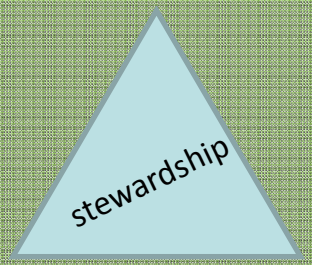
EUCIC EUROPEAN COMMITTEE ON INFECTION CONTROL
European Society of Clinical Microbiology and Infectious Diseases

Dik et al. 2015 Future Microbiology
Zingg et al. 2015 CMI

Meta-competence

To know, how it should be from one profession pointview, is just not enough

antibiotic



Infection prevention

diagnostic

"Every professional can offer an answer to others"

It's all about humblesness

European competence

To know, how it works in one country, is just not enough

"Every country can offer an answer to others"

It's all about curiosity

First cohort

“European Infection Prevention and Control Certificate”

February 2018 – April 2020

36 Trainees from 17 countries are enrolled

Evelina Tacconelli, Verona
EUCIC Chair

Nico T. Mutters, Freiburg
Scientific Coordinator

Alex W. Friedrich, Groningen
Clinical Coordinator

Basic module	• 4 day course covering basic aspects of IPC / fixed dates	1x
Advanced module	• 1-2 day course on various advanced IPC topics / fixed dates / one before ECCMID	6x
Local module	• 1 day course or practical training on special competence in IPC at national level	3x

10x in 2 years

EUCIC general meeting, ECCMID 2018

EUCIC – TRAINING PROGRAM IS ONGOING

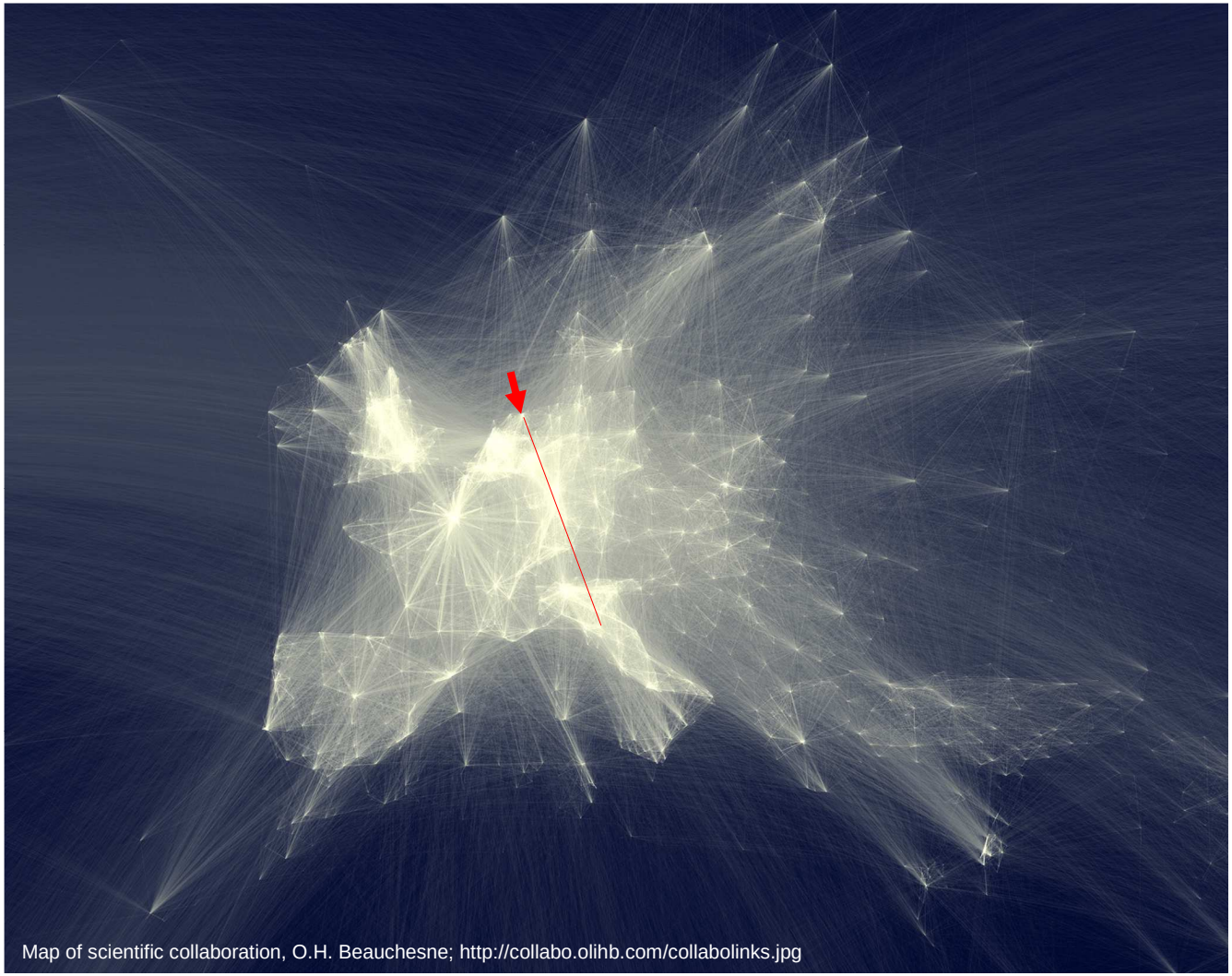
Next EUCIC cohort will start :

Basic course: Postponed to 2021

Basic course 2018-2020

The tipping point

- ❑ Regional reality more important than national data
- ❑ Look at system-related factors
- ❑ Hygiene = Network medicine
- ❑ European meta-competence
- ❑ Connect regions to roll-back AMR



Map of scientific collaboration, O.H. Beauchesne; http://collabo.olihb.com/collabolinks.jpg

Our scientific network is our most resilient weapon against infections

Mille grazie!