Gestion d'une épidémie de BLSE/BHRe : controverse pour/contre l'isolement

Gabriel Birgand

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Gericco - Mars 2025

Qu’est ce que l’isolement?

ou précautions complémentaires contact…

Which strategy?

- **Horizontal approaches:** a broad range of infections
  - Standard precautions (eg, hand hygiene)
  - Antimicrobial stewardship
  - Environmental cleaning and disinfection
  - Universal decolonization (eg, chlorhexidine gluconate bathing)
  - Contact precautions → positive clinical cultures
- **Vertical approaches:** specific pathogens
  - Active surveillance testing → asymptomatic carriers
  - Contact precautions → colonized or infected with specific organisms
  - Decolonization → colonized or infected with specific organisms
  - Cohorting /dedicated staff

Septimus E et al, Infect Control Hosp Epidemiol 2014

Recommandations

- *Staphylococcus aureus* résistant à la méticilline (SARM) **(AF)**
- *Acinetobacter baumannii* résistant à l'imipénème (IPM), **(AF)**
- *Acinetobacter baumannii* ne restant sensible qu'à l'imipénème (IPM), **(AF)**
- entérobactéries productrices de bêtalactamases à spectre étendu (EBLSE), **(AF)**
- entérobactérie hyperproductrice de céphalosporinase en néonatologie, **(AM)**
- *Pseudomonas aeruginosa* avec une résistance à l'imipénème associée à d'autres résistances. **(AM)**

Différence PS vs PCC ?

Précautions standard
- Hygiène des mains - Gants et tablier si contact liquides biologiques - Masque et lunettes si aérosolisation de liquides biologiques

Différence PS vs PCC ?

Précautions standard	*Précautions complémentaires contact*
- Hygiène des mains - Gants et tablier si contact liquides biologiques - Masque et lunettes si aérosolisation de liquides biologiques	- Hygiène des mains - Gants et tablier si contact liquides biologiques + contact environnement proche du patient - Masque et lunettes si aérosolisation de liquides biologiques - Chambre seule - Organisation des soins - Dépistage (épidémie)

Bactéries Hautement Résistantes Emergentes (BHRe)

HCSP, juillet 2013

Quelles mesures?

- ERV, EPC (+/- *A. baumannii réa*)
- Risque des patients rapatrié (& hospitalisé dans l'année)
- Cas : PCC Strict + dépistage prolongé
- Parfois regroupt/cohorting
- Contacts : dépistage extensif
- Importance des précautions standard
- Mesures Flexible adaptées aux situations
- Management coordonné

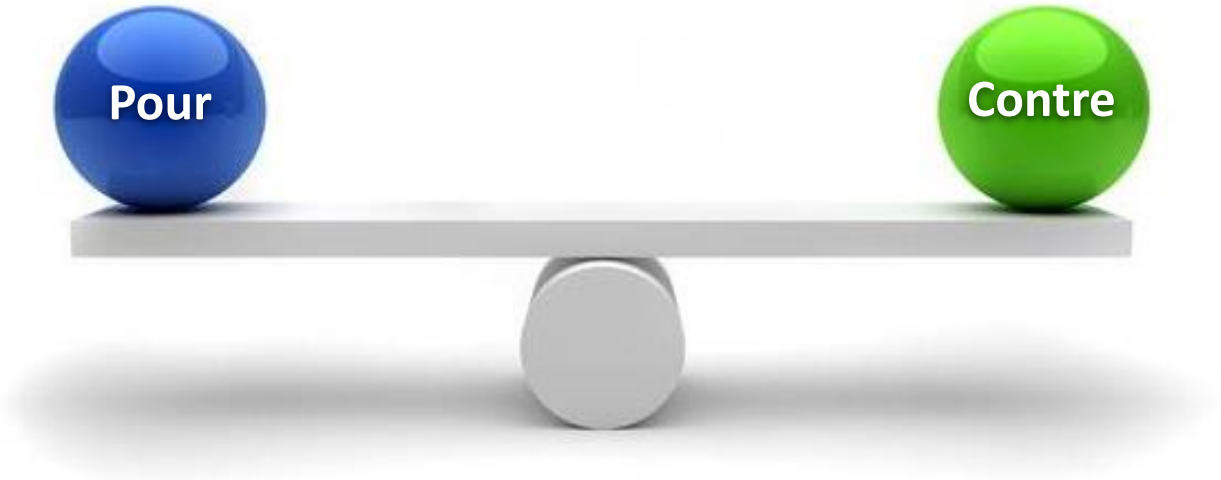
Pourquoi ces mesures ?

- Chambre individuelle ?
- Port systématique de gants et de tablier ?
- Intérêt de l'affichette ?

- **Maîtrise de l'environnement**
- **Réduire le risque de transmission**
- **Sensibiliser les soignants**

Cohorting avec personnel dédié

Pour ou contre l'isolement ?



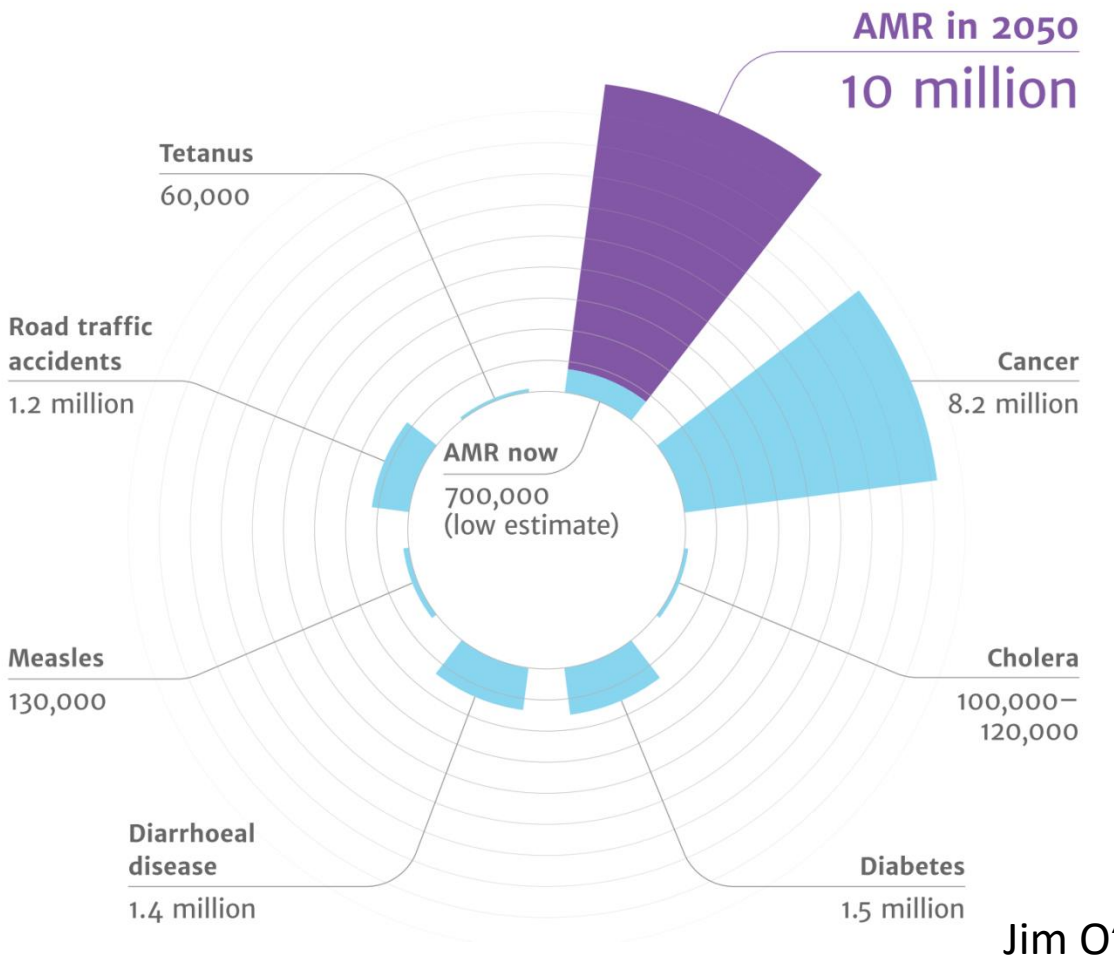
Fardeau de l’antibiorésistance

Imperial College London

Public Health England

By 2050, the death toll could be a staggering
one person every three seconds
if AMR is not tackled now.

Bacteria that already show concerning resistance levels	Broader public health issues for which resistance is a concern
Klebsiella pneumonia	HIV
Escherichia coli (E. coli)	Tuberculosis (TB)
Staphylococcus aureus	Malaria

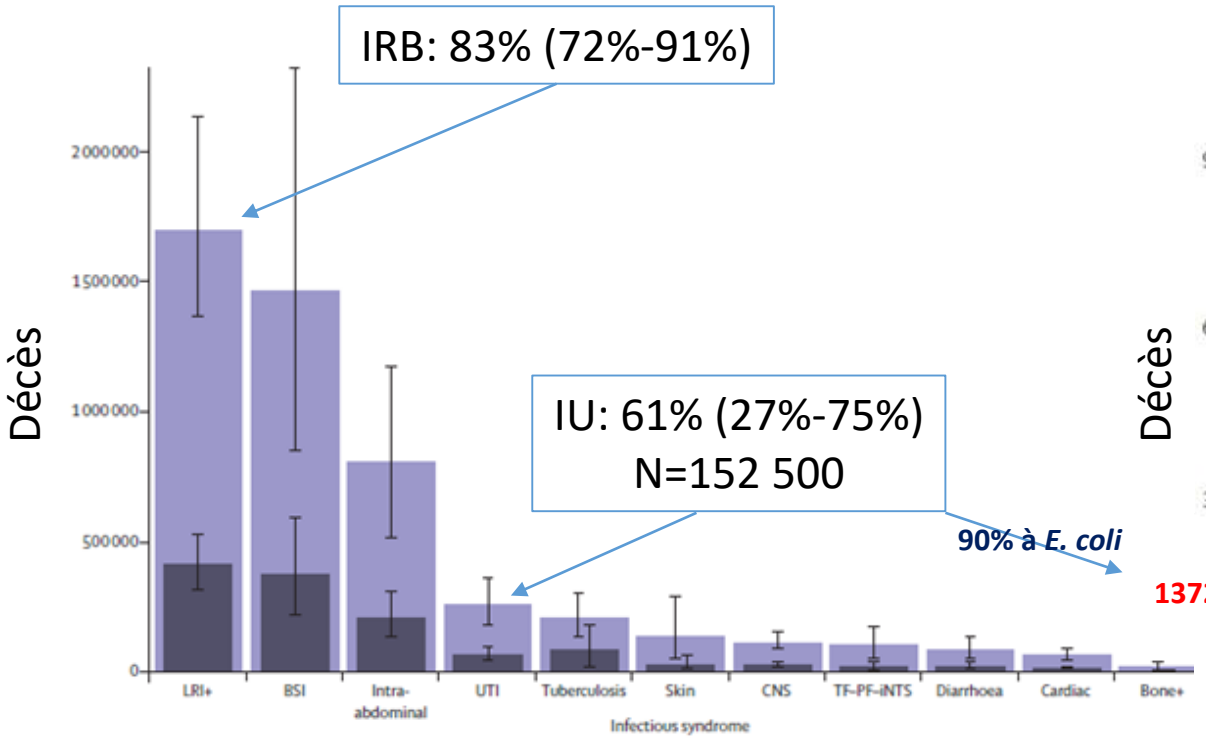


Jim O'Neill et al, May 2016

Epidémiologie de la Résistances

Données mondiales 2019 – Global burden

% estimé d'infections d'origine communautaire

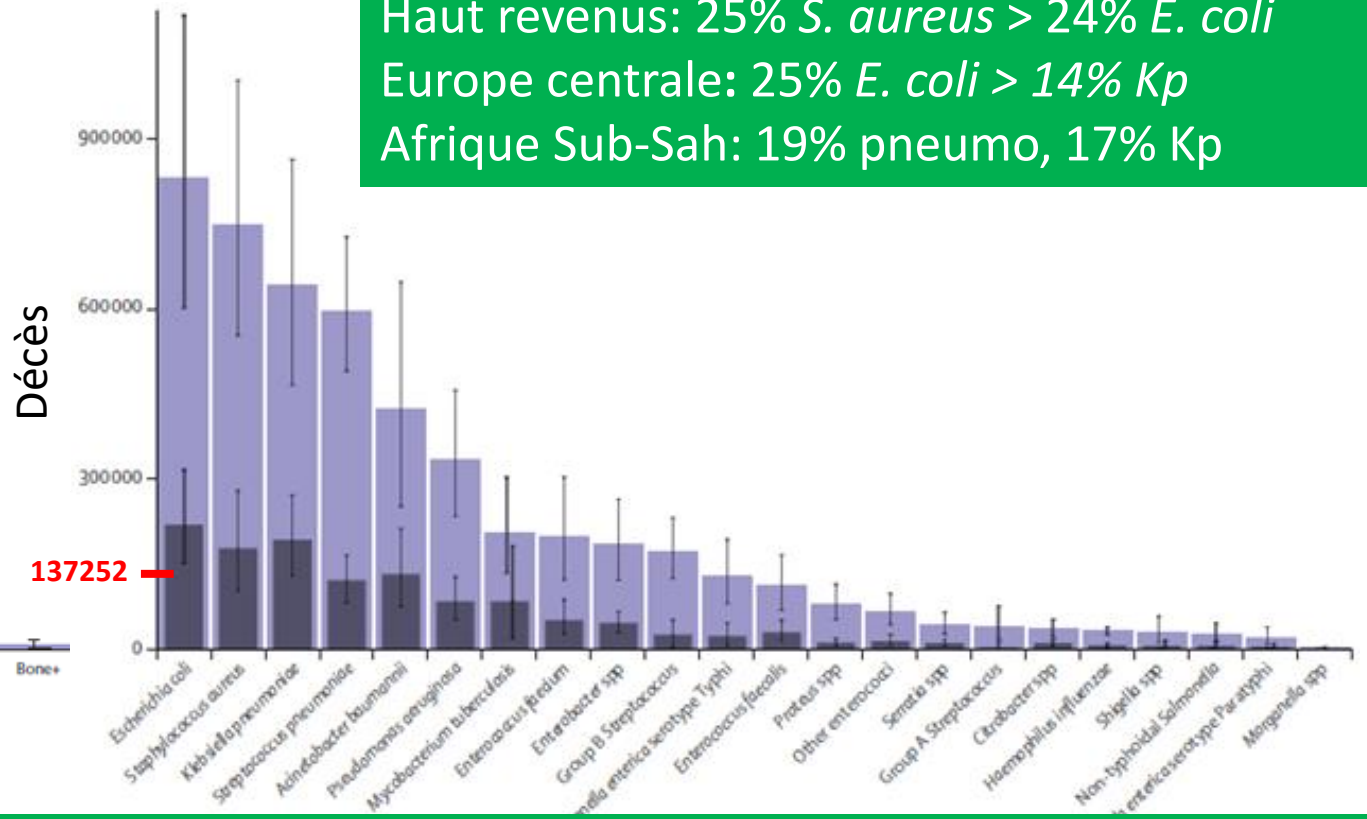


% des décès associés à RATB

Haut revenus: 25% *S. aureus* > 24% *E. coli*

Europe centrale**:** 25% *E. coli* > *14% Kp*

Afrique Sub-Sah: 19% pneumo, 17% Kp

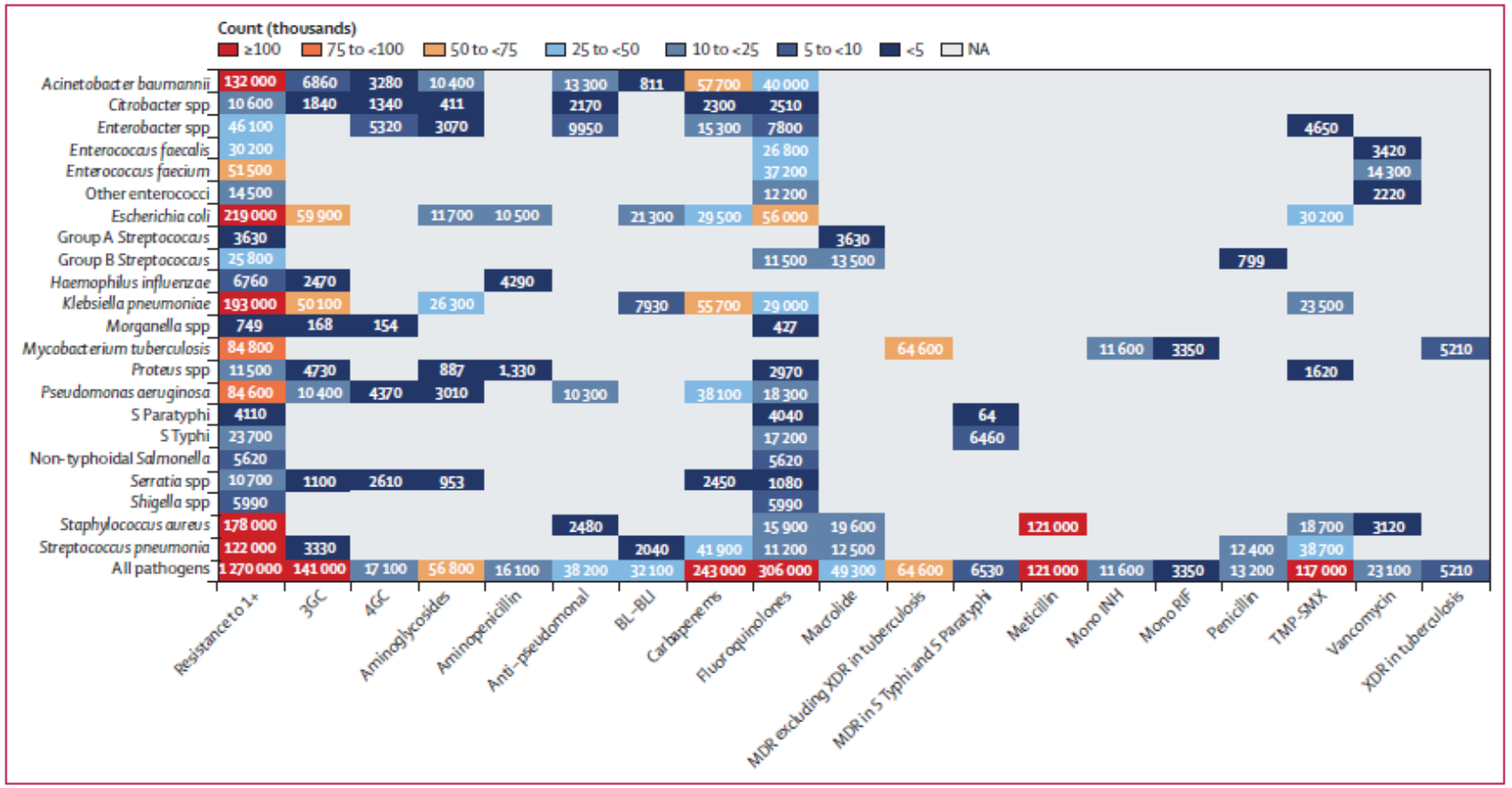


Antimicrobial Resistance Collaborators Lancet
https://doi.org/10.1016/S0140-6736(21)02724-0

Si les infections à Bact-R étaient remplacées par des Bact-S, 1·27 million de décès auraient été prévenus en 2019, 12ème devant VIH et Malaria

Epidémiologie de la Résistances

Données mondiales 2019 – Global burden



- **SARM:** >100 000 décès et 3·5 million DALYs attributable
- **6 combinations** causent entre 50 000 et 100 000 décès attribuables à la resistance :
  - Tuberculose MDR
  - *E coli* C3G-R
  - Ab-RI
  - *K pneumonia* FQ-R
  - *K pneumoniae* C3G-R

Resistance à FQ et β-lactamines pour **plus de 70% des décès attributable** à la RATB tous pathogènes confondus

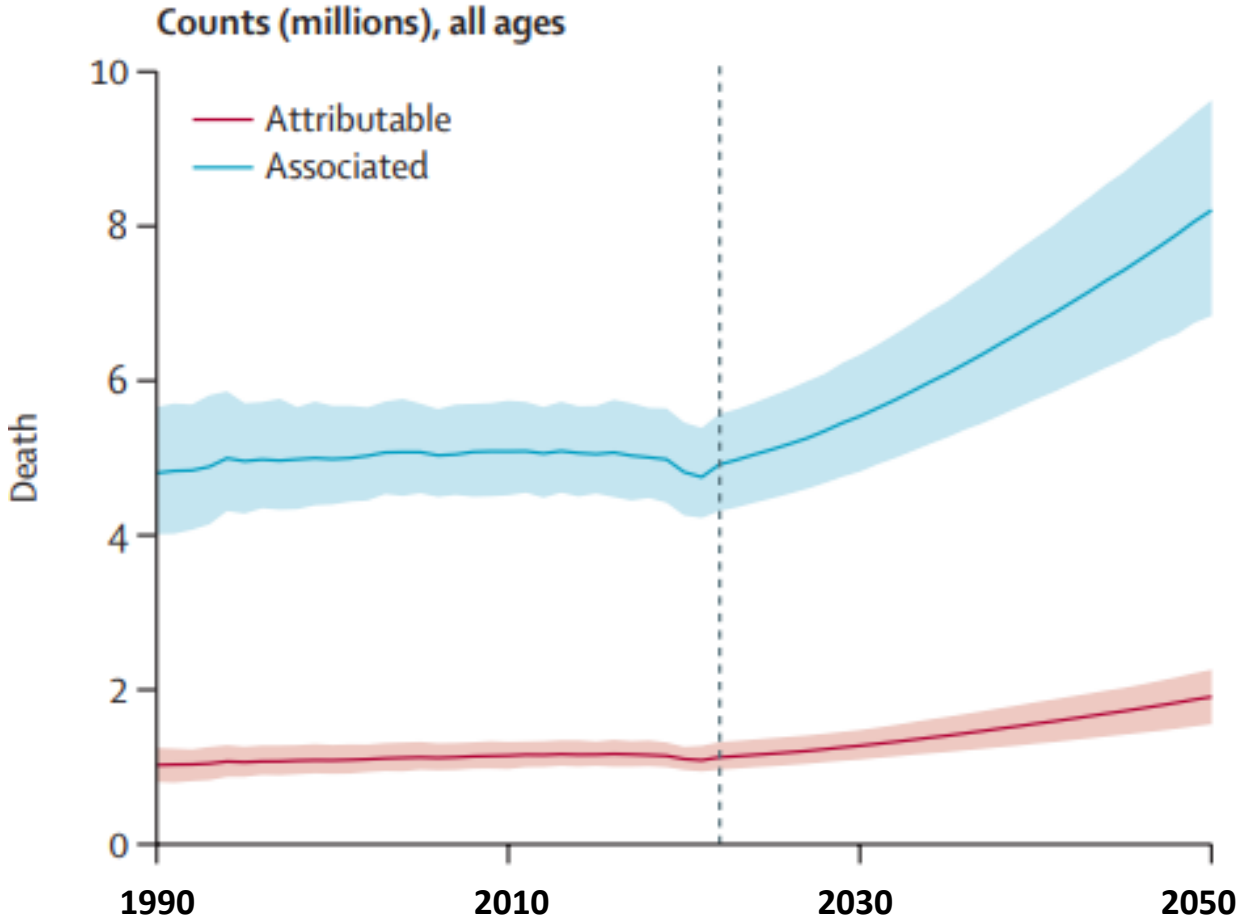
Antimicrobial Resistance Collaborators Lancet
https://doi.org/10.1016/S0140-6736(21)02724-0

THE LANCET

Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050

Carbapenems resistant Gram-negative bacteria from 1990 to 2021, increased more than any other antibiotic class:

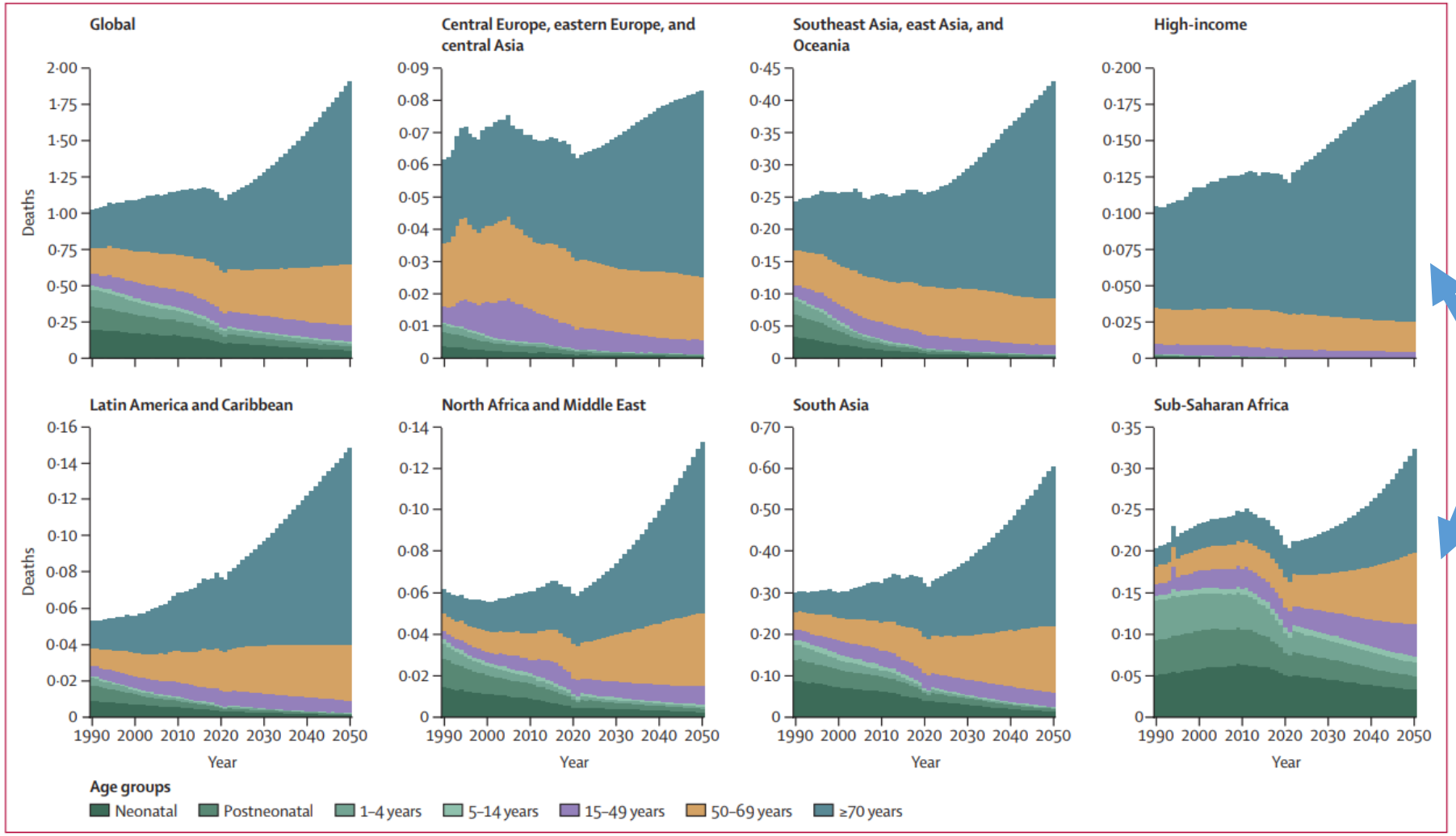
CR-GNB	1990	2021
Associated deaths	619000 (+/- 214000)	1·03 million (+/- 121000)
Attributable deaths	127 000 (+/- 45000)	216 000 (+/- 48000)



Lancet 2024; 404: 1199–226

THE LANCET

Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050



Des évolutions très contrastées en fonction des classes d'age et des regions du monde

Lancet 2024; 404: 1199–226

THE LANCET

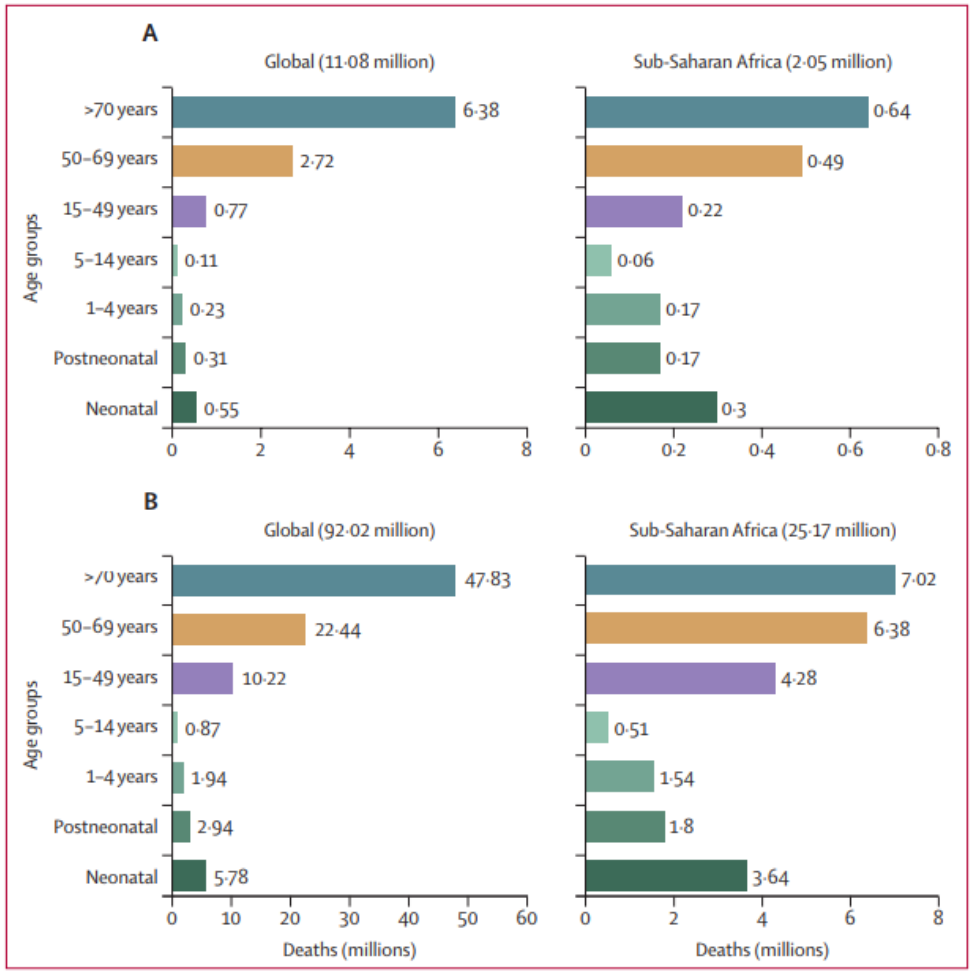
Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050

Test de deux scenario pour contrôler l'évolution

Scenario A: Développement régulier d'ATB visant en particulier les BGN (Gram-neg scenario)

Vs

Scenario B: Amélioration générale des systemes de santé avec **meilleure prise en charge** des sepsis et amelioration de la disponibilité des antibiotiques (Better care scenario)



8x plus efficace et c'est particulièrement vrai pour les LMICs

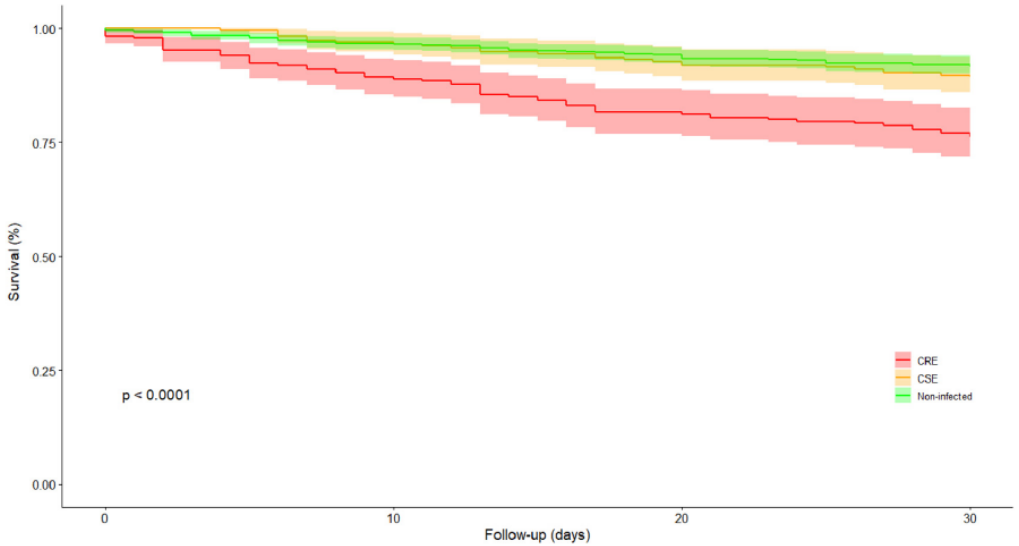
Lancet 2024; 404: 1199–226

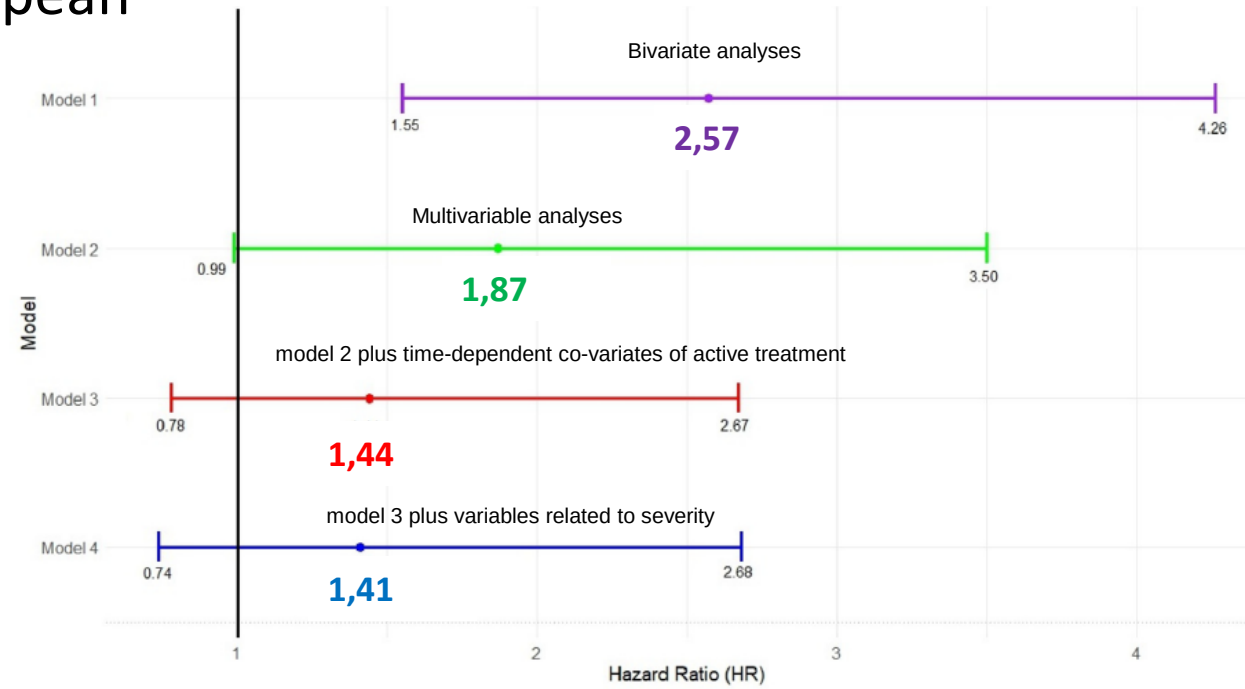
Attributable mortality of infections caused by CRE

A prospective matched-cohorts study in 50 European hospitals from March 2016 to November 2018

- Matching criteria: type of infection, ward, duration to detection
- Multivariable and stratified Cox regression

Infections	235 CRE	235 CSE	705 No
E.coli	7 (3.0)	113 (48.5)	-
Klebsiella spp	208 (88.5)	74 (31.4)	-
30-day mortality	24%	11%	8%



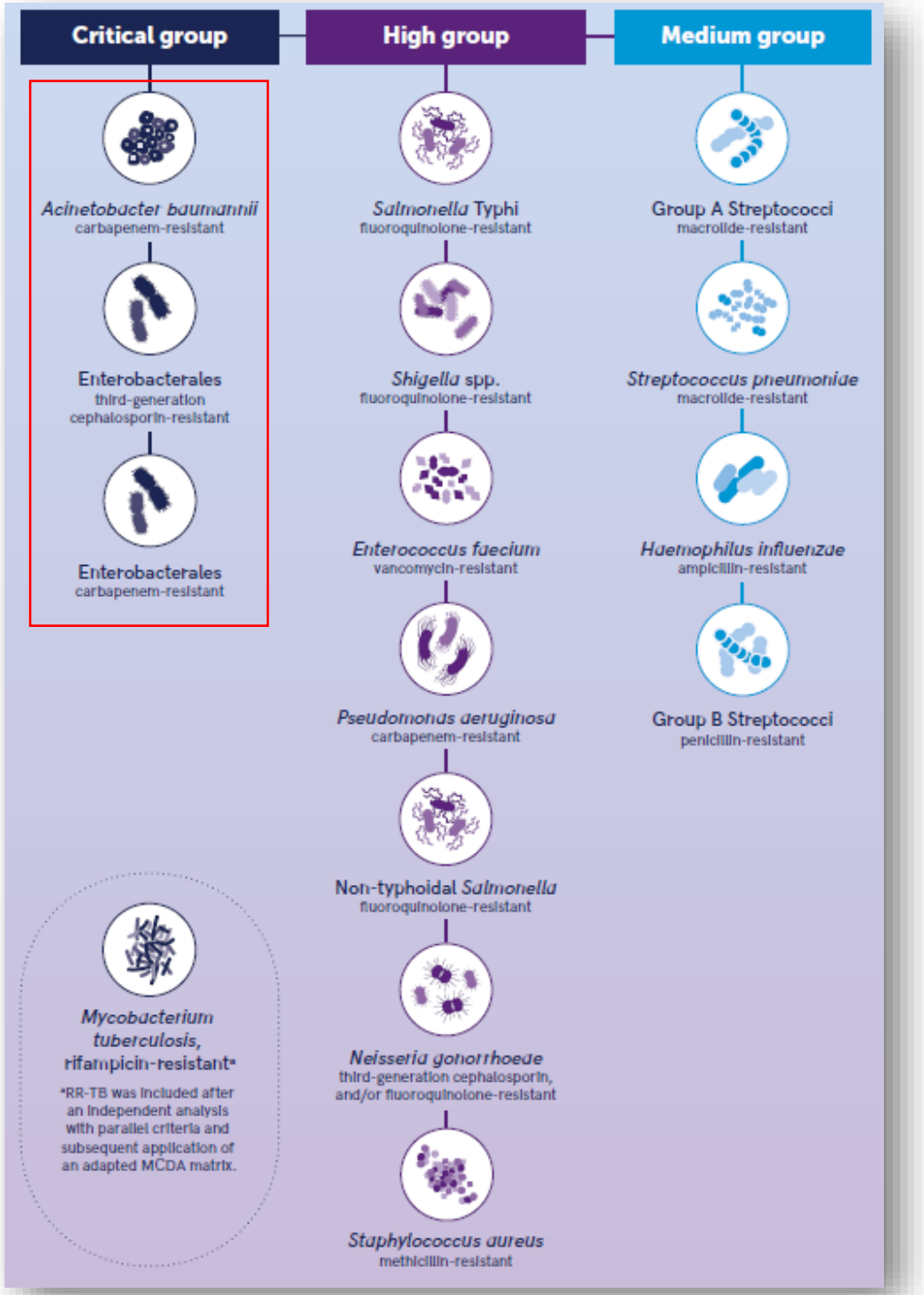


- CRE infections associated with significant attributable mortality and increased adjusted hazard of mortality compared with CSE infections or patients without infection
- Underlying patient characteristics and a delay in appropriate treatment play an important role in the CRE mortality

Clinical Microbiology and Infection 30 (2024) 223e230

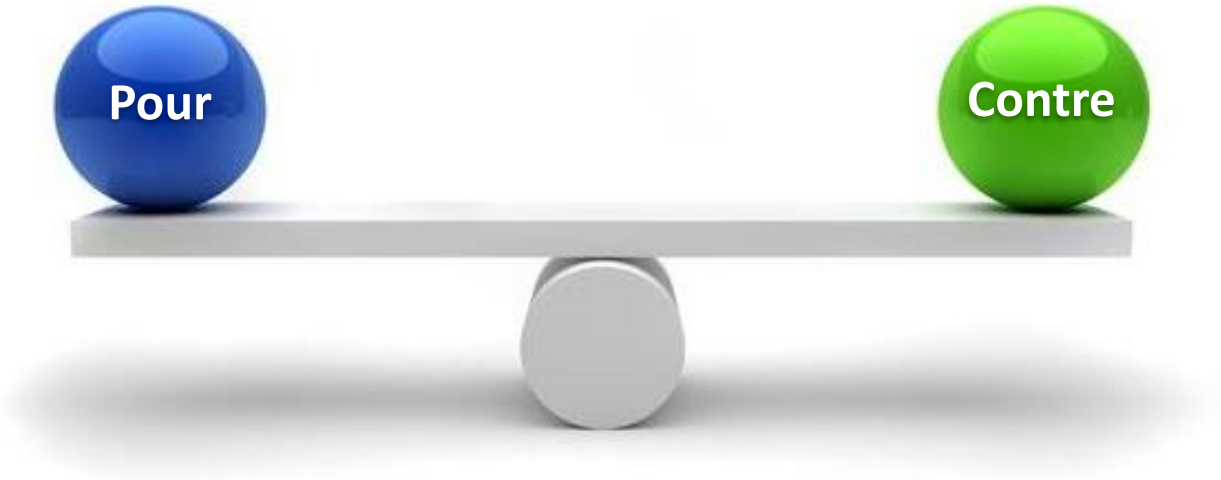
WHO Bacterial Priority Pathogens List, 2024

Priority for R&D and for public health measures.



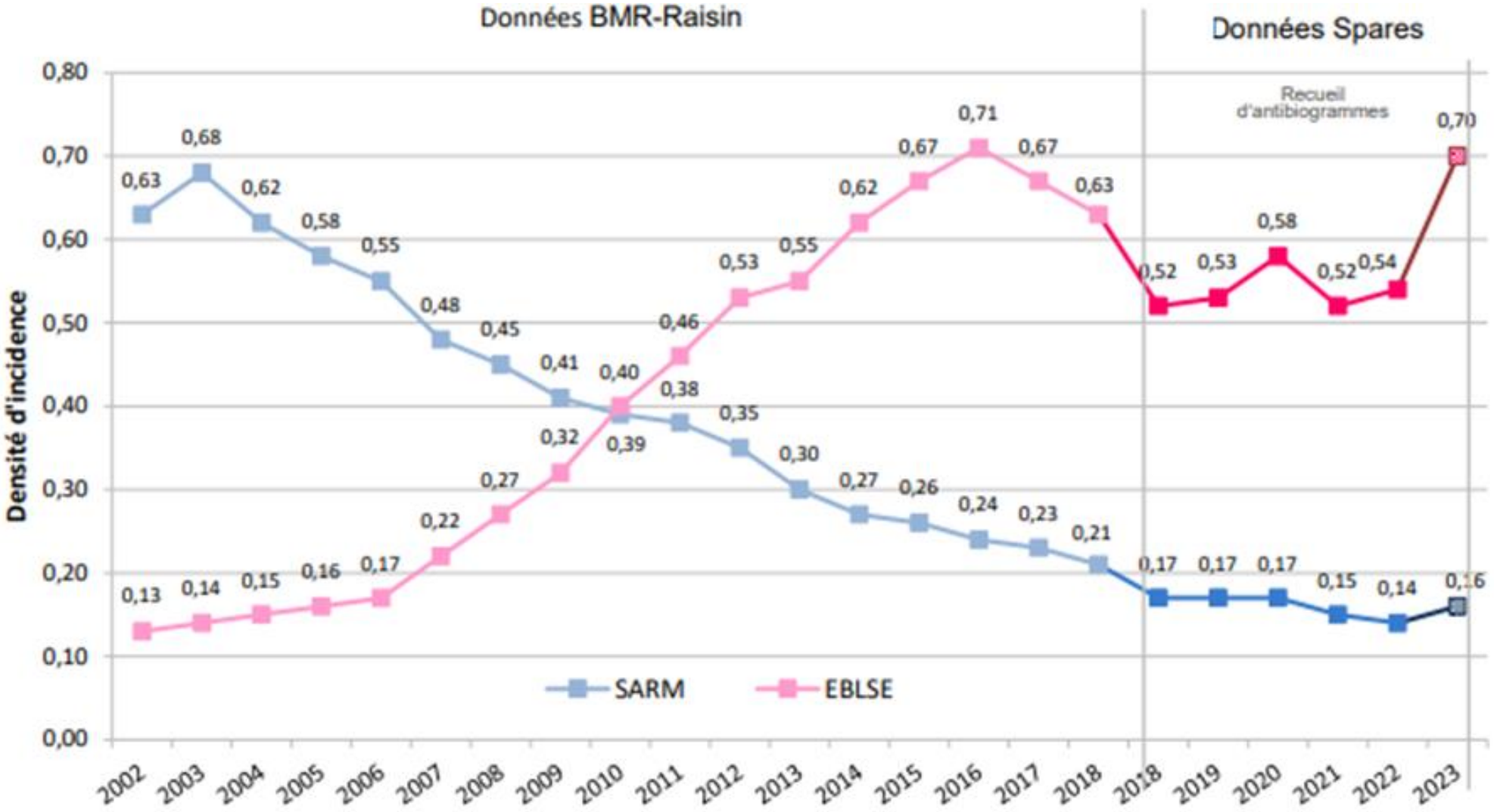
Pour ou contre l'isolement ?

Fardeau de la RATB



Evolution de l’épidémiologie hospitalière

Epidémiologie hospitalière en France



SPARES 2024

Epidémiologie hospitalière en France

CHU Avicennes

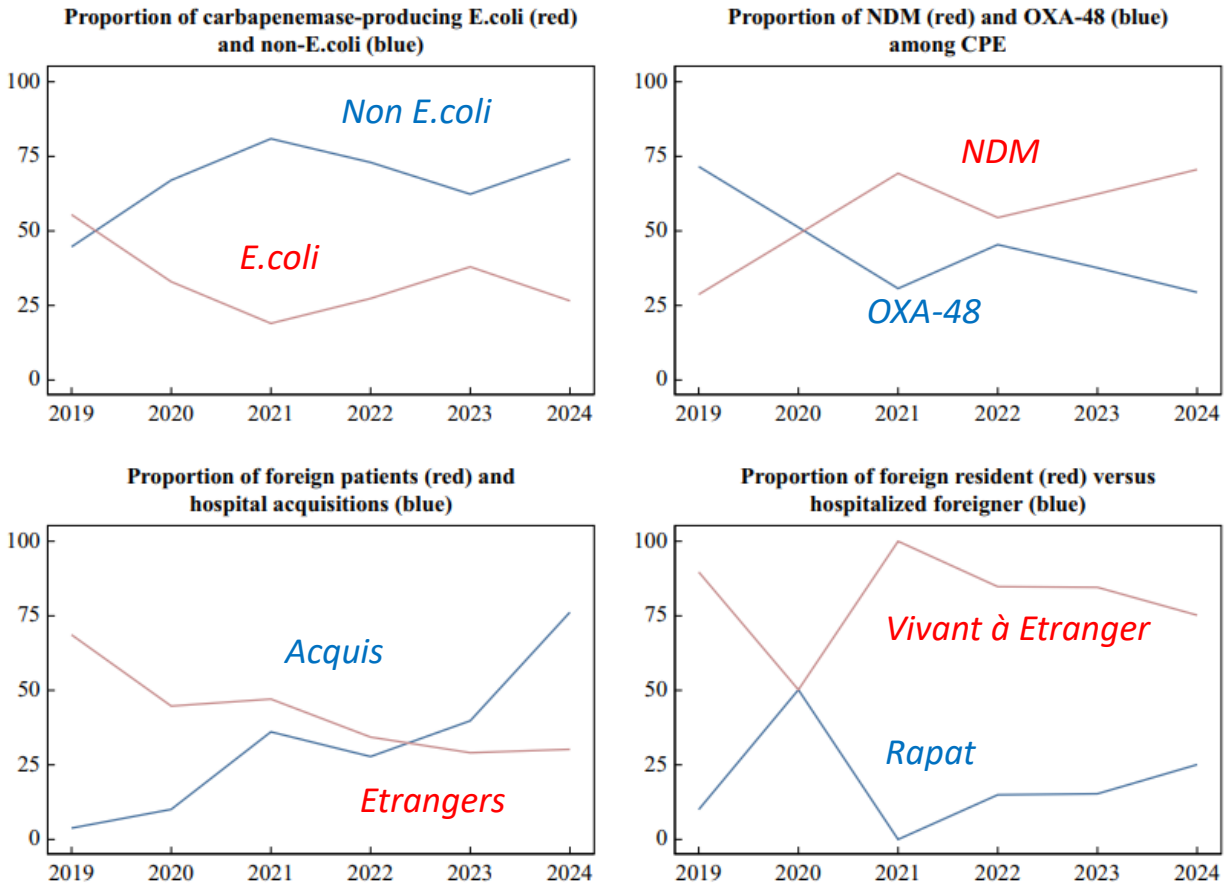
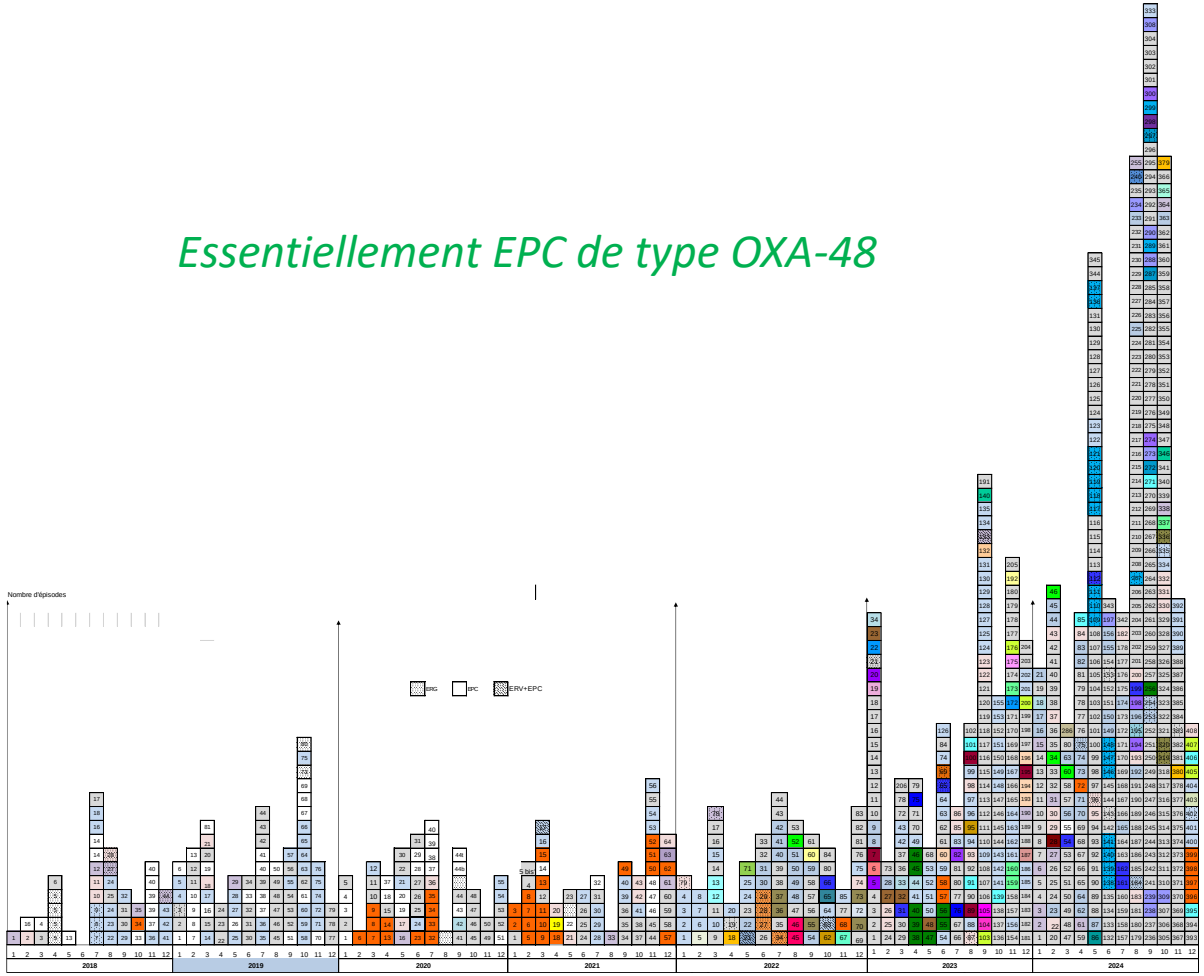


Figure 1. Main changes in carbapenemase-producing Enterobacterales between 2019 and 2024. *E. coli*, *Escherichia coli*.

R. Eid JHI 2024

En Pays de la Loire…

Essentiellement EPC de type OXA-48

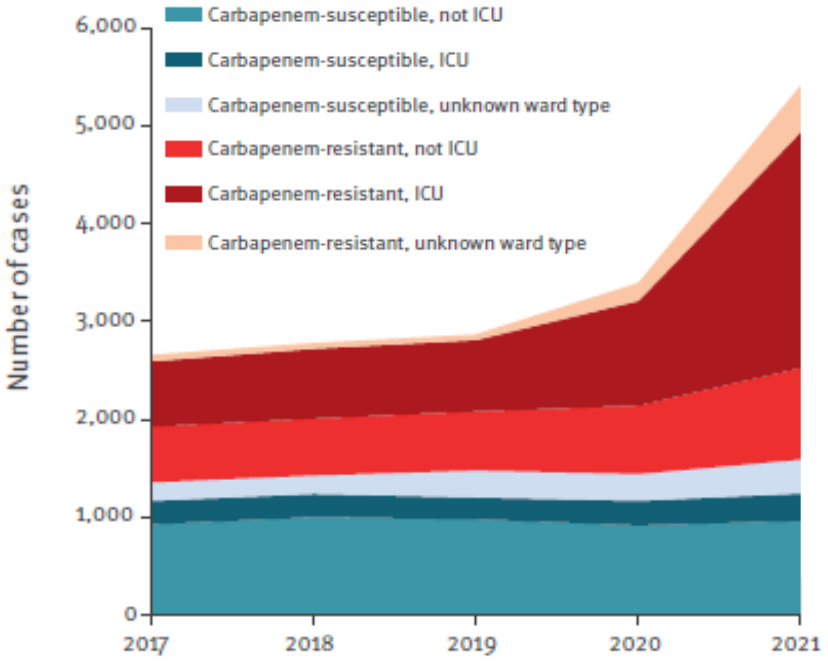


2018 2024

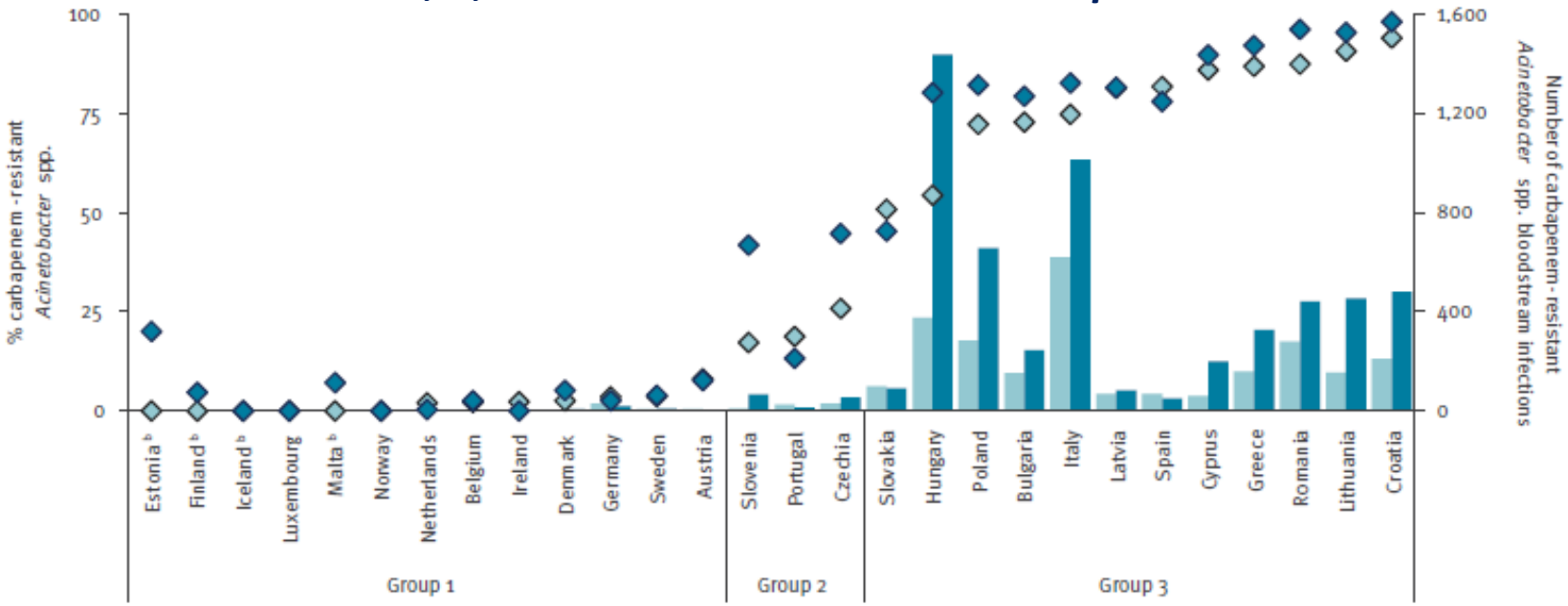
Large increase in bloodstream infections with carbapenem-resistant *Acinetobacter* species during the first 2 years of the COVID-19 pandemic, EU/EEA, 2020 and 2021

- BSIs with Acinetobacter spp. with carbapenem (imipenem and/or meropenem) antimicrobial susceptibility testing results in 2017 to 2021
  - 255 of 826 laboratories reporting, on average, per year

***Acinetobacter species* BSI**



%, n, of BSI with CR-*Acinetobacter species*

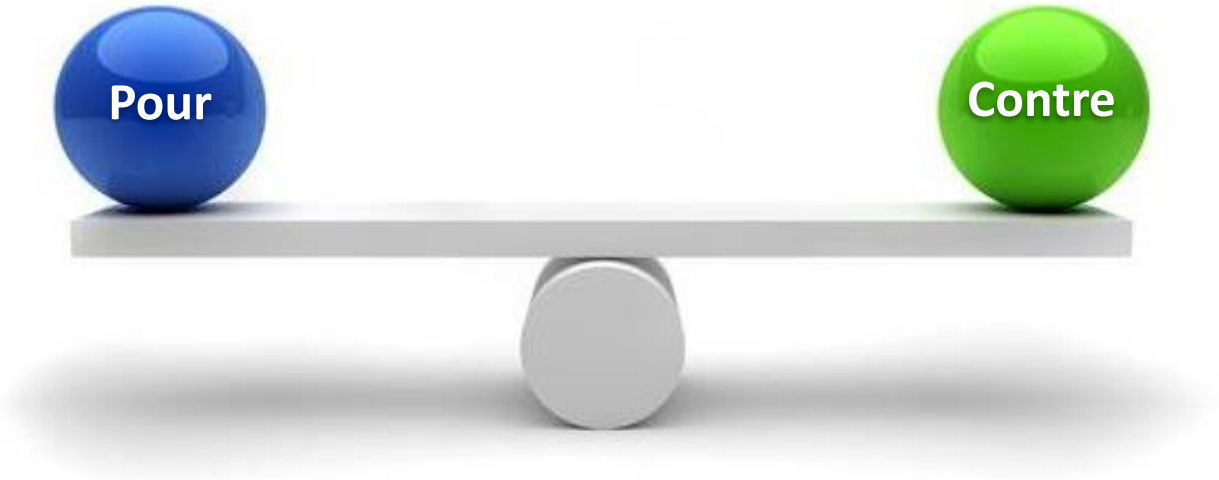


The large increase in carbapenem-resistant Acinetobacter spp. BSI in the EU/EEA during COVID-19

Pete Kinross Eurosurv 2022

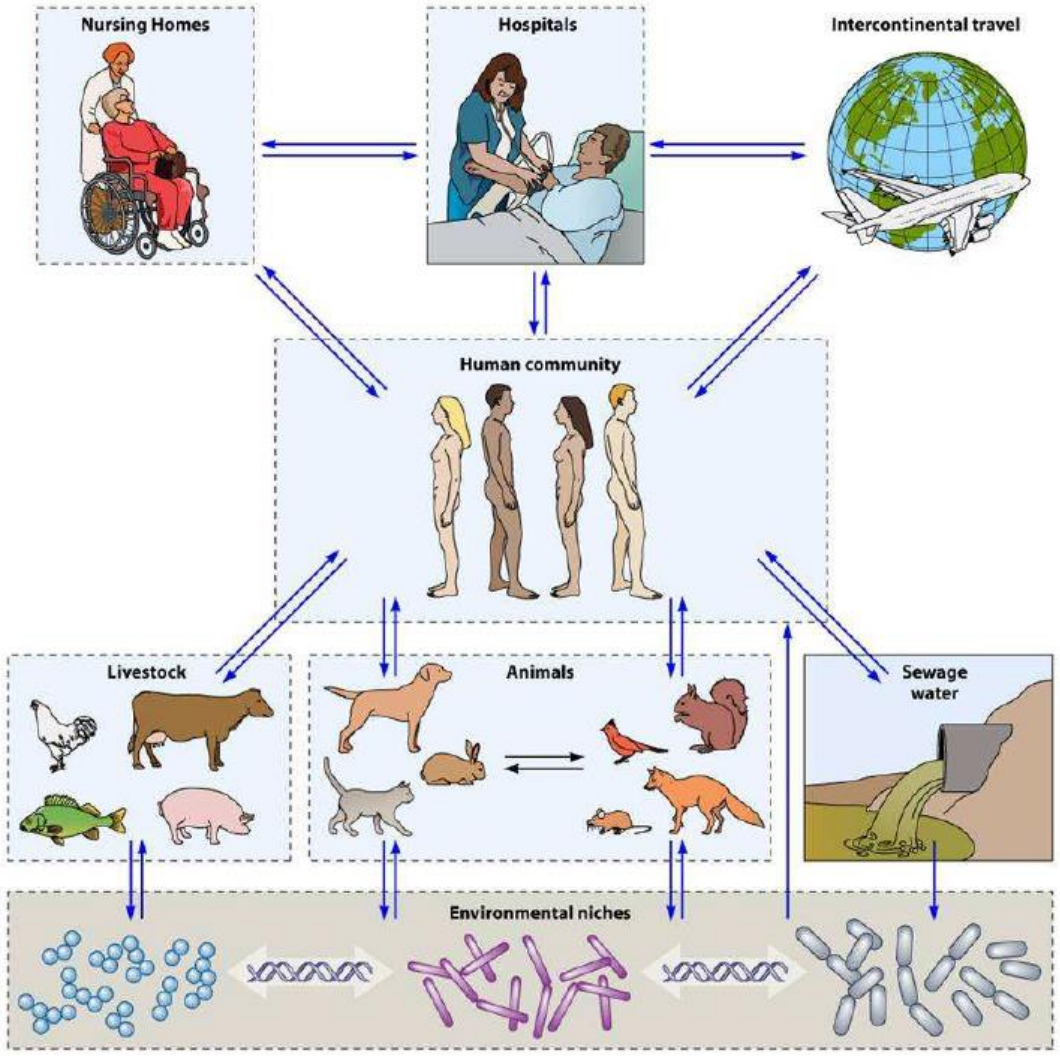
Pour ou contre l'isolement ?

Epidémiologie hospitalière
Fardeau de la RATB

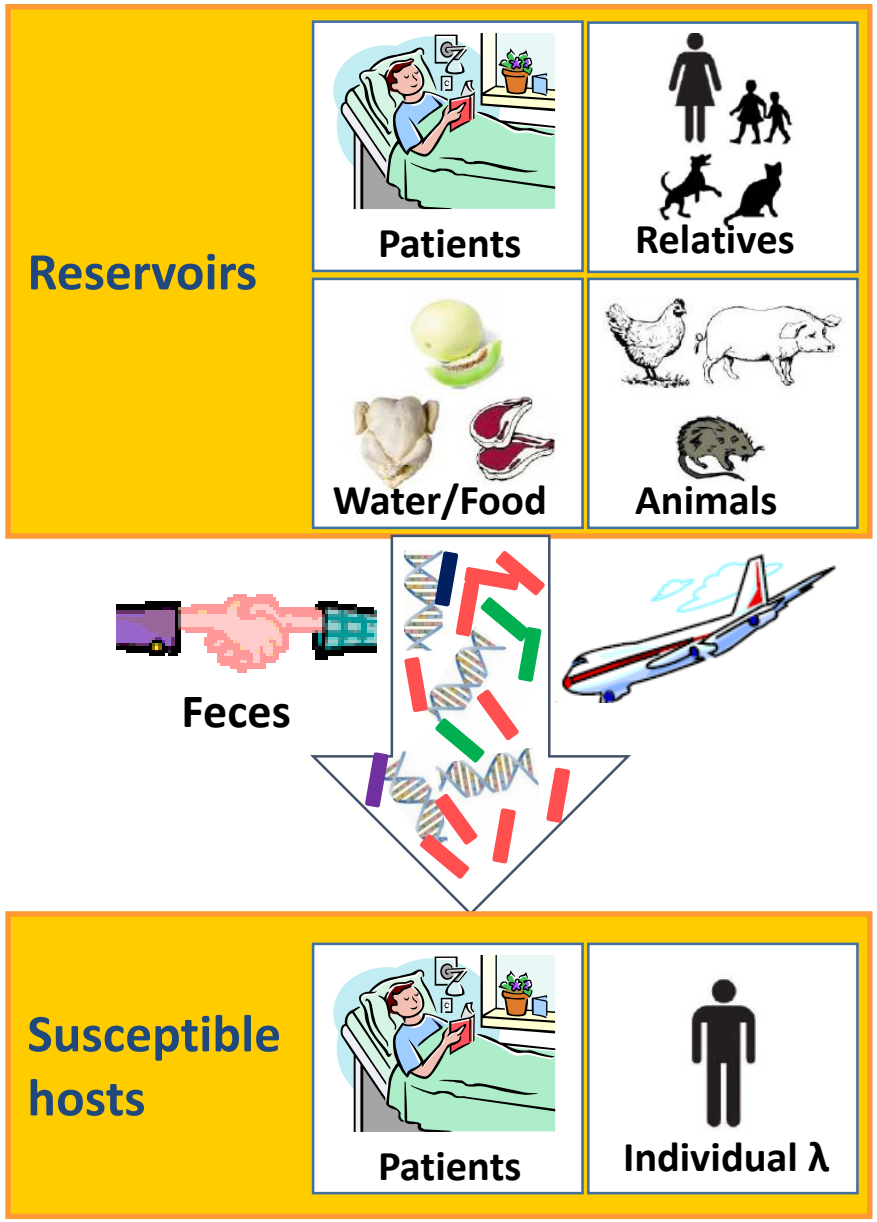


Un réservoir majeur, continu et évolutif

Epidémiologie des E-BLSE



PL Woerther CMR 2013



Réservoir E-BLSE

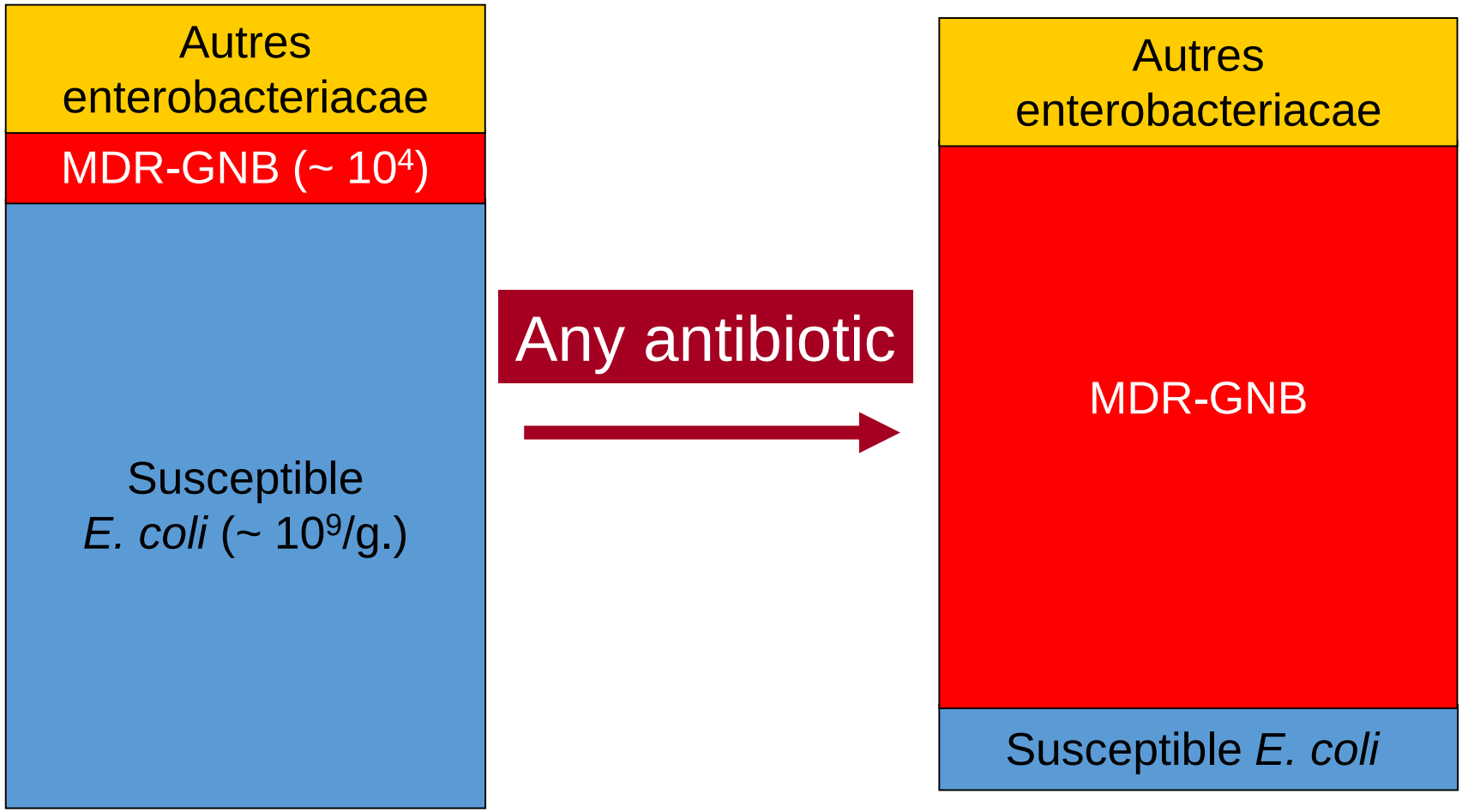
Extretas (feces et urines) = reservoir majeur

- ~ 10^{10} EBLSE produit dans les selles par jour par porteur
- ~ 10^{9} EBLSE dans les urines d'un patient colonisé ou infecté
- ~ 10^{7} bacteries sur la peau

Peau

Lepainteur, Journal of Hospital Infection, Volume 91, Issue 4, December 2015, Pages 346-350

Antibiotiques & EBLSE



Toutes les *Enterobacterales* ne se valent pas…

- CHU de Bale, 1999-2011, 324 patients EBLSE+
  - 93 patients porteurs, 133 contacts (voisins de chambre > 24h)
  - 2 transmissions certaines (*K.pneumoniae*), 5 possibles

Tschudin-Sutter, CID 2012

- CHU de Berne, 2008-2010

	Index	Expo	Acquisitions	PCC	Incidence
E. coli	40	88	4	25%	5.6/1000 j.
K. pneumoniae	8	24	2	78%	13.8/1000 j.

Hilty M, CID 2012

Transmissibilité des EBLSE en Réa

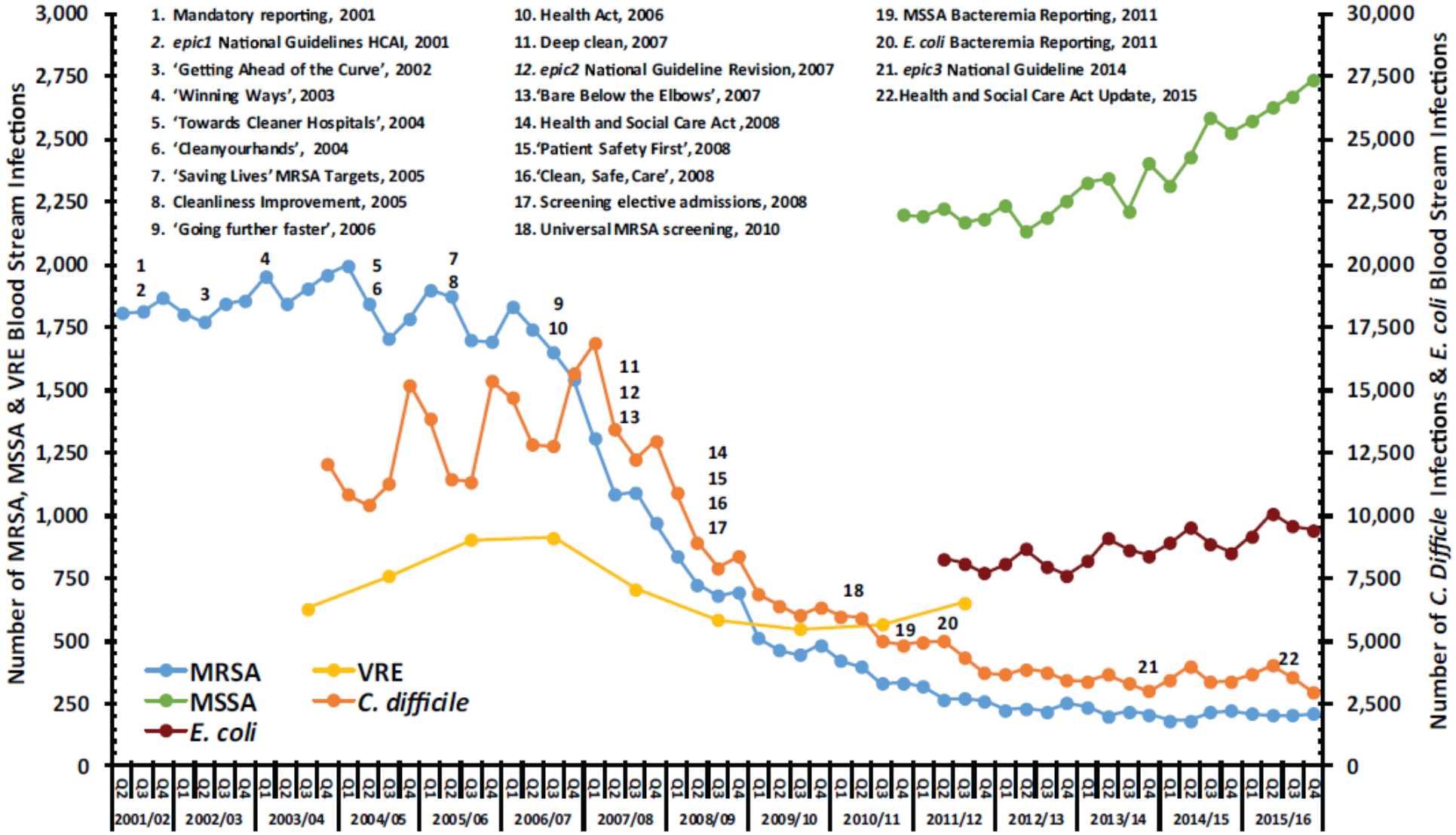
- Objectif: Estimer la capacité de transmission des *E. coli* et non-*E. coli* *Enterobacteriaceae* en réanimation
- Données: MOSAR-ICU trial, 13 Réa 8 European countries 2008-2011
- Dépistage: à admission + deux x par semaine (écouv perianal)

11,420 patients	*E. coli*	non-EcE
Admission prevalence	3.3%	3.8%
Acquisition	2.6%	7.4%
Reproduction numbers	0.047 (0.018-0.098)	0.17 (0.094-0.29)
Global relative cross transmission	3.7 (1.4-11.3)	

Selon ces résultats, ESBL-non *E.coli* était 3.7 plus transmissible que ESBL *E.coli*

Gurieva CID 2017

Evolution en Angleterre



Jonathan D. Edgeworth CID 2020

Durée de portage des EPC

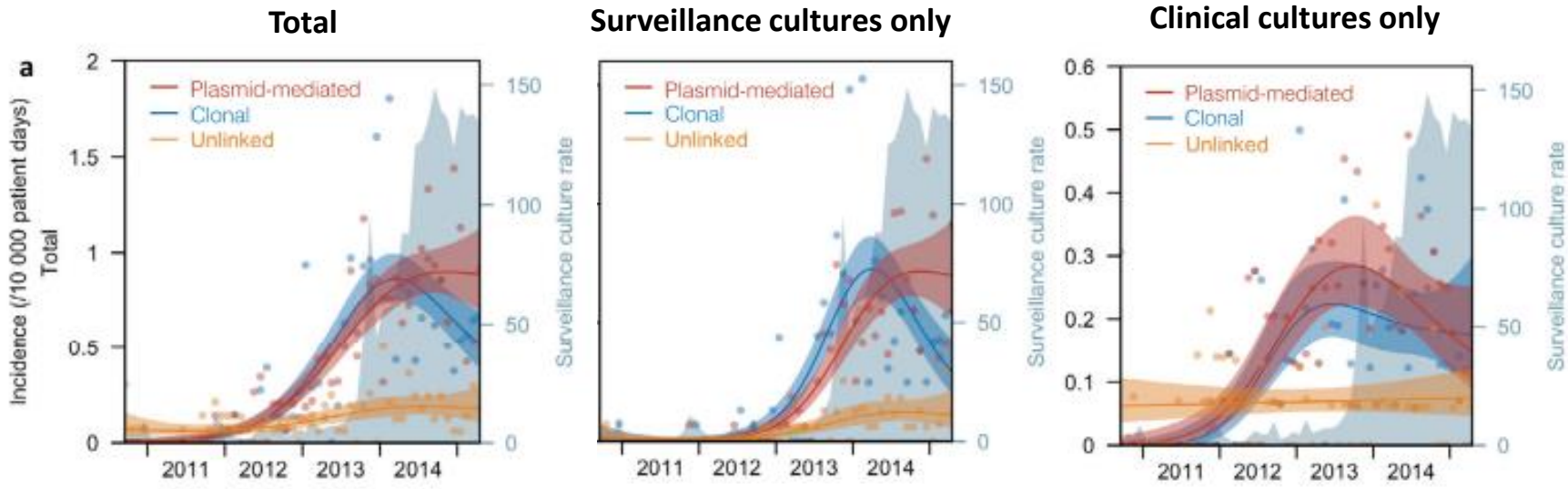
Ref	Methods	Results
Bar-Yoseph JAC 2016	Systematic review n=37 CRE/ESBL colonization	77% (69%-83%) at 1 month, **35% (28%-43%) at 12 months**
Loukili JHI 2023	n=100, 3 CPE-negative rectal swab	**24.5% CPE-clearance, Median time = 698 days.**
Jimenez, AJIC 2021	n=75, 2 negative rectal swab	33% CPE-clearance, Median time = 80 days (Range, 16-457).
Farfour, JHI 2020	n=131 VRE or CPE	50.8% relapsed within a median delay of 15 days (7-60) after neg
Evain, JHI 2019	n=114	**86.3% at first hospital readmission**
Kim, ICHE 2015	n=65, 3 CPE-negative rectal swab	14% CPE-clearance at hosp. discharge, Median time = 27 (23–79) days
Lim, CMI 2018	n=147, 3 CPE-negative rectal swab	11.3% NDM-1 cleared hosp. discharge, Median time = 27 days (24-38)
Feldman, CMI 2013	n=125, 2 CPE-negative rectal swab	52% CPE-clearance
Zimmerman AJIC 2013	n=97, 1 CPE-negative rectal swab	37/97 cleared, Mean time =387 days (312-463)
Ben-David, CID 2021	N=6101, 2 rectal cultures negative +PCR	14.5% completed clearance testing
Yin Mo EID 2020	weekly for 4 weeks, monthly for 5 months, bimonthly for 6 months	**21 CPE carriers for »1 year, Median time = 86 days**; probability of decolonization in 1 year = 98.5%,

Heterogenity in methods and results depending on the time and number of screening performed,
Up to 1/3 of patients still colonised at 1 year

Epidémiologie des E-BLSE / EPC

- Retrospective cohort study over 4.7 years involving all multi-disciplinary public hospitals in Singapore

- 779 patients who acquired CPE (1215 CPE isolates)
- 42% putative clonal transmission
- 45% putative plasmid-mediated transmission
- 13% unlinked

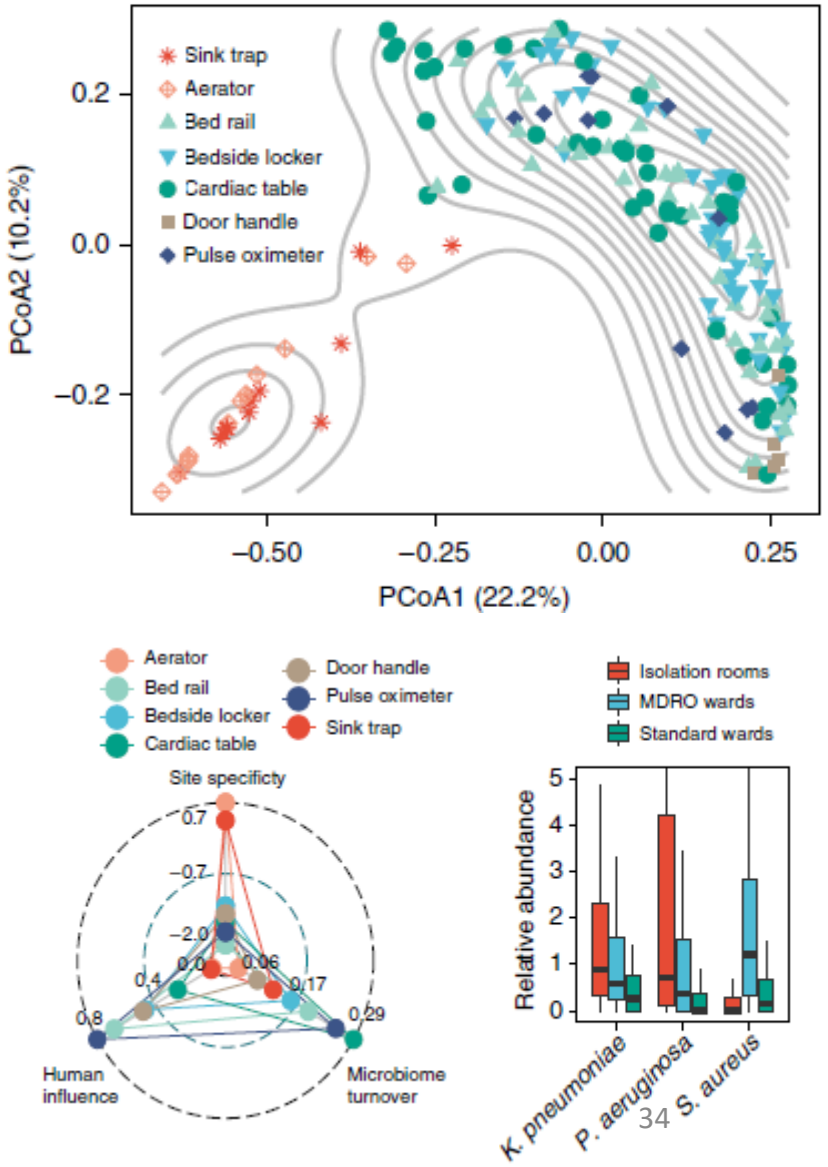


- Indirect ward and hospital contact were identified as independent risk factors associated with clonal transmission
- undetected CPE reservoirs continue to evade hospital infection prevention measures.
- New measures are needed to address plasmid-mediated transmission, which accounted for 50% of CPE dissemination.

Kalisvar Marimuthu Nature Com 2022

Hospital as a reservoir of microorganisms

- Hospital's infrastructure/architecture influence HAI
  - Single room designs, sink, ergonomics, temperature, humidity, and the indoor ventilation system
- Distinct ecological niches for opportunistic, nosocomial pathogens and ARGs
  - Microbes persist in hospitals for extended periods (>8 years), to opportunistically infect patients
  - Significant **uncharacterized diversity of microbes** and ARG combinations
  - Fertile ground for the **evolution of ARG** combinations
  - High prevalence of ARGs plasmids enabling gene transfer across species

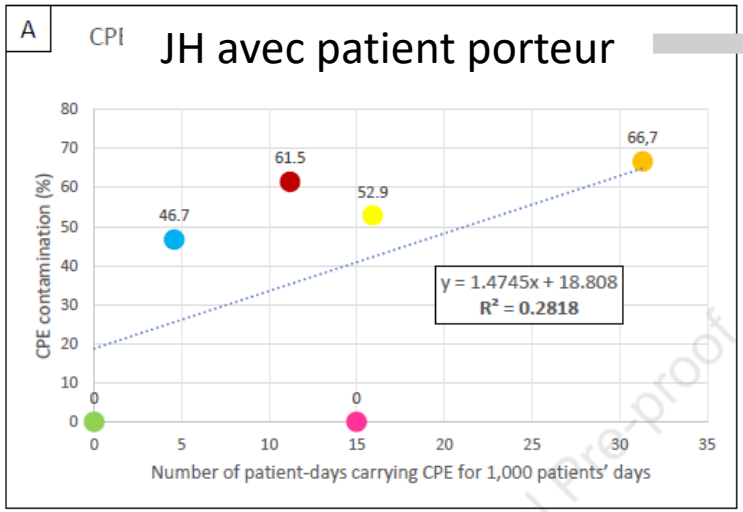


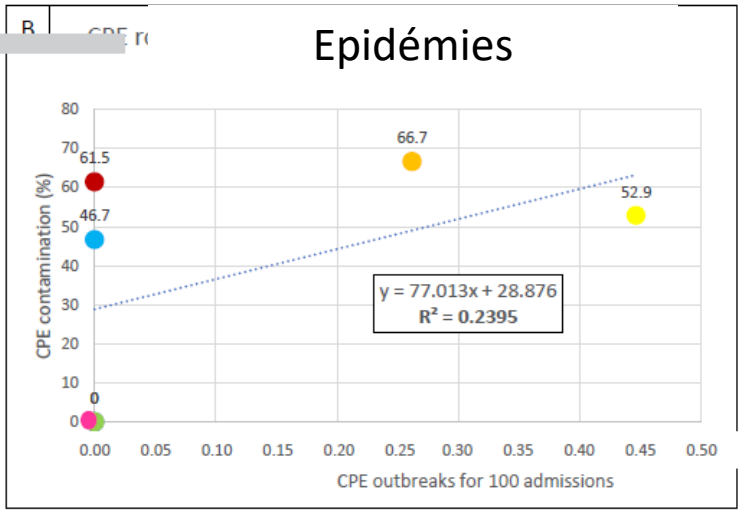
Kern Rei Chng Nature Medicine | VOL 26 | June 2020 | 941–951

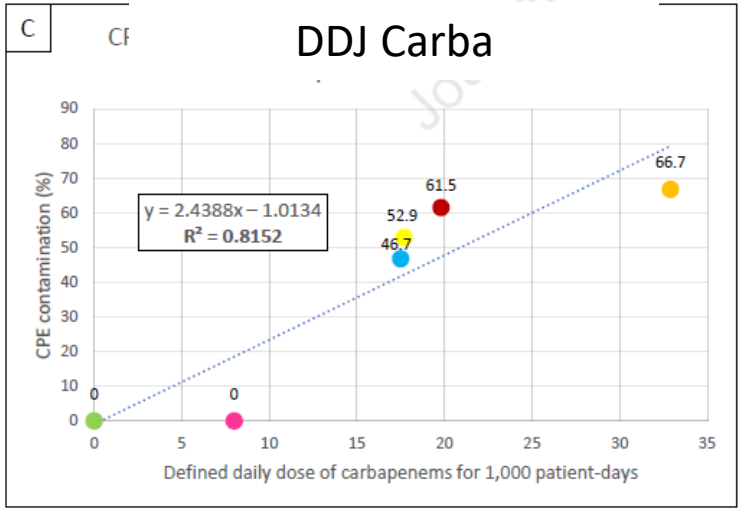
Hospital as a reservoir of microorganisms

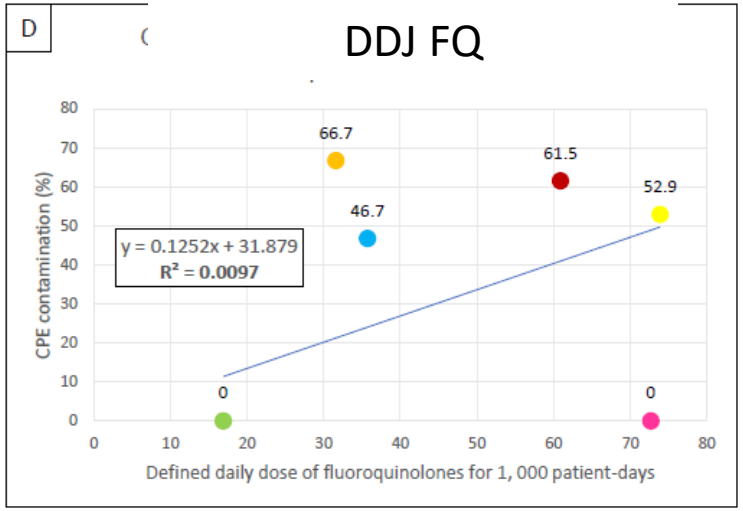
2023, sampling of showers, sinks drains, toilet rims, toilet water

- 139 rooms, 6 med. Wards, 1 SICU
- 19% (0-26%) CPE+
  - 43% shower drains, 19% toilet water, 13% toilet rims, 6% sink drains
- 36% *Citrobacter freundii,* 36% *Enterobacter cloacae*
  - whereas represented 38% of clinical samples





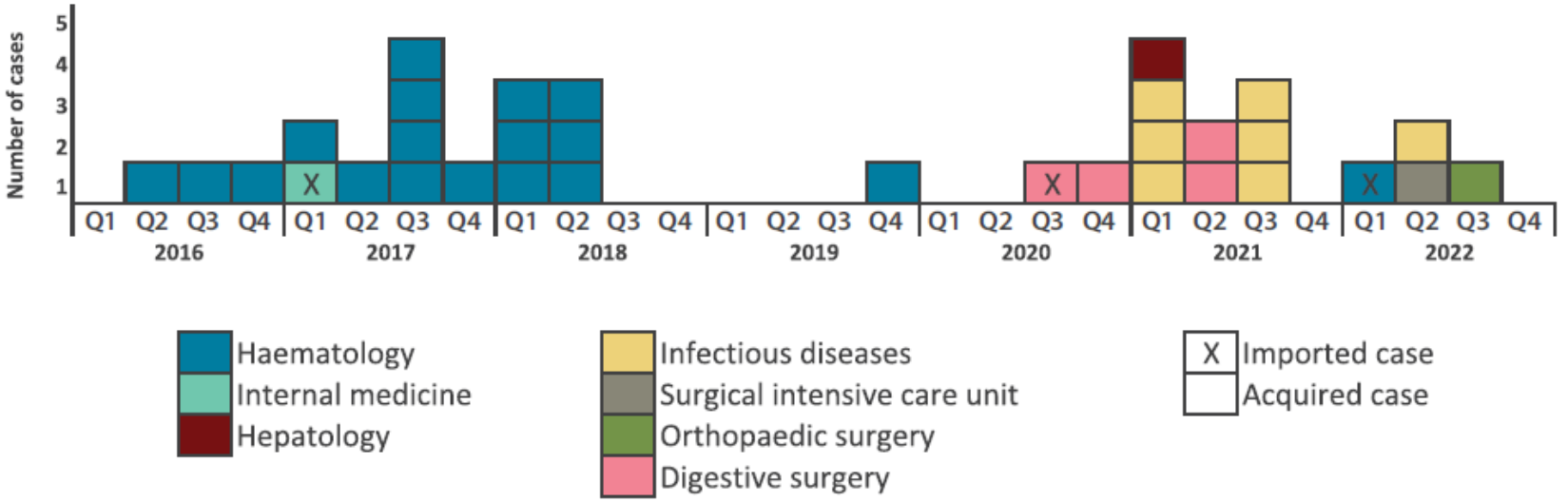




Camille Durand, Journal of Hospital Infection 2024

Hospital as a reservoir of microorganisms

Epidemiologic curve of OXA-48-producing *Citrobacter freundii* sequence type ST-22 strains isolated from patients in hospital A, France, 2016–2022 (n = 33)



- WGS, Illumina
  - 33 OXA-48-producing ST-22 *C. freundii* strains from patients
  - 20 from the hospital environment of 7 wards
  - 240 ST-22 *C. freundii* in France

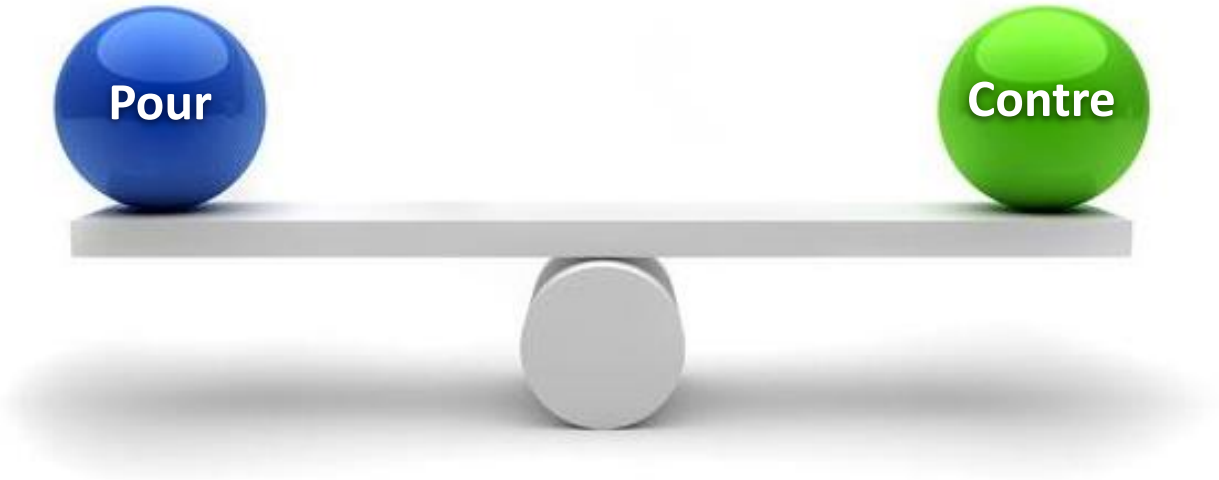
- 52/53 strains = same cluster, different from the 240 epidemiologically unrelated *C.freundii* ST-22
- Persistence in the hospital environment for years and spread through buildings, representing a risk for hospital-acquired infections and outbreaks.
- Reservoir management is essential to prevent further transmission in addition to strict hand hygiene.

Sarah Jolivet, Eurosurveillance 2024

Pour ou contre l'isolement ?

Réservoir environmental hosp.
Epidémiologie hospitalière
Fardeau de la RATB

Reservoir humain
Durée de portage
Transmission plasmidique



Efficacité des précautions complémentaires contact

Efficacité des mesures

- Essai randomisé en cluster en réanimation
  - 13 réanimations européennes, 7473 patients exposés
  - SARM, ERV, EBLSE: dépistage à l'admission et 2 fois par semaine
  - Phase 1: 6 mois, baseline
  - Phase 2: 6 mois, HdM (77% observance) + Toilette CHG
  - Phase 3: 12-15 mois, dépistage rapide et PCC

- Diminution de l'incidence de SARM en phase 2, pas 3
- Pas d'effet sur les ERV et les EBLSE

Flore digestive: **Observance d'HdM**
Autres facteurs

Derde, LID 2014

Universal Glove and Gown Use

- Cluster-RT in 20 medical and surgical ICUs in 20 US hospitals – 2012
  - HCW with gloves and gowns for all patient contact at room entry
  - Outcome: acquisition of MRSA or VRE, screening on admission and discharge

	Intensive Care Units							
	Intervention			Control				
	No. of Acquisitions	Patient-Days at Risk	Mean Rate (95% CI)[a]	No. of Acquisitions	Patient-Days at Risk	Mean Rate (95% CI)[a]	Difference (95% CI)[b]	*P* Value[c]
Drug-Resistant Bacteria								
VRE or MRSA								
Study period	577	32 693.0	16.91 (14.09 to 20.28)	517	31 765.0	16.29 (13.48 to 19.68)		
Baseline	178	8684.0	21.35 (17.57 to 25.94)	176	9804.5	19.02 (14.20 to 25.49)		
Change[d]			−4.47 (−9.34 to 0.45)			−2.74 (−6.98 to 1.51)	−1.71 (−6.15 to 2.73)	.57
VRE								
Study period	411	27 765.5	13.59 (10.26 to 17.99)	337	28 340.5	11.88 (8.65 to 16.33)		
Baseline	108	7691.5	15.18 (10.50 to 21.95)	122	8818.0	14.37 (10.31 to 20.02)		
Change[d]			−1.60 (−7.18 to 3.98)			−2.48 (−5.53 to 0.56)	0.89 (−4.27 to 6.04)	.70
MRSA								
Study period	199	30 454.5	6.00 (4.63 to 7.78)	191	30 024.0	5.94 (4.59 to 7.67)		
Baseline	77	7841.0	10.03 (8.05 to 12.50)	59	9182.0	6.98 (4.50 to 10.83)		
Change[d]			−4.03 (−6.50 to −1.56)			−1.04 (−3.37 to 1.28)	−2.98 (−5.58 to −0.38)	.046

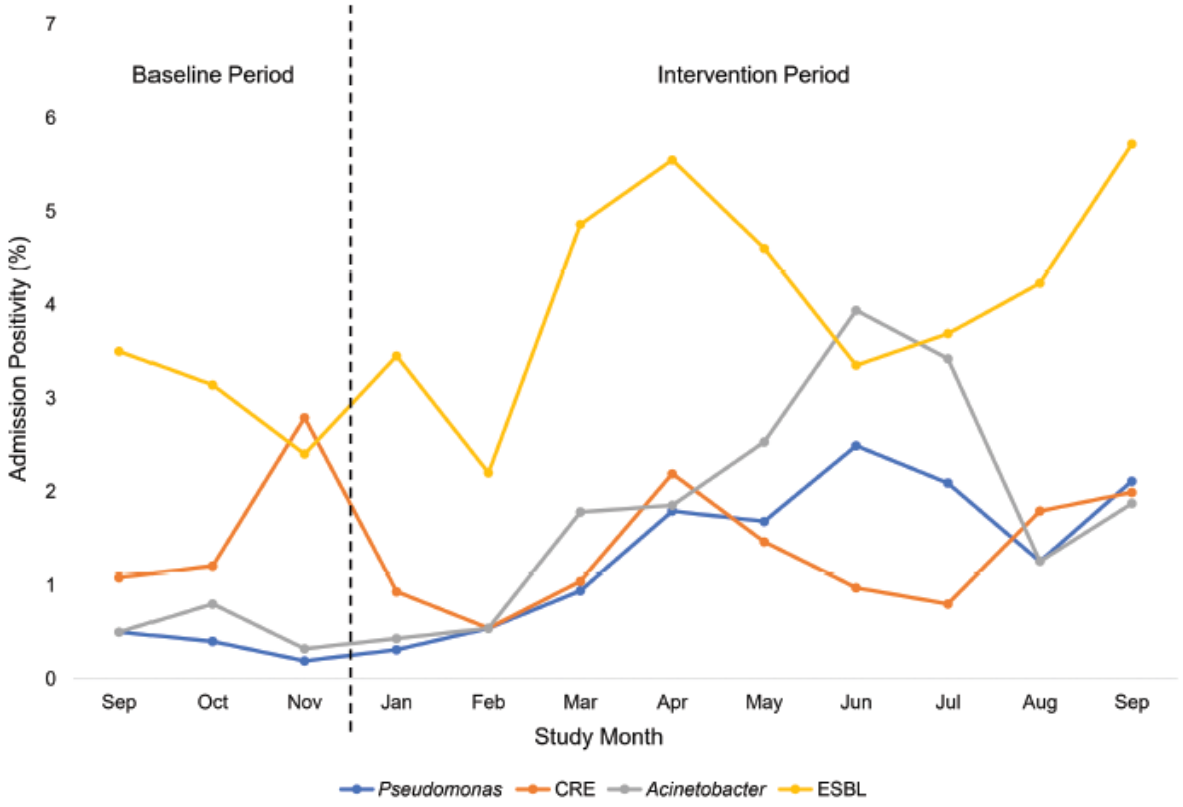
Gloves and gowns for all patient contact did not result in a difference in acquisition of MRSA or VRE.

Harris JAMA 2013

Gants et surblouse universelle

- Cluster-RT in 20 medical and surgical ICUs in 20 US hospitals – 2012
  - HCW with gloves and gowns for all patient contact at room entry
  - Outcome: acquisition of MR-GNB, screening on admission and discharge

Organism	RR for Impact of the Intervention Adjusted for Site-specific Admission Prevalence (95% CI)	*P* Value
Pseudomonas, carbapenem-resistant *Pseudomonas aeruginosa*	0.78 (.51–1.19)	.25
Carbapenemase-resistant Enterobacteriaceae	0.88 (.62–1.23)	.45
Acinetobacter	0.75 (.50–1.13)	.17
ESBL-producing bacteria	0.95 (.74–1.21)	.67
Any	0.90 (.73–1.10)	.31



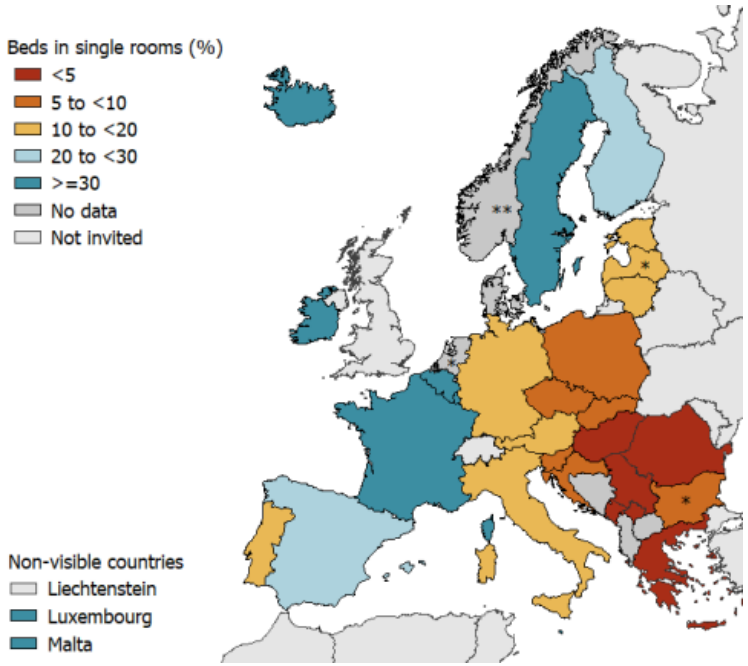
Gants et surblouse universels hors reanimation n'étaient pas associés à moins d'acquisition de BMR-BGN.

Harris CID 2021

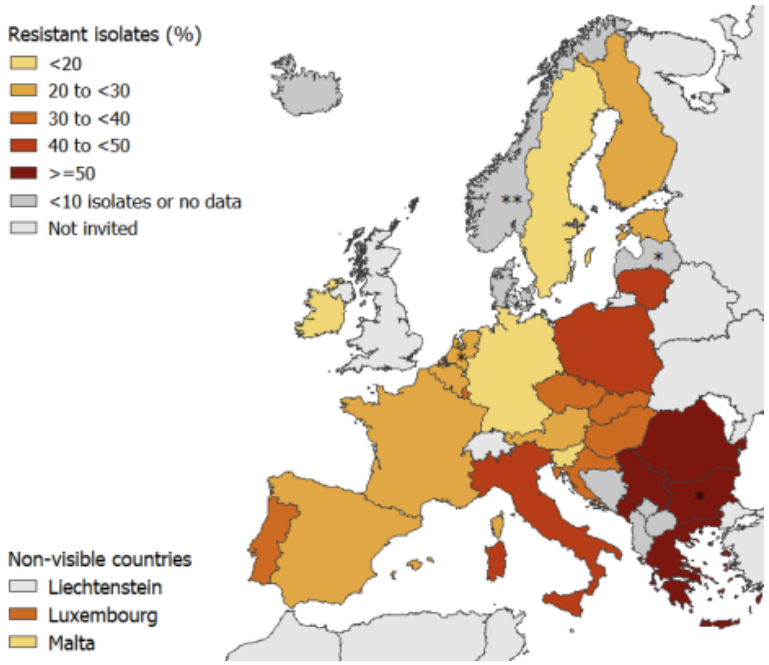
Disponibilité de chambres seules

- Pas assez de chambres seules
  - BMR/BHR, Fin de vie, soins spécifiques, démence…
- Prises de décisions quotidiennes: prioriser
- Quels critères prendre en compte?

Sans compter la COVID-19…



Proportion de chambres seules



Proportion d'*Enterobacterales* C3G-R

Contact precautions for ESBL-E

- On-site survey during the ECCMID
- 32 European, 24 non-EU countries (n = 213)
- **68% EU-respondents considered any CP for ESBL *non-E. coli***
- 30-45% did not require HCW to wear gowns/gloves at all times when entering the room of a patient in CP.
- 10-20% did not consider any rooming specifications or isolation for gram-positive MDRO

SHEA Survey US: **30% not isolate for ESBL**; 48% isolate +/- other resistance pattern
Germany: important concomitant pattern of resistance (fluoroquinolone / carbapenems)
England: focus on ESBL-AmpC strains

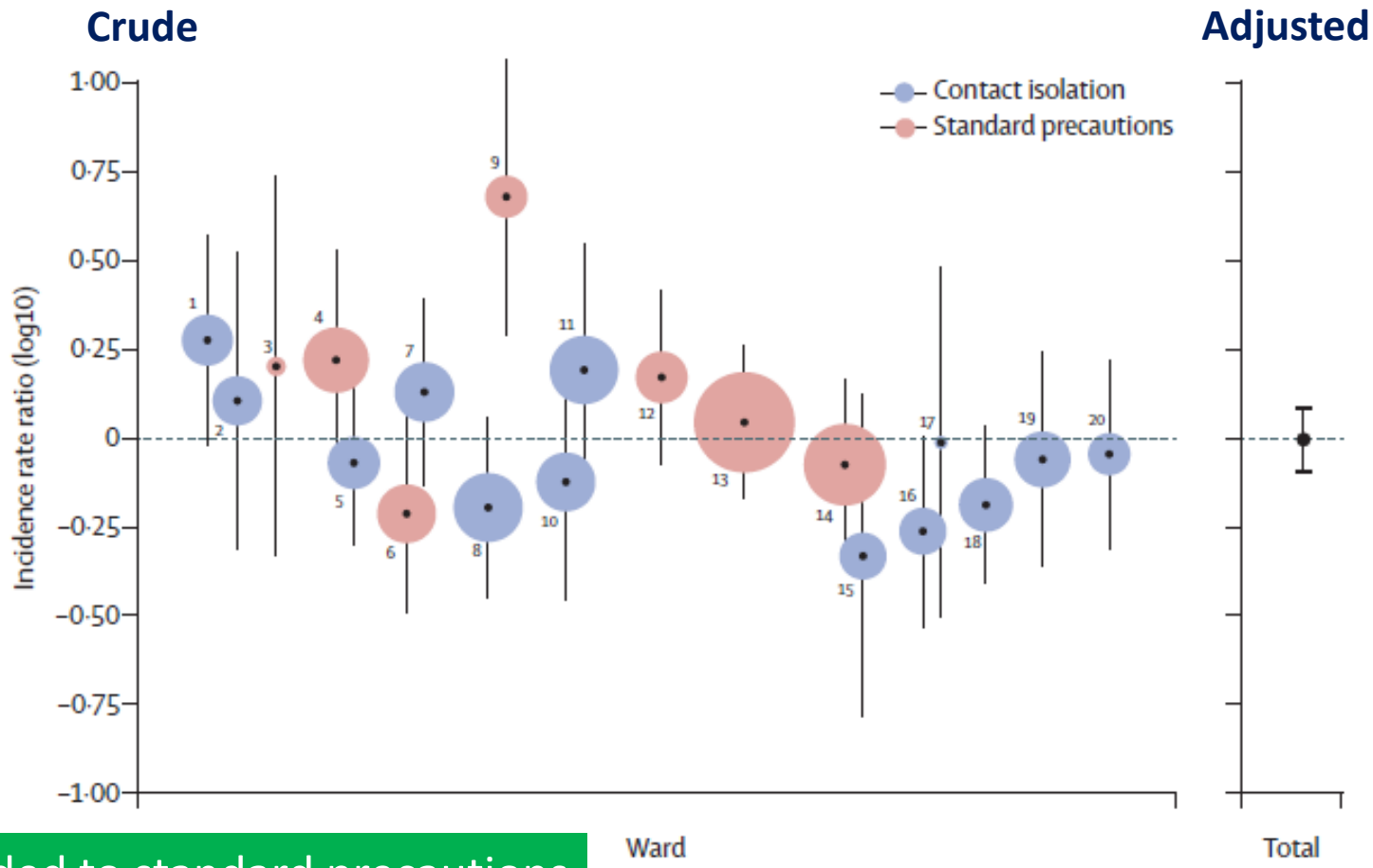
	E. coli ESBL			Non-*E. coli* ESBL		
	EU	Non EU	*p*-value[b]	EU	Non EU	*p*-value[b]
No CP	32.7	34.7	0.636	23.3	34.7	*0.044*
CP only if infected	14.7	10.2		17.3	6.1	
CP if colonised and/or infected	44.7	40.8		50.7	40.8	
Unknown	5.3	10.2		6.0	14.3	
ESBL not determined	2.7	4.1		2.7	33.3	
Total no. responses (%)	150 (75.4)	47 (24.6)		150 (75.4)	49 (24.6)	
Gowns and gloves whenever entering the room	44.9	59.1	0.234	47.3	71.4	*0.046*
Gowns and gloves if direct contact is anticipated	55.1	40.9		52.7	28.6	
Other procedures (e.g. standard precautions only)	0	0		0	0	
Total no. responses (%)	89 (80.2)	22 (19.8)		93 (81.6)	21 (18.4)	
Single room	31.4	31.3	0.960	36.4	27.1	0.494
Cohorting	19.3	18.		20.7	18.8	
Spatial separation[c]	13.6	16.7		13.6	20.8	
No specific measures	35.7	33.3		29.3	33.3	
Total no. responses (%)	140 (74.5)	48 (25.5)		140 (74.5)	48 (25.5)	

Danielle Vuichard Gysin ARIC 2018

Contact precautions for ESBL-E

Cluster-randomised crossover trial in adult wards in four European university hospitals

- Medical, surgical, or combined
- 12 months
- Standard precautions alone or implement contact isolation alongside standard precautions
- Screening for ESBL-E carriage within 3 days of admission, once a week thereafter, and on discharge.



Contact isolation showed no benefit when added to standard precautions for controlling the spread of ESBL-E on non-critical care wards with extensive surveillance screening.

Friederike Maechler LID 2020

Isolation room for ESBL-E

Multiple-bed room non-inferior to a single-bed room for ESBLE

Cluster-randomised, crossover, non-inferiority study on medical and surgical wards of 16 Dutch hospitals

- **693 ESBL+** and 9527 wardmates
- Transmission of ESBLE to ≥1 wardmate identified for:
  - Single-bed room: n=11 (4%)
  - Multiple-bed room: n=14 (7%)
  - Crude risk difference 3.4% (0.3-7.1)

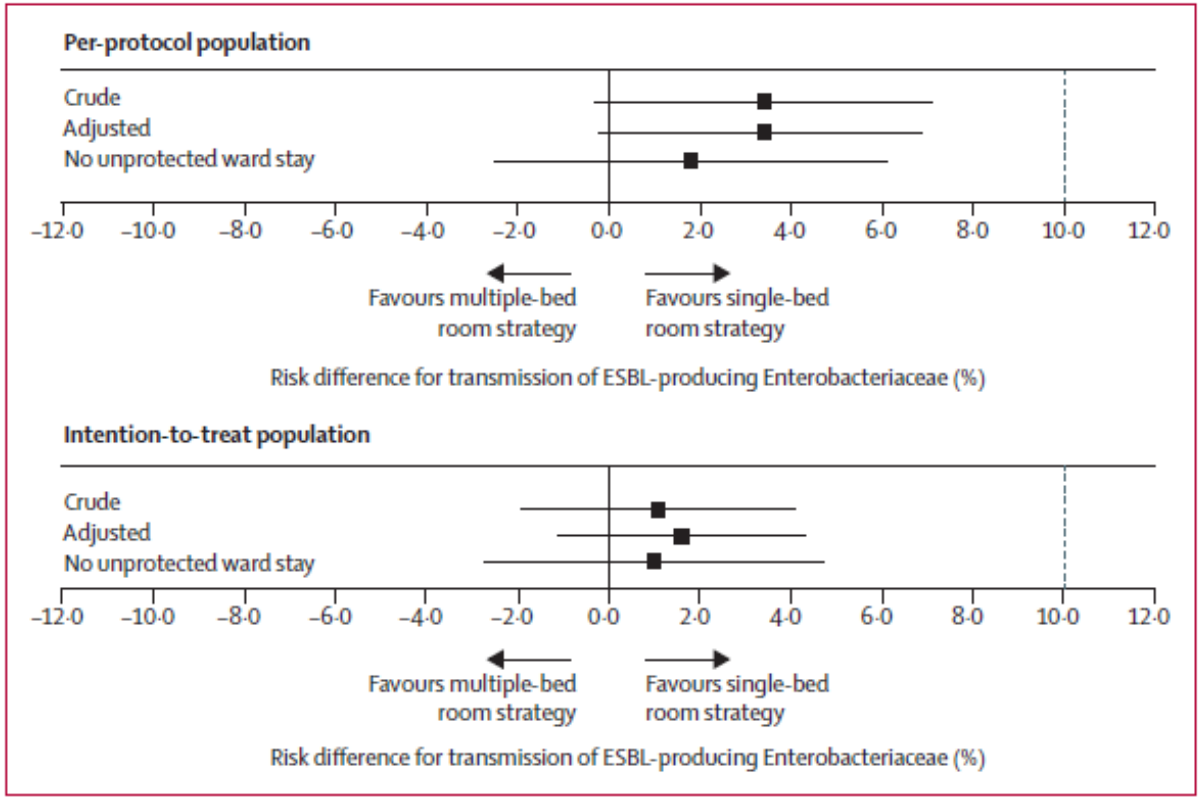
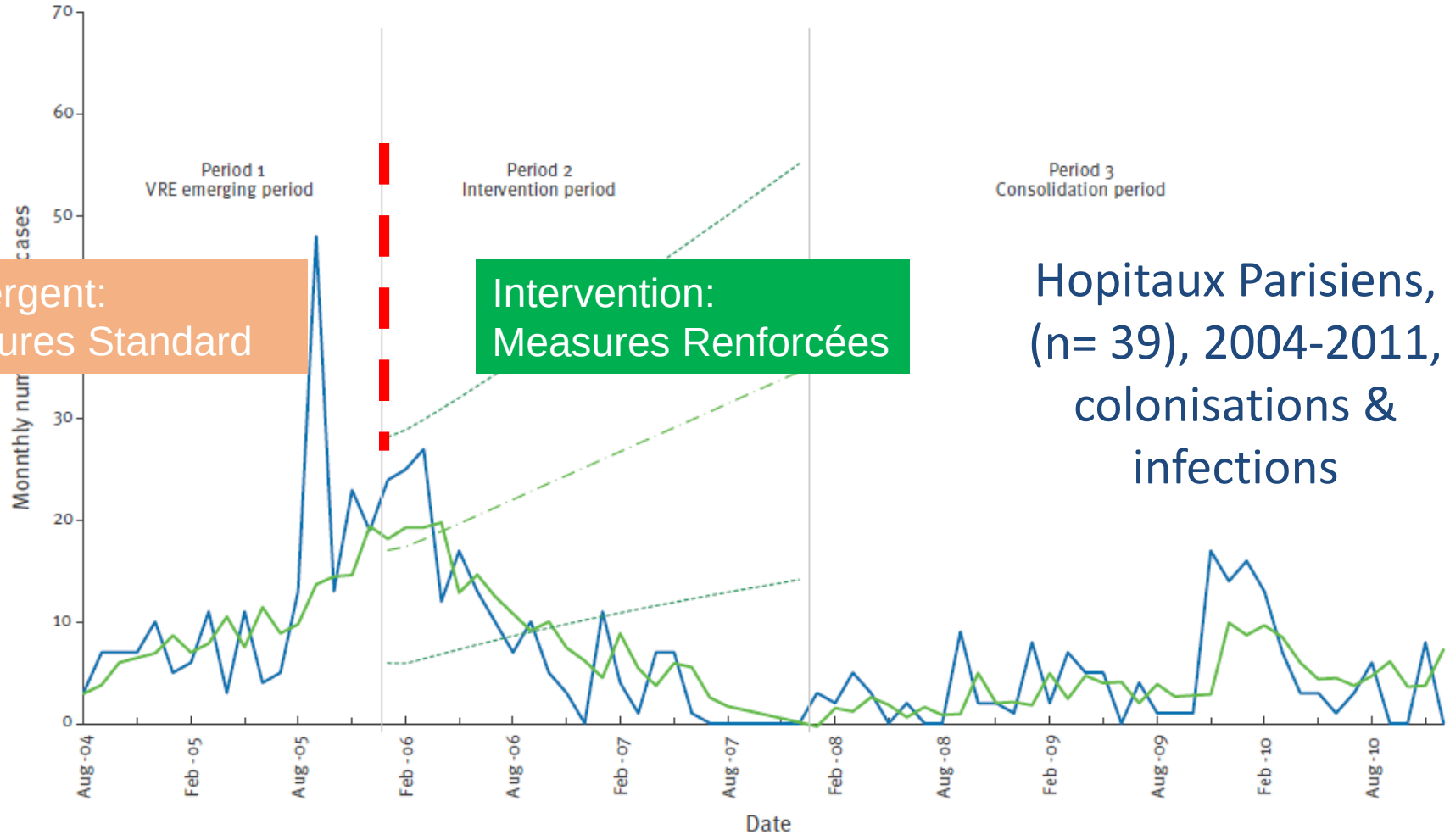


Figure 2: **Non-inferiority plots for the primary outcome**
The figures show two-sided 90% CIs for crude and adjusted differences in risk of transmission of ESBL-producing Enterobacteriaceae in the per-protocol and intention-to-treat populations, and the risk difference for index patients without unprotected ward stay. The prespecified non-inferiority margin (indicated by the dotted line) was 10%. Adjusted analyses were adjusted for unprotected ward days of the index patient. ESBL=extended-spectrum β-lactamase.

Marjolein F Q Kluytmans-van den Bergh, Lancet Infect Dis 2019

Efficacité de la stratégie de maîtrise des BHRe

Est-ce que cela fonctionne pour les BHRe ?



Emergent:
Mesures Standard

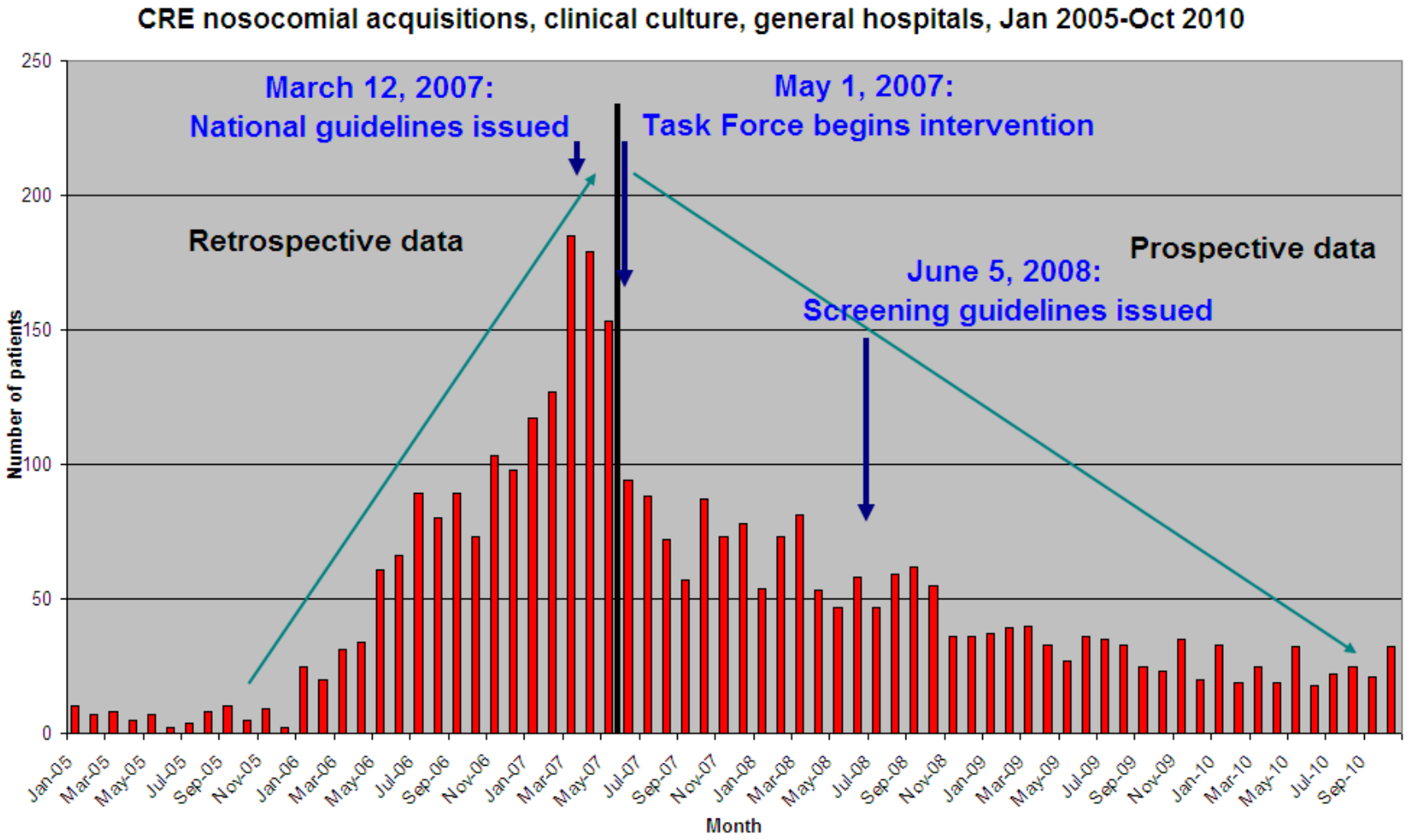
Intervention:
Measures Renforcées

Hopitaux Parisiens, (n= 39), 2004-2011, colonisations & infections

Fournier et al Eurosurv 2012

Est-ce que cela fonctionne pour les BHRe ?

- Strong national commitment with national task force
- Cohorting patients with CPE with dedicated staff
- Visits on site (all hospitals)
- Evaluation of IC policies and laboratory methods
- Checking adherence to the guidelines
- Feedback to hospital directors



Schwaber MJ et al, Clin Infect Dis 2011 & 2014

Efficacité des mesures

	% outbreaks	OR (95% CI)	P value
Surgery	8%	1	0.19
Intensive care unit	11%	1.4 (0.7–2.8)	
Medicine	12%	1.6 (0.9–2.8)	
RLTC	17%	2.3 (1.0–5.1)	
Colonisation	11%	1	0.34
Infection	13%	1.3 (0.8–2.1)	
CPE	8%	1	<0.001
GRE	21%	3.2 (2.1–4.9)	
Standard precautions	18%	1	<0.001
Contact precautions	7%	0.4 (0.2–0.6)	
Dedicated nursing staff	3%	0.1 (0.03–0.5)	

39% des épidémies sont survenues alors que le cas index était en PCC d'emblée

	VRE	CPE
Contact precautions	0.3 (0.1–0.5)	0.4 (0.2–0.7)
Dedicated nursing staff	0.1 (0.0–0.4)	0.2 (0.0–1.3)

Fournier et al, Eurosurveillance 2018

Pour ou contre l'isolement ?

Efficacité des mesures

Réservoir environmental hosp.

Epidémiologie hospitalière

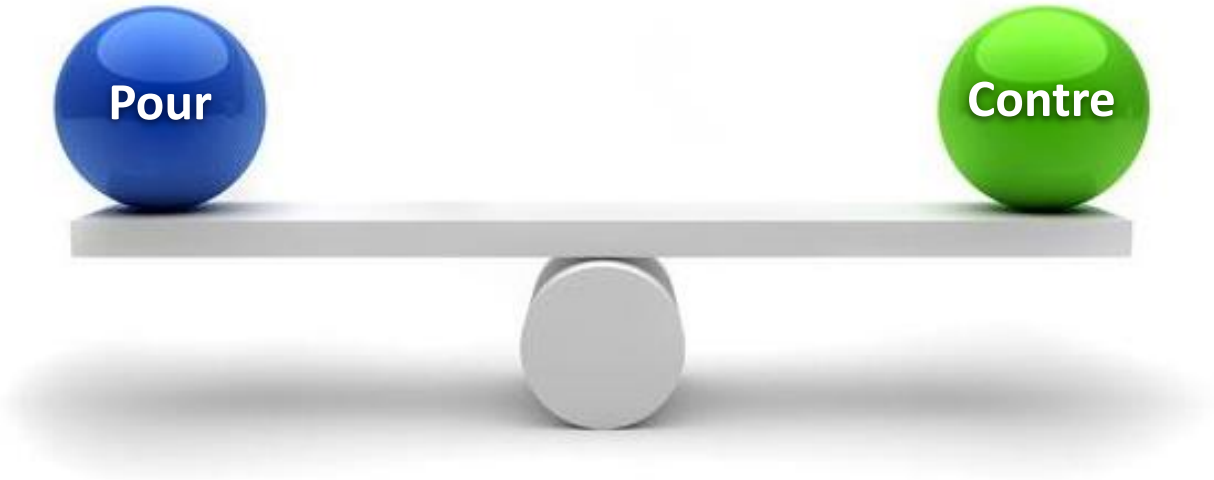
Fardeau de la RATB

Efficacité des mesures

Reservoir humain

Durée de portage

Transmission plasmidique

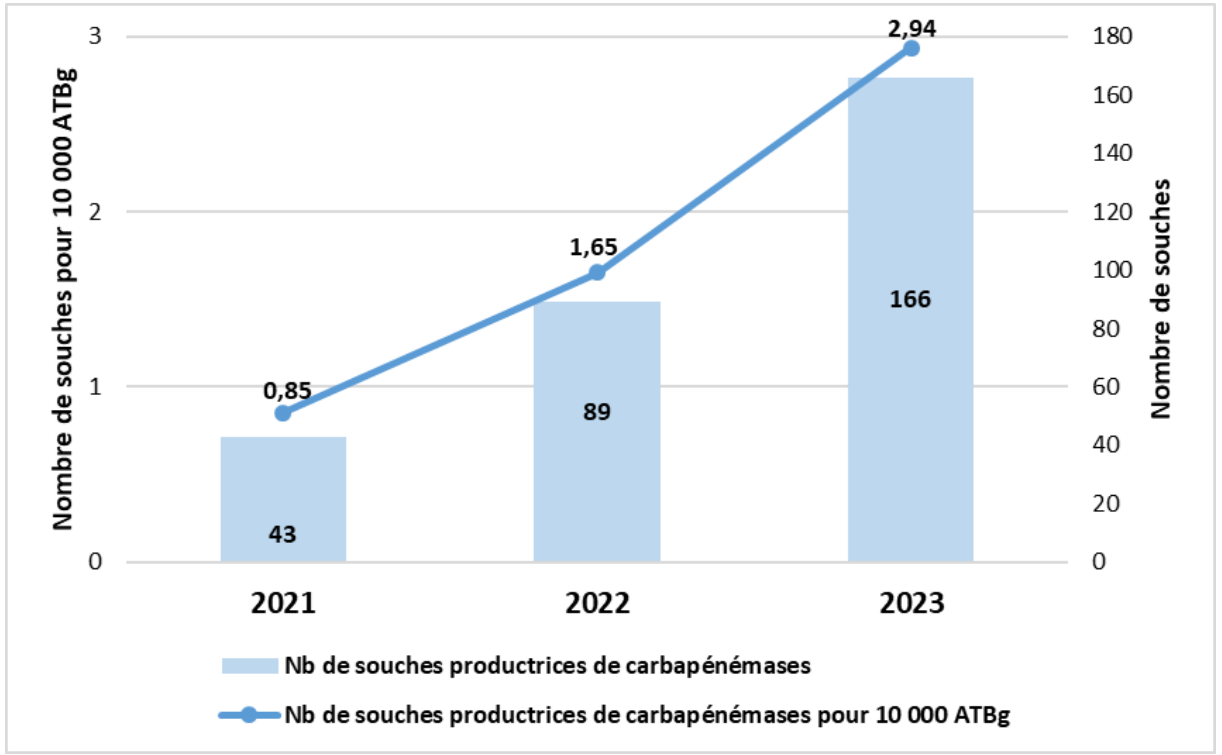


Mais une situation devenue endémique…

Epidémiologie communautaire en France

Prélèvements urinaires	Cibles à l'horizon 2025	Nombre de régions atteignant la cible	Valeurs nationales 2023	Tendances 2022-2023 au niveau national
Soins de ville				
% d'*E. coli* résistants aux C3G	≤ 3% au niveau national et dans toutes les régions	6	3,8%	↗ (+0,5)
% d'*E. coli* résistants aux FQ	≤ 10% au niveau national et dans toutes les régions	1	13,5%	↗ (+0,9)
% d'*E. coli, K. pneumoniae* et *E. cloacae* producteurs de carbapénémases	≤ 0,5% au niveau national et dans toutes les régions	16	0,050%	↗ (+0,020)
EHPAD				
% d'*E. coli* résistants aux C3G	≤ 8% au niveau national et dans toutes les régions	9	9,3%	↗ (+0,8)
% d'*E. coli* résistants aux FQ	≤ 18% au niveau national et dans toutes les régions	8	19,2%	↗ (+0,5)
% d'*E. coli, K. pneumoniae* et *E. cloacae* productrices de carbapénémases	≤ 0,5% au niveau national et dans toutes les régions	16	0,067%	↗ (+0,014)

Evolution du nombre de souches urinaires de *E. coli* productrices de carbapénémases



Prévalence de portage d'EBLSE à Bichat

2009 – 2012

- 1136 prélèvements contact EPC et 145 patients porteurs EBLSE (13%)
- Services :
  - ✓ Maladies infectieuses (n= 577) : 11%
  - ✓ SSR (n= 210) : 19%
  - ✓ Médecine/chirurgie (n= 349) : 11%
  - ✓ Réanimations à l'admission 23%
  - *E. coli* : 96 (57%)

105 (75%) étaient méconnus

Lolom, Ricai 2012

2016

- 844 dépistages rectaux et 146 patients porteurs EBLSE (17%)
- Services :
  - ✓ Médecine 47%
  - ✓ SSR 25%
  - ✓ Chirurgie 21%
  - ✓ Réanimations 7,5%
  - *E. coli (62%) & CTX-M (94%)*

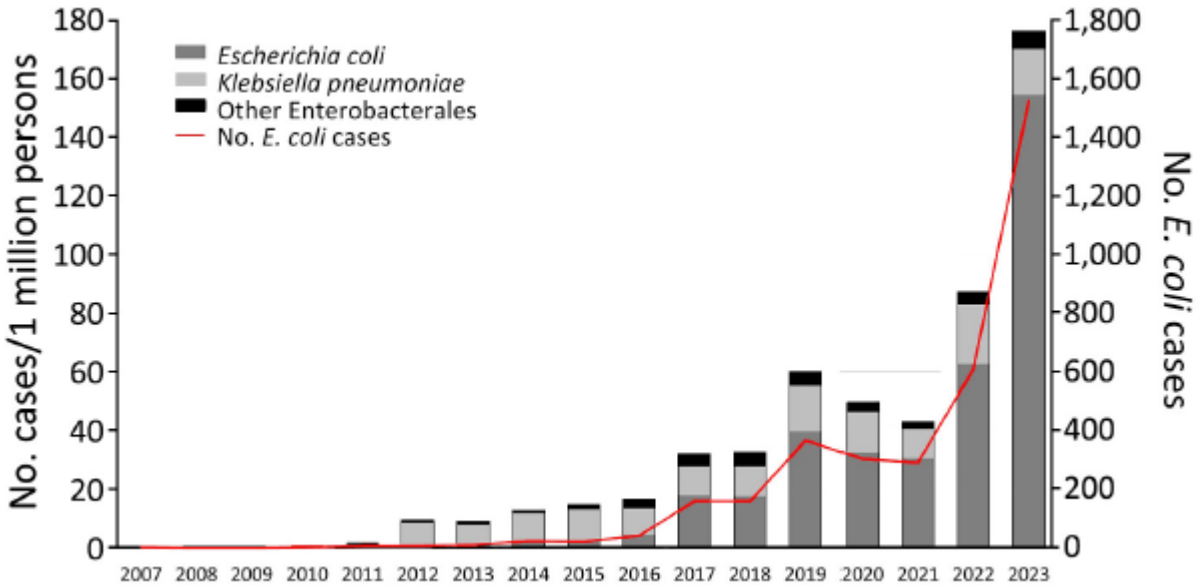
96 (66%) étaient méconnus

S. Jolivet, Clin Microbiol Infect 2018;24:1311

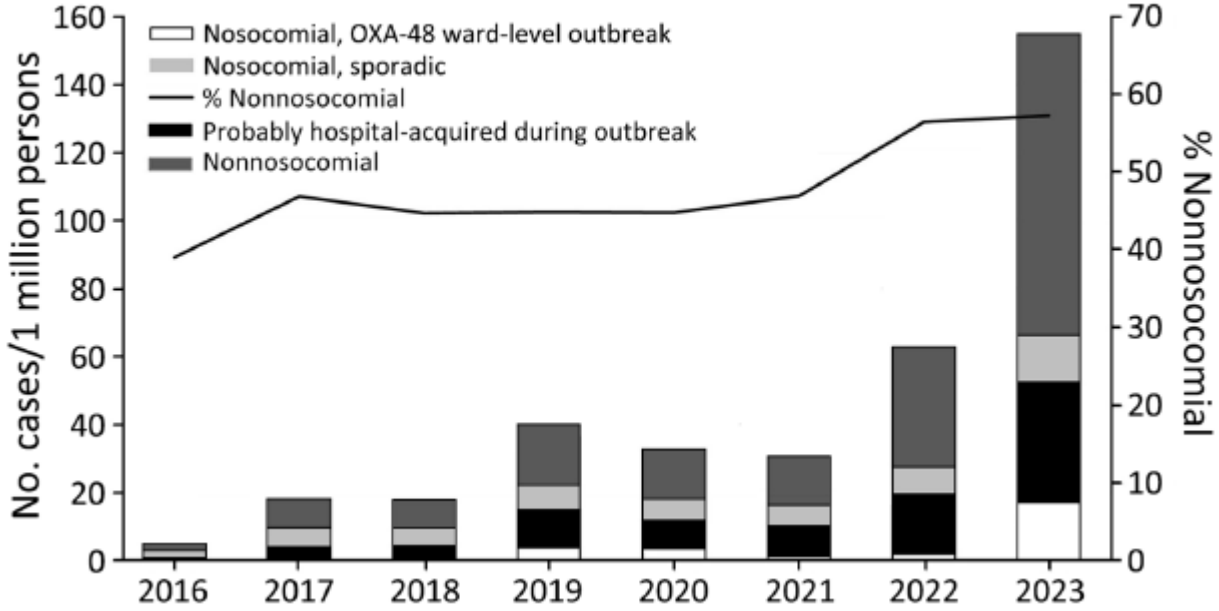
Evolution *E.coli* OXA-48 en Israël, 2007–2023

- 3,510 incident cases of OXA-*E.coli*
  - *3 bla*OXA alleles : *bla*OXA-244, *bla*OXA-48, and *bla*OXA-181
  - 71% chromosomally, 29% plasmid encoded

Newly detected cases

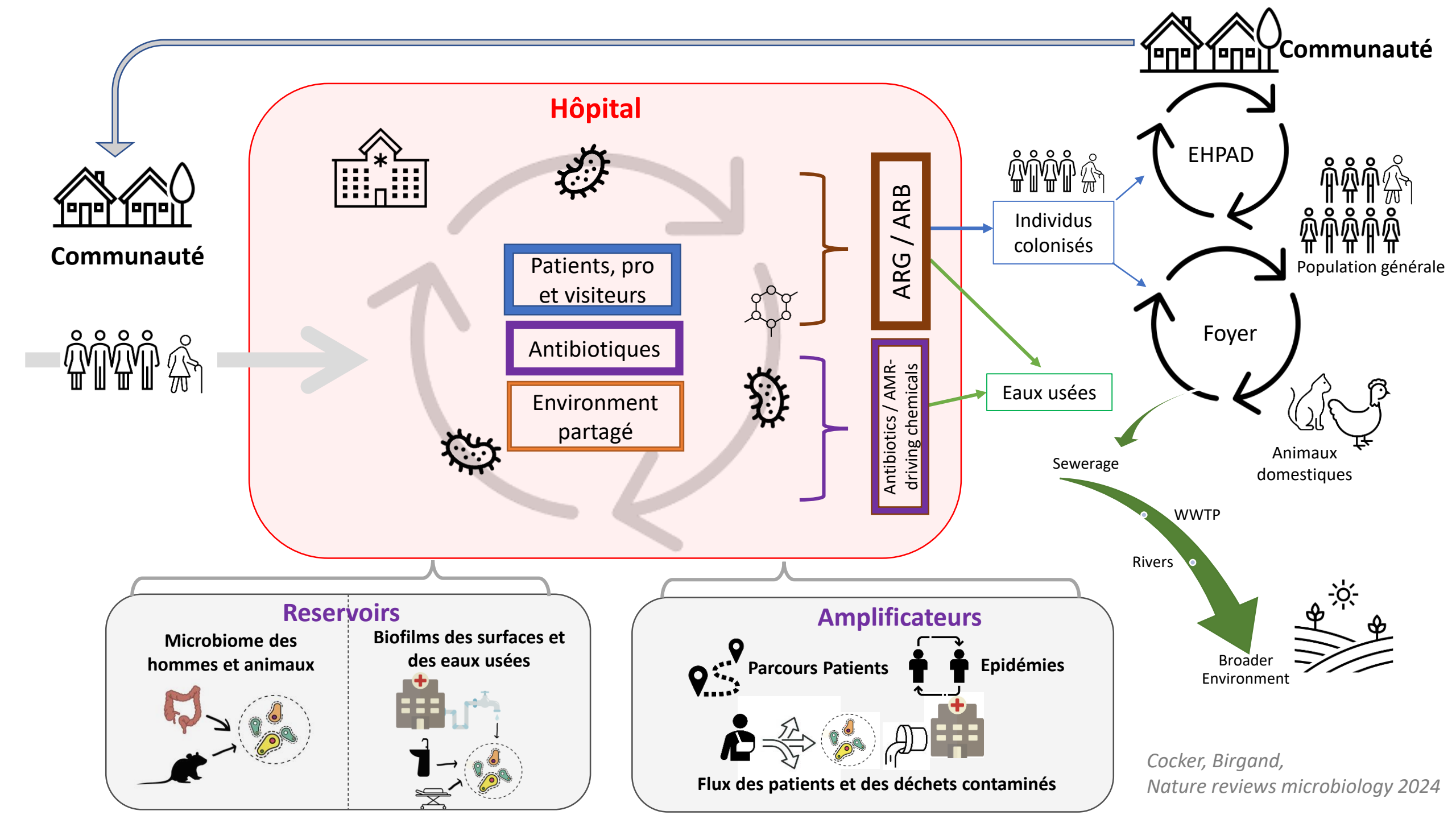


By type of acquisition



- Measures that contained Israel's outbreak of K. pneu Carba-R not sufficient to control OXA-EC = community acquisition
- Healthcare-focused criteria for screening at hospital admission inadequate, low MICs of most OXA-EC might curtail their detection, reservoirs in the hospital environment

Elizabeth Temkin EID 2024



Cocker, Birgand,
Nature reviews microbiology 2024

Pour ou contre l'isolement ?

Efficacité des mesures

Réservoir environmental hosp.

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Evolution endémique

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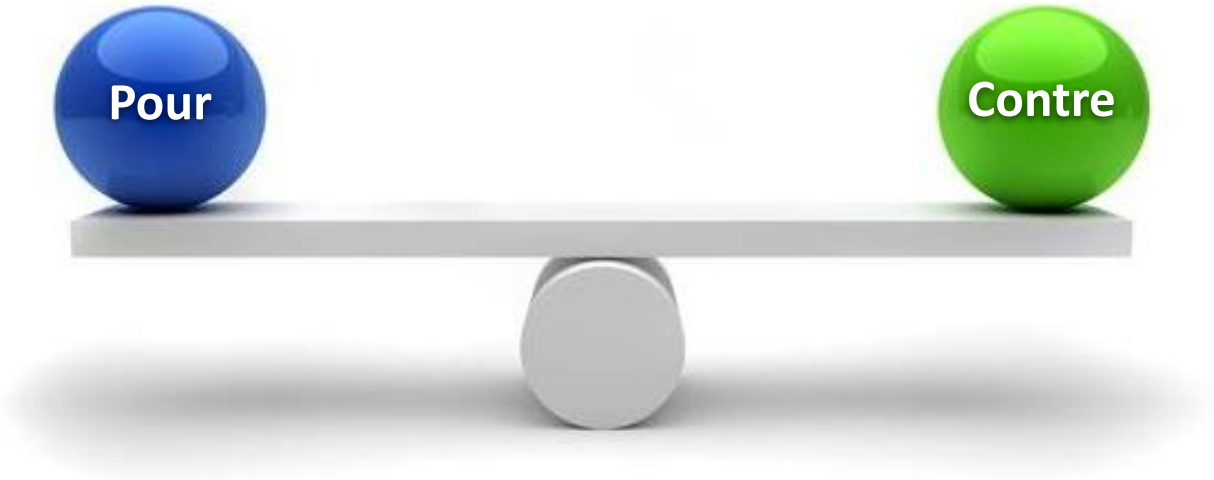


Les effets pervers de la stratégie…

Limites de la politique d'isolement

Revue systématique de 27 études :

- Les patients isolés sont **moins visités** par les soignants
- Les patients isolés sont **plus anxieux** et plus déprimés
- On note plus d'**évènements indésirables** chez les patients isolés
- Prolongation des **durées de séjour** et augmentation des coûts

Capability		Example of extracted data	Number of studies containing data
2	 Bodily health	Carriers perceive delays in care and impact on length of hospital stay	20/27 [20,24,25,27-33,35-38, 40-42,44,45][a]
5	 Emotion	Isolation is reported to be unpleasant and stressful	17/27 [20-23,25,26, 28,29,33,35, 37,40,41, 43-45][a]
6	 Practical reason	Carriers lack understanding of reasons for control measures	12/27 [20,27,28,31, 33,36-38,40, 44,45][a]
7	 Affiliation A	Carriers fear to harm close surroundings	12/27 [20,23,25,27, 31-33,37, 38,40,44,45]
	 Affiliation B1	Carriers report social situations in which they are treated differently	16/27 [20,25,27-29, 31-33,36,38-40, 44,45][a]
	 Affiliation B2	Carriers report that HCWs act unknowing and uncaring	13/27 [20,25,27,28, 30,31,33,36, 39,40,44,45][a]
9	 Play	Carriers have questions about using public facilities	7/27 [20,32,33,36, 40,44,45]
10	 Control over environment	Carriage creates insecurities about job opportunities in healthcare	4/27 [20,33,45][a]

Rump, Clinical Microbiology and Infection 25 (2019) 274e279

Impact of contact isolation on occurrence of medical errors and adverse events

- Isolated vs non-isolated patients in ICU, adverse events & medical errors
  - 170 isolated vs 980 nonisolated patients, 2 ICU Iatroref III study

	Non-isolated patients 980 (100)	Isolated patients 170 (100)	Adjusted sHR [95 % CI]	p^a
Adverse events				
Accidental removal of endotracheal tube or catheter	41/784 (6.5)	14/148 (9.5)	1.3 (0.6–2.8)	0.5
Phlebitis/pulmonary embolism	26 980 (2.7)	15/170 (8.8)	1.8 (0.8–3.9)	0.15
Haemorrhage	24/980 (2.5)	15/170 (8.8)	1.5 (0.7–3.5)	0.3
Packed red blood cells administration (number of packs)	195/980 (19.9)	76/170 (44.7)	1.3 (0.9–1.8)	0.2
Hypoglycaemia	168/980 (17.1)	74/170 (43.5)	1.5 (1.0–2.1)	0.03
Hyperglycaemia	535/980 (54.6)	135/170 (79.4)	1.5 (1.2–2.0)	0.002
Hypernatremia	23/980 (2.4)	11/170 (6.5)	0.7 (0.2–1.8)	0.4
VAP	64/497 (12.9)	50/125 (40)	1.1 (0.7–1.8)	0.7
VAP (sensitive isolates)	56/497 (11.3)	32/125 (25.6)	1.0 (0.6–1.8)	0.9
VAP (resistant isolates)	16/497 (3.2)	29/125 (23.2)	2.1 (1.3–3.3)	0.002
Medical errors				
Anticoagulant prescription error	66/980 (6.7)	23/170 (13.5)	1.9 [1.1–3.3]	0.02
Anticoagulant administration error	31/705 (4.4)	12/148 (8.1)	1.0 [0.4–2.2]	0.9
Anticoagulant administration or prescription error	88/705 (12.5)	32/148 (21.6)	1.5 [0.9–2.5]	0.09
Insulin administration error administering insulin	417/711 (58.7)	118/158 (74.7)	1.0 [0.8–1.4]	0.8

- Errors could be avoided without having to examine the patient
  - Paper charts located into the patient's room
- Historical-matched cohort : 150 CP vs 300 non CP
  - Decrease in vital sign recording
  - x6 occurrence of preventable adverse events
  - x8 supportive care failure (falls, pressure ulcers, fluid or electrolyte disorders)

Zahar Intensive Care Med (2013) 39:2153–2160

Effect of Contact Precautions on Frequency of Hospital Adverse Events

296 medical or surgical inpatients admitted to non–ICU hospital wards

- Adverse events detected by chart review
- 35.1% of 296 subjects experienced ≥1 adverse event during their hospital stay
- Contact precautions =
  - Fewer noninfectious adverse events
  - Fewer severe adverse events

Type of Adverse Event	R_tR (95% CI)	*P* Value
Noninfectious adverse events[a]		
Patients on contact precautions vs. not on contact precautions	0.70 (0.51–0.95)	.02
Prior hospitalization in previous 30 days	1.22 (0.87–1.70)	.25
Charlson comorbidity score ≥2	1.04 (0.75–1.45)	.80
Male gender	0.73 (0.54–0.99)	.05
Preventable noninfectious adverse events[a]		
Patients on contact precautions vs not on contact precautions	0.85 (0.59–1.24)	.41
Male gender	0.67 (0.46–0.98)	.04
Charlson comorbidity score ≥2	0.89 (0.60–1.33)	.57

Lindsay D. Crof ICHE 2015, vol. 36, no. 11

Evaluation of Patients' Adverse Events During Contact Isolation for Vancomycin-Resistant Enterococci Using a Matched Cohort Study With Propensity Score

- **Objectives:** To compare adverse events between a contact isolation group with VRE and a matched comparison group using a relatively large data set from full electronic medical records (EMR) and propensity score–matching methods
  - Seoul National University Bundang Hospital (SNUBH) in Korea, a tertiary, university-affiliated hospital that has 1337 inpatient beds.

Table 2. Incidence Results for Adverse Events Between VRE Contact Isolation Group vs Matched Comparison Group

		FSW PSM				1:10 nearest neighbor PSM			
Adverse events	Group	No. of events	Cumulative patient-days	1000 Patient-day incidence (95% CI)	Incidence rate ratio	No. of events	Cumulative patient-days	1000 Patient-day incidence (95% CI)	Incidence rate ratio
Pressure ulcer	VRE contact isolation	8	3157	2.53 (1.09-4.99)	1.53 (0.76-3.07)	8	3146	2.54 (1.10-5.01)	2.09 (0.89-4.92)
	Matched comparison	879	531 465	1.65 (1.55-1.77)		15	12 344	1.22 (0.68-2.00)	
Fall	VRE contact isolation	3	3446	0.87 (0.18-2.54)	0.68 (0.22-2.10)	3	3435	0.87 (0.18-2.55)	0.57 (0.17-1.92)
	Matched comparison	698	542 294	1.29 (1.19-1.39)		19	12 355	1.54 (0.93-2.40)	
All	VRE contact isolation	11	3068	3.59 (1.79-6.42)	1.21 (0.67-2.20)	11	3057	3.60 (1.80-6.44)	1.29 (0.65-2.54)
	Matched comparison	1548	524 803	2.95 (2.80-3.10)		34	12 191	2.79 (1.93-3.90)	

Abbreviations: FSW, fine stratification and weighting; PSM, propensity score matching; VRE, vancomycin-resistant *Enterococci*.

Table 3. Cox Proportional Hazard Model Results for Adverse Events between VRE Contact Isolation Group vs Matched Comparison Group

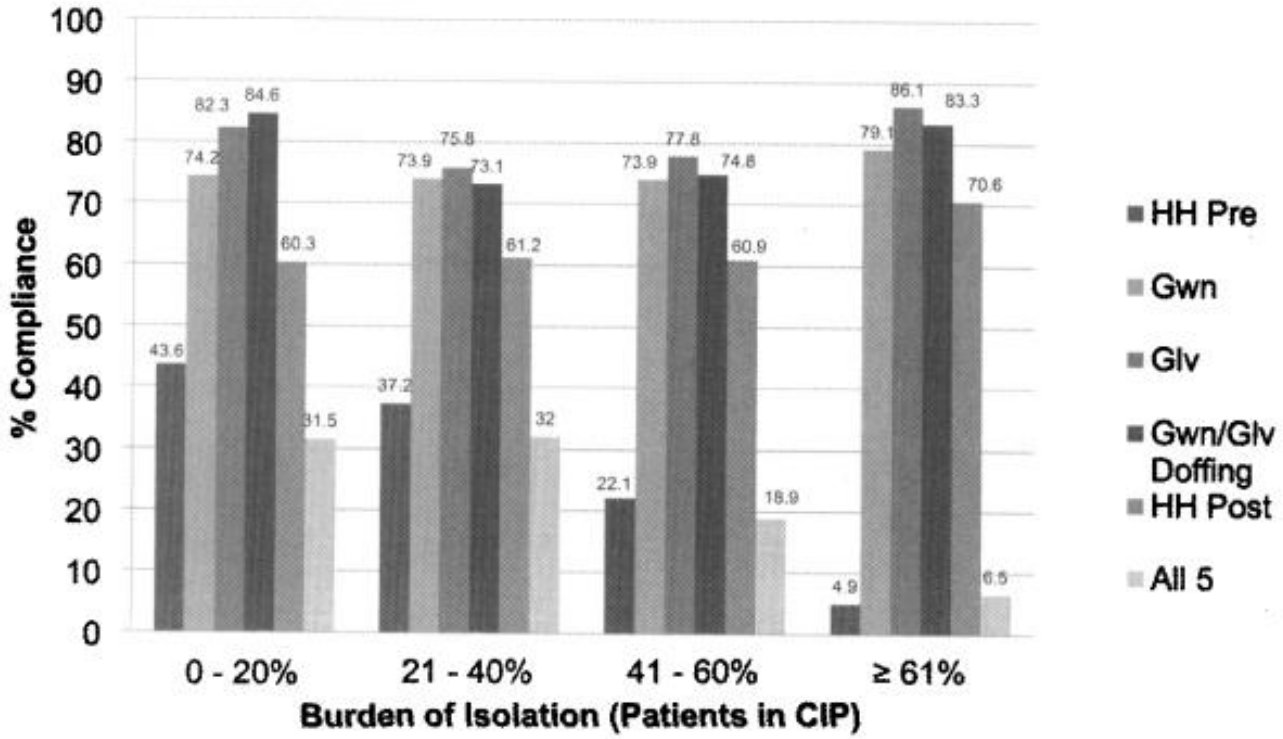
		Pressure ulcer		Fall		All	
Matching methods	Characteristics	HR (95% CI)	*P* value	HR (95% CI)	*P* value	HR (95% CI)	*P* value
Unmatched	VRE (yes)	2.06 (1.00-4.26)	.05	0.69 (0.22-2.17)	.52	1.48 (0.81-2.73)	.20
FSW	VRE (yes)	1.42 (0.67-2.99)	.36	0.66 (0.20-2.13)	.48	1.14 (0.61-2.12)	.68
1:10	VRE (yes)	2.07 (0.85-5.01)	.11	0.60 (0.17-2.13)	.43	1.28 (0.63-2.60)	.49

No association was found between the likelihood of adverse events and contact isolation using propensity score–matching methods and closely related covariates for adverse events.

JaHyun Kang JAMAopen
doi:10.1001/jamanetworkopen.2022.1865 (ab373

Contact Precautions: More Is Not Necessarily Better

- Is the increases in contact isolation associated with decreased adherence to isolation practices?
  - Prospective cohort study, 1013 observations



- Increase in % of patients in contact isolation = ↘ compliance with contact isolation precautions
- Tipping point for noncompliance = 40% of patients in CP

Sorabh Dhar ICHE 2014 , VOL. 35 , NO. 3

Coût économique de la stratégie de maîtrise des BHRe

Analyse de 41 épisodes ERG/EPC dans 3 hôpitaux parisiens

Coûts moyens en 10^3 euros	Total N=41
Perte de recette	38%
Renforcement en personnel	
Microbiologie	29%
Précautions contact	27%
Coût total par épisode	30.9
Coût par cas	8.7

8700 € par cas
dont 13 avec
prélèvement clinique

>50% du cout global en moyenne

>25 et <50% du cout global en moyenne

<25% du cout global en moyenne

Birgand, BMJ open 2015

Coût économique de la stratégie de maîtrise des BHRe

Analyse de 41 épisodes ERG/EPC dans 3 hôpitaux parisiens

Coûts moyens en 10^3 euros	Total N=41	1 cas Isolé ≤48h N=14	1 cas Isolé >48h N=14
Perte de recette	38%		54%
Renforcement en personnel			
Microbiologie	29%	34%	29%
Précautions contact	27%	53%	
Coût total par épisode	30.9	4.44	11.4
Coût par cas	8.7	4.44	11.4

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Birgand, BMJ open 2015

Coût économique de la stratégie de maîtrise des BHRe

Analyse de 41 épisodes ERG/EPC dans 3 hôpitaux parisiens

Coûts moyens en 10^3 euros	Total N=41	1 cas Isolé ≤48h N=14	1 cas Isolé >48h N=14	1 cas 2aires N=6	>1 cas 2aires N=7
Perte de recette	38%		54%	30%	70%
Renforcement en personnel					
Microbiologie	29%	34%	29%	41%	8%
Précautions contact	27%	53%			
Coût total par épisode	30.9	4.44	11.4	14.8	136.5
Coût par cas	8.7	4.44	11.4	7.4	12.8

>50% du cout global en moyenne

>25 et <50% du cout global en moyenne

<25% du cout global en moyenne

Birgand, BMJ open 2015

Coût sanitaire de la stratégie de maîtrise des BHRe

Caractéristiques	Patients porteurs	Patients jamais identifiés porteurs
Moyenne de durée de séjour, jours (IC 95%)	31 (15-72)	14 (8-25)

Prolongation de durée de séjour = 23 jours (21 - 26)

Caractéristiques	Patients porteurs	Patients jamais identifiés porteurs
Coût moyen, € (IC 95%)	18 010 (14 561 – 21,469)	11 029 (8 732 – 13 325)

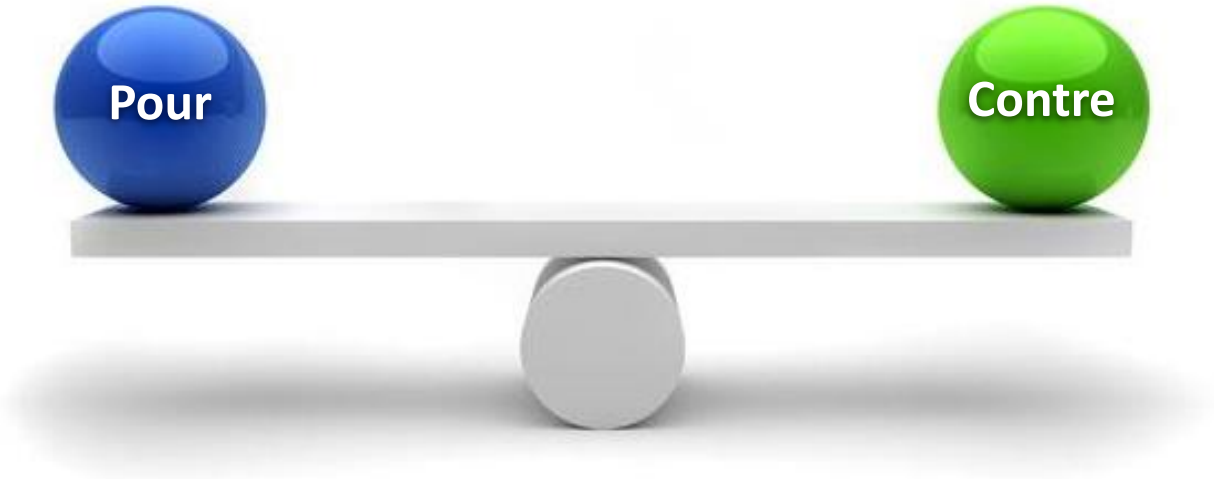
Surcoût = 6 981€ (3 377 – 10 585)

Birgand et al ICHE 2014

Pour ou contre l'isolement ?

Perte de chance/coût BHRe
Evolution endémique
Efficacité des mesures
Reservoir humain
Durée de portage
Transmission plasmidique

Efficacité des mesures
Réservoir environmental hosp.
Epidémiologie hospitalière
Fardeau de la RATB



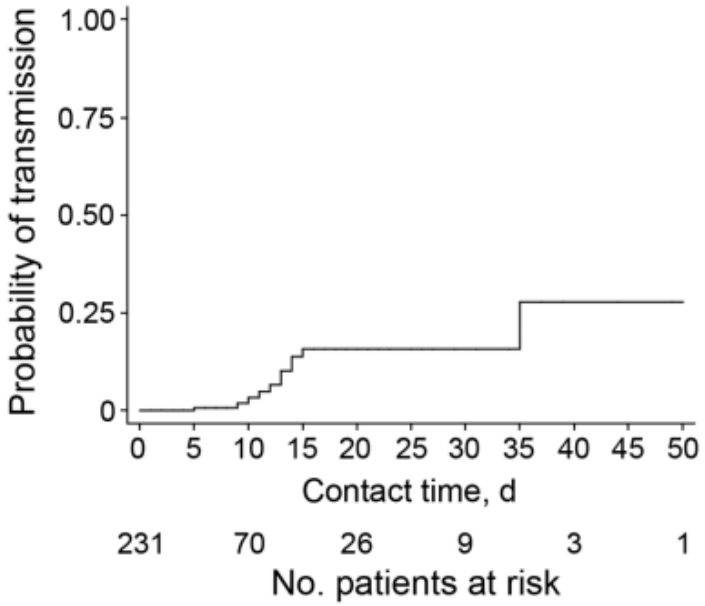
Et si on arrêtait d'isoler ?

Prospective Validation of Cessation of Contact Precautions for ESBL-*E. coli*

- Etude prospective observationnelle, **Hôpital de Basel** (MCO), Hôpital Felix-Platter (SSR) → Abandon de l'isolement depuis 06/2013

231 patients contacts identifiés, 151 en MCO, 80 en SSR

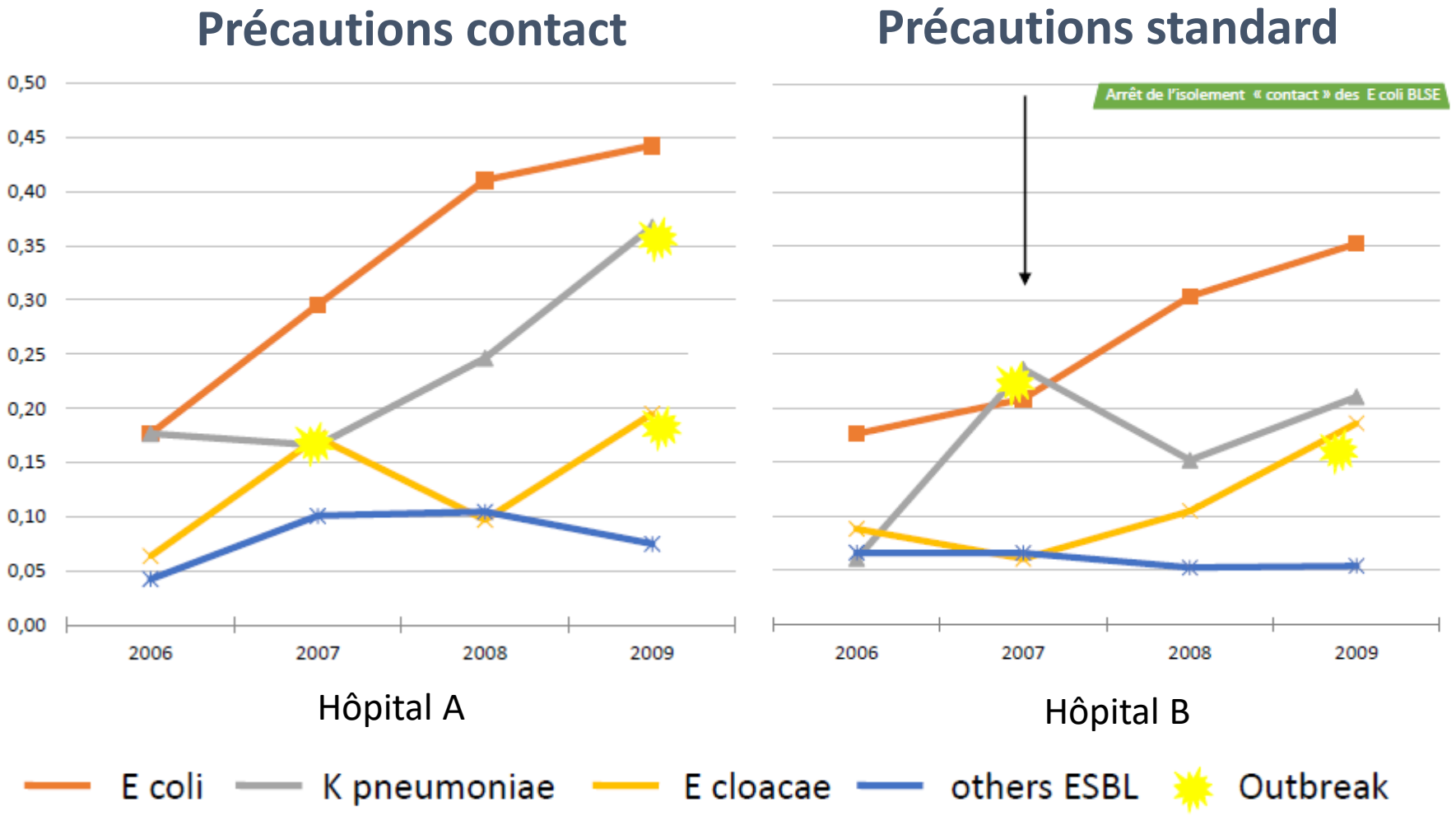
- Durée contact médiane :
  - MCO = 4 jours [3 – 6];
  - SSR : 15 jours [9 – 23
- 24 contacts (12 MCO, 12 SSR) positifs
- **11 (4,8%) contacts positifs identiques PFGE**
  - 4/151 (2,6%) en MCO
  - 7/80 (8,8%) en SSR



When **exposure times are short** and adherence to **standard precautions is high**, the discontinuance of contact precautions for ESBL-producing *E. coli* in healthcare settings results in **transmission rates similar to those observed when contact precautions** are used

Sarah Tschudin-Sutter EID 2016

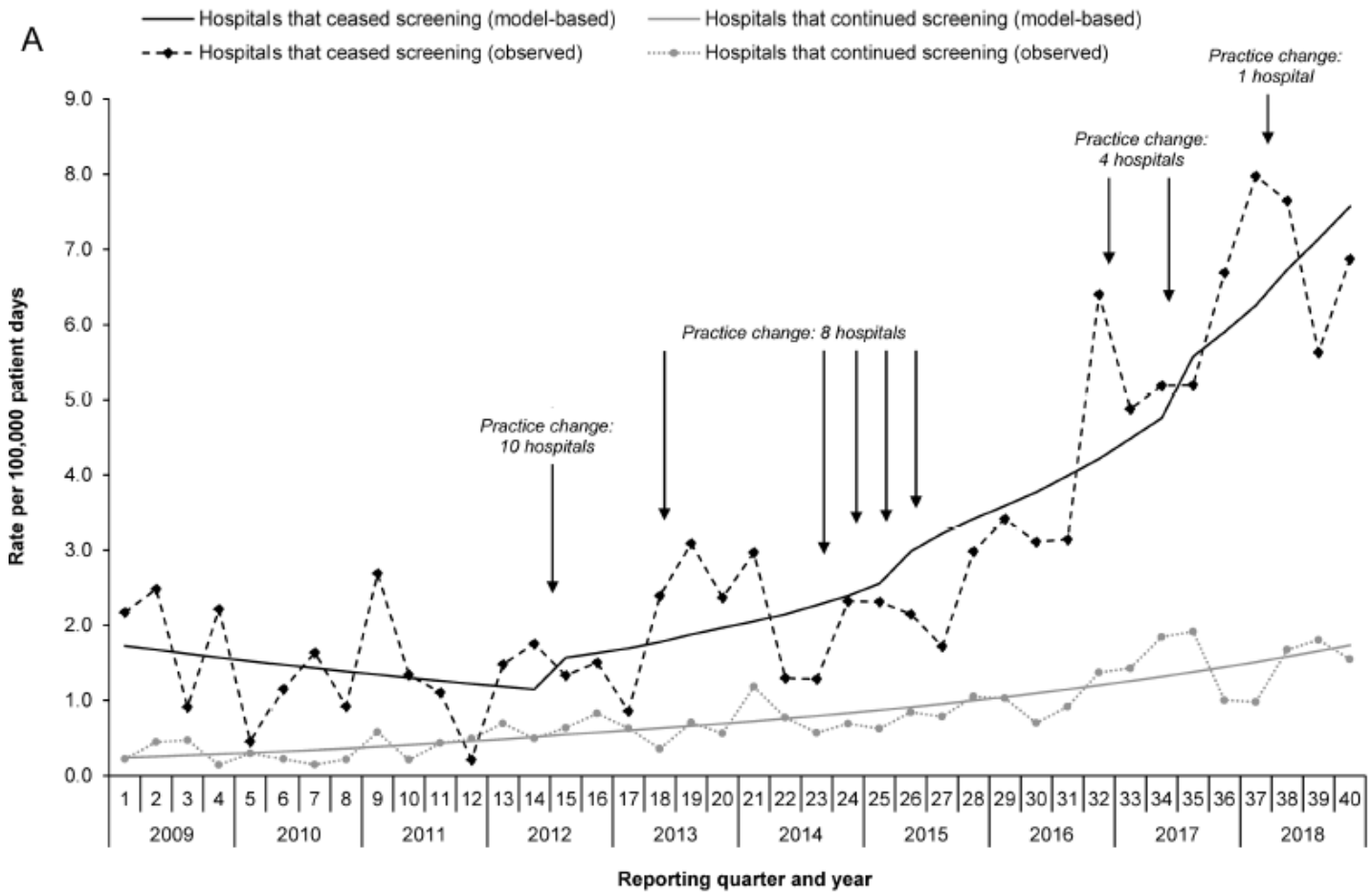
Usefulness of contact precautions for ESBL- *E. coli*



Zahar, BMC inf dis 2015

Arrêt des PCC pour les ERV

Ontario, Canada, 2012, Hospitals discontinued contact precautions for vancomycin-resistant Enterococcus (VRE).



Hospitals aiming to minimize VRE bloodstream infections should use contact precautions and screen patients at risk for VRE colonization.

Jennie Johnstone CID 2021

Comment s’en sortir ?

Isolement à la carte ?

Table 1. Locally variable factors that may influence the likelihood of benefit of contact isolation.

Local factor	Lower likelihood of benefit	Higher likelihood of benefit
Hand-hygiene compliance by health care workers	High	Low
Epidemiology of health care–associated infections	Low endemic rates	Epidemic or uncontrolled rates
Organism of concern	All or easily treatable	Selected or difficult to treat
Prevalence of organism	Common	Rare
Clinical features of source patient	Asymptomatic	Open wound, diarrhea, or uncontained secretions
Clinical features of patients at risk of infection	Healthy	Vulnerable to infection because of age, immune status, or other risks
Physical environment	Clean, spacious, single rooms	Crowded, dirty wards
Available resources	Limited	Plentiful

Kirkland et al, Clin Inf Dis 2009

HIGH PRIORITY

- ○Symptomatic infections
- ○Immunocompromised status

- -*Infectious Respiratory Particle transmitted through the air
- -Pathogens with high transmissibilty (R >2.5)
- -High environmental stability (>1 month)
- -Lack of immunity in the population
- -High mortality rate

- Inproper hospital infrastructure
- Low adherence to IPC measures
- Low nurse/patient ratio
- No IPC programme

MEDIUM PRIORITY

- Requiring extensive medical interventions
- High number of colonized body sites
- Prolonged ICU stay

- Pathogens with moderate transmissibilty (R <2.5)

- Moderate environmental stability (>1 week)
- Moderate immunity in the population
- Moderate mortality rate

- Limited IPC programme
- Insufficient finacial support for IPC programs

LOW PRIORITY

- No invasive procedures
- Asymptomatic colonization
- Short ICU stay (<6 weeks)

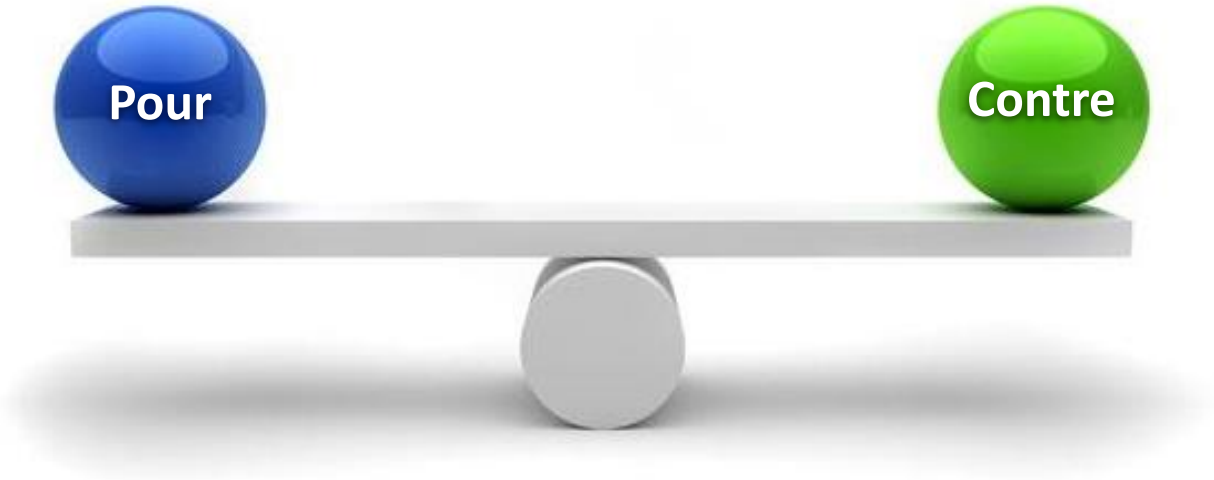
- **Contact transmission
- Pathogens with low transmissibilty
- Low environmental stability (<1 day)
- High immunity in the population

- Proper infrastructure
- Audited IPC programme
- Financial support for IPC programs

Emine Alp Meşe, Under review

Pour ou contre l'isolement ?

	Perte de chance/coût BHRe **Evolution endémique**
Efficacité des mesures	**Efficacité des mesures**
Réservoir environmental hosp.	**Reservoir humain**
Epidémiologie hospitalière	**Durée de portage**
Fardeau de la RATB	**Transmission plasmidique**



Conclusion

- Prévisions pessimistes concernant le fardeau des *Enterobacterales*-R…
  - Meilleure prise en charge > Développement de nvx ATB
- **Hôpital = amplificateur du phénomène**
- **Evolution communautaire** nécessitant de revisiter nos mesures
  - Rehausser le niveau des précautions standard (HdM) plutôt qu'isoler
- **Toutes les *Enterbacterales* BLSE ne valent pas** : *E.coli* vs non *E.coli*
  - Maîtrise des EPC encore possible dans une grande partie du territoire
  - Est-ce que toutes les carbapénèmases se valent ? OXA vs non OXA
- Evolution vers un **isolement à la carte** … Application?
- Echec assuré si absence d'une réelle maîtrise de l'antibiothérapie

Merci

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