Cette présentation a été effectuée le 2 décembre 2024, au cours de la journée « Contrôle des BGNPC au Québec : c'est le temps d'agir! » dans le cadre des 27es Journées annuelles de santé publique.

Épidémiologie et impacts cliniques des BGNPC

Yves Longtin MD FRCPC
Jewish General Hospital
McGill University Faculty of Medicine
AMMI Canada

McGill

Hôpital général juif
Jewish General Hospital

OBJECTIFS

1. Décrire l'état de la situation et l'évolution des BGNPC dans les milieux de soins du Québec.

2. Évaluer le fardeau de la résistance aux antimicrobiens (RAM) et des EPC au Canada et dans le monde à l'aide d'une gamme d'indicateurs

3. Comprendre l'impact clinique des infections à EPC

Déclaration de conflit d'intérêts

Yves Longtin

Relations avec les organismes sans but lucratif :

Salary support:
Fonds de recherche en santé du Québec

Scientific committee membership:
WHO Working Group on Antimicrobial Resistance
AMMI Canada
Comité des infections nosocomiales du Québec
Canadian Nosocomial Infection Surveillance Program

Qu'est-ce que la RAM ?

- Conceptuellement:
  - La résistance aux antimicrobiens (RAM) se produit lorsque les bactéries, les virus, les champignons et les parasites ne réagissent plus aux médicaments antimicrobiens

- Conséquences:
  - Les antimicrobiens deviennent inefficaces
  - Les infections deviennent difficiles ou impossibles à traiter

- La RAM est un processus naturel ! mais s'accélère par l'activité humaine telle que la surutilisation de l'ATB

https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

L’histoire des antibiotiques n’a-t-elle commencé qu’en 1928 ?

Sir Alexander Fleming (1881 – 1955)

Chronologie des antibiotiques (et de la RAM)

Daptomycin
30 million years

Vancomycin
240 million years

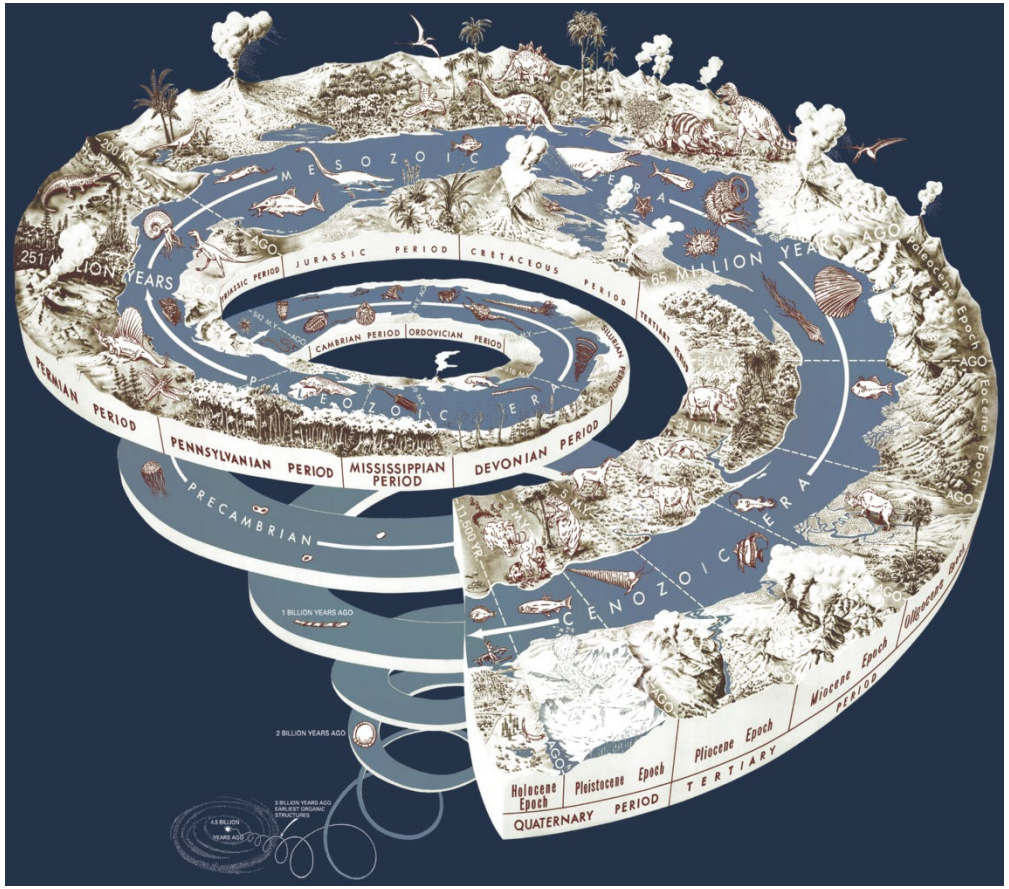
Original carbapenem thienamycin
Source: *Streptomyces cattleya*

Streptomycin
610 million years

Beta-lactams Aspergillus, *Streptomyces*, *Flavobacterium* and *Burkholderia*

Erythromycin
880 million years

Beta-lactamases
> 2 billion years



Wright (2007). *Nat Rev Microbiol* 5:175-186

Hall et Barlow (2004). *Drug Resist Updat* 7:111–23

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Organismes multirésistants

S. aureus résistant à la méthicilline (SARM)

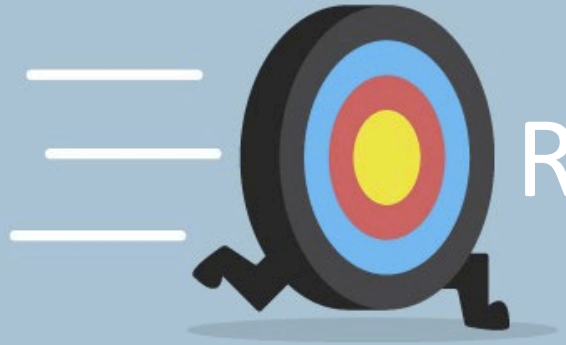
Entérobactéries résistantes aux carbapénèmes

Acinetobacter antibiorésistant

Entérocoque résistant à la vancomycine (E

Candida auris

"Has-beens"
Entérocoque résistant à la gentamicine
Entérobactéries productrices de B-lactamase à spectre étendu (ESBL)



RAM

Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis

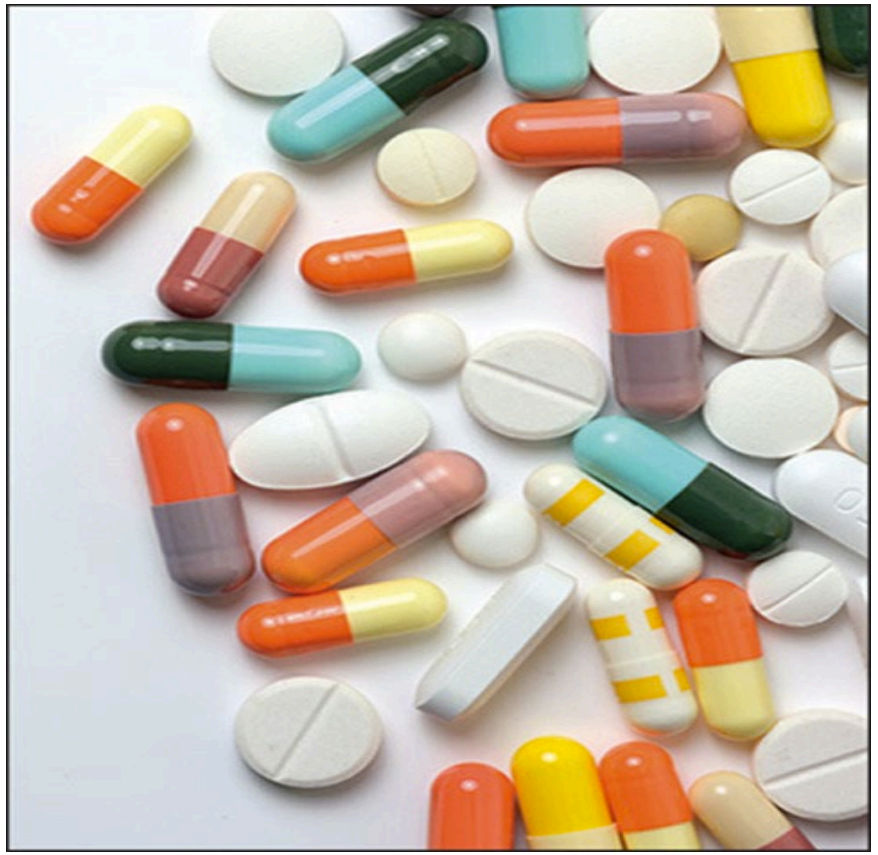
*Antimicrobial Resistance Collaborators**

Summary

Background Antimicrobial resistance (AMR) poses a major threat to human health around the world. Previous publications have estimated the effect of AMR on incidence, deaths, hospital length of stay, and health-care costs for specific pathogen–drug combinations in select locations. To our knowledge, this study presents the most comprehensive estimates of AMR burden to date.

Lancet 2022; 399: 629–55
Published Online
January 20, 2022
https://doi.org/10.1016/
S0140-6736(21)02724-0

- Objectif : Quantifier le fardeau de la RAM dans 204 pays en 2019
  - 12 syndromes infectieux et 23 agents pathogènes
  - Sources multiples de données
    - Rev syst, bases de données de surveillance, bases de données hospitalières
    - Total: 471 million de données
- 2 comparaisons
  - Comparaison de l'infection due à la RAM et à la même infection, mais sans RAM
  - Comparaison de l'infection due à la RAM à l'absence d'infection
  - Cela permet de comparer le fardeau de l'infection et le fardeau de la RAM



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Lancet. 2022 Feb 12;399(10325):629-655.

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- Conclusions
  - Décès associés à RAM: 4.95 million (95% CI, 3.62-6.57)
- Décès attribuables à RAM: 1.27 million (95% CI, 0.91-1.71)*
- Gains découlant de la prévention des infections et de la prévention de la propagation de la RAM
- Seulement 1 RAM majeure est évitable par la vaccination (pneumocoque)

*Comparateurs : Décès dus au VIH : 680K Malaria : 627k

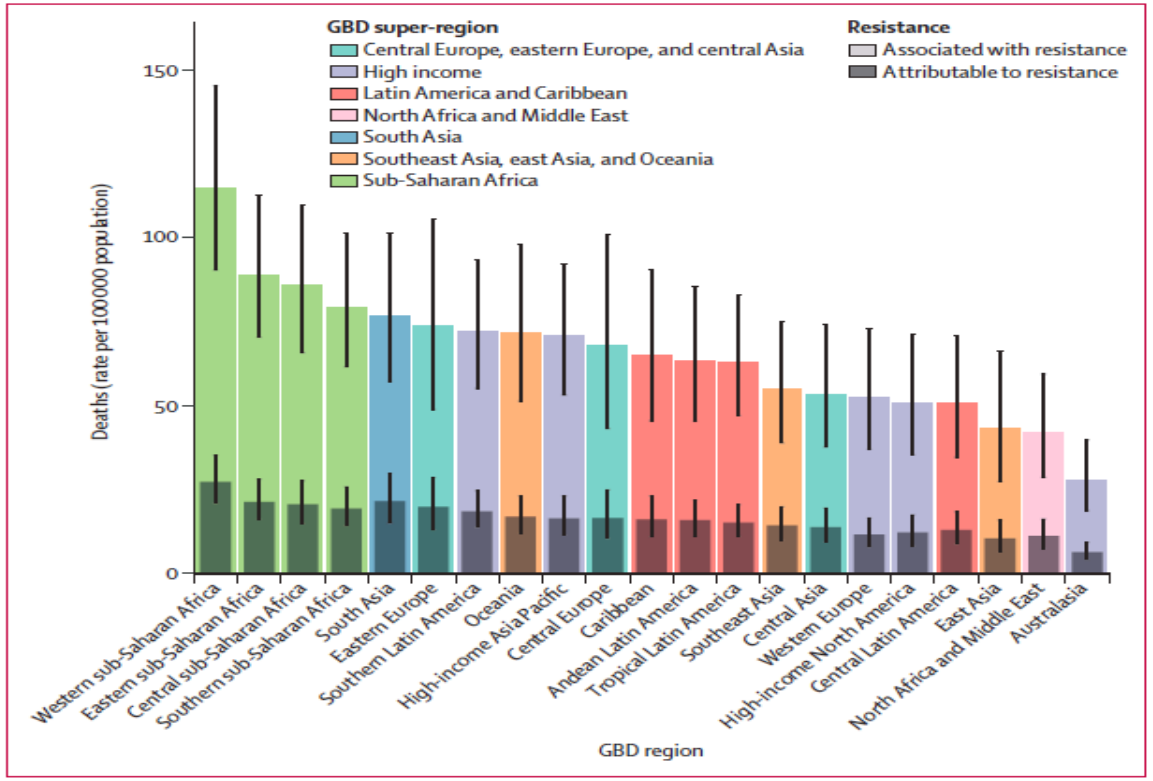

Figure 2: **All-age rate of deaths attributable to and associated with bacterial antimicrobial resistance by GBD region, 2019**
Estimates were aggregated across drugs, accounting for the co-occurrence of resistance to multiple drugs. Error bars show 95% uncertainty intervals. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

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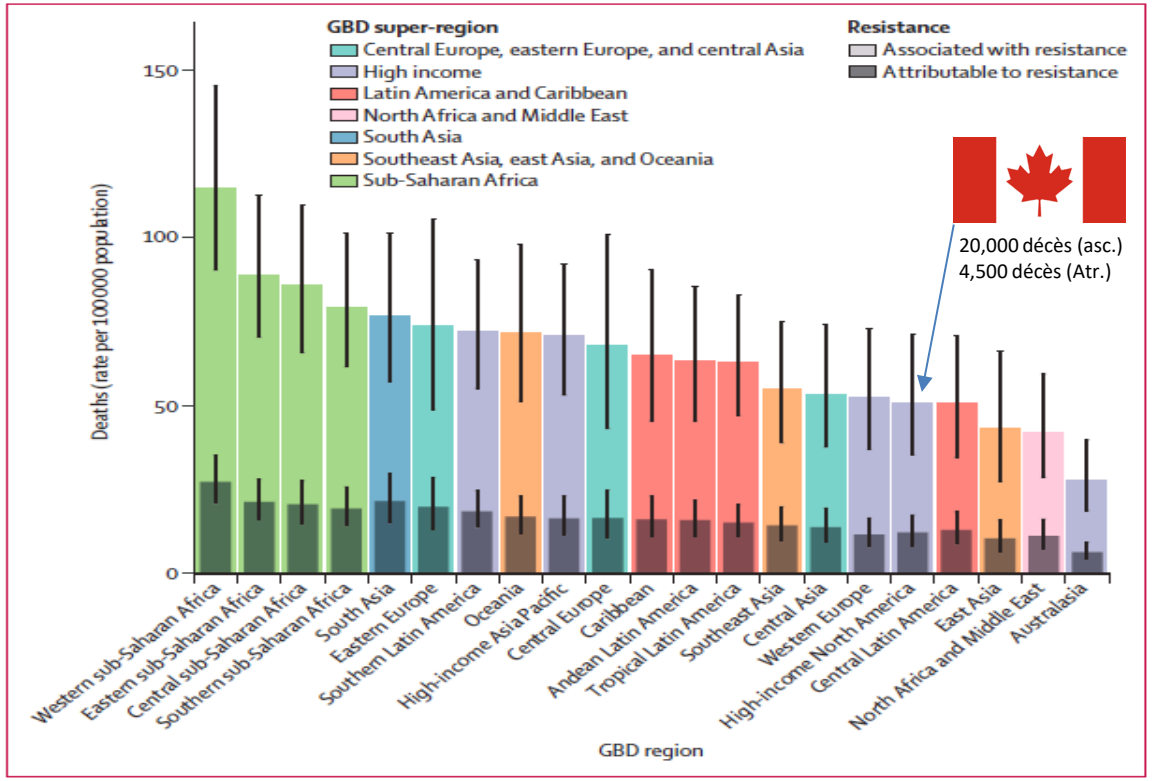

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Lancet. 2022 Feb 12;399(10325):629-655.

Causes de décès au Canada

Top 12 leading causes of death in Canada

Cause	No. deaths (2019)
Malignant neoplasms	80372
Diseases of heart	53364
Accidents (unintentional injuries)	15527
Cerebrovascular diseases	13717
Chronic lower respiratory diseases	12902
Diabetes mellitus	6987
Influenza and pneumonia	6945
Alzheimer's disease	6181
Intentional self-harm (suicide)	4581
Chronic liver disease and cirrhosis	3708
Nephritis, nephrotic syndrome and nephrosis	3770
Other ill-defined and unspecified causes of mortality	3378
Total, all causes of death	**285301**

20 000 décès associés à RAM

4,500 décès Attributable À RAM

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https://www150.statcan.gc.ca/n1/daily-quotidien/231127/t001b-eng.htm

Prévisions, 2050

	Associated death counts (thousands)				Associated death rates per 100 000				Attributable death counts (thousands)				Attributable death rate per 100 000			
	1990	2019	2021	2050	1990	2019	2021	2050	1990	2019	2021	2050	1990	2019	2021	2050
Global	4780 (4000–5550)	4940 (4430–5450)	4710 (4230–5190)	8220 (6850–9650)	89·6 (75·0–104)	63·8 (57·2–70·4)	59·7 (53·6–65·7)	87·7 (73·2–104)	1060 (841–1270)	1200 (1050–1350)	1140 (1000–1280)	1910 (1560–2260)	19·8 (15·8–23·9)	15·5 (13·6–17·4)	14·5 (12·7–16·2)	20·4 (16·6–24·2)
Central Europe, Eastern Europe, and Central Asia	285 (240–330)	281 (252–310)	265 (235–295)	360 (297–420)	67·8 (57·1–78·4)	67·1 (60·1–74·0)	63·4 (56·2–70·6)	90·5 (76·3–106)	63·0 (49·5–76·6)	68·6 (59·2–78·0)	64·0 (55·2–72·8)	82·9 (67·1–98·7)	15·0 (11·8–18·2)	16·4 (14·1–18·6)	15·3 (13·2–17·4)	20·8 (17·0–24·8)
High-income	477 (385–568)	579 (513–644)	553 (489–618)	883 (674–1040)	52·5 (42·4–62·5)	53·3 (47·3–59·3)	50·7 (44·8–56·6)	78·1 (59·8–92·2)	108 (82·9–133)	131 (115–146)	125 (110–140)	192 (146–225)	11·9 (9·12–14·7)	12·0 (10·6–13·5)	11·4 (10·1–12·8)	17·0 (12·9–19·9)
Latin America and Caribbean	247 (210–284)	339 (305–372)	322 (285–360)	650 (520–808)	63·3 (53·8–72·8)	57·9 (52·2–63·6)	54·2 (47·9–60·6)	96·7 (78·0–119)	55·7 (44·4–67·0)	82·4 (72·4–92·5)	78·1 (67·7–88·6)	148 (117–185)	14·3 (11·4–17·2)	14·1 (12·4–15·8)	13·2 (11·4–14·9)	22·1 (17·5–27·2)
North Africa and Middle East	264 (219–310)	243 (211–274)	226 (194–259)	525 (430–641)	78·0 (64·5–91·4)	40·0 (34·8–45·2)	36·3 (31·1–41·5)	61·4 (49·2–73·9)	63·0 (49·4–76·7)	64·7 (54·4–75·1)	60·2 (50·1–70·3)	133 (107–161)	18·6 (14·6–22·6)	10·7 (8·97–12·4)	9·66 (8·05–11·3)	15·5 (12·3–19·0)
South Asia	1400 (1170–1630)	1350 (1200–1500)	1260 (1110–1420)	2400 (1910–2980)	128 (107–149)	74·7 (66·5–83·0)	68·5 (60·2–76·8)	114 (91·3–141)	308 (249–367)	356 (303–408)	335 (282–387)	604 (463–743)	28·2 (22·8–33·6)	19·7 (16·8–22·6)	18·1 (15·3–21·0)	28·8 (22·5–35·6)
Southeast Asia, East Asia, and Oceania	1110 (916–1310)	1140 (995–1290)	1150 (1010–1290)	1940 (1580–2370)	65·8 (54·2–77·5)	52·8 (46·0–59·5)	52·7 (46·3–59·1)	92·0 (75·0–113)	250 (195–304)	271 (235–307)	270 (237–304)	428 (348–511)	14·8 (11·5–18·0)	12·5 (10·9–14·2)	12·4 (10·8–13·9)	20·3 (16·4–24·5)
Sub-Saharan Africa	990 (797–1180)	1010 (811–1200)	923 (732–1110)	1470 (1140–1860)	202 (162–241)	93·2 (75·1–111)	81·5 (64·6–98·4)	69·3 (53·7–87·5)	210 (158–262)	227 (179–276)	209 (161–257)	323 (245–416)	42·8 (32·2–53·3)	21·0 (16·5–25·5)	18·5 (14·2–22·7)	15·3 (11·5–19·5)

Table 3: Deaths (in counts and all-age rates) associated with and attributable to bacterial antimicrobial resistance, globally, by GBD super-region, for 1990, 2019, 2021 and 2050

Prévisions 2050

Décès associés à la RAM : 37 000

RAM Décès attribuables : 8 000

Prévisions démographiques : 48M

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Lancet. 2022 Feb 12;399(10325):629-655.

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

*GBD 2021 Antimicrobial Resistance Collaborators**

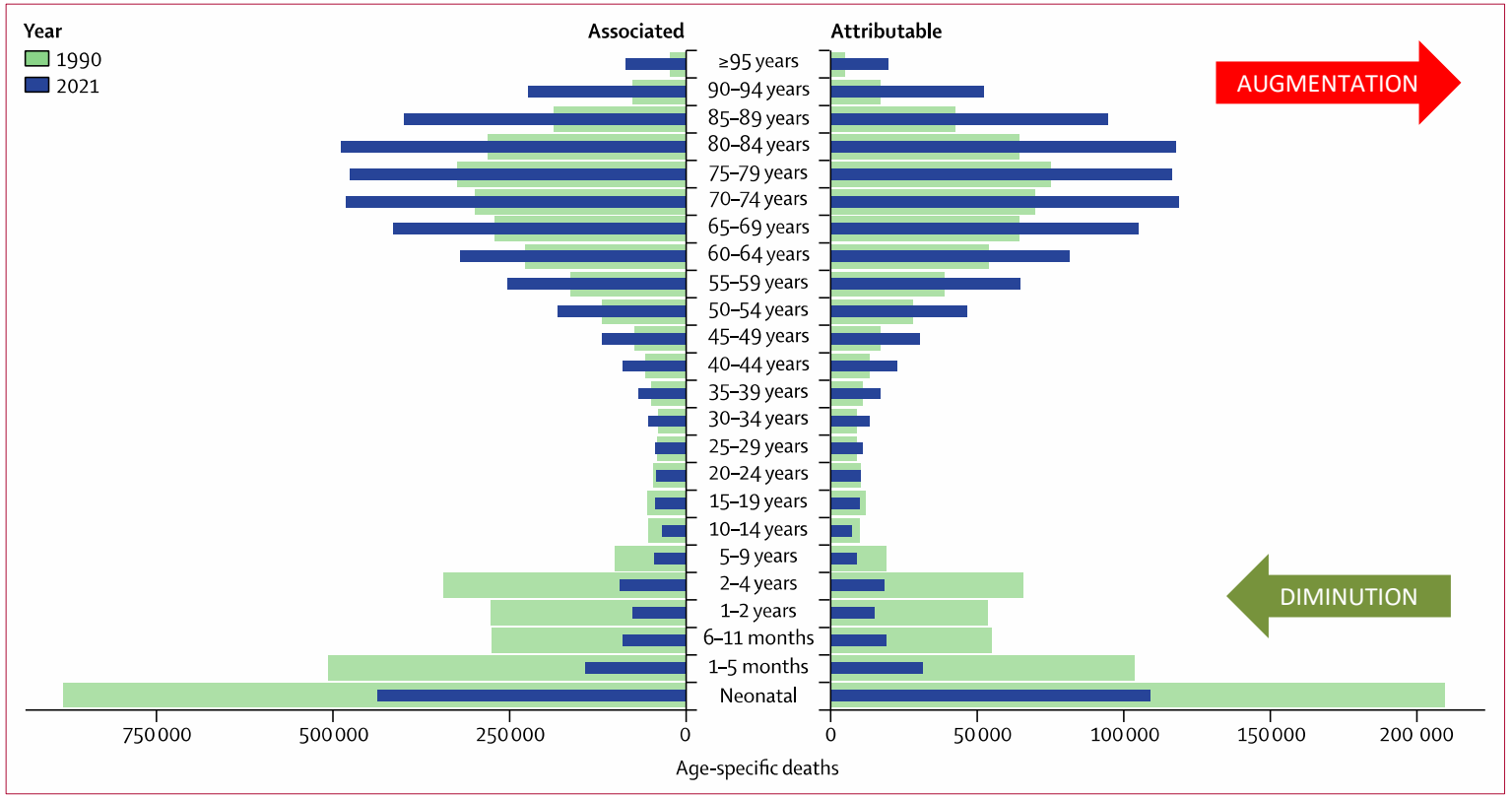


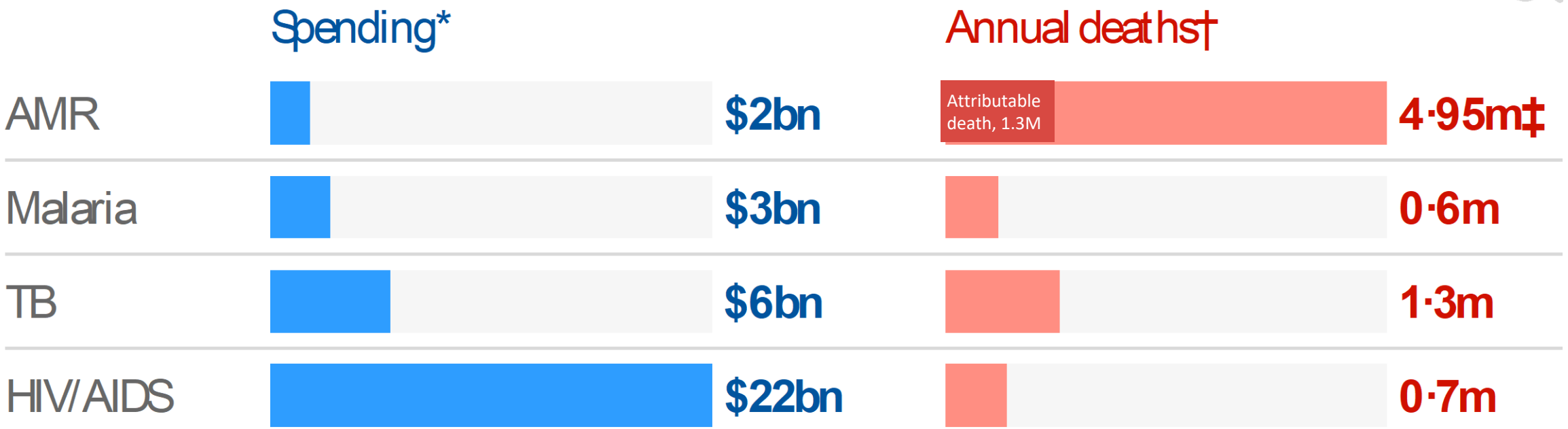
Figure 2: **Deaths attributable and associated with antimicrobial resistance, by detailed age group, for 1990 and 2021**
Counterfactuals have distinct x-axes.

Diminution des décès liés à la RAM chez les enfants, mais augmentation du nombre de personnes >50

Naghavi, Mohsen et al. The Lancet, Volume 404, Issue 10459, 1199 - 1226

Antibiotics

The ability to deploy drugs and diagnostics for HIV/AIDS, malaria, and TB is well developed. However, similar support is absent for antibiotics even though non-TB bacterial infections kill far more than HIV/AIDS, malaria, and TB combined.



*Average spending, 2017 to 2021; † Estimated global deaths in 2019; ‡ Associated deaths

https://www.thelancet.com/pb-assets/Lancet/infographics/antibiotic-resistance-2024/antibiotic-resistance2024-1720780667507.pdf

Political Declaration of the High-level Meeting on Antimicrobial Resistance

Sept 9th 2024

- AMR is one of the most urgent global health threats
- AMR demands immediate action to safeguard our ability to treat human, animal and plant disease and enhance food safety
- Globally, AMR could result in USD 1 trillion of additional health-care costs by 2050
- AMR can lead to 11% decline in livestock production by 2050
- Commit to reduce global deaths associated with AMR by 10% by 2030 compared to their 2019 levels.

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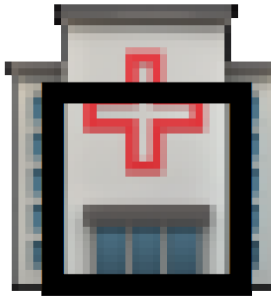
https://www.un.org/pga/wp-content/uploads/sites/108/2024/09/FINAL-Text-AMR-to-PGA.pdf?utm_medium=email&utm_campaign=2024-AMR-Digest-Vol-1-Issue-1&utm_source=Envoke-All-contacts-for-AMRC&utm_term=NEW%21-The-AMR-Digest-Vol-1-Issue-1

La RAM est-elle un problème lié aux communautés ou aux milieux de soins de santé ?

https://designwell365.com/design/healthcare/transforming-healthcare-buildings-into-community-hubs/



48% (10/21) Healthcare Associated

52% Community Associated

Urgent Threats

- Carbapenem-resistant *Acinetobacter*
- *Candida auris*
- *Clostridioides difficile*
- Carbapenem-resistant Enterobacteriaceae **CPE**
- Drug-resistant *Neisseria gonorrhoeae*

Serious Threats

- Drug-resistant *Campylobacter*
- Drug-resistant *Candida*
- ESBL-producing Enterobacteriaceae
- Vancomycin-resistant *Enterococci* **VRE**
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant nontyphoidal *Salmonella*
- Drug-resistant *Salmonella* serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* **MRSA**
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

Concerning Threats

- Erythromycin-resistant group A *Streptococcus*
- Clindamycin-resistant group B *Streptococcus*

Watch List

- Azole-resistant *Aspergillus fumigatus*
- Drug-resistant *Mycoplasma genitalium*
- Drug-resistant *Bordetella pertussis*

U.S. Centers for Disease Control and Prevention

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Mainly a threat in healthcare settings

Les 15 principaux agents pathogènes nosocomiaux NHSN, adultes, 2018 - 2021

Pathogen	# Pathogens	% Pathogens	Rank	Emerging AMR
Escherichia coli	73,556	16.2	1	Yes (AmpC, ESBL, CPE)
Staphylococcus aureus	51,131	11.3	2	Yes (MRSA)
Enterococcus faecalis[2]	39,129	8.6	3	Partly (VRE)
Select *Klebsiella* spp.	38,496	8.5	4	Yes (CPE)
Pseudomonas aeruginosa	36,004	7.9	5	Yes (CRO)
CoN staphylococci	32,276	7.1	6	
Enterobacter spp.	18,431	4.1	7	Yes (CPE)
Enterococcus faecium[2]	16,904	3.7	8	Yes (VRE)
Candida albicans[2]	16,458	3.6	9	
Proteus spp.	13,953	3.1	10	Yes (CPE)
Bacteroides spp.	11,602	2.6	11	
Viridans group streptococci	9,962	2.2	12	
Other *Candida* spp. [2]	9,803	2.2	13	Yes (C. auris)
Other *Enterococcus* spp. [2]	9,091	2.0	14	
Candida glabrata[2]	7,622	1.7	15	
Other pathogens	68,522	15.1		
Total	**452,940**	**100.0**		

Global R to 3GC: 42%
Global MRSA: 35%

WHO Glass 2022

La prévention de la transmission et des infections nosocomiales est essentiel

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https://www.cdc.gov/nhsn/hai-report/data-tables-adult/table-11.html

https://www.who.int/publications/i/item/9789240062702

Portrait mondial de la RAM

https://iris.who.int/bitstream/handle/10665/364996/9789240062702-eng.pdf?sequence=1

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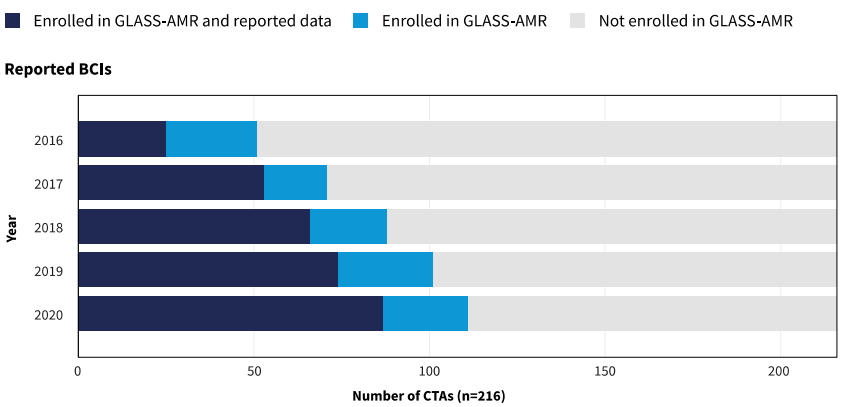
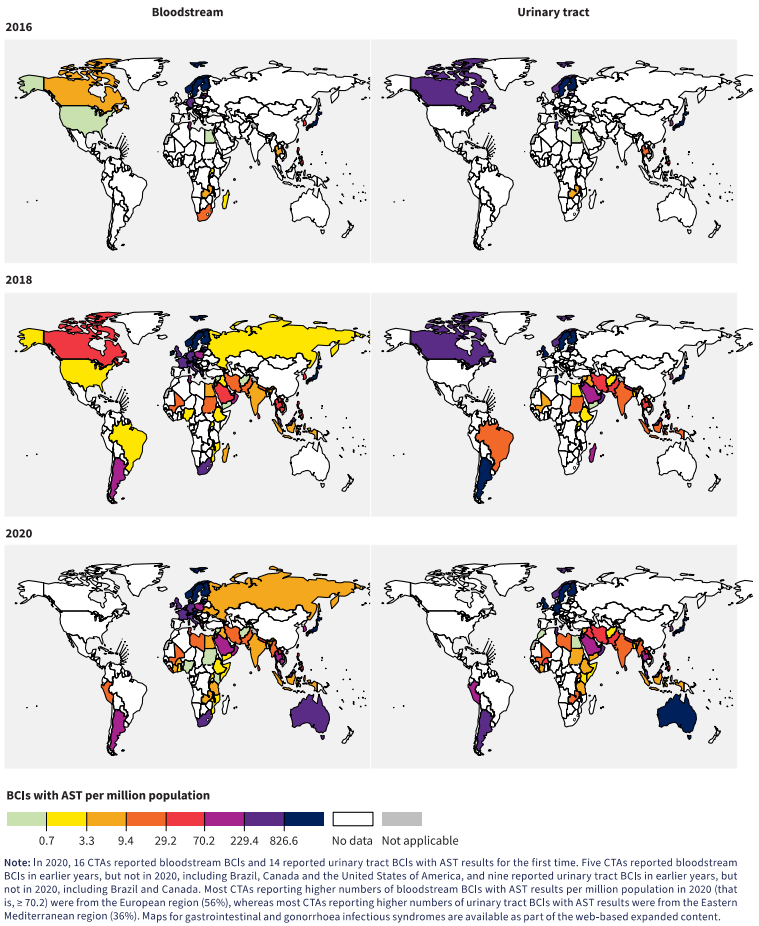
GLASS, WHO 2022

Fig. 3.2. CTAs enrolled in GLASS-AMR that reported 2016-2020 bacterial identification results and/or AST results for bacteriologically confirmed infectious syndromes under surveillance in 2017-2021 data calls



No. Participating countries

Fig. 3.4. BCIs with AST results reported to GLASS-AMR per one million population for selected infectious syndromes under surveillance (2016, 2018, 2020)



Note: In 2020, 16 CTAs reported bloodstream BCIs and 14 reported urinary tract BCIs with AST results for the first time. Five CTAs reported bloodstream BCIs in earlier years, but not in 2020, including Brazil, Canada and the United States of America, and nine reported urinary tract BCIs in earlier years, but not in 2020, including Brazil and Canada. Most CTAs reporting higher numbers of bloodstream BCIs with AST results per million population in 2020 (that is, ≥ 70.2) were from the European region (56%), whereas most CTAs reporting higher numbers of urinary tract BCIs with AST results were from the Eastern Mediterranean region (36%). Maps for gastrointestinal and gonorrhoea infectious syndromes are available as part of the web-based expanded content.

No data from Canada 2020

https://iris.who.int/bitstream/handle/10665/364996/9789240062702-eng.pdf?sequence=1

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Comment la RAM se comporte-t-elle au Québec par rapport au reste du monde?

Agents: E. coli et K.pneumoniae
Source: bactériémies

A. Bien mieux que la moyenne
B. Un peu mieux que la moyenne
C. Dans la moyenne
D. Un peu en dessous de la moyenne
E. Bien en-dessous de la moyenne

slido

Please download and install the Slido app on all computers you use

Comment la RAM se comporte-t-elle au Québec par rapport au reste du monde? (bactériémies à E. coli et K.pneumoniae)

ⓘ Start presenting to display the poll results on this slide.

E.Coli bactériémies

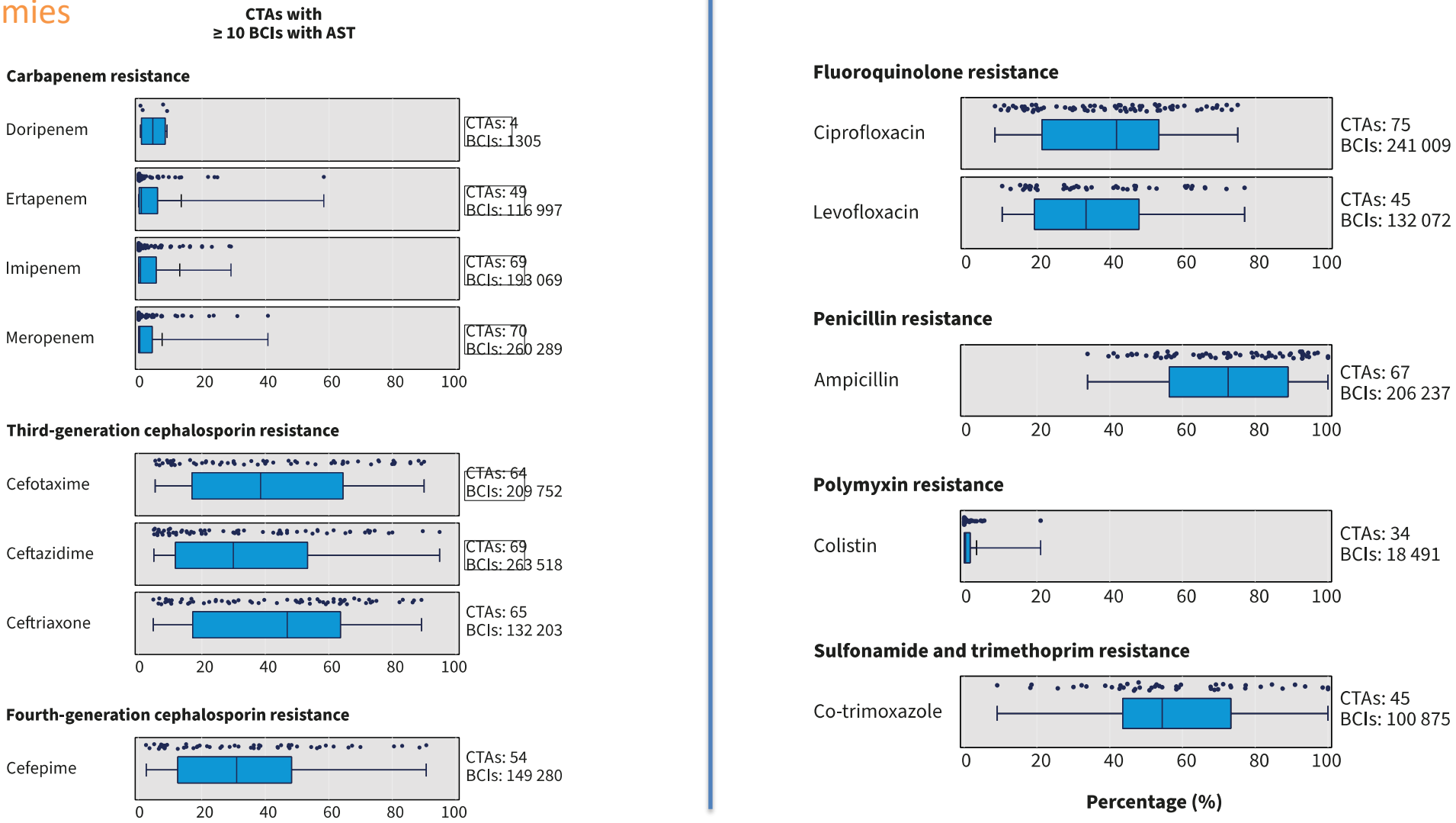

Fig. 3.7b. Percentage resistance to antimicrobials under surveillance in *E. coli* in all CTAs reporting ≥10 *E. coli* bloodstream infections with AST results compared to CTAs where the reported number per million population was above the 75th percentile in 2020

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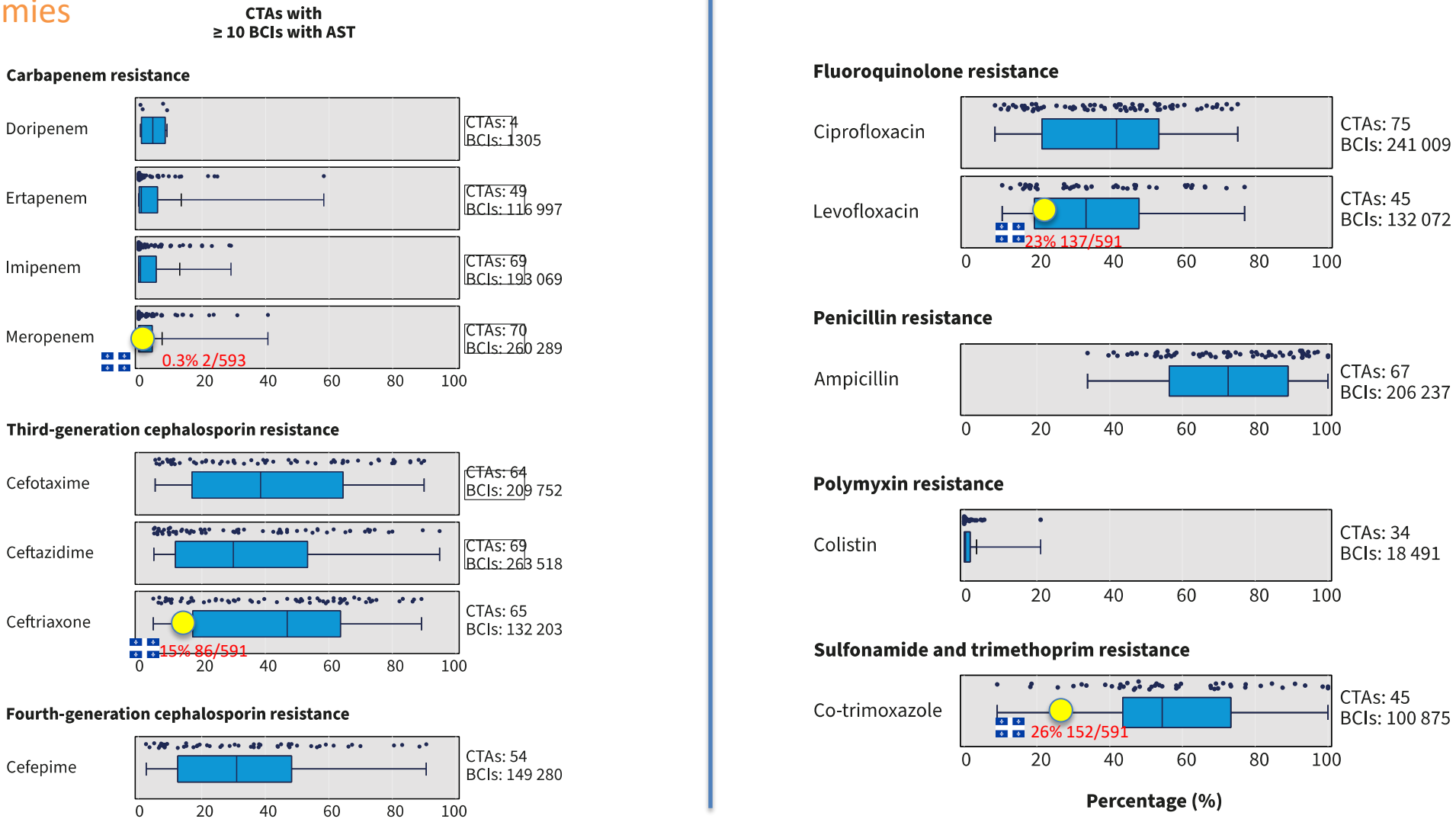
https://iris.who.int/bitstream/handle/10665/364996/9789240062702-eng.pdf?sequence=1

https://www.inspq.qc.ca/sites/default/files/publications/3575_bacteriemies-nosocomiales-panhospitalieres_2023-2024.pdf

E.Coli bactériémies



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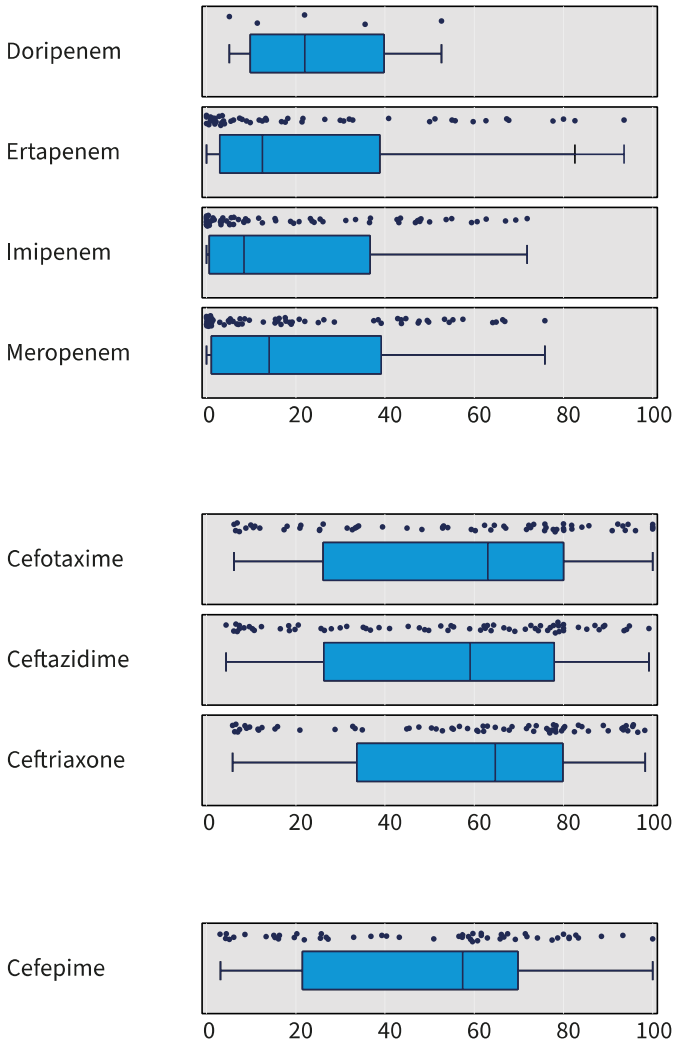
https://iris.who.int/bitstream/handle/10665/364996/9789240062702-eng.pdf?sequence=1

https://www.inspq.qc.ca/sites/default/files/publications/3575_bacteriemies-nosocomiales-panhospitalieres_2023-2024.pdf



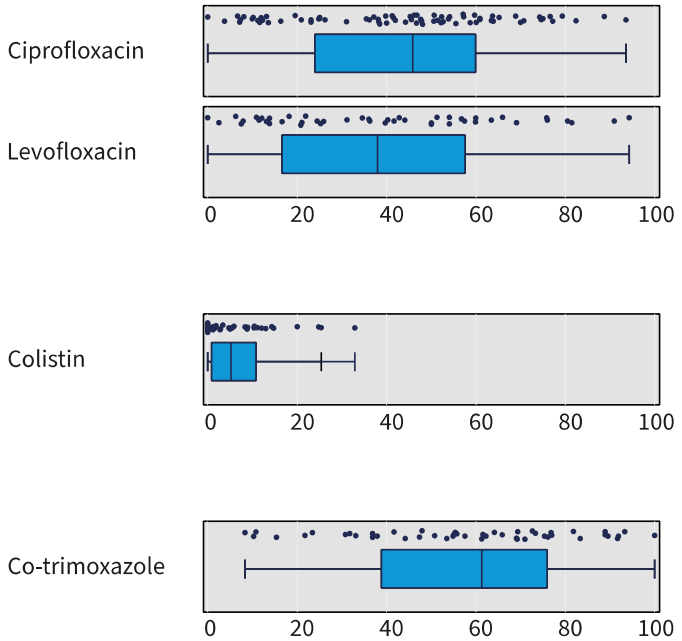
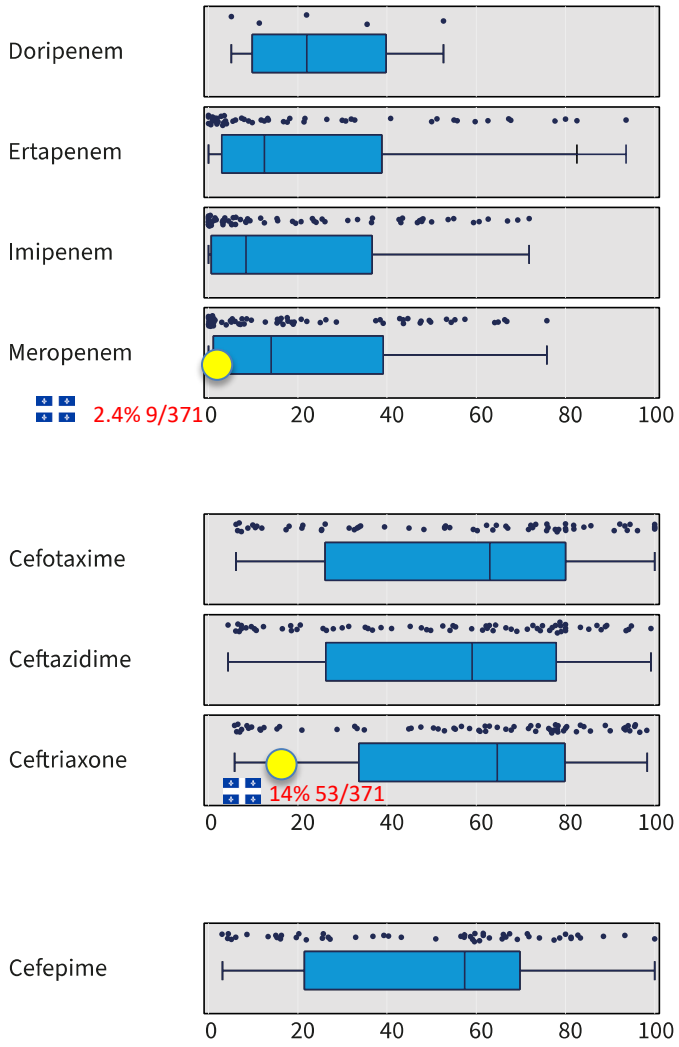


Fig. 3.7c. Percentage resistance to antimicrobials under surveillance in *K. pneumoniae* in all CTAs reporting ≥ 10 *K. pneumoniae* bloodstream infections with AST results compared to CTAs where the reported number per million population was above the 75th percentile in 2020

https://iris.who.int/bitstream/handle/10665/364996/9789240062702-eng.pdf?sequence=1

https://www.inspq.qc.ca/sites/default/files/publications/3575_bacteriemies-nosocomiales-panhospitalieres_2023-2024.pdf



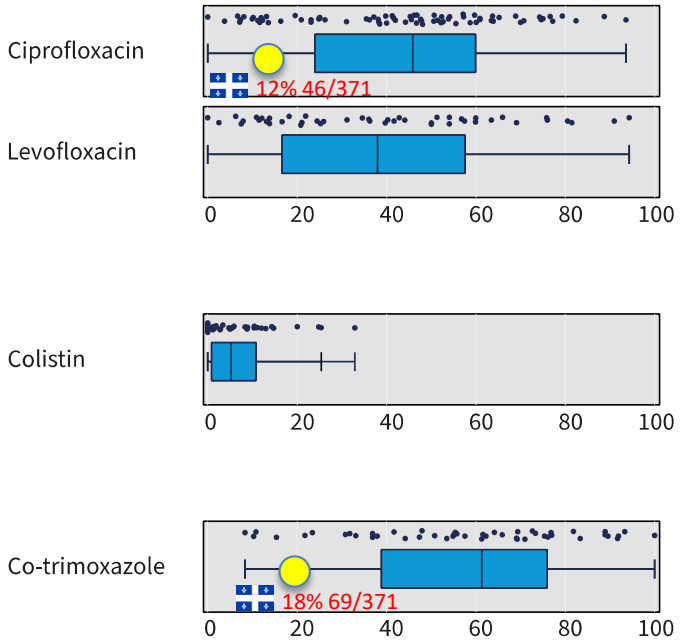


Fig. 3.7c. Percentage resistance to antimicrobials under surveillance in *K. pneumoniae* in all CTAs reporting ≥ 10 *K. pneumoniae* bloodstream infections with AST results compared to CTAs where the reported number per million population was above the 75th percentile in 2020

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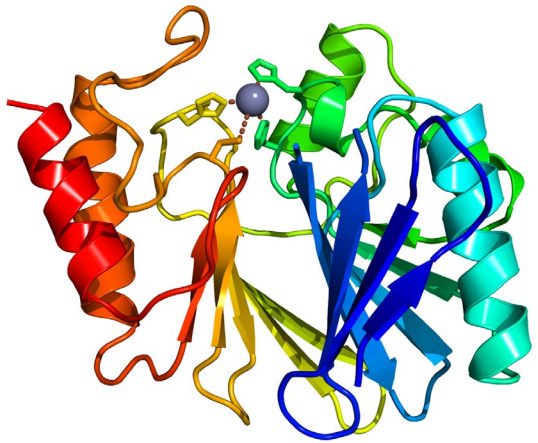
https://www.inspq.qc.ca/sites/default/files/publications/3575_bacteriemies-nosocomiales-panhospitalieres_2023-2024.pdf

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

*GBD 2021 Antimicrobial Resistance Collaborators**

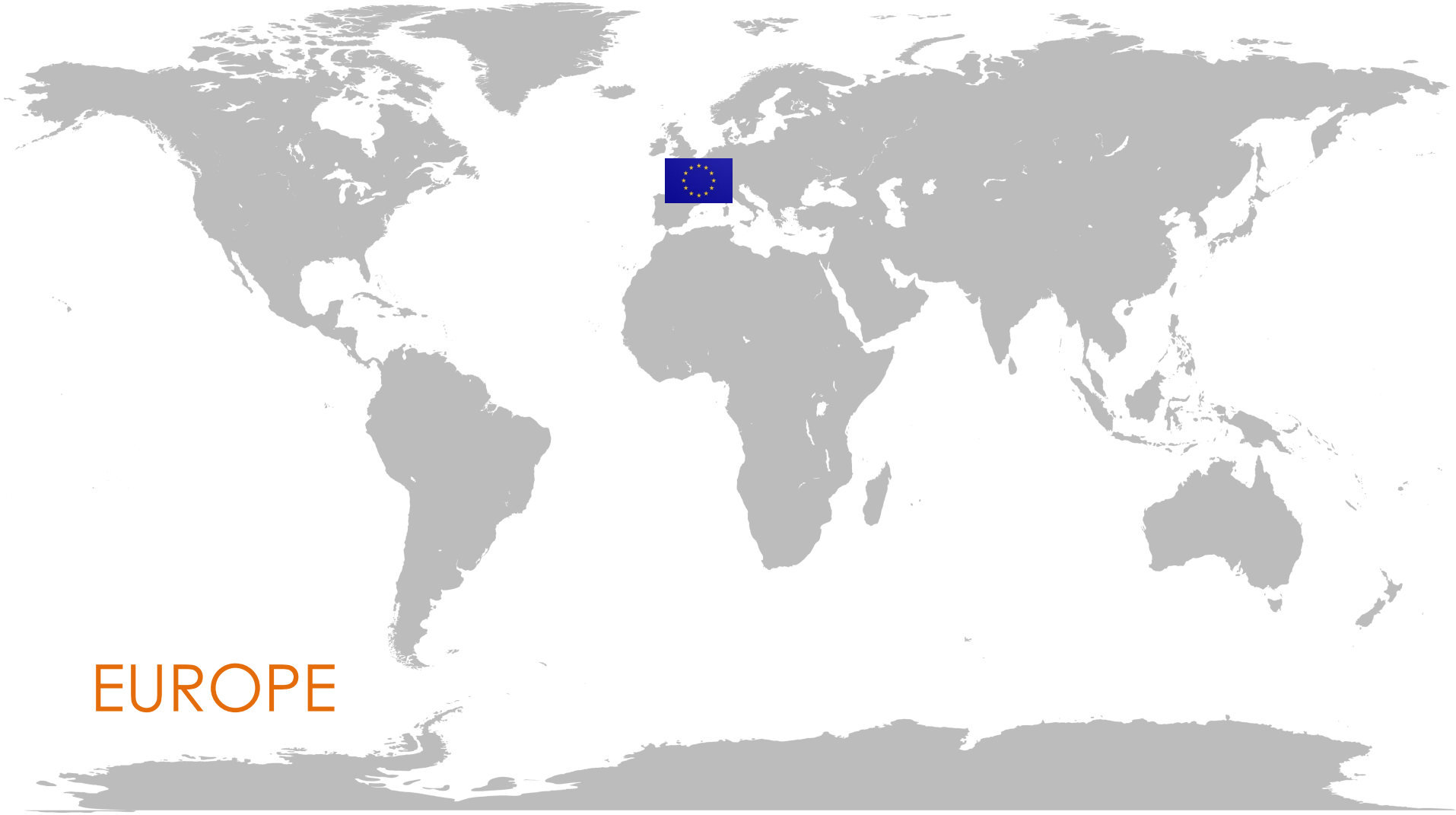
Les bactéries GN résistantes aux carbapénèmes est la forme de RAM qui devrait augmenter le plus



Metallo-B-lactamase

	1990	2021
Associated deaths	619 000	1 030 000
Attributable deaths	127 000	216 000

Naghavi, Mohsen et al. The Lancet, Volume 404, Issue 10459, 1199 - 1226
https://en.wikipedia.org/wiki/Metallo-beta-lactamase_protein_fold



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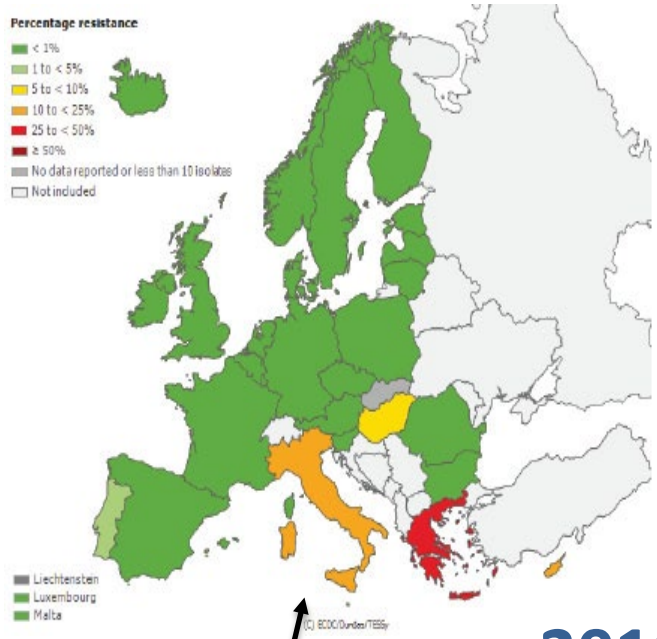
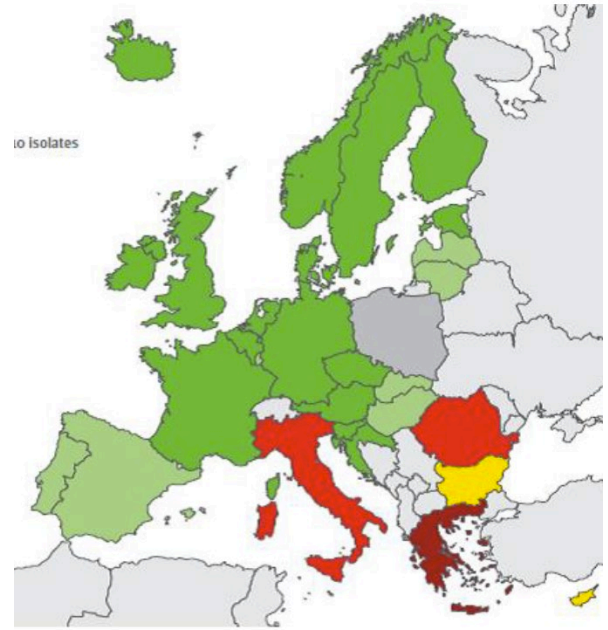
Klebsiella pneumoniae : pourcentage d'isolats invasifs résistants aux carbapénèmes.



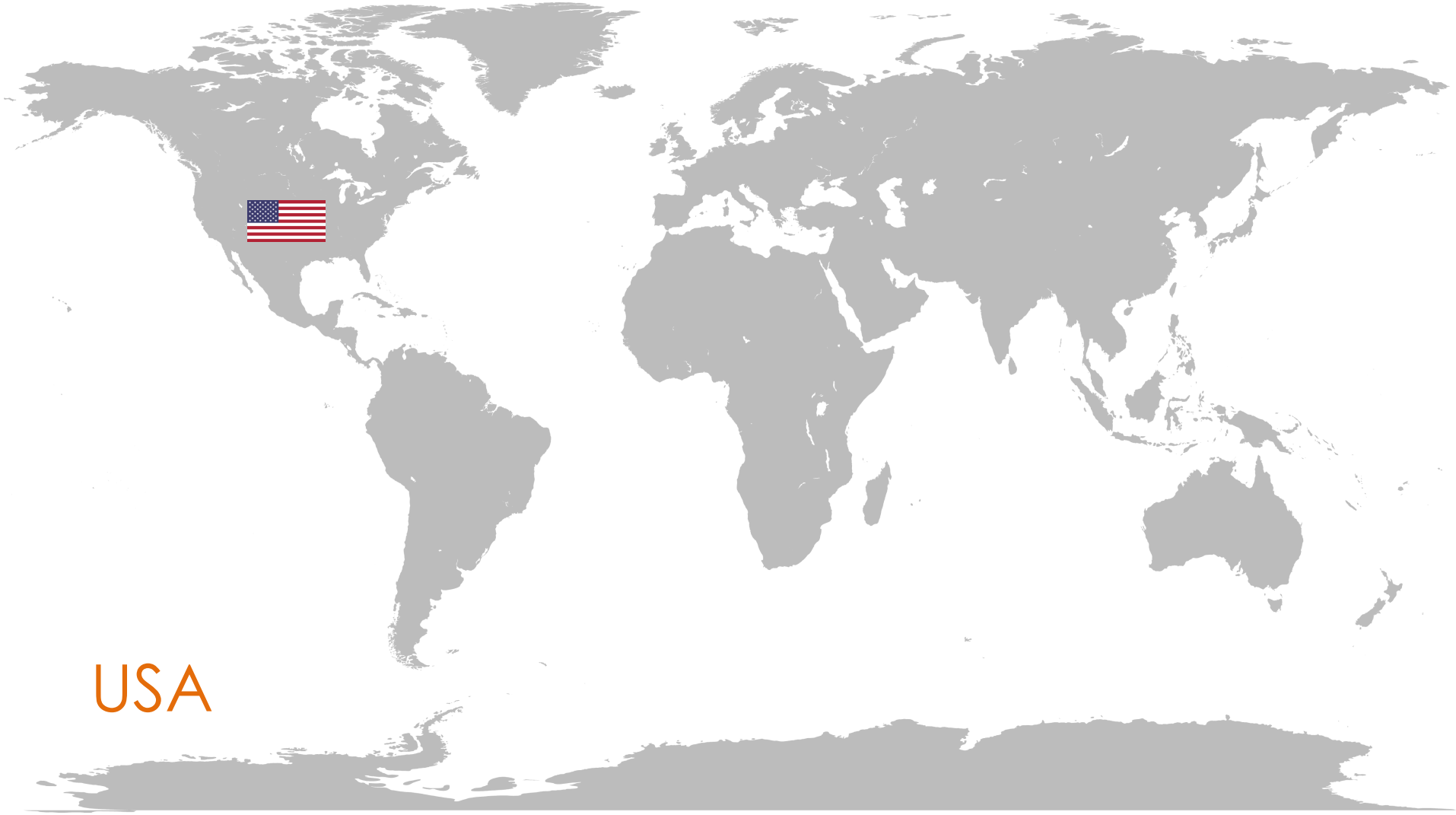
2010

2011



2014

ITALIE (2006): 1.3%



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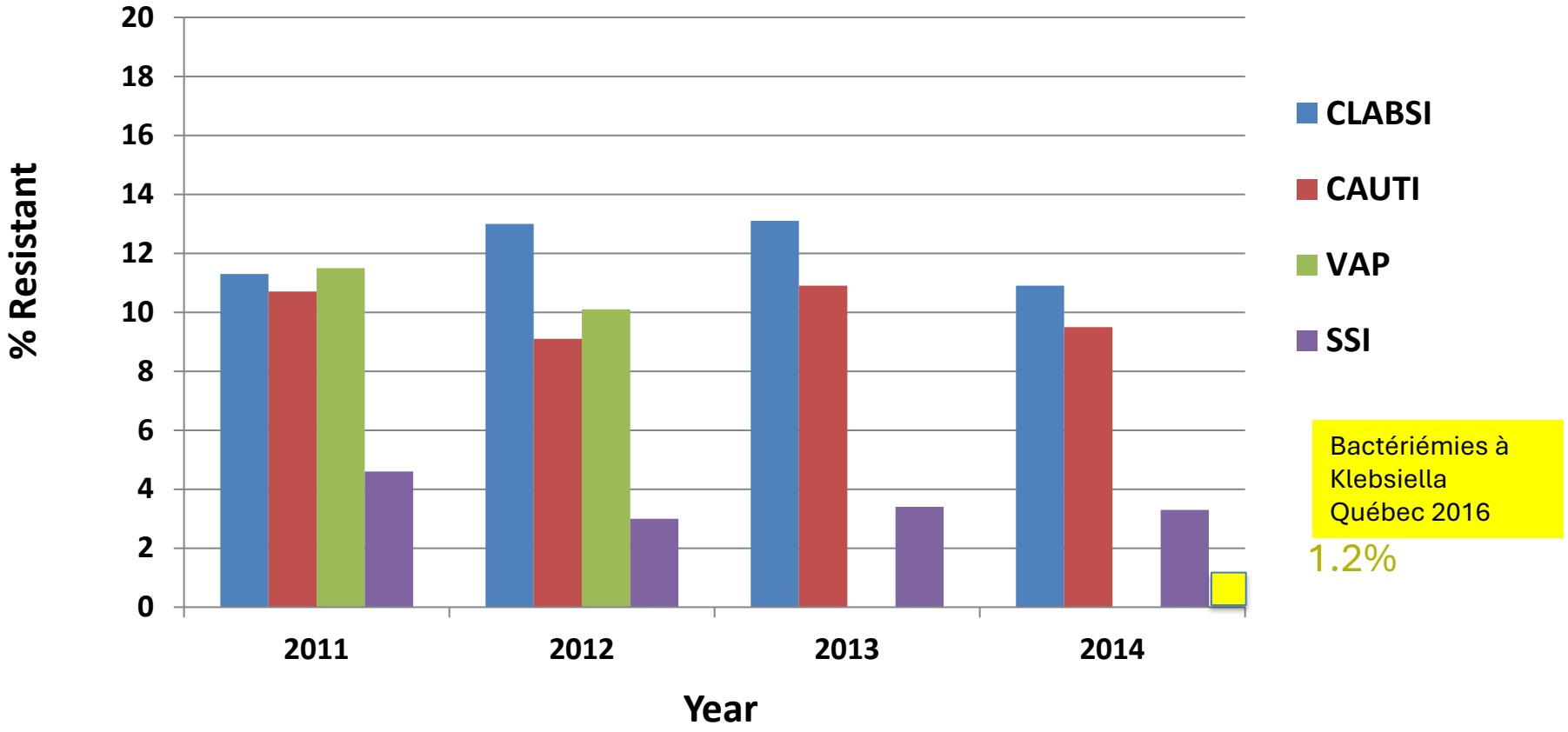
% carbapenem-resistant *Klebsiella* species (CRE)



Source: A. Lee U. Sydney

Weiner et al. Infect Control Hosp Epidemiol 2016; 37: 1288-1301

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Transmission d'EPC de la Grèce à d'autres pays européens

2007-2010

Country	Year	Total Number of Patients	Origin of Patients	Number of Secondary Cases	Probability of the Greek Origin	References	Mechanisms of Resistance
Belgium	2009	3	3 patients transferred from Greek hospitals	0	Confirmed	Bogaerts et al. 2010 [19]	*bla*KPC-2
Denmark	2009	2	2 patients transferred from Greek hospitals	0	Confirmed	Hammerum et al. 2010 [20]	*bla*KPC-2
Finland	2009	1	1 patient transferred from Crete	0	Confirmed	Osterblad et al. 2010 [21]	*bla*KPC-2
France	No data	8	1 patient transferred from Crete	7	Confirmed	Naas et al. 2010 [22]	*bla*KPC-2
France	2007	1	1 patient transferred from Crete	0	Confirmed	Cuzon et al. 2008 [23]	*bla*KPC-2
France	2009	1	1 patient transferred from Greek hospital	0	Confirmed	Barbier et al. 2010 [24]	*bla*KPC-2
France	2009	4	1 patient transferred from Greek hospital	3	Confirmed	Kassis-Chikhani et al. 2010 [25]	*bla*KPC-2
Germany	2007-2008	9	1 patient treated in Greece	8	Hypothetical	Wendt *et al.* 2010 [26]	*bla*KPC-2
Hungary	2008	7	1 patient transferred from Greek hospital	6	Confirmed	Tóth et al. 2010 [27]	*bla*KPC-2
Norway	2007	6	4 patients tr sferred from Greek hospitals			Samuelson et al. 2009 [28]	*bla*KPC-2
Sweden	No data	1	1 ent tr r i G ital		d	mark Wisell et al. 2007	*bla*KPC-2
The Netherlands	No data	14				et al. 2010 [30]	*bla*KPC-2

2011

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Jewish Gener

CNISP CPO Surveillance Update

Mise à jour de la surveillance OPC du PCSIN

CNISP annual meeting/Réunion annuelle du PCSIN

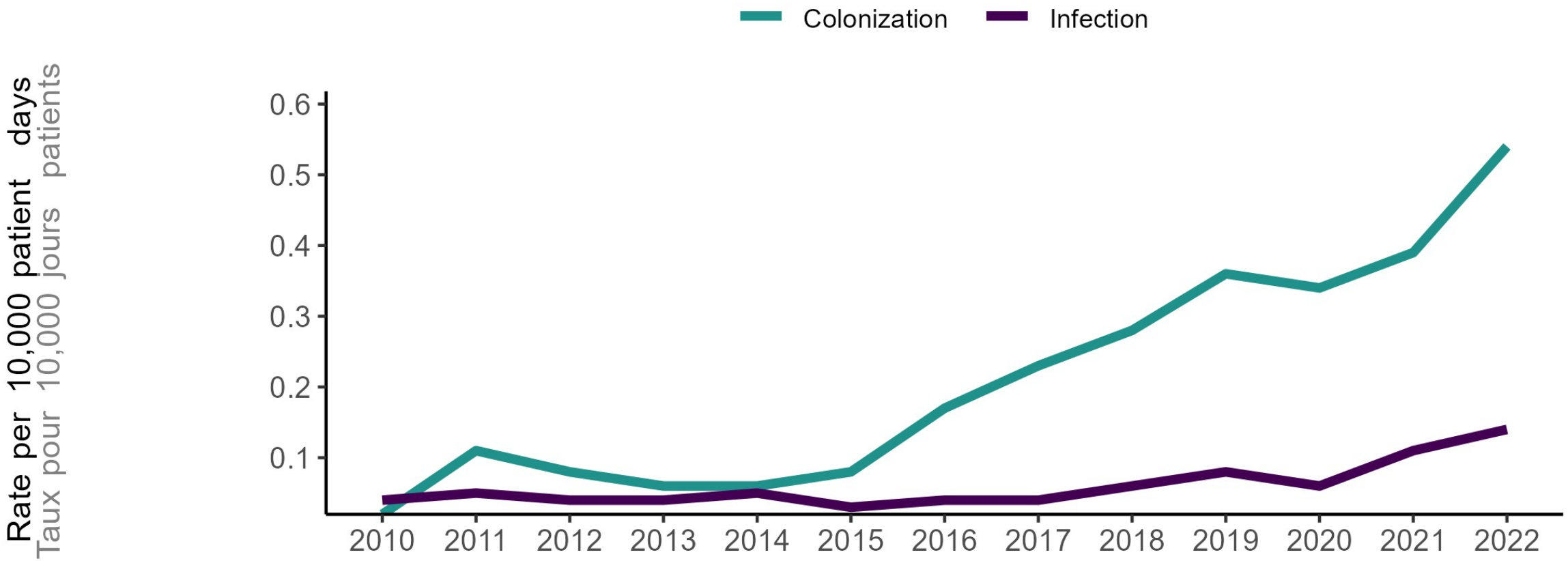
October 2023/octobre 2023

Public Health Agency of Canada
Agence de la santé publique du Canada

CPE infection and colonization rates, 2010-2022

Taux d'infection et colonisation de l'EPC, 2010-2022

CPE

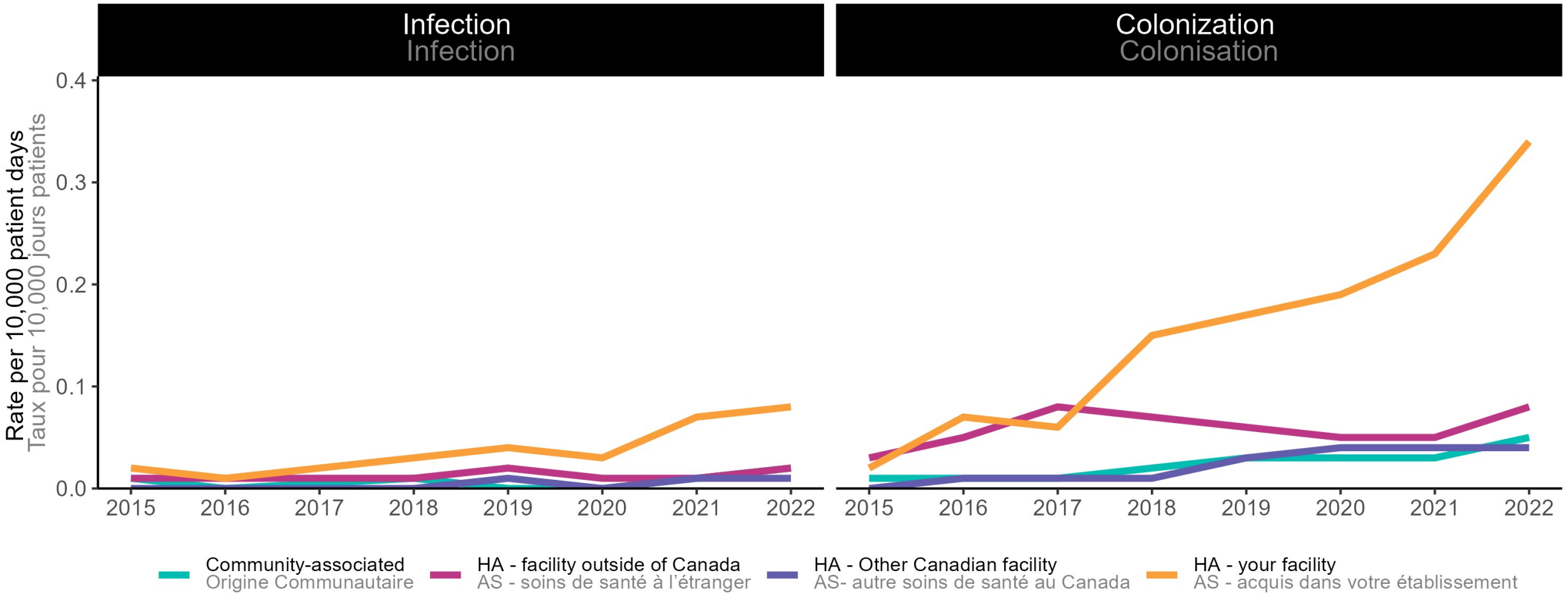


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
No. Infections	12	17	14	19	25	19	23	25	36	54	41	73	107
No. Colonizations	7	38	29	29	31	43	96	129	161	239	215	260	415

CPE rates by source of acquisition, 2015-2022

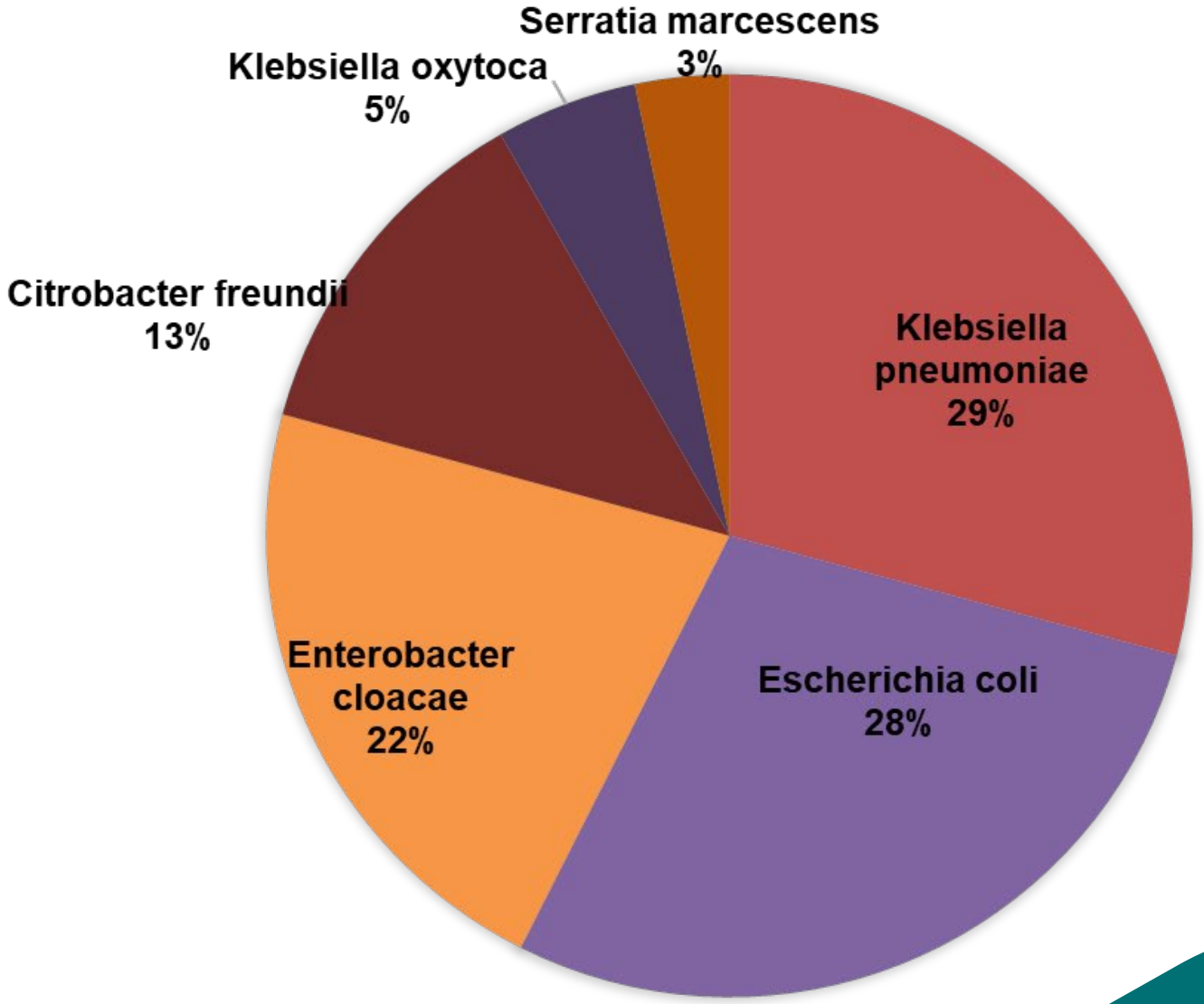
Taux d'EPC selon la source d'acquisition, 2015-2022

CPE

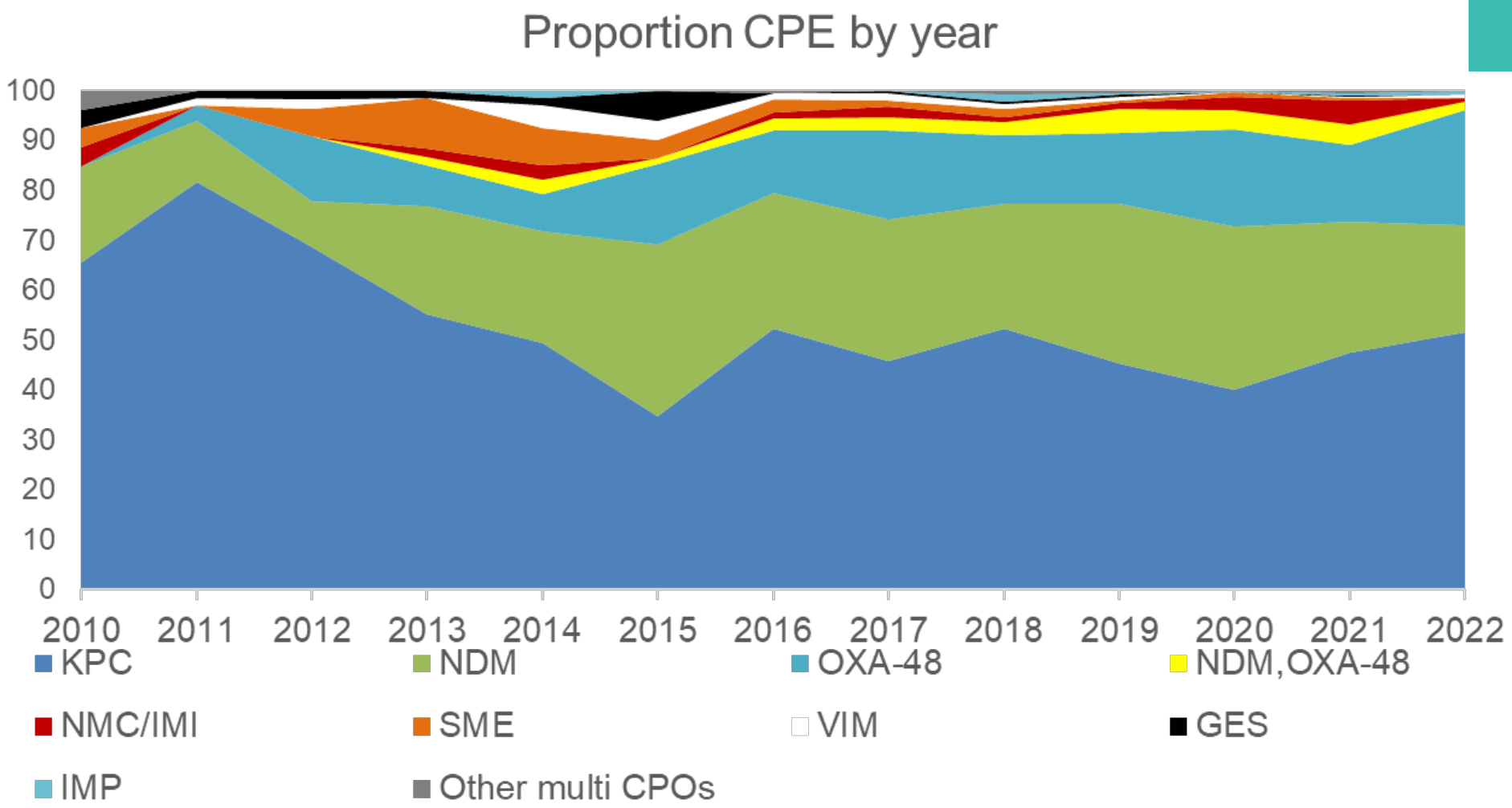


Proportion of carbapenemase producing Enterobacteriaceae (CPE)

NML



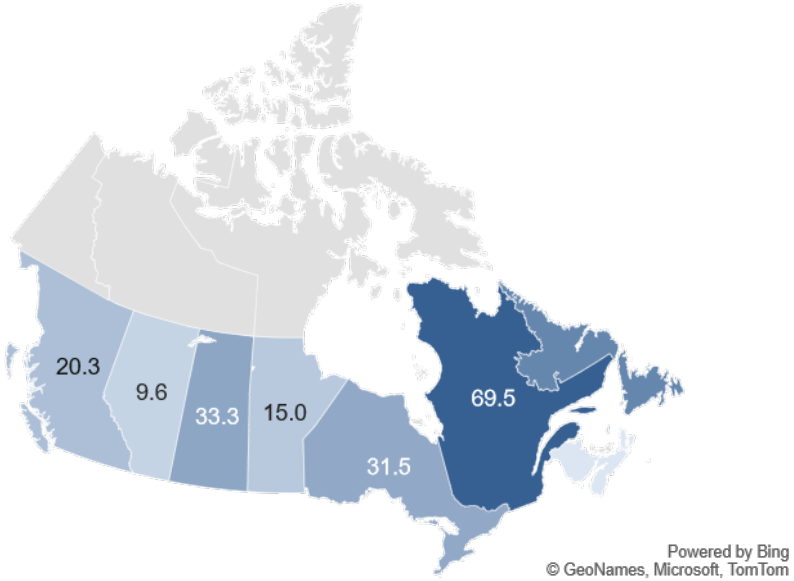
NML



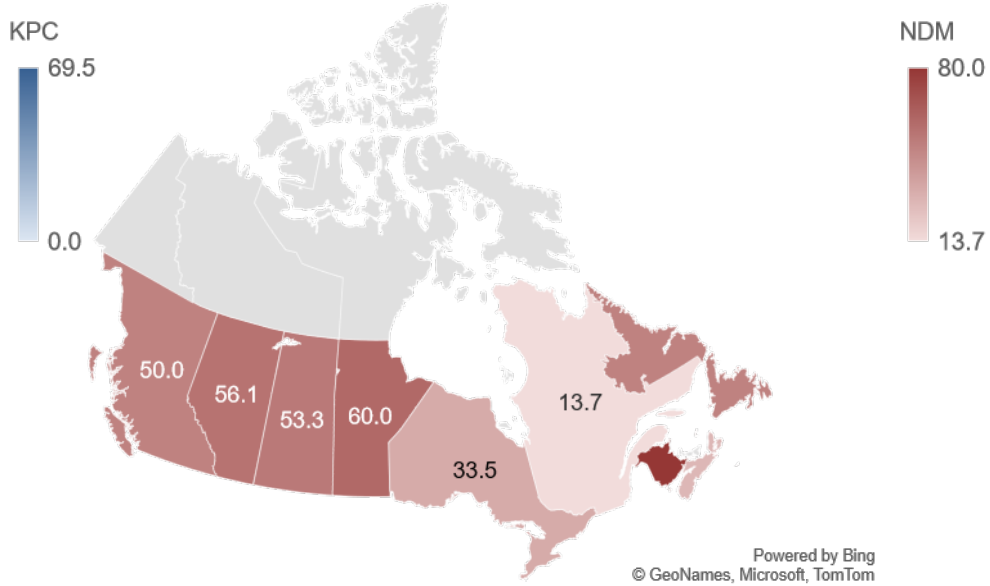
91% of CPE harbour NDM, KPC or OXA-48

NML

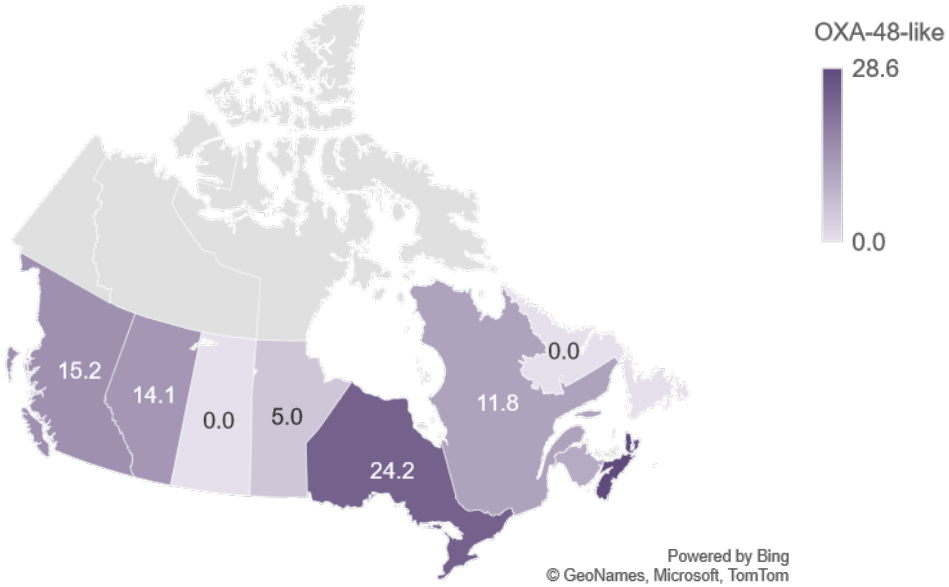
Proportion of KPC within each province



Proportion of NDM within each province



Proportion of OXA-48-like within each province



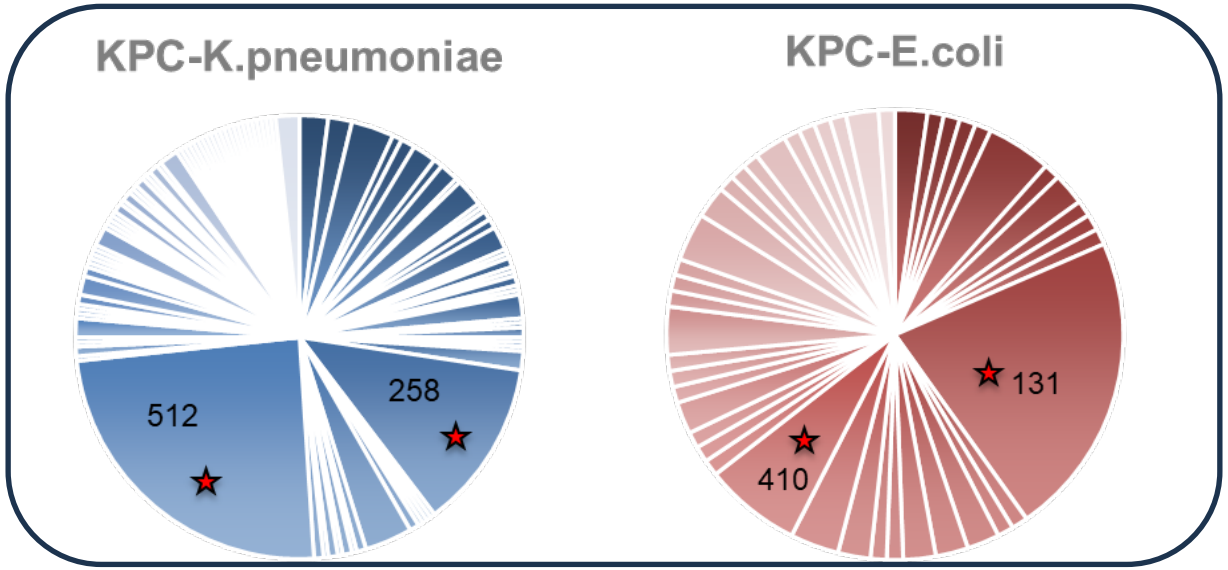
NDM-BC, AB, SK,MB

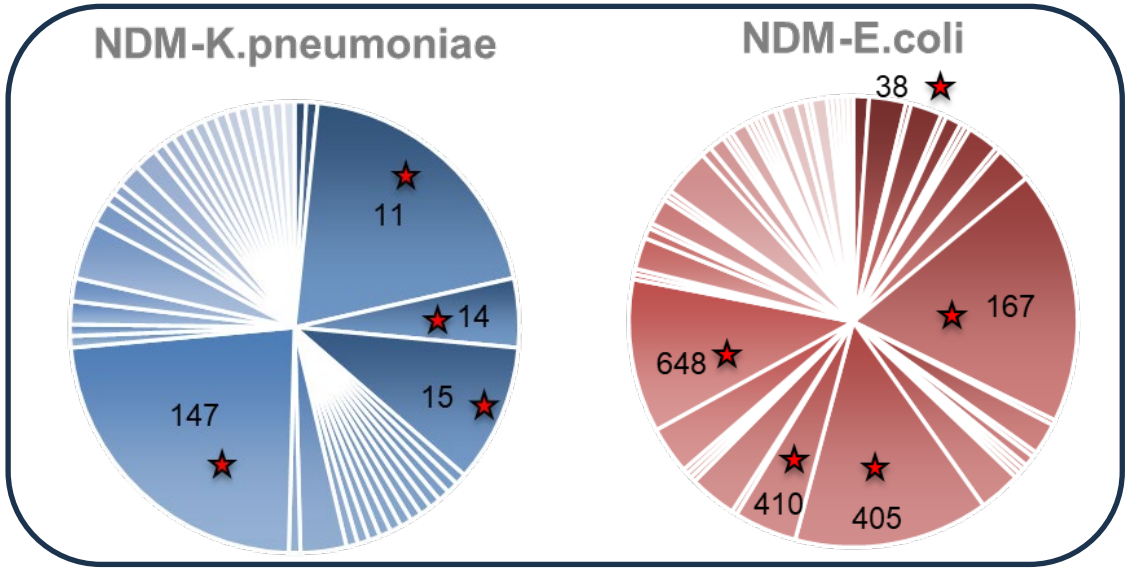
KPC-QC

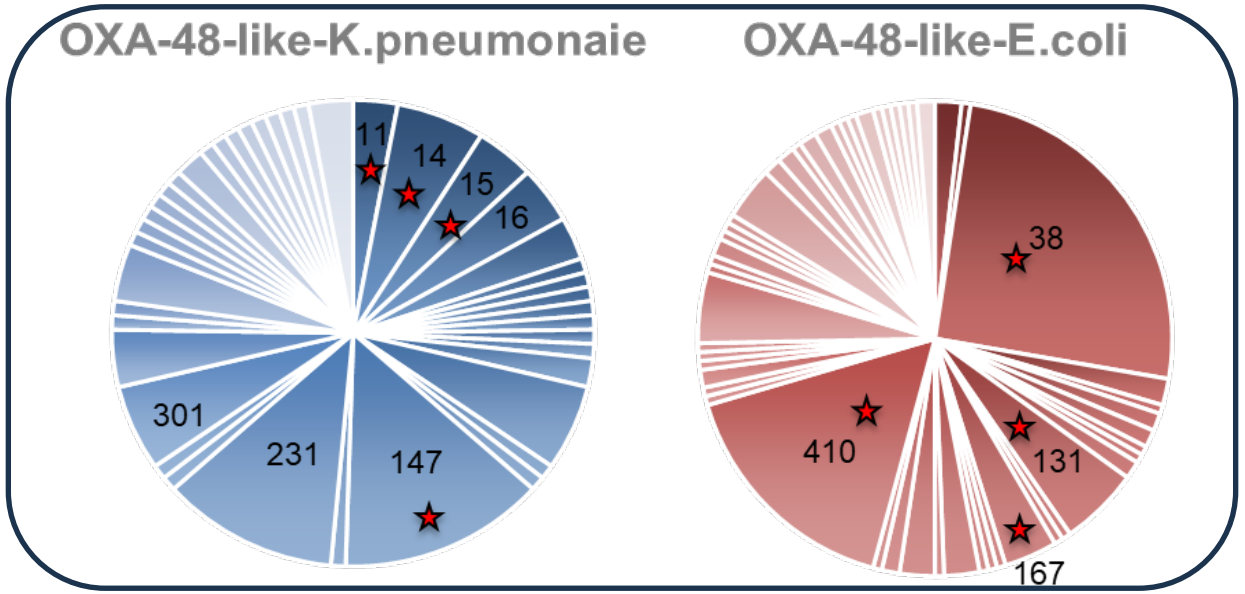
OXA-48-ON

Typing the top CPOs-*K. pneumoniae and E.coli*

NML







High risk clone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Le réviseur a été convié à apporter des commentaires sur la version préfinale de ce document et en conséquence, n'en ont pas révisé ni endossé le contenu final.

Les auteur(-trice)s ainsi que les membres du comité scientifique et les réviseurs ont dûment rempli leurs déclarations d'intérêts et aucune situation à risque de conflits d'intérêts réels, apparents ou potentiels n'a été relevée.

FINANCEMENT

Ce rapport a été réalisé grâce à un financement du ministère de la Santé et des Services sociaux du Québec

MISE EN PAGE

Marie-Amélie Bras, agente administrative
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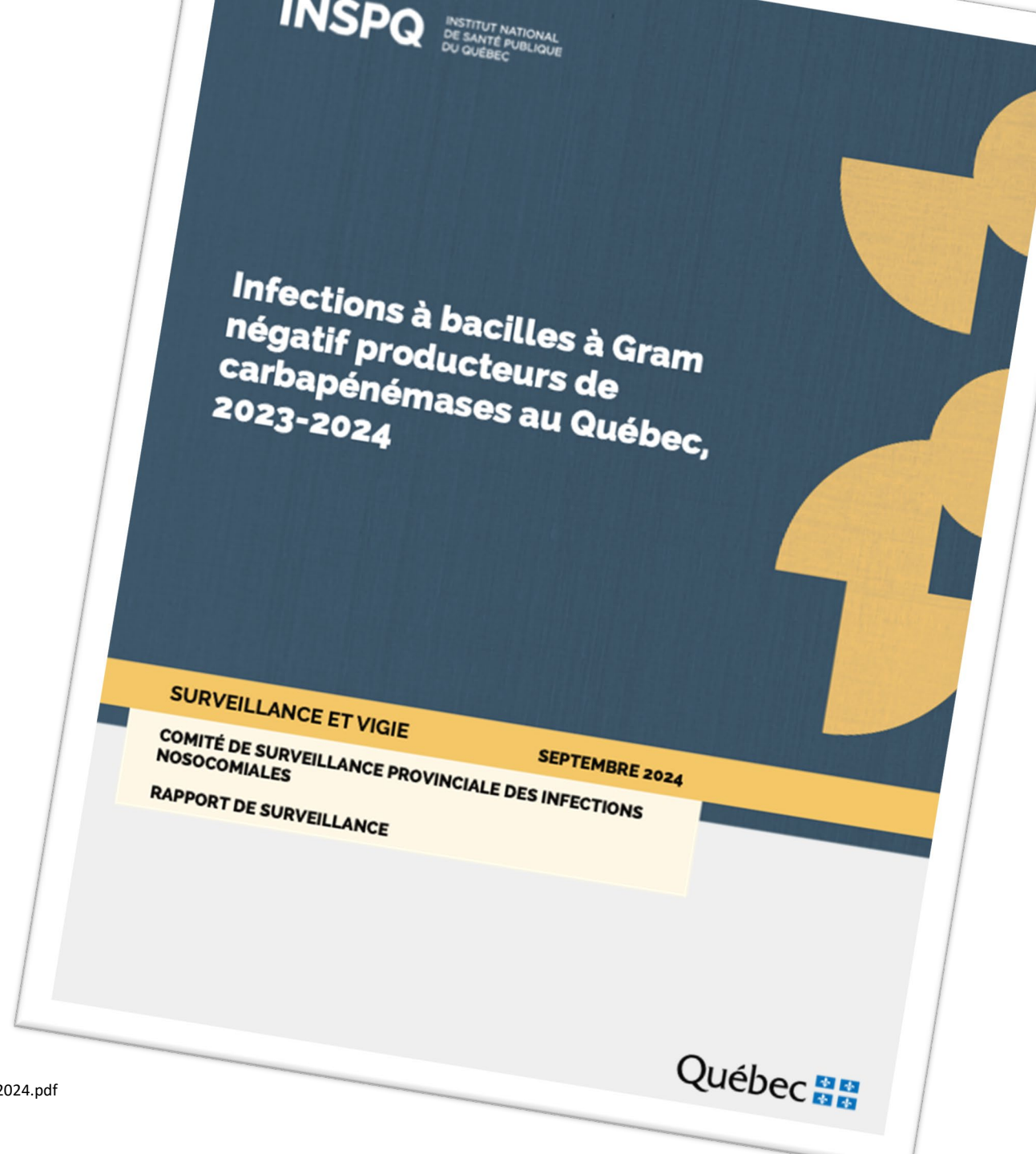
REMERCIEMENTS

Nous tenons à remercier toutes les équipes de prévention et contrôle des infections qui participent à la surveillance des infections nosocomiales au Québec.



https://www.inspq.qc.ca/sites/default/files/publications/3577-infections-bacilles-gram-negatif-carbapenemases-QC-2023-2024.pdf

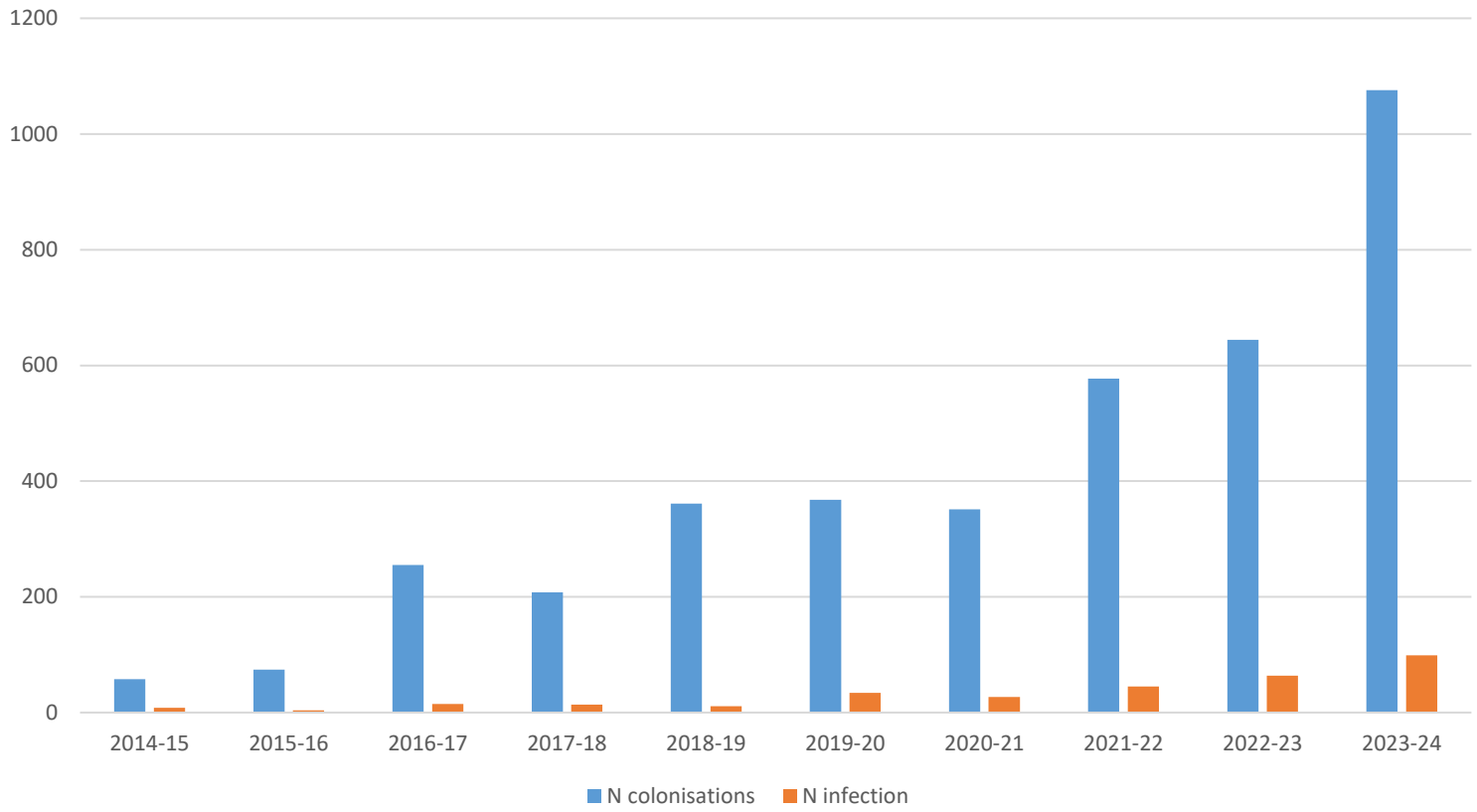
Tableau 1 Sommaire de la participation, des cas, des dénominateurs et des taux pour la surveillance des infections à BGNPC, 2019-2020 à 2023-2024

	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
Installations participantes (N)	88	84	83	86	88
Admissions (N)	735 713	596 209	648 874	665 604	688 231
Jours-présence (N)	4 965 755	4 183 386	4 409 071	4 666 352	4 828 333
Infections à BGNPC					
Infections nosocomiales à BGNPC (cat. 1a et 1b) (N)	13	16	29	30	54
Usagers infectés (cat. 1a et 1b) (N)	12	15	29	28	49
Infections toutes catégories à BGNPC (cat. 1a, 1b, 1c, 1d, 1e, 2, 3 et 4) (N)	34	27	45	64	99
Taux d'incidence des infections nosocomiales (cat. 1a et 1b) [A]	0,03	0,04	0,07	0,06	0,11
Colonisations à BGNPC					
Colonisations nosocomiales à BGNPC (cat. 1a et 1b) (N)	368	351	577	644	1 076
Colonisations toutes catégories à BGNPC (cat. 1a, 1b, 1c, 1d, 1e, 2, 3 et 4) (N)	480	425	662	785	1 259
Taux d'acquisition des colonisations nosocomiales (cat. 1a et 1b) [A]	0,74	0,84	1,31	1,38	2,23

[A] Taux par 10 000 jours-présence.

https://www.inspq.qc.ca/sites/default/files/publications/3577-infections-bacilles-gram-negatif-carbapenemases-QC-2023-2024.pdf

Evolution du nombre d'infections et de colonisations au Québec, 2014-2015 à 2023-2024



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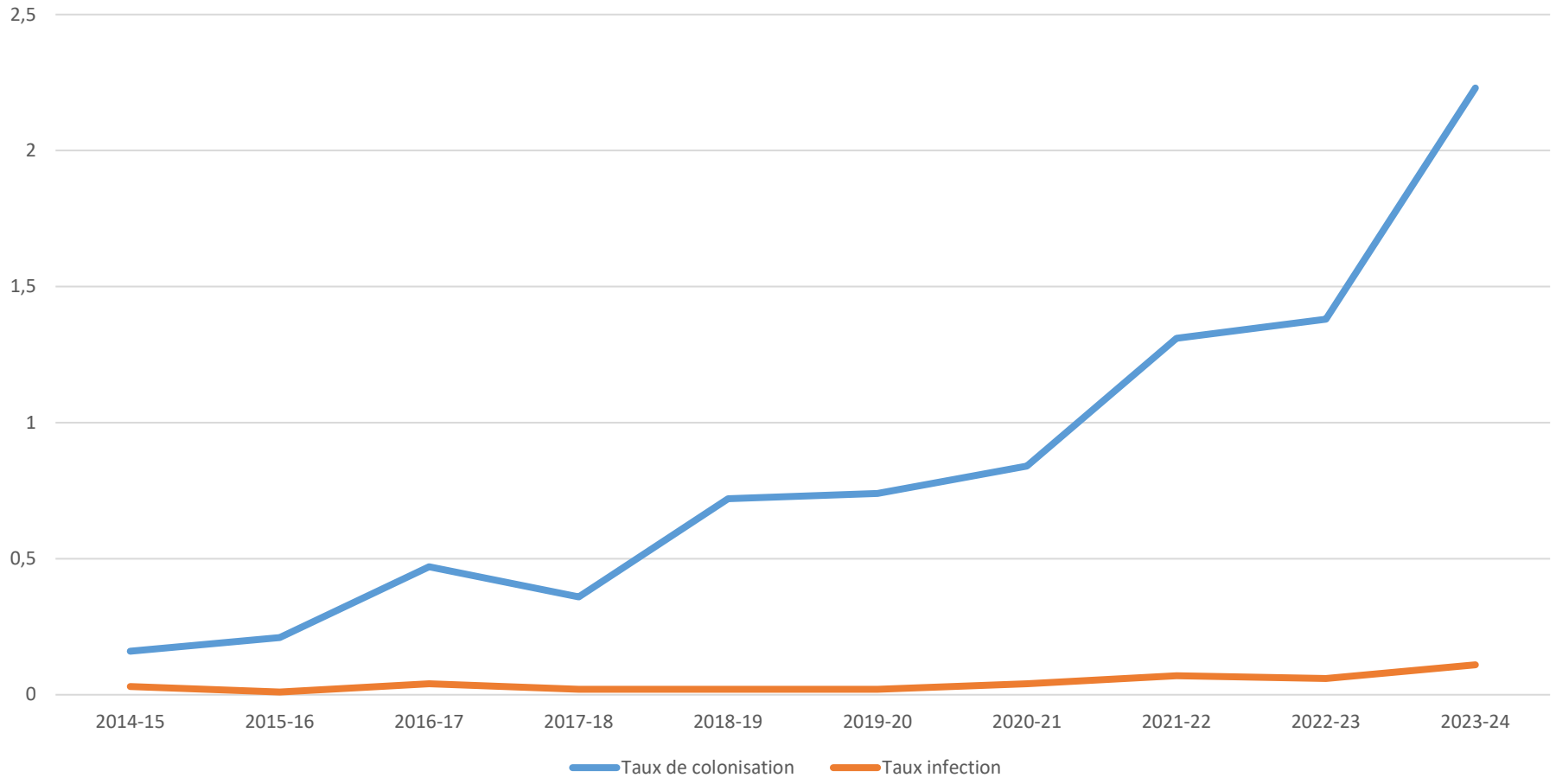
Evolution du taux d'infection et de colonisation au Québec, 2014-2015 à 2023-2024



A. Augmentation des colonizations mais infections stables

B. Augmentation des colonizations et des infections proportionelle

https://www.inspq.qc.ca/sites/default/files/publications/3577-infections-bacilles-gram-negatif-carbapenemases-QC-2023-2024.pdf

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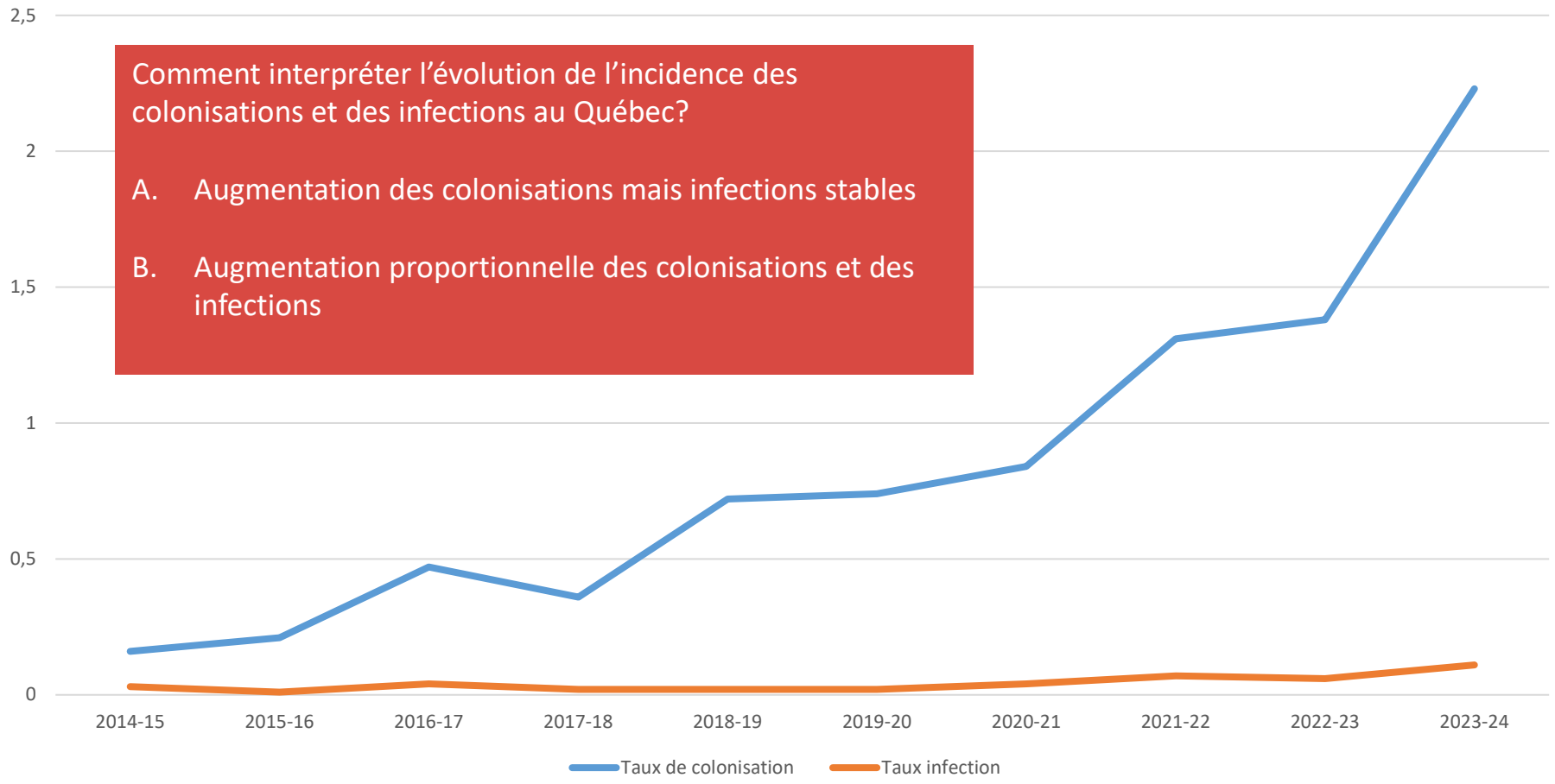

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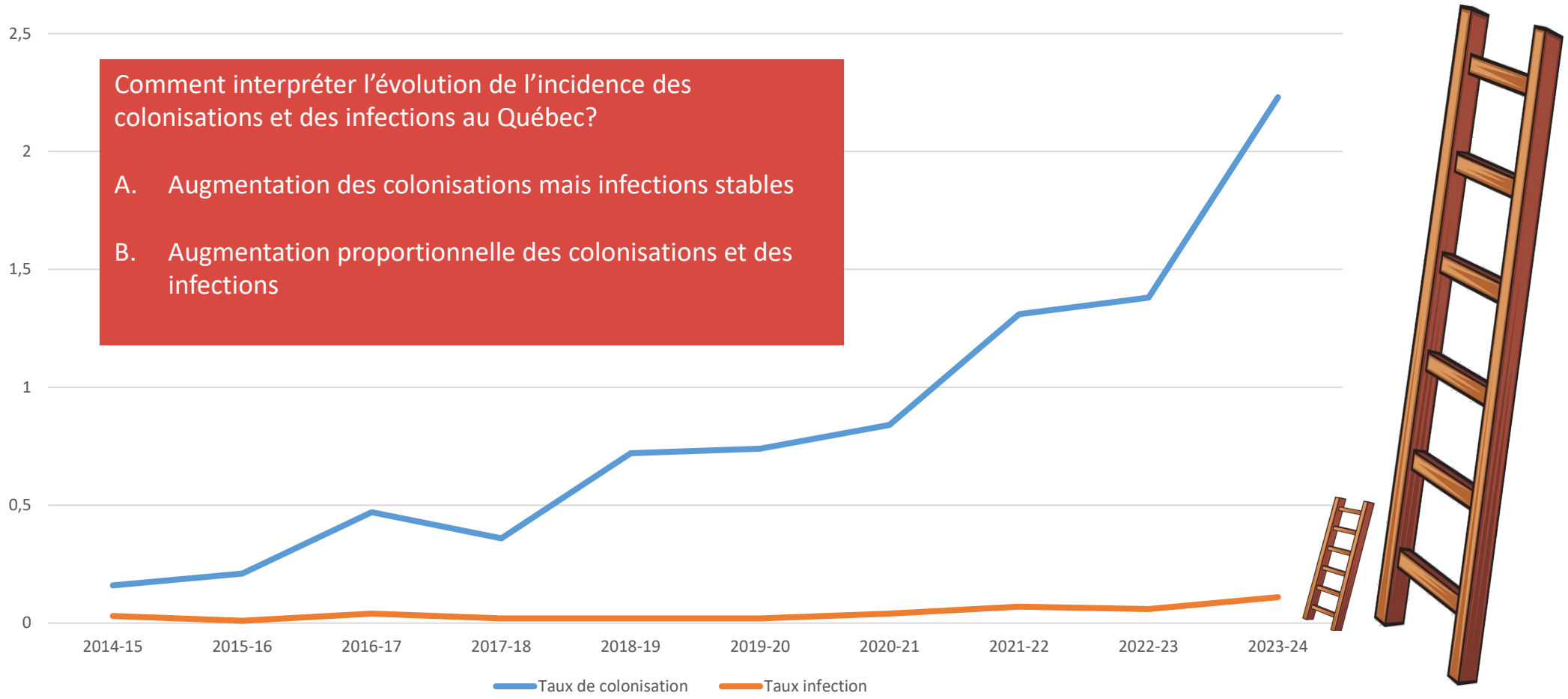
Comment interpréter l'évolution de l'incidence des colonisations et des infections au Québec?

ⓘ Start presenting to display the poll results on this slide.

Evolution du taux d'infection et de colonisation au Québec, 2014-2015 à 2023-2024



Comment interpréter l'évolution de l'incidence des colonisations et des infections au Québec?

A. Augmentation des colonisations mais infections stables

B. Augmentation proportionnelle des colonisations et des infections

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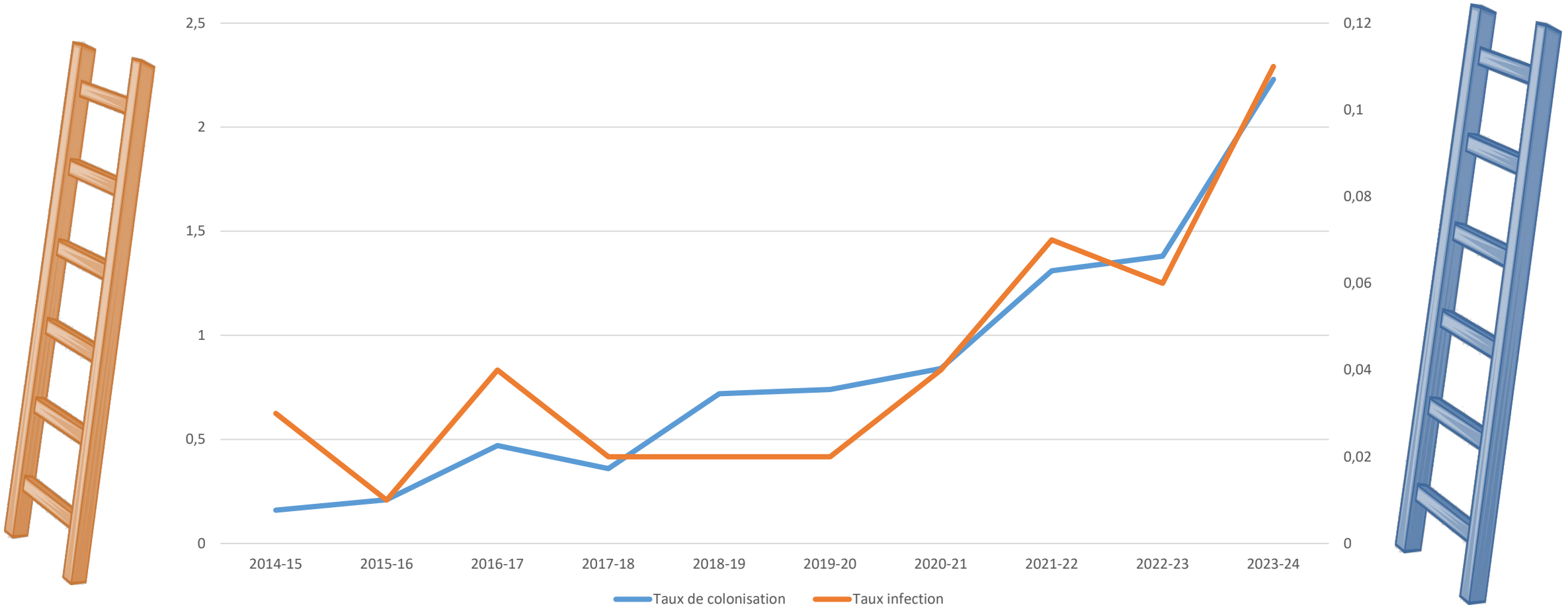
Evolution du taux d'infection et de colonisation au Québec, 2014-2015 à 2023-2024



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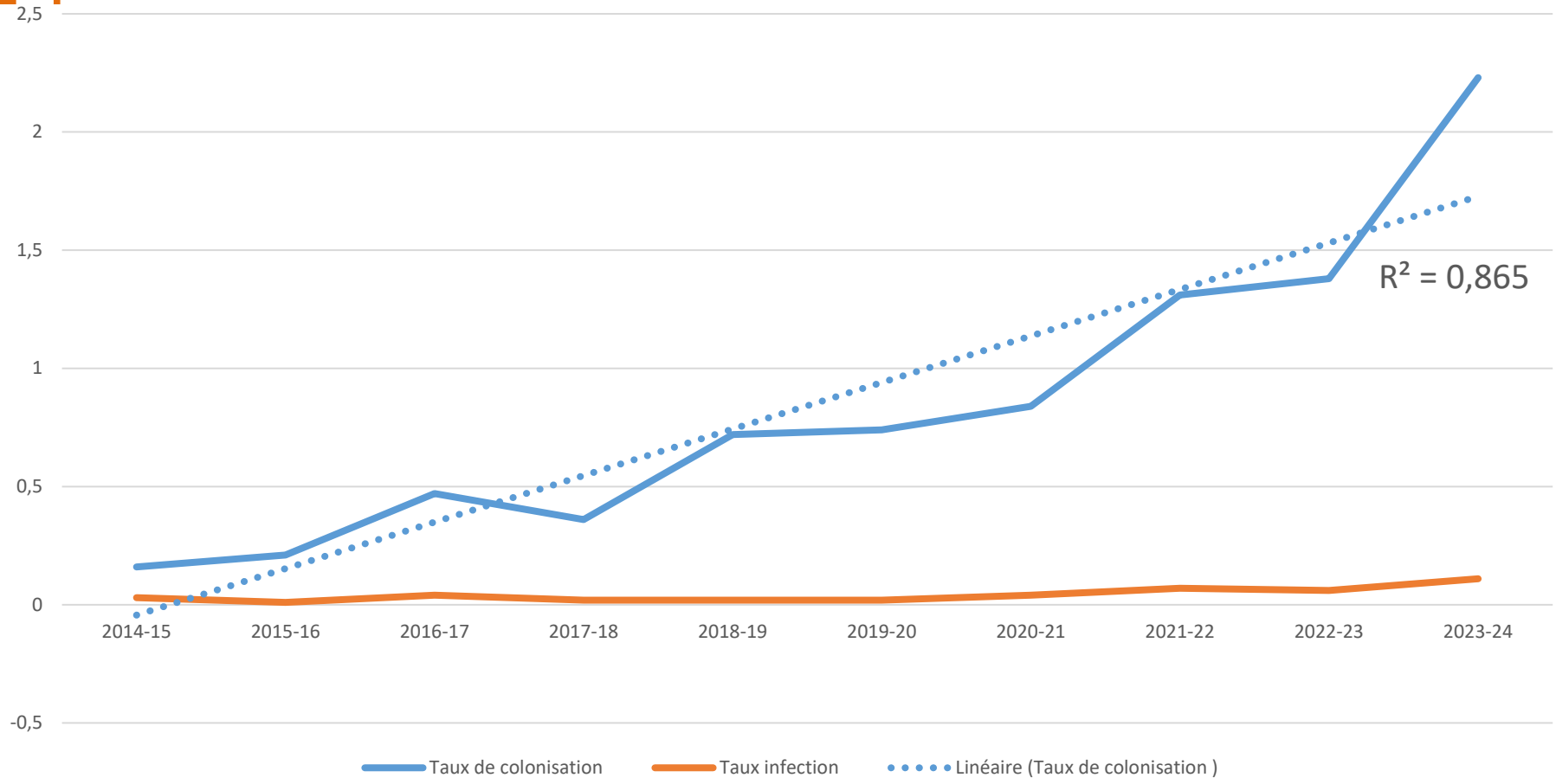

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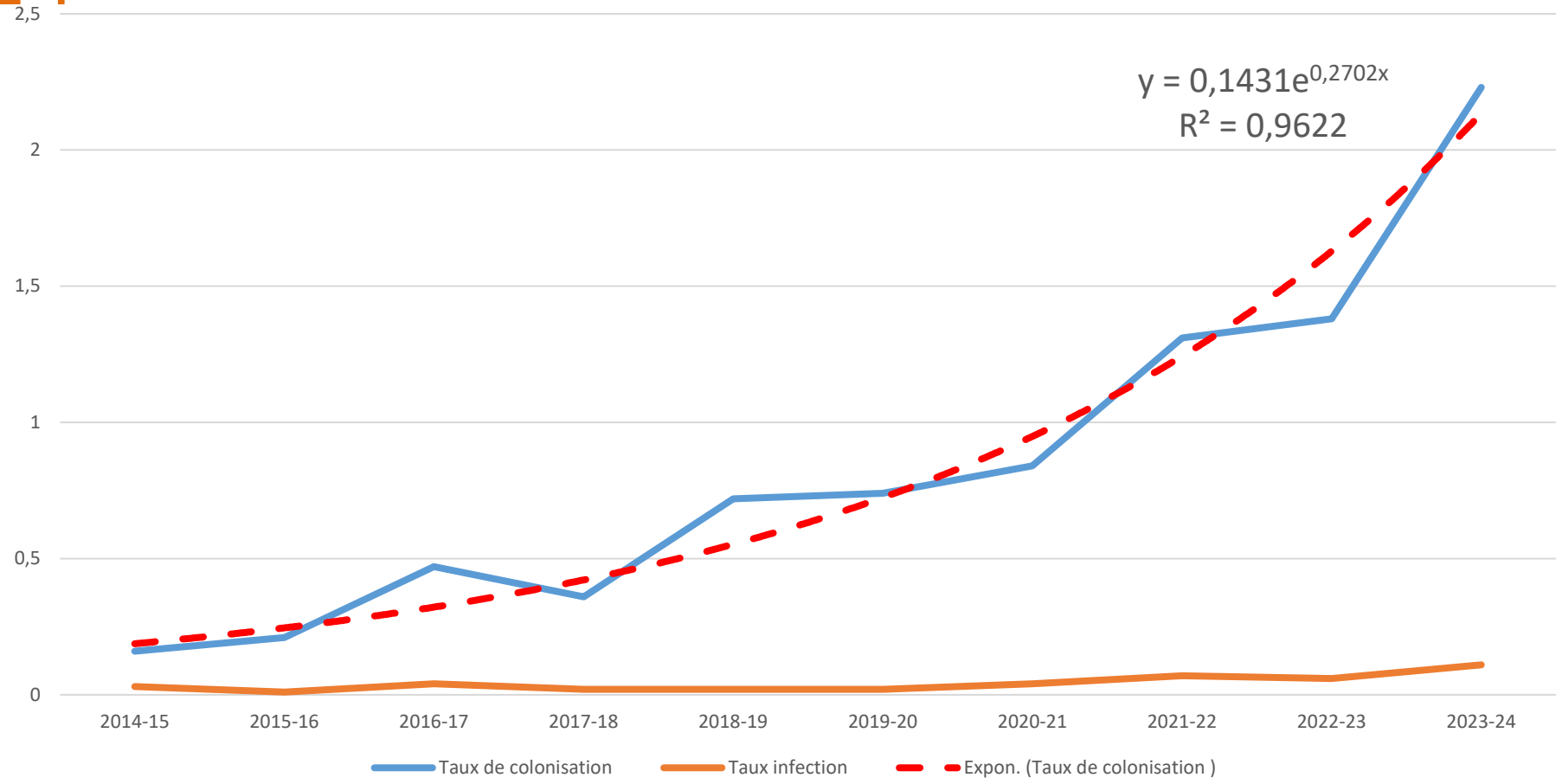

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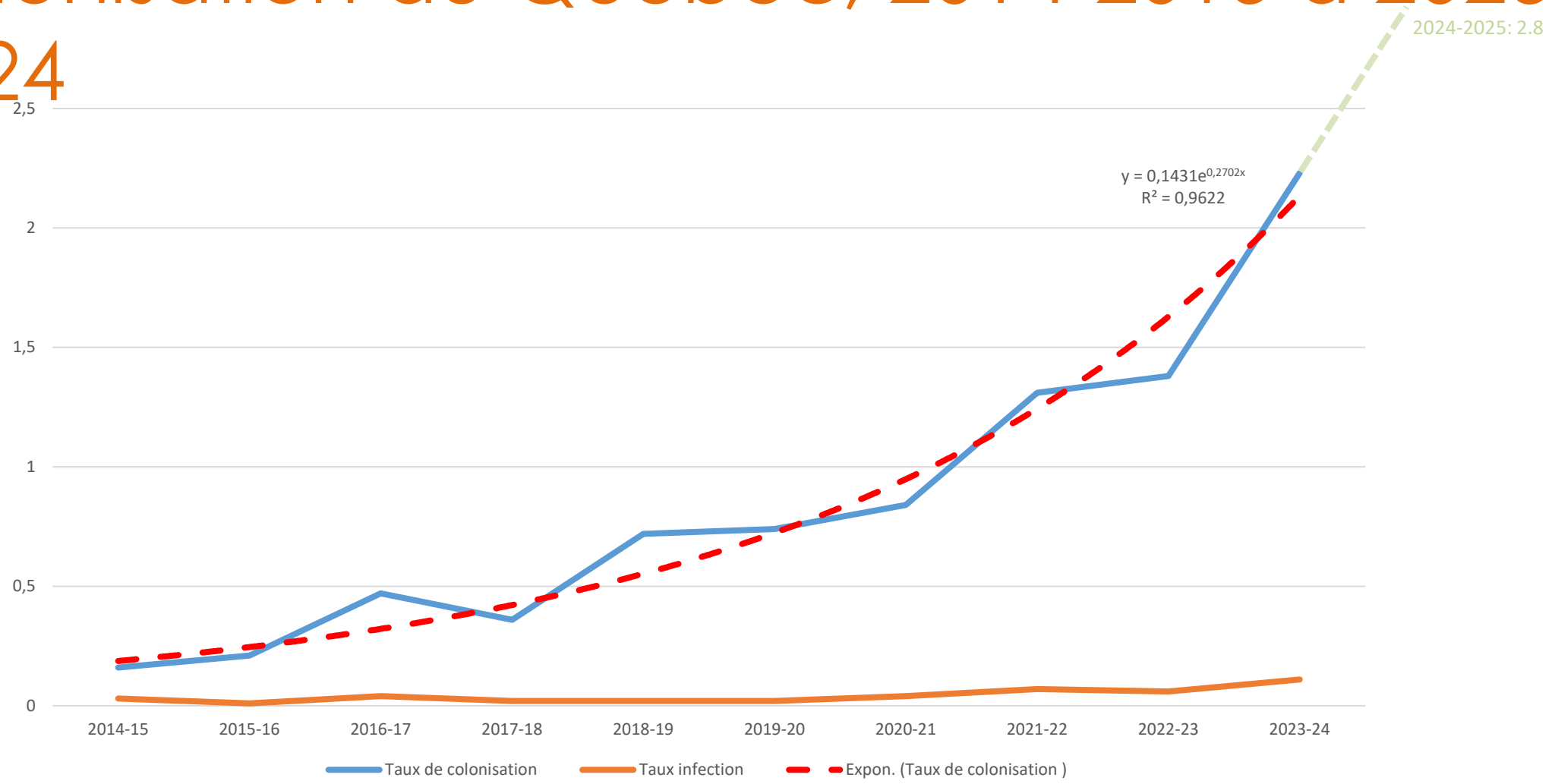

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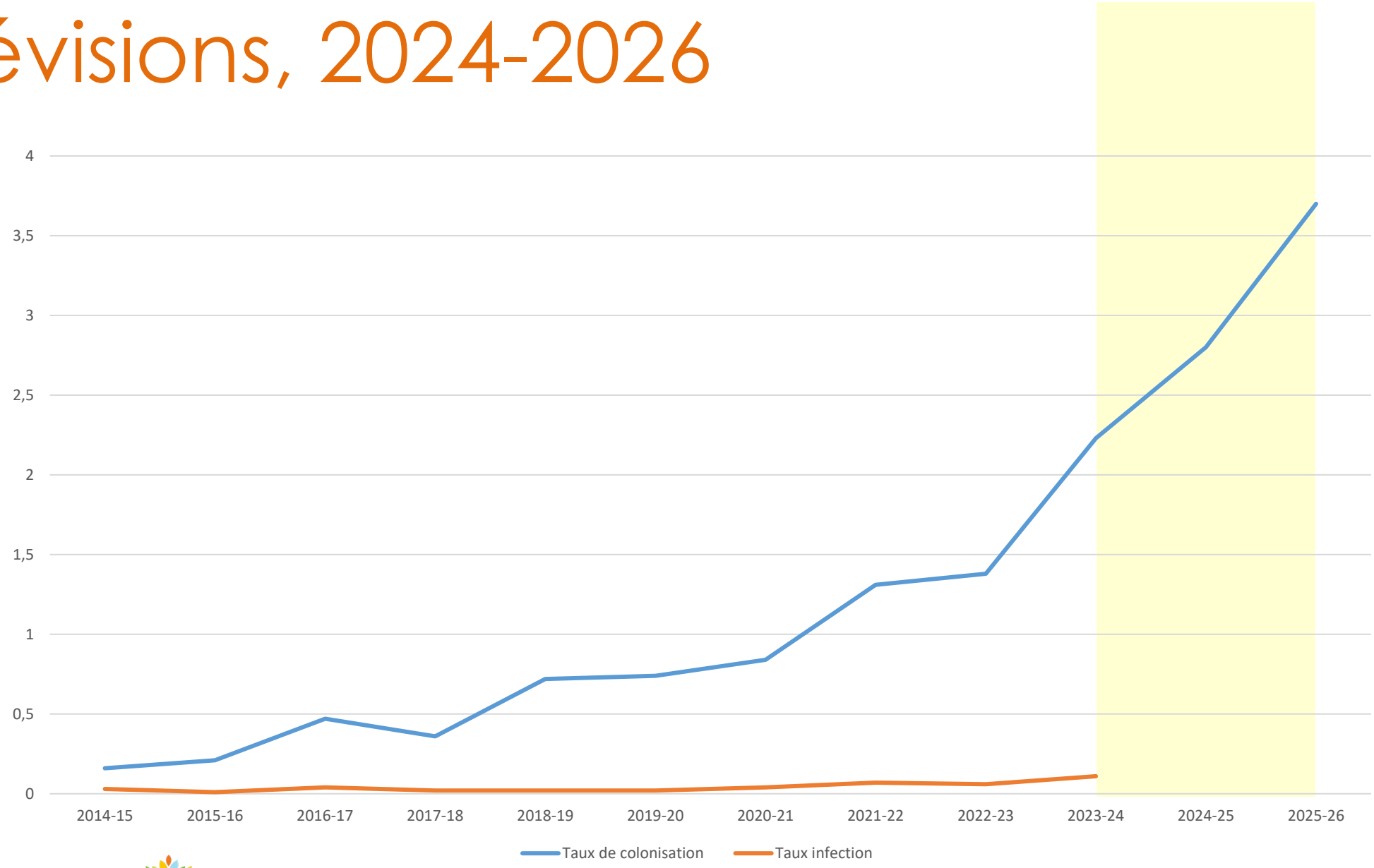
Prévisions, 2024-2026



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Impact de la mission universitaire

Figure 1 **Taux d'incidence des infections nosocomiales à BGNPC (cat. 1a et 1b) et taux d'acquisition des colonisations (cat. 1a et 1b) pour les installations participantes (N = 88), 2023-2024**

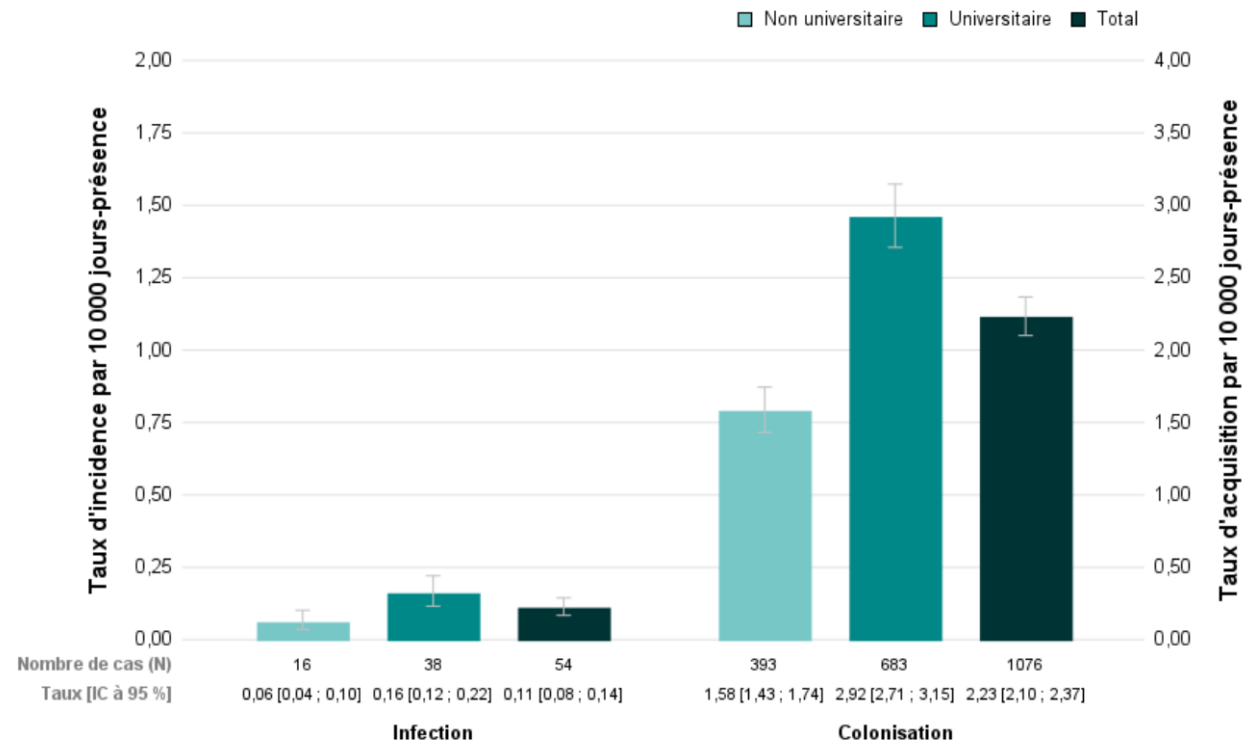

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Figure 2 Évolution du nombre d'installations participantes selon le nombre de colonisations nosocomiales à BGNPC (cat. 1a et 1b) déclarés, 2019-2020 à 2023-2024

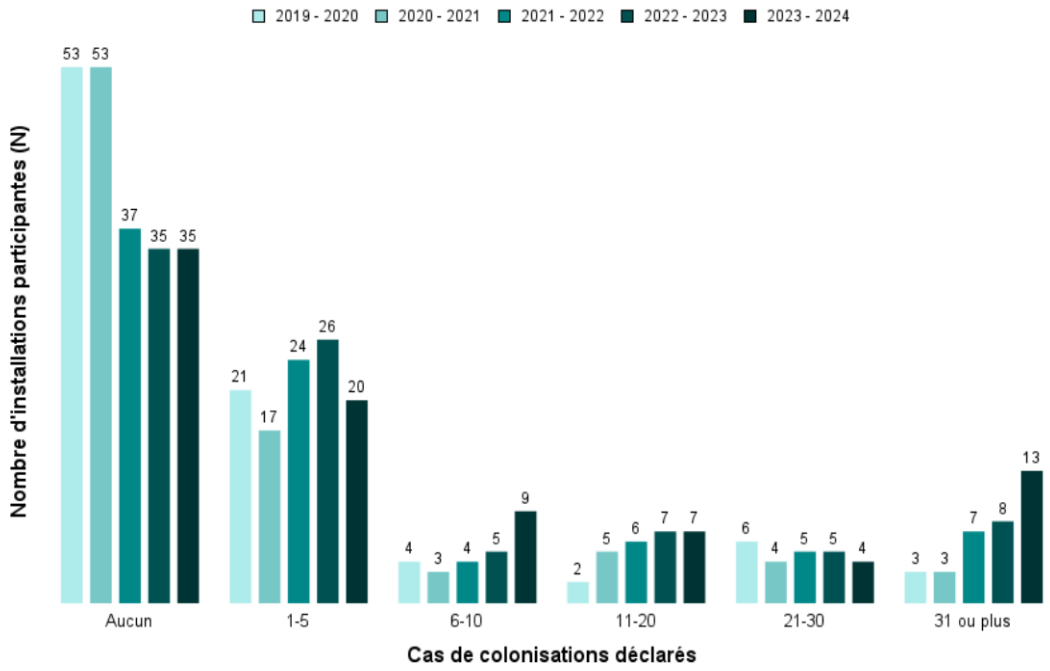
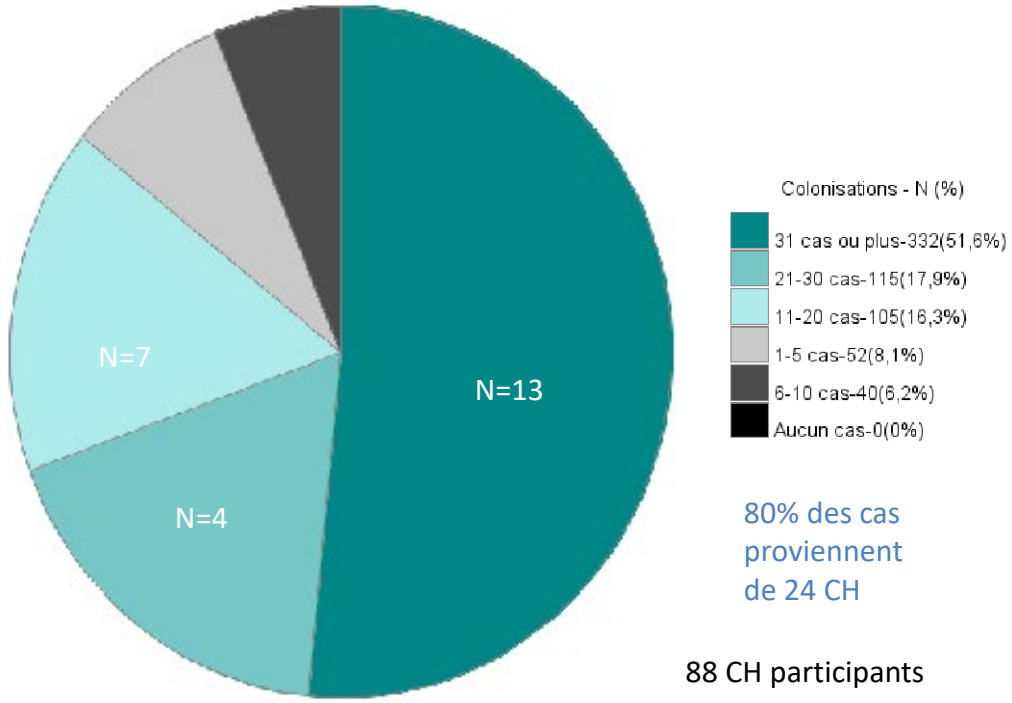


Figure 3 Répartition du nombre de colonisations nosocomiales à BGNPC (cat. 1a et 1b) pour les installations participantes (N = 88), 2023-2024



80% des cas proviennent de 24 CH

88 CH participants

https://www.inspq.qc.ca/sites/default/files/publications/3577-infections-bacilles-gram-negatif-carbapenemases-QC-2023-2024.pdf

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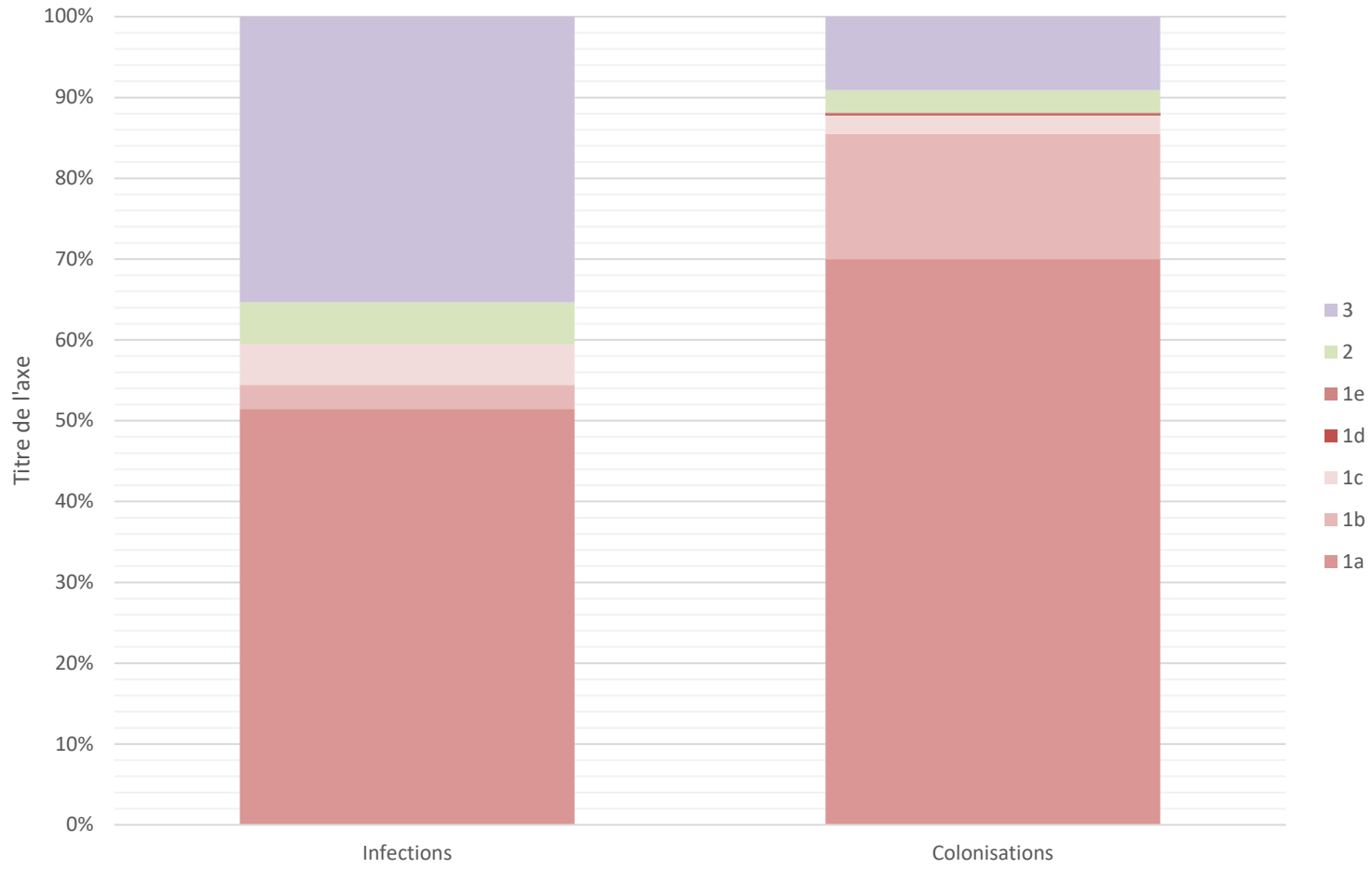
Origine des cas



https://www.inspq.qc.ca/sites/default/files/publications/3577-infections-bacilles-gram-negatif-carbapenemases-QC-2023-2024.pdf

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INFECTIONS

Tableau 3 **Nombre de cas d'infection, selon le type d'infection, et nombre de bactériémies à BGNPC de toute catégorie d'attribution (N = 99), 2023-2024**

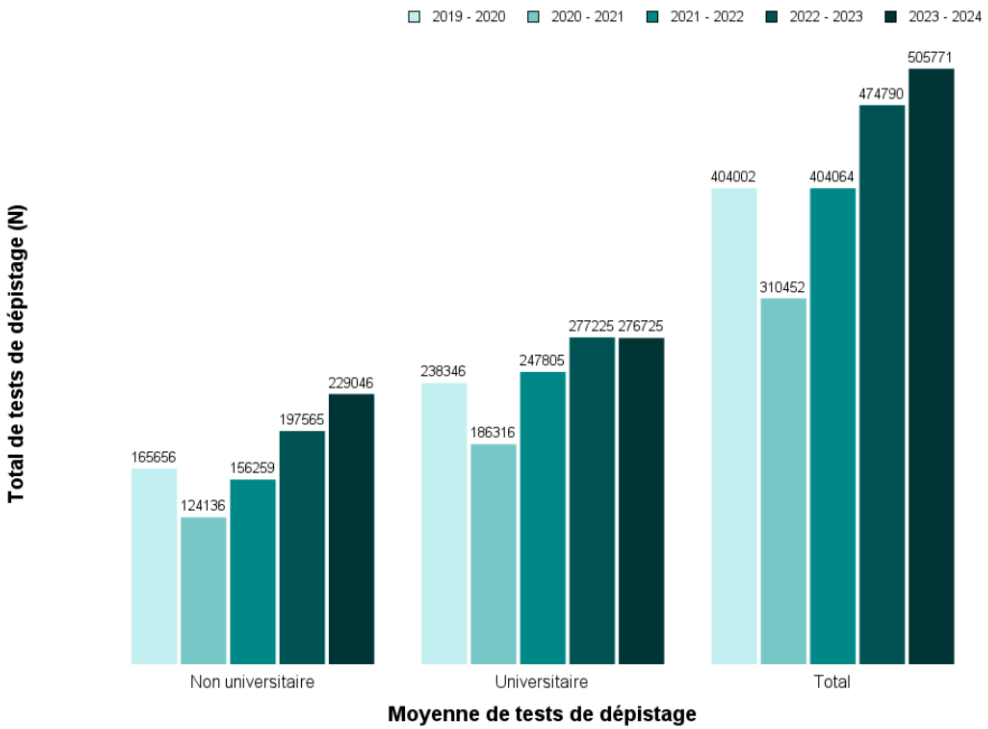
Catégories d'infection	Types d'infection	Infections (N)	Bactériémies secondaires (N)
Bactériémies primaires	BBM	0	-
	BAC	4	-
	Non-BAC	4	-
	HD	0	-
Infections primaires	Urinaire	48	7
	Abdominale	7	2
	Pulmonaire	16	3
	Infection de site opératoire	5	2
	Peau et tissus mous	8	0
	Os et articulations	6	1
	Autres	1	1
Total		**99**	**16**

Un total de 13 décès de toutes causes (associés ou non aux infections) est observé dans les 30 jours suivant le début de l'infection en 2023-2024, pour une létalité de 13,1 % (tableau 4). En plus des données présentées ci-dessous, onze cas de décès sur les treize sont de catégories (1a, 1b et 1c).

24 bactériémies

Tests de dépistage

Figure 4 Évolution du nombre total et de la moyenne de tests de dépistage par admission, 2019-2020 à 2023-2024



	Non universitaire	Universitaire	Total
2019 - 2020	0,44	0,66	0,55
2020 - 2021	0,42	0,62	0,52
2021 - 2022	0,50	0,74	0,62
2022 - 2023	0,58	0,85	0,71
2023 - 2024	0,64	0,83	0,74

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IMPACT CLINIQUE

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POURQUOI S'INQUIÉTER ?

- EPC sont dangereux
  - Plus difficile à traiter
  - Peut être plus virulent
  - Mortalité augmentée
  - Morbidité augmentée
- Gourmand en ressources
  - Antibiotiques plus coûteux
  - Durée de l'hospitalisation
  - Mesures d'isolement
- Problèmes dérivés
  - Toxicité des médicaments
  - Qualité des soins en raison de l'isolement dans une chambre individuelle

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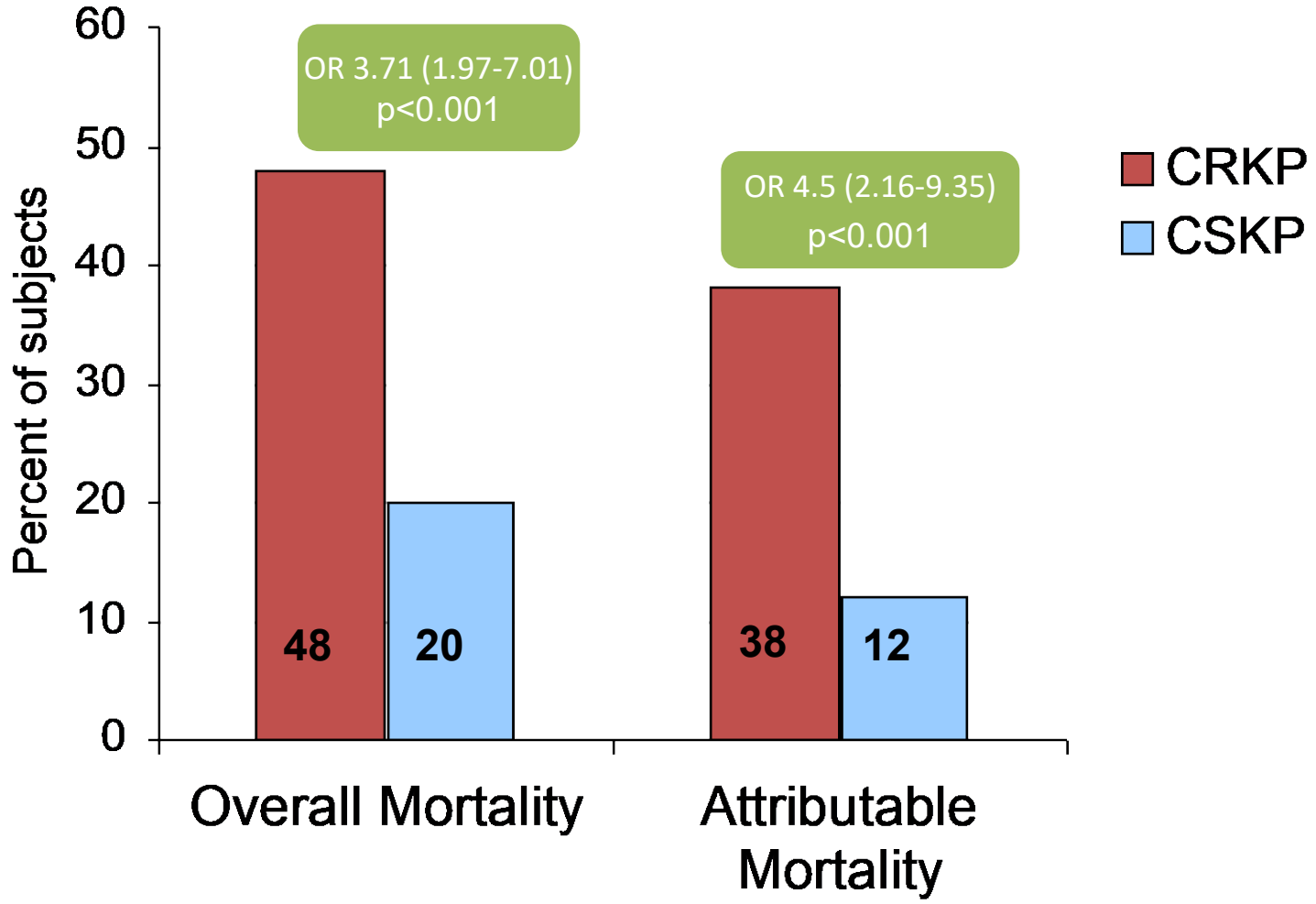
Mortalité



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Patel et al. Infect Control Hosp Epidemiol 2008;29:1099-1106

Open access

BMJ Open

Impact of carbapenem resistance on mortality in patients infected with *Enterobacteriaceae*: a systematic review and meta-analysis

Ruyin Zhou ,[1] Xiangming Fang,[1,2] Jinjin Zhang,[1] Xiaodong Zheng,[3] Shuangyue Shangguan,[1] Shibo Chen,[4] Yingbo Shen,[5] Zhihai Liu,[6] Juan Li,[7] Rong Zhang,[8] Jianzhong Shen,[9] Timothy R Walsh,[10] Yang Wang[9]

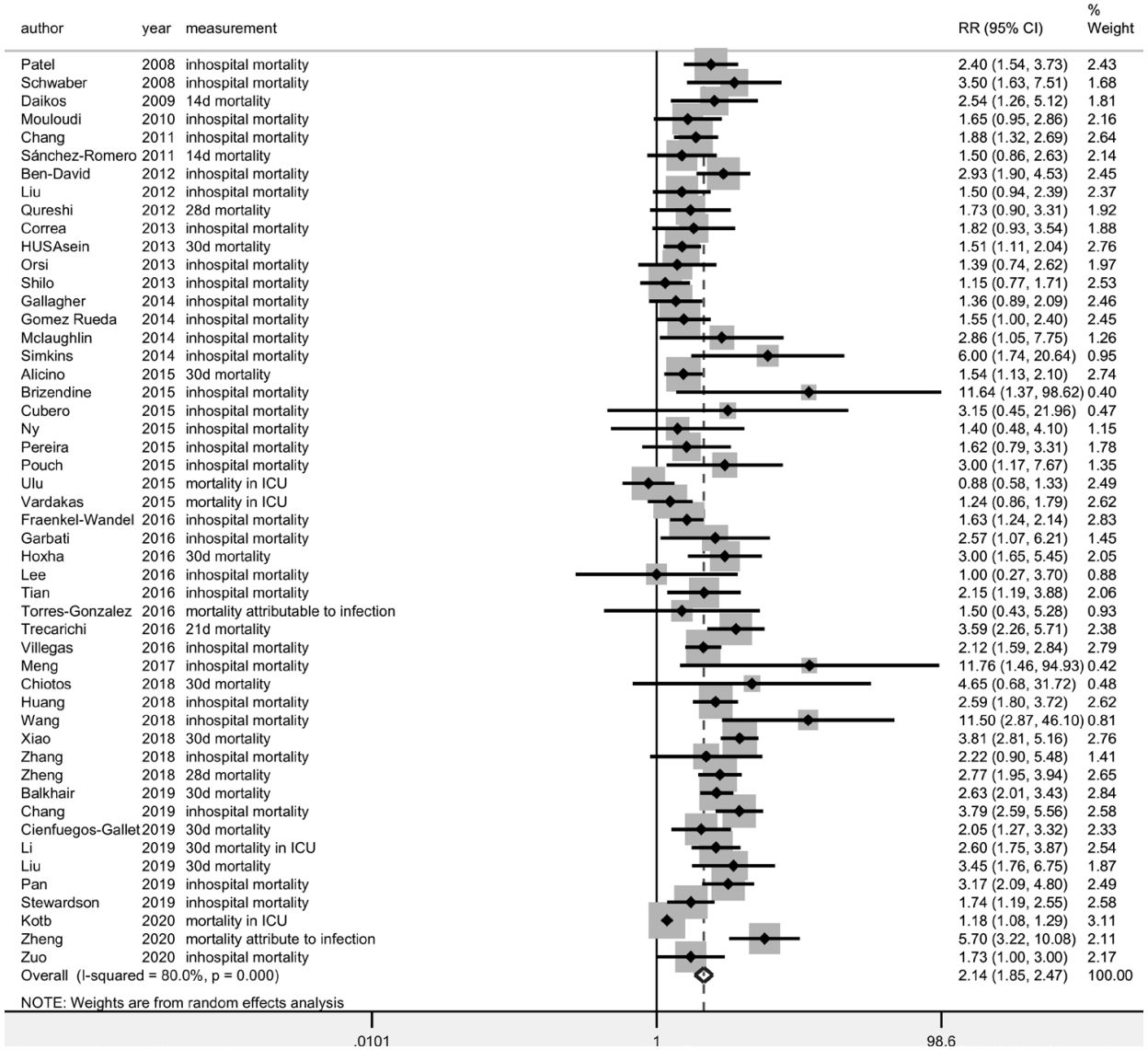

Figure 2 Forest plot of overall mortality in patients with carbapenem-resistant *Enterobacteriaceae* (CRE) versus carbapenem-susceptible *Enterobacteriaceae* (CSE) infections (outcome measure=relative risk). ICU, intensive care unit.

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Table 2 Pooled estimated results for different types of mortality outcome

Mortality outcome type	Number of studies	Number of CRE patients	Number of CSE patients	Unweighted means of mortality among CRE patients	Unweighted means of mortality among CSE patients	RR (95% CI)	P value (significance tests of RR=1)
In-hospital mortality	31	1668	3753	42.30%	20.00%	2.09 (1.81 to 2.42)	0.000
28-day or 30-day mortality	17	1161	2463	42.85%	19.88%	2.23 (1.83 to 2.72)	0.000
21-day mortality	1	161	117	52.20%	14.50%	3.59 (2.26 to 5.71)	0.000
14-day mortality	4	84	287	45.09%	27.01%	1.70 (1.24 to 2.35)	0.001
6-day or 7-day mortality	3	149	372	25.90%	6.57%	3.68 (2.32 to 5.83)	0.000
Mortality attributable to infection	8	391	778	43.30%	17.45%	2.74 (1.97 to 3.81)	0.000
Mortality in ICU	4	1035	824	58.83%	50.50%	1.17 (1.08 to 1.28)	0.000
30-day mortality in ICU	1	244	263	28.90%	11.00%	2.60 (1.75 to 3.87)	0.000

CRE, carbapenem-resistant *Enterobacteriaceae* ; CSE, carbapenem-susceptible *Enterobacteriaceae*; ICU, intensive care unit.

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Léger biais de publication (manque de petites études qui ne détectent pas de mortalité augmentée)

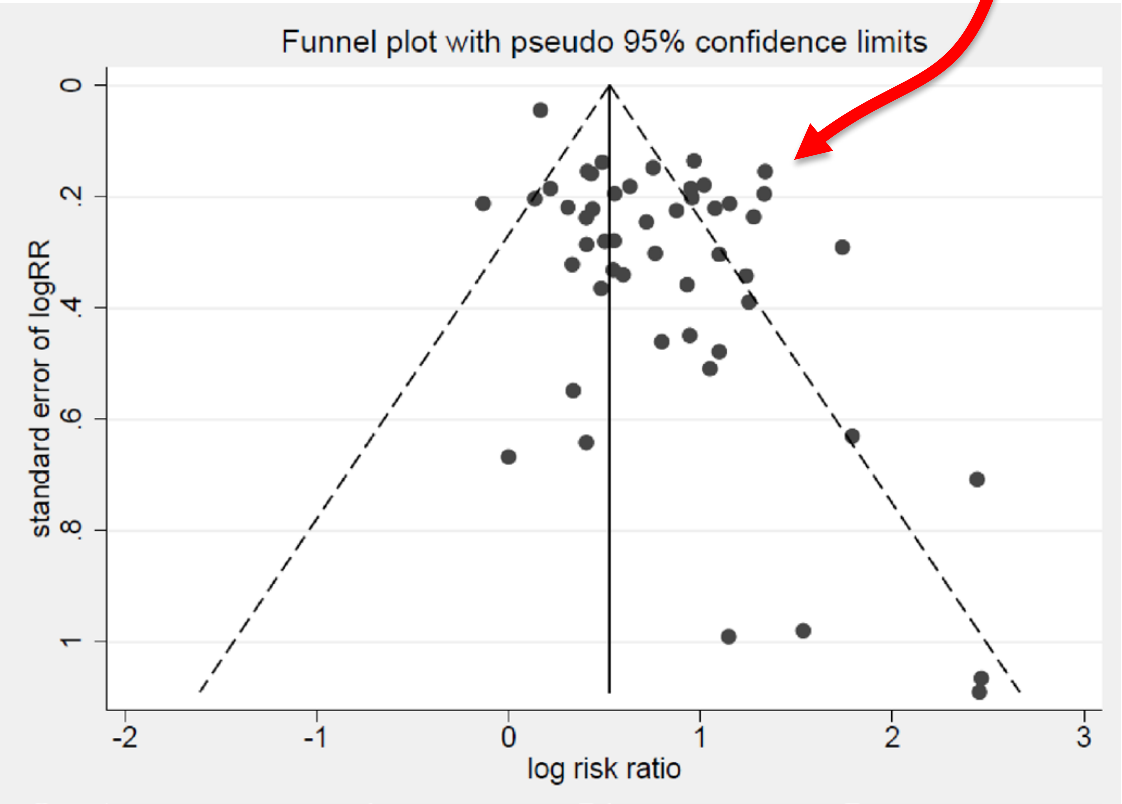

Figure 4 Funnel plot of studies evaluating mortality of patients with infections due to carbapenem-resistant compared with carbapenem-susceptible *Enterobacteriaceae*.

Zhou R et al. *BMJ Open* 2021;**11:**e054971.

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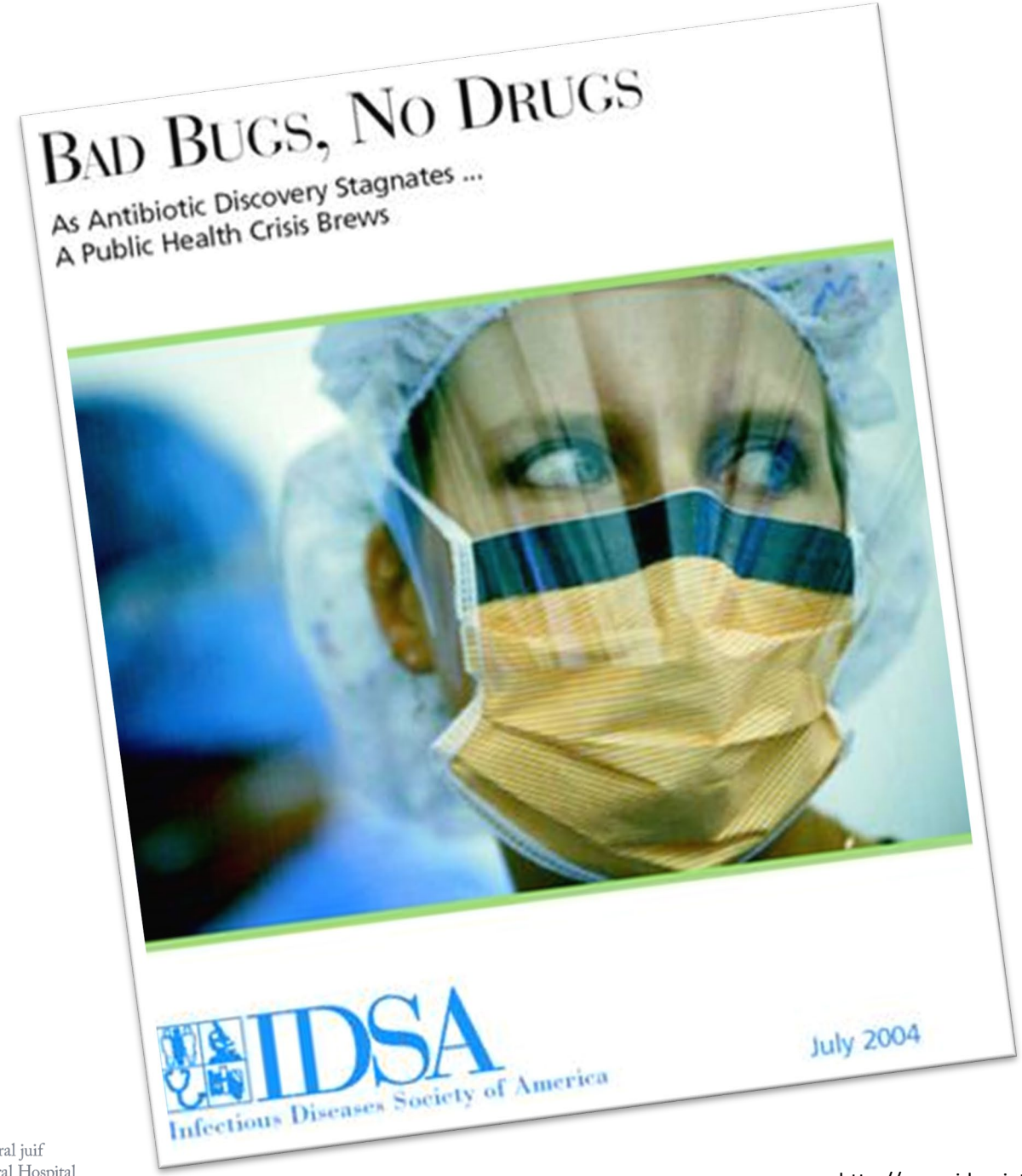
"A post-antibiotic era means, in effect, an end to modern medicine as we know it. Things as common as strep throat or a child's scratched knee could once again kill."
-Dr. Margaret Chan, Director General of the World Health Organization
Keynote Address, Conference On Combating Antimicrobial Resistance,
Copenhagen, Denmark (March 14, 2012)



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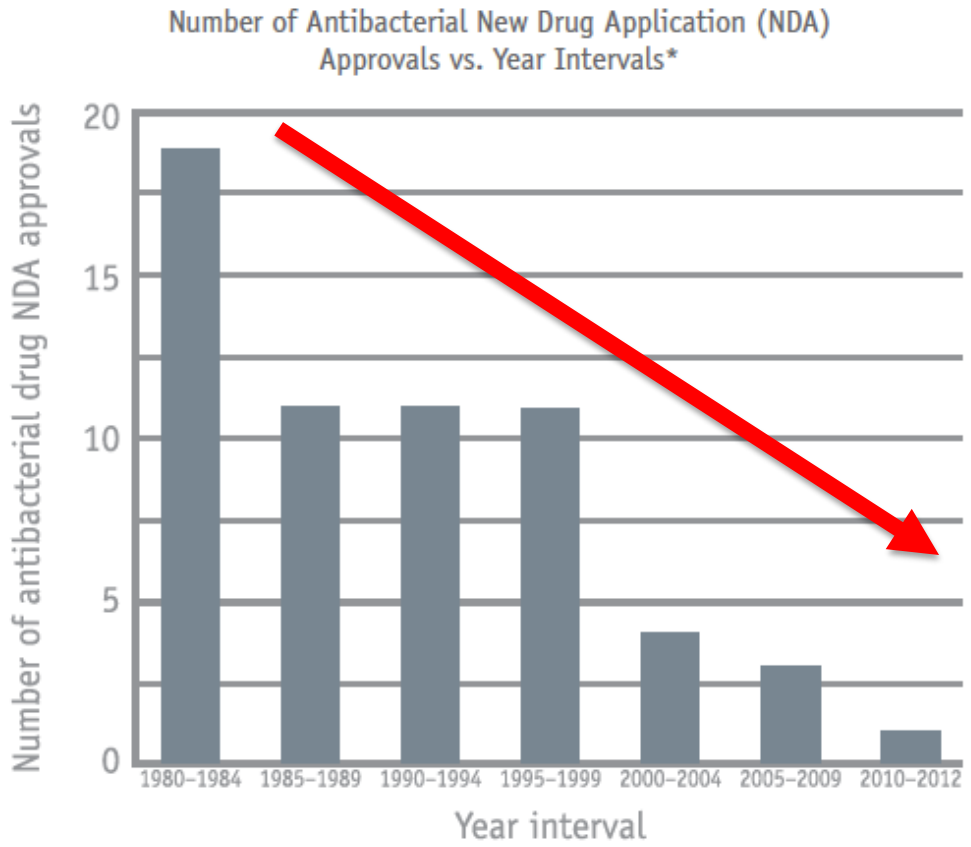
http://www.idsociety.org/pa/IDSA_Paper4_final_web.pdf.

Tomorrow's Antibiotics: The Drug Pipeline

The number of new antibiotics developed and approved has steadily decreased in the past three decades, leaving fewer options to treat resistant bacteria.



*Intervals from 1980–2009 are 5-year intervals; 2010–2012 is a 3-year interval. Drugs are limited to systemic agents.
Data courtesy of FDA' s Center for Drug Evaluation and Research (CDER).

http://www.cdc.gov/drugresistance/threat-report-2013/

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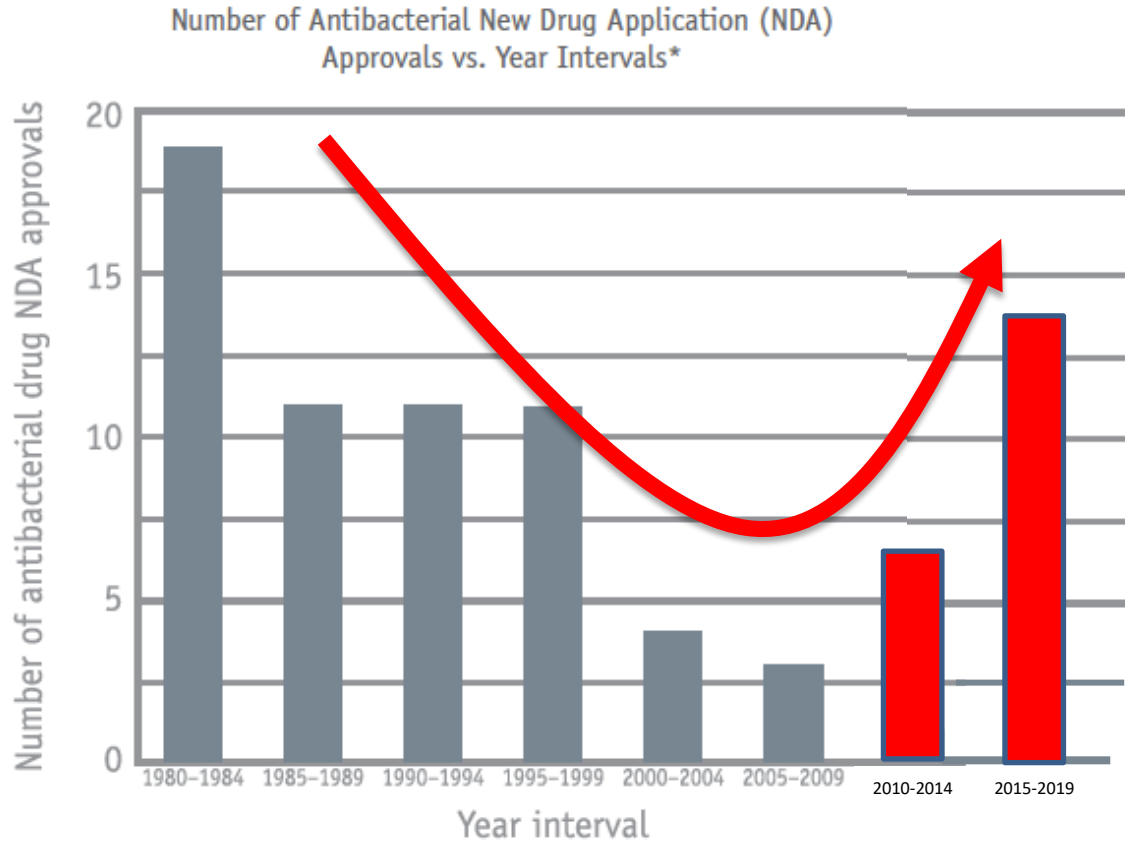

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Data courtesy of FDA's Center for Drug Evaluation and Research (CDER).

Cefiderocol 2019
Imipenem rele: 2019
Lefalumin: 2019
Seracycline: 2018
Plazomicin: 2018
Eravacycline: 2018
Ryfamicine: 2018
Omdacycline: 2018
Meropenem-vabor: 2017
Secnidazole: 2017
Delafloxacin: 2017
Ozenoxacin: 2017
Ceftazidime-avib: 2015
Dalbavancin: 2014
Ceftolozane/tazo: 2014
Finafloxacin: 2014
Tedilozid: 2014
Ceftaroline: 2010
Fidaxomycine 2011

http://www.cdc.gov/drugresistance/threat-report-2013/

https://pubs.acs.org/doi/10.1021/acs.jmedchem.0c01516

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Clinical Infectious Diseases
IDSA GUIDELINES

Infectious Diseases Society of America 2024 Guidance on the Treatment of Antimicrobial-Resistant Gram-Negative Infections

Pranita D. Tamma,[1,©] Emily L. Heil,[2] Julie Ann Justo,[3] Amy J. Mathers,[4] Michael J. Satlin,[5] and Robert A. Bonomo[6]

[1]Department of Pediatrics, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA; [2]Department of Practice, Sciences, and Health-Outcomes Research, University of Maryland School of Pharmacy, Baltimore, Maryland, USA; [3]Department of Pharmacy, Dartmouth Hitchcock Medical Center, Lebanon, New Hampshire, USA; [4]Departments of Medicine and Pathology, University of Virginia, Charlottesville, Virginia, USA; [5]Department of Medicine, Weill Cornell Medicine, New York, New York, USA; and [6]Medical Service and Center for Antimicrobial Resistance and Epidemiology, Louis Stokes Cleveland Veterans Affairs Medical Center, University Hospitals Cleveland Medical Center and Departments of Medicine, Pharmacology, Molecular Biology, and Microbiology, Case Western Reserve University, Cleveland, Ohio, USA

Rouge : disponible uniquement par l'entremise de SAP au Canada

- Infection due à KPC: Meropenem-vaborbactam, ceftazidime-avibactam, imipenem-relebactam (option: cefiderocol)
- Infections due à NDM: ceftazidime-avibactam+aztrenoman, cefiderocol
- Infections due à Oxa-48: ceftazidime-avibactam, cefiderocol
- Tigecycline: alternative pour infection n'impliquant pas la circulation sanguine ou les voies urinaires
- Colistin : n'est plus suggéré à l'exception de la cystite EPC non compliquée

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Bucking the trend… Except in Canada?

Clinical Infectious Diseases

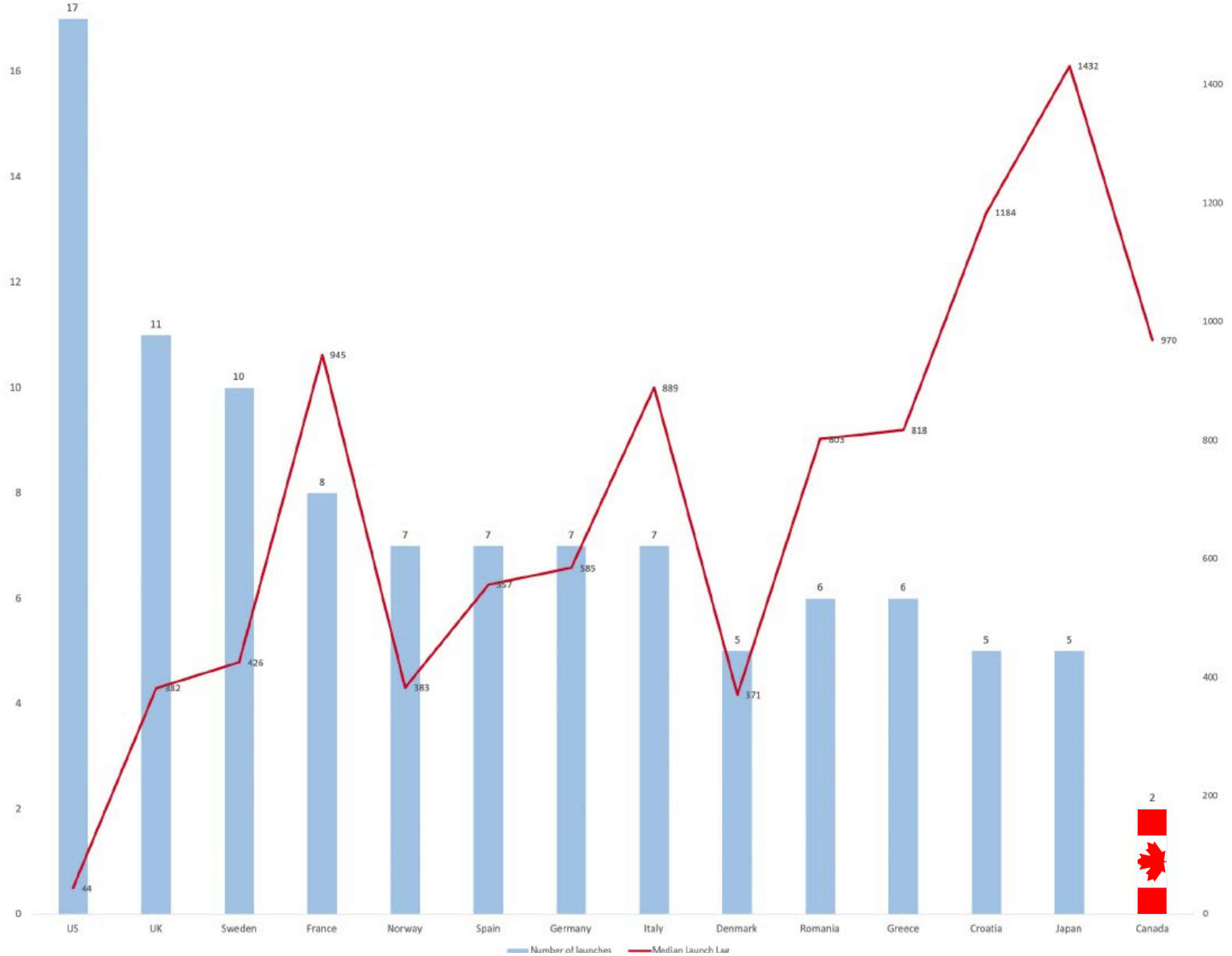
MAJOR ARTICLE

Patient Access in 14 High-Income Countries to New Antibacterials Approved by the US Food and Drug Administration, European Medicines Agency, Japanese Pharmaceuticals and Medical Devices Agency, or Health Canada, 2010–2020

Kevin Outterson,[1,2] Ebiowei S. F. Orubu,[3,4] John Rex,[5,6] Christine Årdal,[7] and Muhammad H. Zaman[4]

[1]Boston University School of Law, Boston, Massachusetts, USA; [2]CARB-X, Boston, Massachusetts, USA; [3]Social Innovation on Drug Resistance Program, Boston University, Boston, Massachusetts, USA; [4]Department of Biomedical Engineering, Boston University, Boston, Massachusetts, USA; [5]F2G Limited, Eccles, Cheshire, United Kingdom; [6]McGovern Medical School at The University of Texas Health Science Center at Houston, Houston, Texas, USA; and [7]Antimicrobial Resistance Centre, Norwegian Institute of Public Health, Oslo, Norway

Outterson K, et al. Clin Infect Dis. 2022 Apr 9;74(7):1183-1190. doi: 10.1093/cid/ciab612. PMID: 34251436



Délais mise en marché: 2.7 years

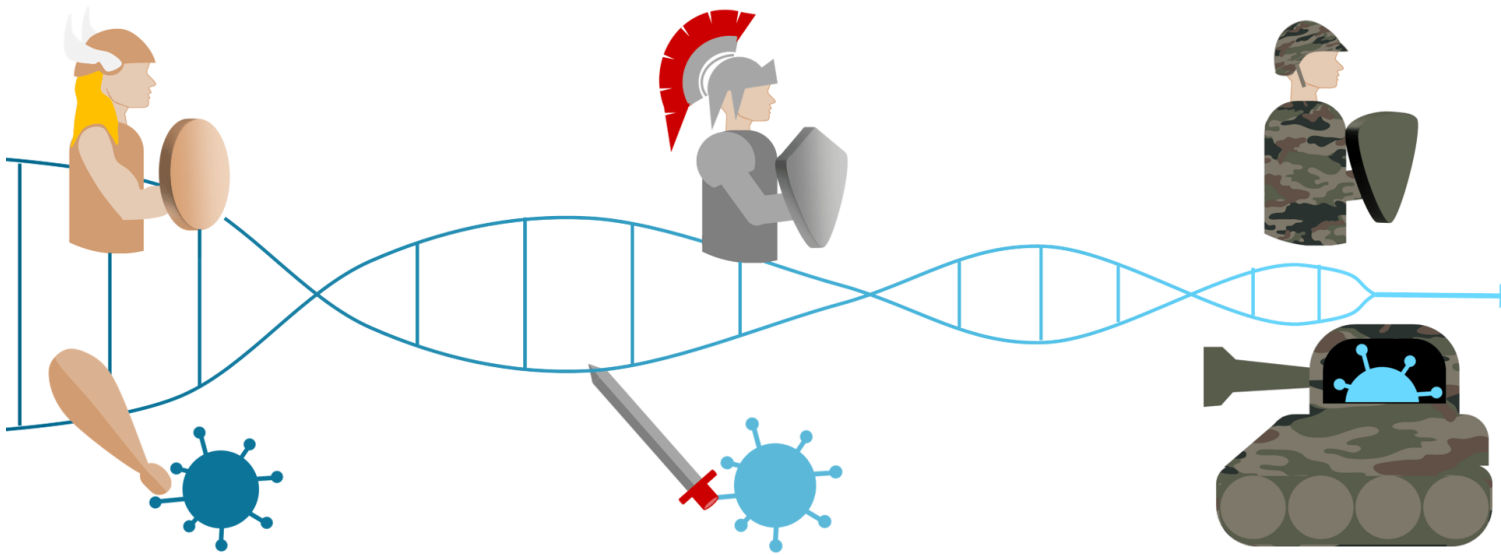
2/17 (12%) approuvés au CAN

Figure 1. Median launch lag, in days (right axis) and number of launches (left axis) in 14 high-income countries for new molecular entity antibacterials first approved by the United States Food and Drug Administration, European Medicines Agency, Japanese Pharmaceuticals and Medical Devices Agency, or Health Canada, 2010–2019. Abbreviations: UK, United Kingdom; US, United States.

Outterson K, et al. Clin Infect Dis. 2022 Apr 9;74(7):1183-1190. doi: 10.1093/cid/ciab612. PMID: 34251436

Conclusions

- EPC se propagent de manière exponentielle
- Les EPC sont associés à une morbidité et mortalité augmentées
- Les nouveaux traitements non disponibles au Canada
- Il est temps d'agir!



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THANK YOU!

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