Swiss ASP workshop & networking event in Berne, Fri, 5th Nov 2021

Antimicrobial stewardship in practice: Making the most of what you have

Continuing professional education: SSI/SGInf (4 credits), GSASA/FPH (37.5 credit points)

1. Background

The Antibiotic Stewardship programme (SwissASP) network activities are implemented within the framework of the national StAR strategy and supported by the Federal Office of Public Health. In the first phase of the project (2016-2019, StAR-1 project), the SwissASP framework conditions and portfolio documents were developed based on international standards, and antimicrobial stewardship (AS) needs in Switzerland.

These documents aim to support the implementation of sustainable antimicrobial stewardship in hospitals. This, as well as the follow-up project – StAR-2 – have been implemented in partnership with Swissnoso, Swiss Society for Infectious Diseases, and Swiss Society for Microbiology.

In this current second phase (StAR-2 project), the SwissASP Programme working group aims to create a functioning network for developing and implementing bottom-up antimicrobial stewardship activities, where experiences and tools can be shared. This workshop was the first face-to-face meeting of the network after three previous meetings via Zoom (due to the pandemic) with more than 50 participants on each call.

Aiming at healthcare professionals interested or already involved in local antimicrobial stewardship implementation, the event counted a **total of 70 participants, including pharmacists, clinicians, and microbiologists in different-size hospitals across Switzerland.**

2. Event purpose

- to provide broader perspectives on hospital antimicrobial stewardship implementation from different stakeholders at the national and international level (morning programme)
- a focus on practical aspects of stewardship implementation (through moderated small group interactions)
- provide networking opportunities for participants to exchange on implementation at different sites

3. Meeting structure and content

a) Morning session

10:00 Berne **Welcome and introduction / Setting the scene** — **PD Dr. Julia Bielicki (JB), (ID UKBB & Swissnoso), moderator and Prof Andreas Widmer (President Swissnoso)**

Brief outline of the event background and purpose, introducing speakers of the morning programme

1005 ZOOM **The national StAR strategy and antimicrobial stewardship** — **Simon Gottwalt, Swiss National Action Plan AMR in human medicine, Federal Office of Public Health**

FOPH/national perspective

- StAR strategy → One Health approach (incl. human, animal, and environment); eight fields of action, incl. antimicrobial stewardship programmes; exchange among stakeholders v. important
- Cross-links to the minimum standards (NOSO strategy); the National Research Programme on "Antimicrobial Resistance" (NRP 72); lessons from Covid- response; the evaluation and upcoming revision of the epidemic law in 2023

10:20 ZOOM **Be AWaRe- new WHO antibiotic groupings for hospital antimicrobial stewardship** — **Prof. Benedikt Huttner, Programme Lead World Health Organization**

Reflections on using the WHO Essential Medicines List (EML) - Antibiotic AWaRe Lists (2017)

- "Access to 1st/2nd choice for most: Access, Watch, Reserve" as part of the WHO EML
- AWaRe to track antibiotic use in hospitals and nationally, comparison across different countries

10:40 ZOOM **Paediatric aspects of antimicrobial stewardship (AS)** — **PD Dr. Julia Bielicki (JB), (Inf Dis at UKBB & SwissASP Lead, Swissnoso), moderator**

- Far higher rate of antibiotic use in paediatric compared to adult populations
- Challenges: AS in light of neonatal and childhood mortality (diarrhoea, pneumonia, meningitis, measles) and morbidity (economic impact), especially in low- and middle-income countries
- Increasingly highly resistant *Acinetobacter sp.* /other GNs; Meropenem very commonly used

11.00 ZOOM **Cantonal health director perspective of hospital antimicrobial stewardship** — **Dr. Lukas Engelberger, President GDK, Cantonal Health Director (Basel-Stadt)**

Antimicrobial resistance as a significant threat to humans and health systems

- In analogy to Covid-19 crisis: the need for optimized, joint interventions to limit the spread of resistance
- Cantonal support to promote harmonized approach for adequate in- and outpatient prescribing

11:20 Key points of stewardship in the UK **Prof. Philip Howard, BSAC (vice-president) and University Hospital Leeds, UK**

ZOOM

Zoom conversation moderated by JB (replacing the originally planned presentation on **"Local implementation of stewardship, a UK perspective":** not shown due to technical problems)

https://www.swissnoso.ch/fileadmin/swissnoso/Dokumente/5_Forschung_und_Entwicklung/9_AB_Stewardship/UK%20approach%20to%20AMR%20-%20Nov21_presentation_Philipp%20Howard.pptx (presentation available online)

Important drivers of advancing hospital antimicrobial stewardship (AS) in the UK include:

- The Health and social care act (2015) requires organized infection control activities from public and private hospitals. NICE guidelines define AS systems and practices: all hospitals to have AS teams (clinician & pharmacist); AS committee with members including adult and paediatric physicians, pharmacists, microbiologists; and education and raising awareness in patients/councils/the public
- UK AMR national action plans set out antibiotic prescribing targets, e.g., 1% reduction of total antibacterials per admission (improved empiric prescribing; Watch & Reserve approach- AWaRe); as a result, prescribers to focus on narrow-spectrum antibiotics
- Development of NICE guidelines for common infections (respiratory, urinary tract, *C. difficile*, cellulitis) that are freely available and informing WHEN and WHEN NOT to use antibiotics
- Clinical quality improvement schemes
    - in-hospital requirement: as part of the 48-72h review, the prescriber needs to define the patient outcome and justify if no IV-PO switch was done
    - recognition of sepsis = important indication for rapid treatment and broad-spectrum antibiotic (sepsis bundle contributed to the reduction of in mortality in hospitals)
- All national consumption data uploaded automatically (everything issued in pharmacy) as well as resistance date- everything is broken down into data for hospitals and community
- The UK has one of the highest rates of antibiotic use in the hospital population- probably one important reason is that lots of ambulatory care is happening in hospitals

11.15 Round table discussion on the importance and ways of effective AMS

Berne implementation at the system level, with national stewardship/IPC experts

PD Dr. Michael Osthoff (Clinical Medicine/Infectious Diseases, USB)
Prof. Christoph Meier (Clinical Pharmacy, UniBas)
Prof Andrea Endimiani (Microbiology & Research, IFIK)
Prof Hugo Sax (Infection Prevention & Control, Swissnoso).
Moderator: PD Dr. Julia Bielicki (SwissASP Lead, Swissnoso and UKBB)

Round table discussion: Questions

Parallels between COVID crisis and antimicrobial resistance: Anything we can derive from the response?

- Hospital management endorsement and accountability through the committee
- IPC got "visible." Now antimicrobial stewardship needs to step out from the "shadow" of IPC and become visible, especially to our frontline physicians
- Need for a committee, leaders' role models, champions, and implement guidelines, especially to identify patients NOT requiring antibiotics (e.g., by adding tools like procalcitonin to evaluate the likelihood of a patient having only a viral infection)
- Drug shortage, stressful situations that required rapid action
- Awareness that even in highly developed countries like Switzerland, drug supplies may be limited (due to scarcity in Asia), requiring careful use: this was a wake-up call for many people
- Covid-19 is very "fast," whereas antimicrobial resistance is somehow a "slower" problem. We have a bit more time and need to avoid "hit & run" decisions
- Need for improved rapid diagnosis, especially from native blood allowing early, targeted treatment and avoiding antibiotic overuse (e.g., Meropenem in sepsis), e.g., T2 or molecular technology (high direct costs might be well invested through the benefits from a rapid diagnosis)
- Along with such rapid tests, need for timely action on test results: clinicians providing advice and stewardship

Intersection of IPC vs. Stewardship- anything to learn from challenges in the past (implementing IPC)?

- Professionals need the awareness of what happens after your action: Resistant organisms are something "invisible," but we can detect it through diagnostics and act accordingly. Prescribing antibiotics may create resistance, but the second step is spreading it, passing bacteria on to somebody else, consequences of which are not visible or only later. Covid has shown this phenomenon to everyone.
- Need for leadership and guidelines and clinicians to follow them
- It is debatable, whether any benefit in "punishment" of clinicians not following guidelines, e.g., through cutting pay or reimbursement (as you would crossing a red traffic light driving your car)
- Instead, the focus should be on leadership, positive work culture, and the use of best knowledge and data to support clinicians in sound decision-making and providing personal/timely feedback.
- Need to differentiate between system (aggregated feedback) and individual (prescriber) feedback
- Role models, decision support systems, electronic prescribing, pre-authorization, guidelines. Empower clinicians to choose the most appropriate antibiotic and follow-up closely, IV→ PO switch, stop, step down, etc.

Intersection of IPC and Stewardship… (continued)

- "Friendly competition" might be helpful, e.g., through peer pressure showing antibiotic use by different teams/team members
- To highlight the importance and potential impact of prescribing antibiotics, adding hurdles to the prescription of antibiotics, similar as for prescription of opioids (e.g., monitoring and storing records for ten years). Teaching patients, doctors, nurses that antibiotics are "very special drugs"

Start smart, then focus- what are the challenges in the acute setting?

- It might be difficult to restrict something people want to use in a patient who appears very sick. If you need them, you want to give them early (need for appropriate empiric antibiotics).
- In a broader picture- it is important finding the balance regarding restricting antibiotic use without compromising the link to the companies producing antibiotic agents (companies' interest in production might cease once antibiotics are not used enough).
- "To force functions in a system design," you need to think about how hard you make your barrier: a "hard barrier" may create delay, sometimes hurdles may be too high for getting a good outcome. Softer barriers might include the idea of "personal antibiotic footprint," comparable to carbon footprint has been used in some areas like outpatients.
- Need for a system supporting the clinician to make adequate decisions BUT requiring close follow-up and monitoring of the case and adapting much sooner (increasing awareness). This, instead of not allowing to use antibiotics at all
- Implementing pathways for community-acquired pneumonia, urinary tract infection that are evaluated every month, providing CONSTANT feedback to providers/frontline physicians (better than giving feedback only once a year).

The benefit of hospitals working together and promoting stewardship

- It has been shown many times that different entities sharing goals and having a common platform creates friendly competition, sharing experiences. Fundamental to have shared goals and commitment. These mechanisms are still underused
- Sharing what works and what doesn't is an important model, especially for smaller hospitals: Examples for stewardship include pharmacists joining the intensive care round, electronic health records and clinical decision systems, difficult to implement appropriate alerts. Often hospitals choose different systems/approaches, reinventing the wheel all the time. Metadata would be an essential thing to share. Important to compare how people do it, how your system is doing it

Key points from this session include

Governance, accountability, and leadership

- Stewardship committee/working group, accountable and endorsed by hospital management
- Need for leadership, multidisciplinary team, and champions supporting strategies and guidelines
- Increase visibility of antimicrobial stewardship (similar as IPC) to frontline staff
- Create an understanding of why to use antibiotics carefully (development and spreading of resistance)
- Provide leadership promoting peer exchange and positive work culture ("friendly competition")
- Seek to cross-link to IPC and microbiology (optimising rapid diagnostics, follow up of results)
- Maintain links with different stakeholders (including antibiotic development and supplies)

Expertise and technology

- Guidelines to empower clinicians to make appropriate antibiotic decisions
- IT: decision support systems, electronic prescribing, and health records, with appropriate alerts
- Establish mechanisms to support prescribers (empirical antibiotic guidelines, timely and personal feedback, etc.) AND that require close monitoring ± adaption of antimicrobial treatment
- Implement guidelines/pathways for specific infections, e.g., community-acquired pneumonia, UTI
    - Consider the inclusion of additional tools (e.g., pro-calcitonin)
    - Reevaluate regularly (e.g., monthly), providing continuous feedback to frontline physicians

Monitoring and surveillance

- Monitoring of consumption and prescription data

Reporting and communication

- Share system feedback (aggregated) at higher/management level
- Mechanisms of feedback to prescribers regarding their antibiotic prescription
- Provide individual feedback to prescribers (e.g., cases of prescriptions diverging from guidelines)

Education and training

- Education of prescribers and others involved at all levels on relevant stewardship action

Interventions/Specific activities

- Strengthen the network of antibiotic stewards as a platform for shared goals and commitment
    - Sharing data (e.g., metadata) and exchanging about tools and approaches that work, for implementing stewardship (instead of everyone trying to reinvent the wheel), etc.

b) Afternoon interactive session

Seven small groups (each one with 4-6 participants) participated in a 1-hour interactive session (case scenario of an inadequate antibiotic prescription). They were asked to explore ways of antimicrobial stewardship action and propose what they felt would be essential elements of stewardship as per the following three areas (up to 3 suggestions for each per group):

- Strategies (e.g., "generic" bottom-up or top-down strategies; stewardship "core areas")
- Specific tools that would have helped to prevent this/similar problem or help rapid decision-making resistance data, AB guidelines, allergy algorithm, training, audit, etc.
- Which other elements (beyond scenario) or external support (Swissnoso, societies, etc.)

Aggregated feedback received in this session's discussions

Strategies: key points from this session include

Leadership: dedicated antimicrobial stewardship team:

Multidisciplinary team or working group; responsible for stewardship; executive support.

"Link" ID or pharmacy staff, role models, and "champions."

Taking time out of the day to engage people, discuss prescribing decisions, etc.

Provide immediate/quick feedback (team huddles, daily discussions, teaching rounds, etc.).

To provide feedback:

- Individual feedback/follow-up mechanism (timely and individual) where prescription guidelines not followed (e.g., clinicians often diverging from guidelines to discuss reasons)
- Need for consistent information for prescribers, so that similar details are received independently from which source (supported by guidelines)

Involve stakeholders, create awareness and positive work culture (friendly competition)

Targeted intervention strategies to tackle specific disease areas, e.g., pneumonia

Prioritisation "as a strategy": identify areas most needed/to focus on first

Quality management and quality of care: Showcase to hospital management that providing stewardship is a "service"; record what we are already doing/time spent on stewardship (many things we do may qualify; one might use FMH log of infectious disease consultations?); rather than simply asking for more resources/ staff to do something that seems impossible.

Quality management and quality of care (continued): Consider "re-packaging" or "branding" what we are already doing as a consistent "stewardship bundle"; formalise, involve others so that consistent advice is provided regardless of who is on duty; let people do what they are best at (let surgeons operate and us take care of stewardship)

Strategies: key points from this session include (continued)

Support education on and teaching/auditing the use of guidelines Groups include frontline staff, department leads, champions, new prescribers, postgraduate training.

Tools: key points from this session include

Guidelines Easy access, up to date, ready to use at the bedside, to support stewardship strategies

Prioritisation "as a tool": identify areas with biggest needs/to focus on first

IT/monitoring of consumption, prescription data: Aggregated feedback, most useful to inform hospital management (rather than individual prescribers); hospital/ward-specific antibiograms or regional resistance patterns (of doubtful benefit, since trends might be pretty similar across Switzerland); benchmarking across hospitals, specialties, wards, teams (NB avoid creating a culture of blaming, see → feedback); E-tools for guidelines, clinical decision making, prescribing with adequate (not too many) alerts, e.g., for broad-spectrum antibiotics.

Other elements/external support: key points from this session include

Generic information negotiation/business case/cost-effectiveness evaluation

At political level: Lobbying relevant stakeholders for the legal framework of stewardship; generic, basic, and more advanced stewardship activities as "minimum standards"; or link to ASP and minimum standards (Swissnoso/other societies). Linking to financial rewards?

Advocate for stewardship to be "certified", as a quality award; charter institutions/prescribers may subscribe to; e.g., through hospital self-reporting (comparable to Athena Swan Charter, a framework supporting gender equality within higher education/research; bronze-silver-gold); this might increase "healthy" competition across hospital sites; similar to successful IPC intervention modules like WHO hand hygiene award (user self-declaration). Here, essential that the awarded institution and people actually "doing" stewardship are well connected and that energy and motivation are transmitted throughout the organisation.

Multidisciplinary, patient-centered education and training on stewardship at all levels

15:15	**Wrap up and session closure**	**PD Dr. Julia Bielicki (JB), (UKBB & Swissnoso), moderator**
Berne	**Event closure**	**and Prof Andreas Widmer (President Swissnoso)**

Next steps include: working group to review output from the workshop, circulate information on next steps, and further action to network. Workshop ends.

Strategie Antibiotikaresistenzen

StAR

Stewardship in the Swiss Antibiotic Resistance Strategy

Simon Gottwalt, BAG

Swiss ASP Networking Meeting, 5.11.2021

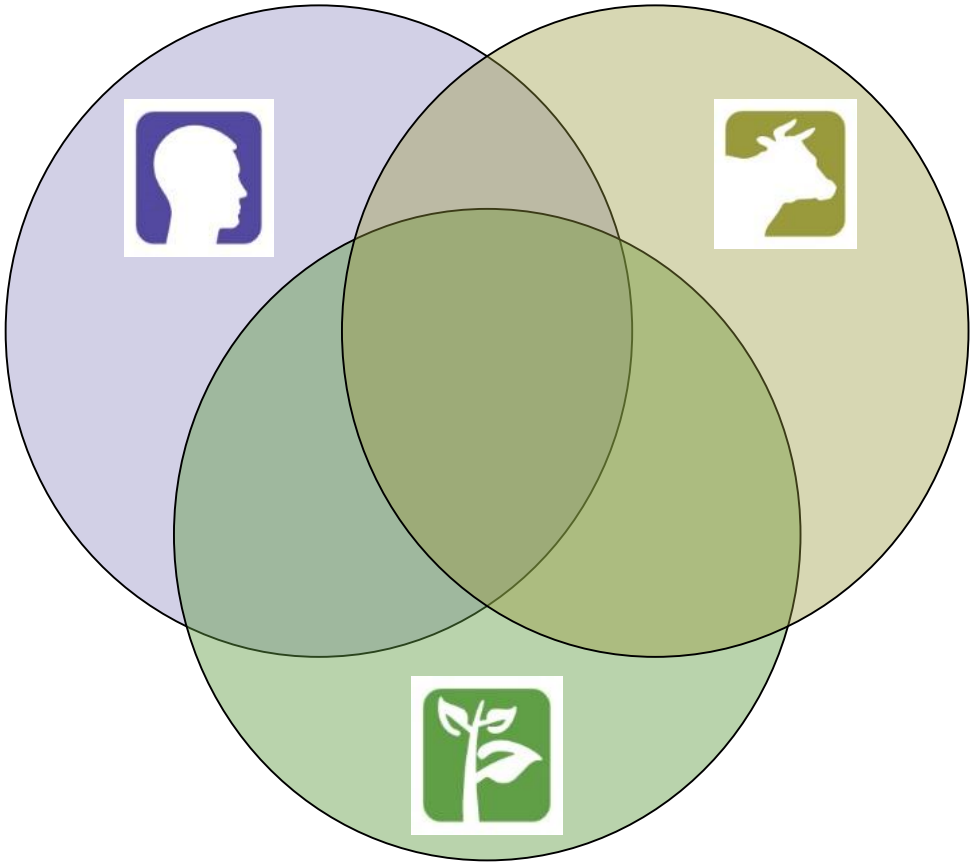
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Gesundheit BAG
Bundesamt für Lebensmittelsicherheit und Veterinärwesen BLV

Eidgenössisches Departement für Wirtschaft, Bildung und Forschung WBF
Bundesamt für Landwirtschaft BLW

Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation UVEK
Bundesamt für Umwelt BAFU

Strategie StAR= One Health



Overarching goal: Preserve the effectiveness of antibiotics for humans and animals

Mensch

Tier und Landwirtschaft

Umwelt

Strategie StAR- 8 fields of action, 35 measures

Prävention: Strategie NOSO und Nationale Strategie Impfen (NSI)

Nationales Forschungsprogramm Antimikrobielle Resistenz NFP72

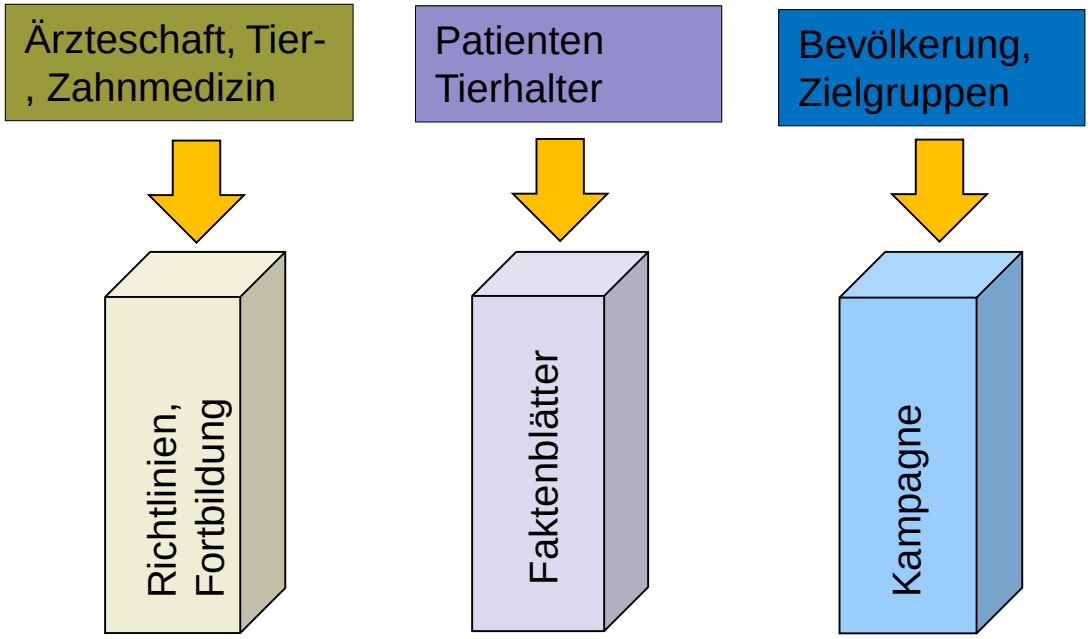
Surveillance

1. **Konstanter Ausbau Nationales Zentrum für Antibiotikaresistenzen Anresis**

2. **Nationales Referenzlabor zur Früherkennung neuer Antibiotikaresistenzen NARA** (Universität Fribourg)

3. **Meldepflicht für CPE und VRE**

Information and Education

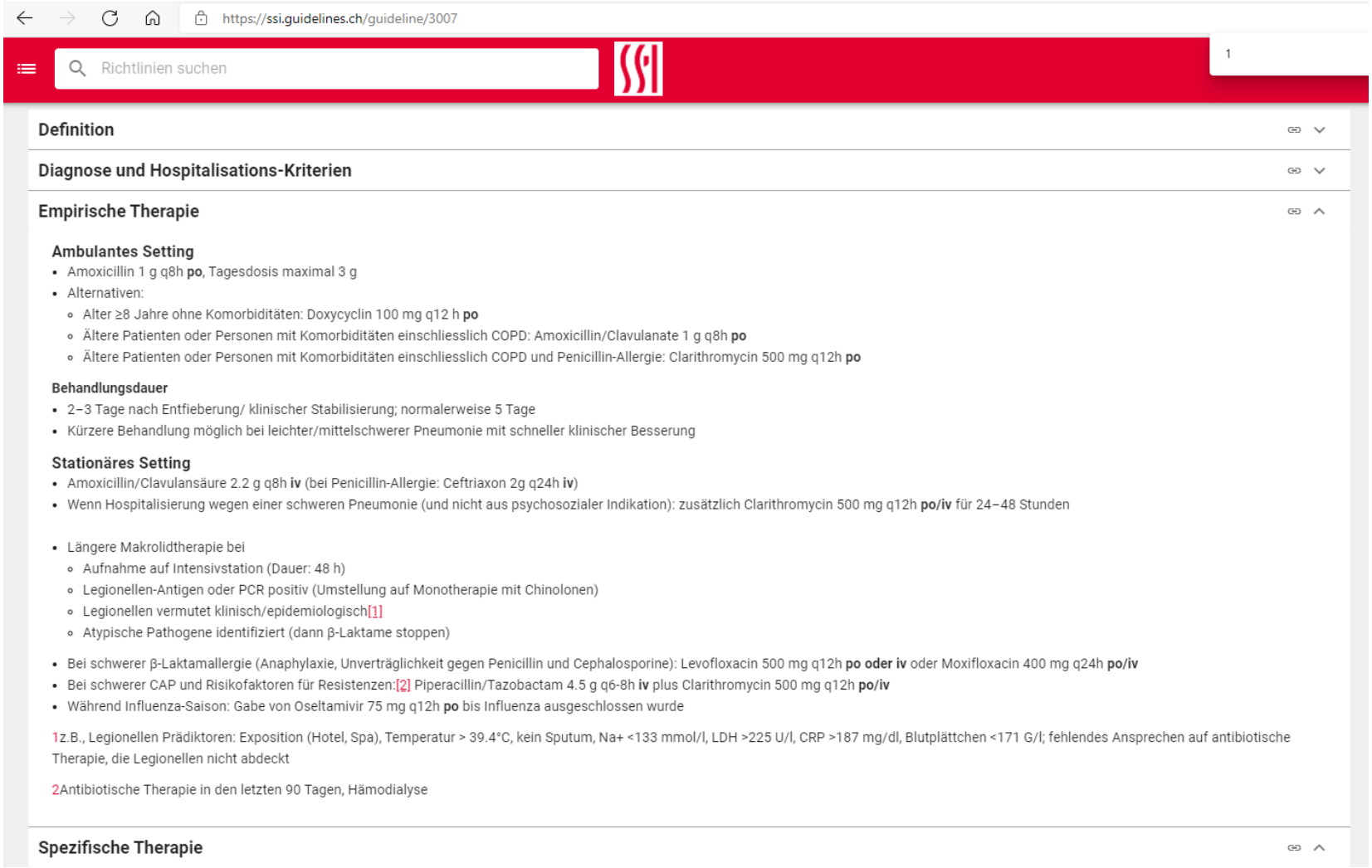


Appropriate use of antibiotics

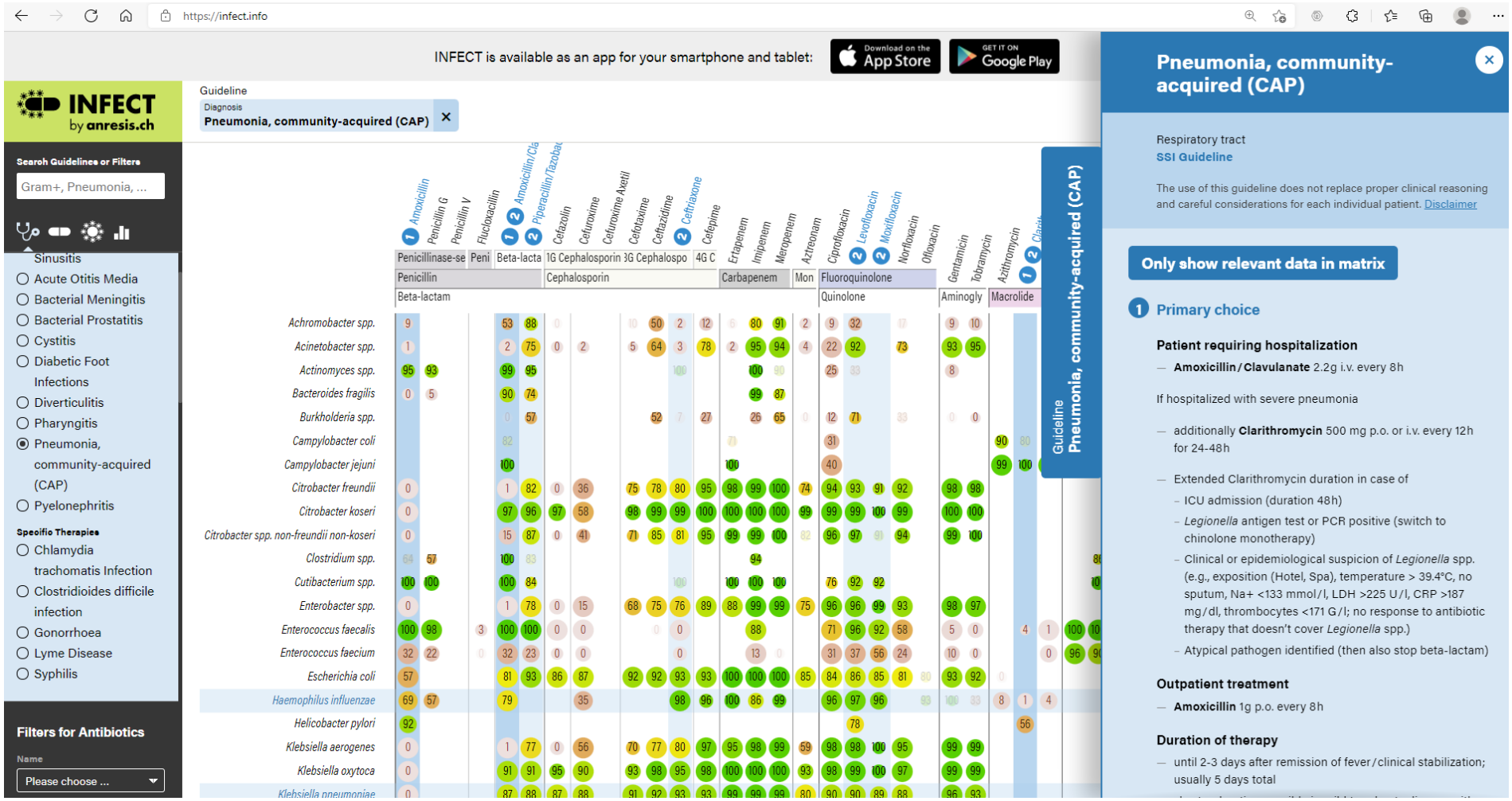
Nationale Richtlinien für:

- **Antibiotika-Verschreibung** www.guidelines.ch (SSI)
  Richten sich primär an Grundversorger

SSI Guidelines

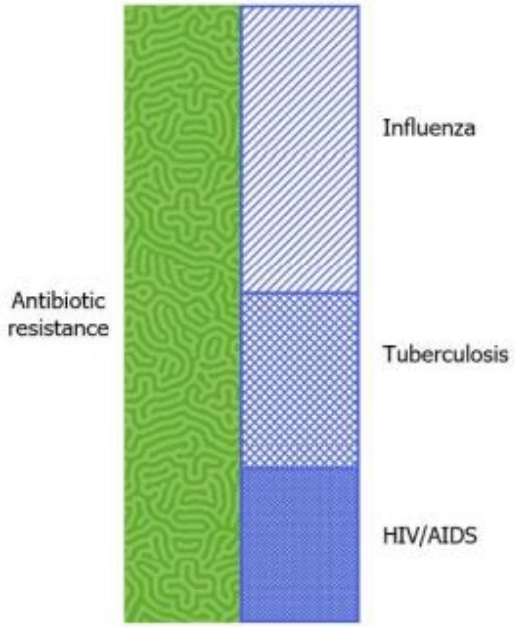


Infect.info: Linking Guidelines and Resistance Data



ABR is a hospital problem

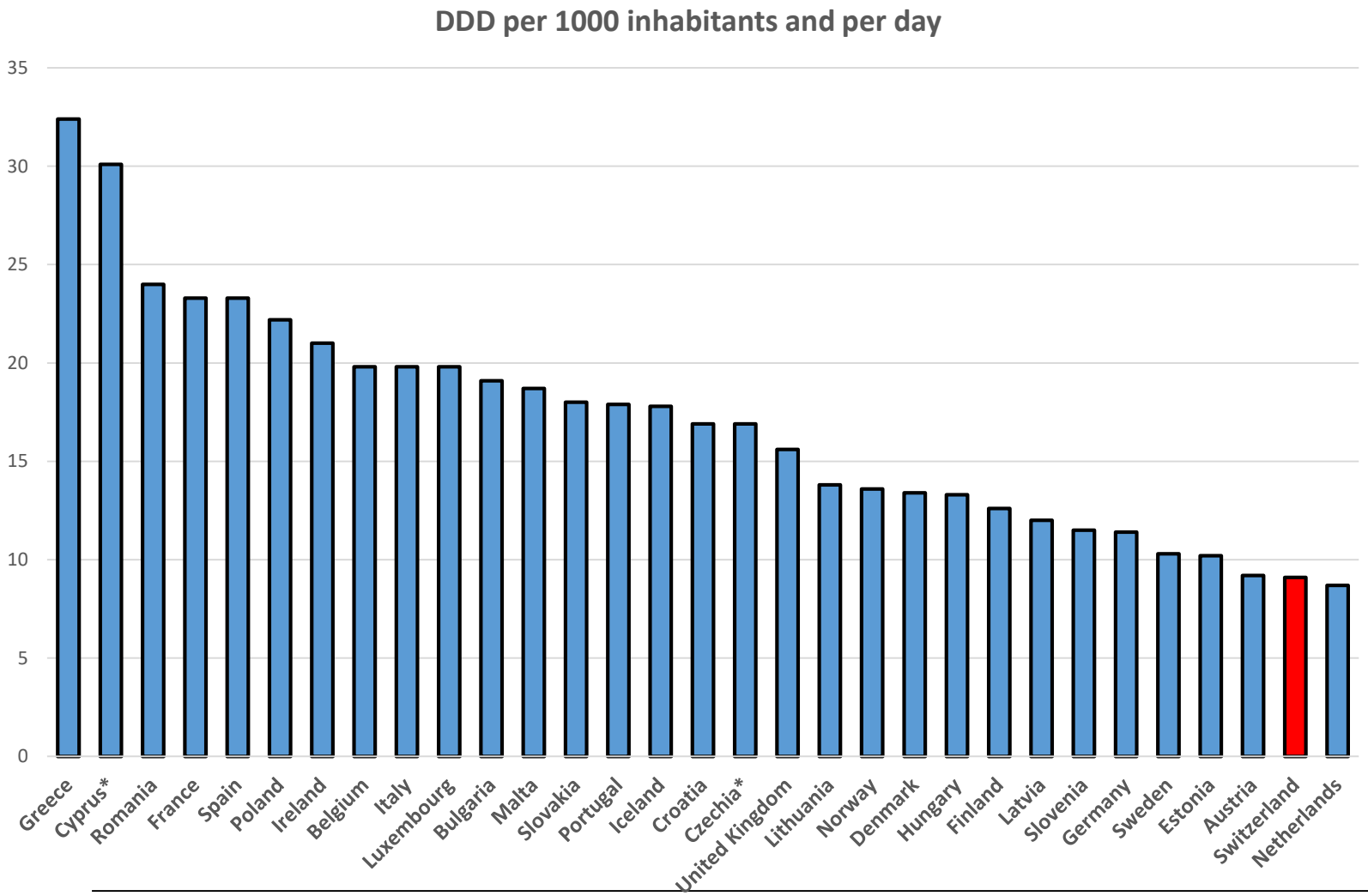
The burden of infections with bacteria resistant to antibiotics on the European population is comparable to that of influenza, tuberculosis and HIV/AIDS combined.



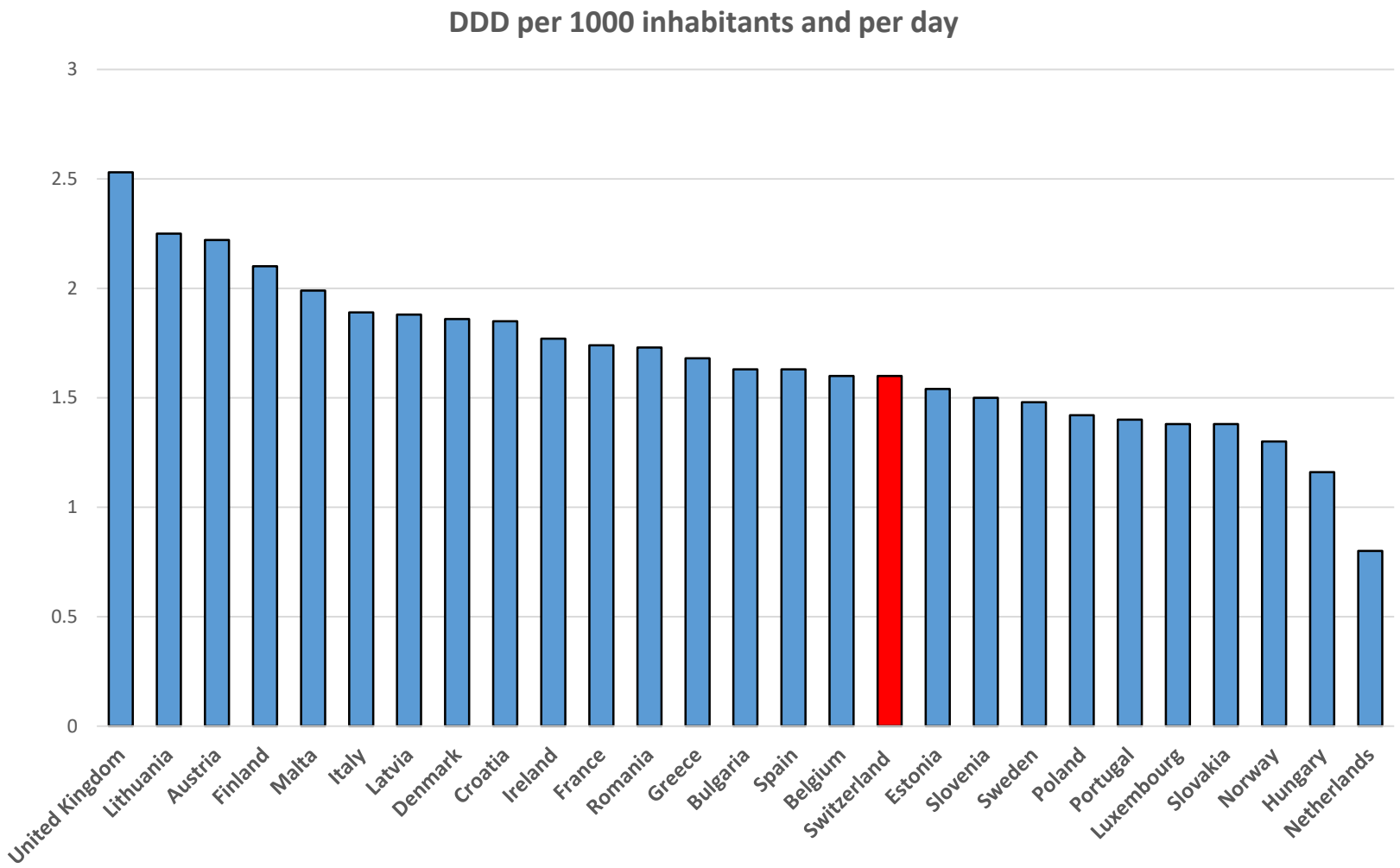
75 %
Healthcare-associated infections

75% of the burden of bacteria resistant to antibiotics in Europe is due to healthcare-associated infections. This could be minimised through adequate infection prevention and control measures, as well as antibiotic stewardship in healthcare settings.

Antibiotic consumption primary care



Antibiotic consumption in hospitals



Appropriate use of antibiotics

Nationale Richtlinien für:

- **Antibiotika-Verschreibung** www.guidelines.ch (SSI)
  Richten sich primär an Grundversorger

- **Prävention und Kontrolle von multiresistenten Erregern und Eintrittsscreening in Spitälern** (Swissnoso)

- **Stewardship-Programme in Spitälern:** Empfehlungen für modularen Aufbau (Swissnoso)

Stewardship Programs in StAR

- **Hohe Priorität innerhalb von StAR**

- **Antibiotika Verbrauchs-Monitoring** durch ANRESIS bereits implementiert, interaktive Live-Version bald verfügbar
  → ca. 50 % der Spitäler sind angeschlossen

- **Nächste Schritte**:
  - Veröffentlichung der Guideline-Dokumente
  - Weitere Unterstützung bei der Umsetzung
  - Monitoring der Umsetzung
  - ?

Strukturelle Mindestanforderungen

Strukturelle Mindestanforderungen
für die Prävention und Bekämpfung von healthcare-assoziierten Infektionen (HAI) bei hospitalisierten Patientinnen und Patienten für Schweizer Akutspitäler

- **Blueprint für Stewardship-Programme?**
- **Einbindung in Mindestanforderungen?**

StAR – future development

- **Ergebnisse NFP 72**
- **Zwischenevaluation 2023**
- **Lehren aus Covid-19**

  → Anpassung der Ausrichtung von StAR

- **Revision Epidemiengesetz gestartet**

Thans you for your attention

Why are children and young people different: The challenge of antimicrobial resistance in the paediatric population

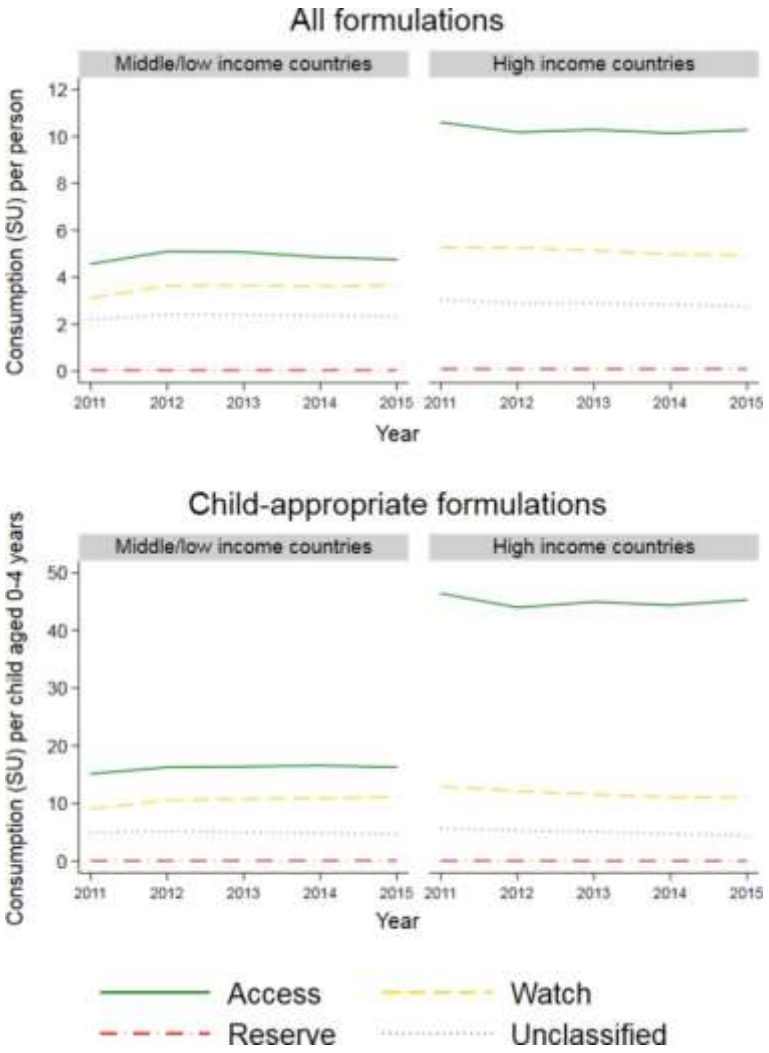
Dr. med. Julia Bielicki, MPH PhD

BSAC, 2. November 2021

I use

No conflicts of interest to declare

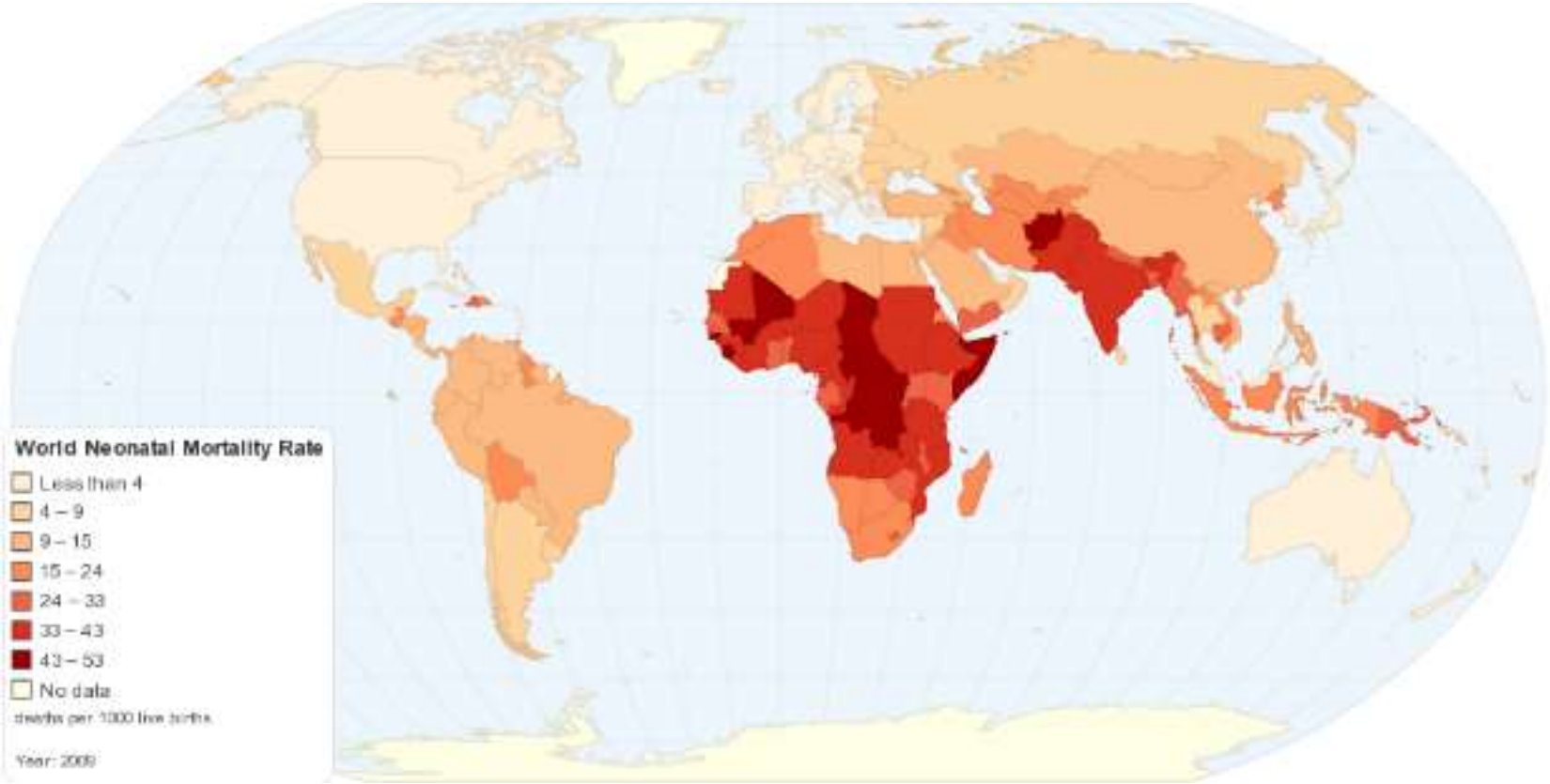
Children use more antibiotics than adults



Jackson C, Bielicki J et al. BMJ Global Health. 2019

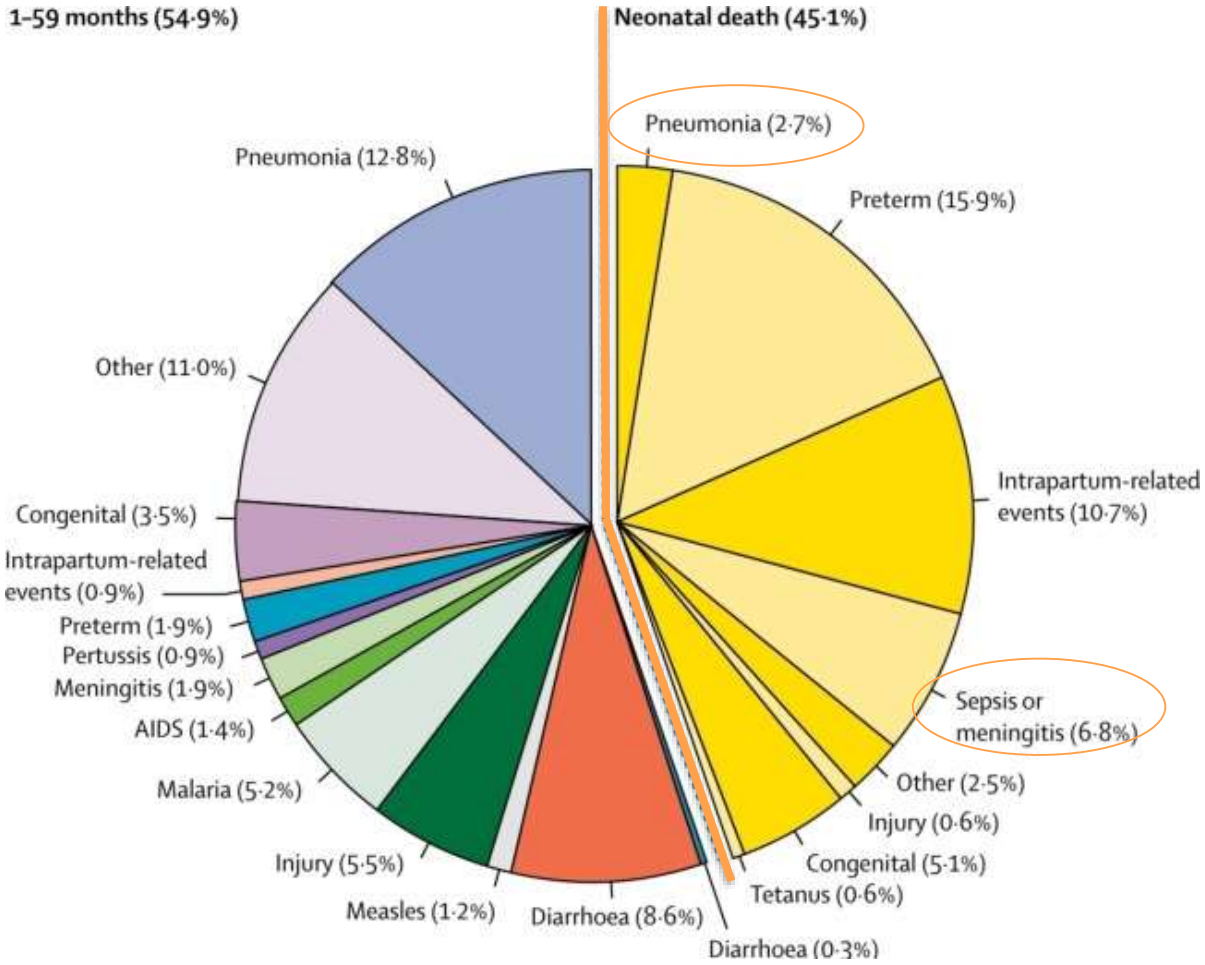
Neonates and children continue to die from infection

2.9 million neonatal deaths/year worldwide – 25% due to neonatal sepsis



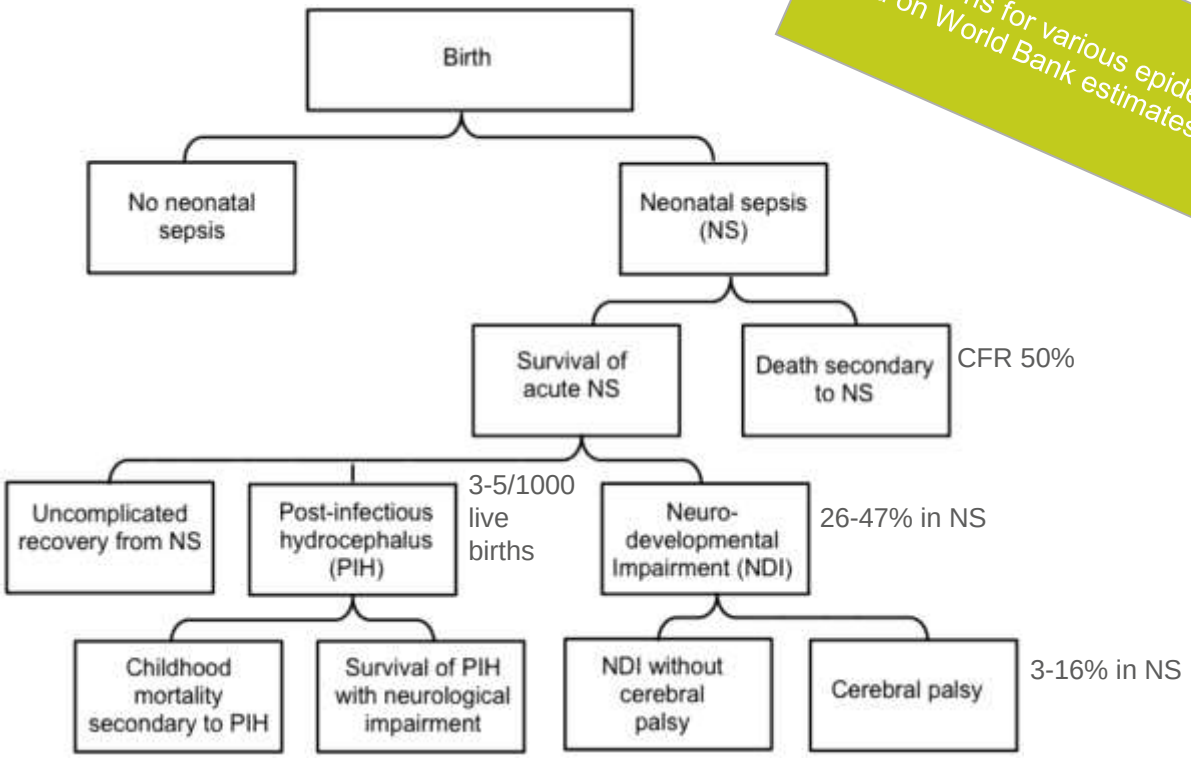
Folgori, Bielicki et al. Lancet; 2017; 5(11):e1066-8.

Why do neonates die?



Liu et al. Lancet. 2016; 388: 3027-3035

The negative effects of neonatal sepsis beyond mortality

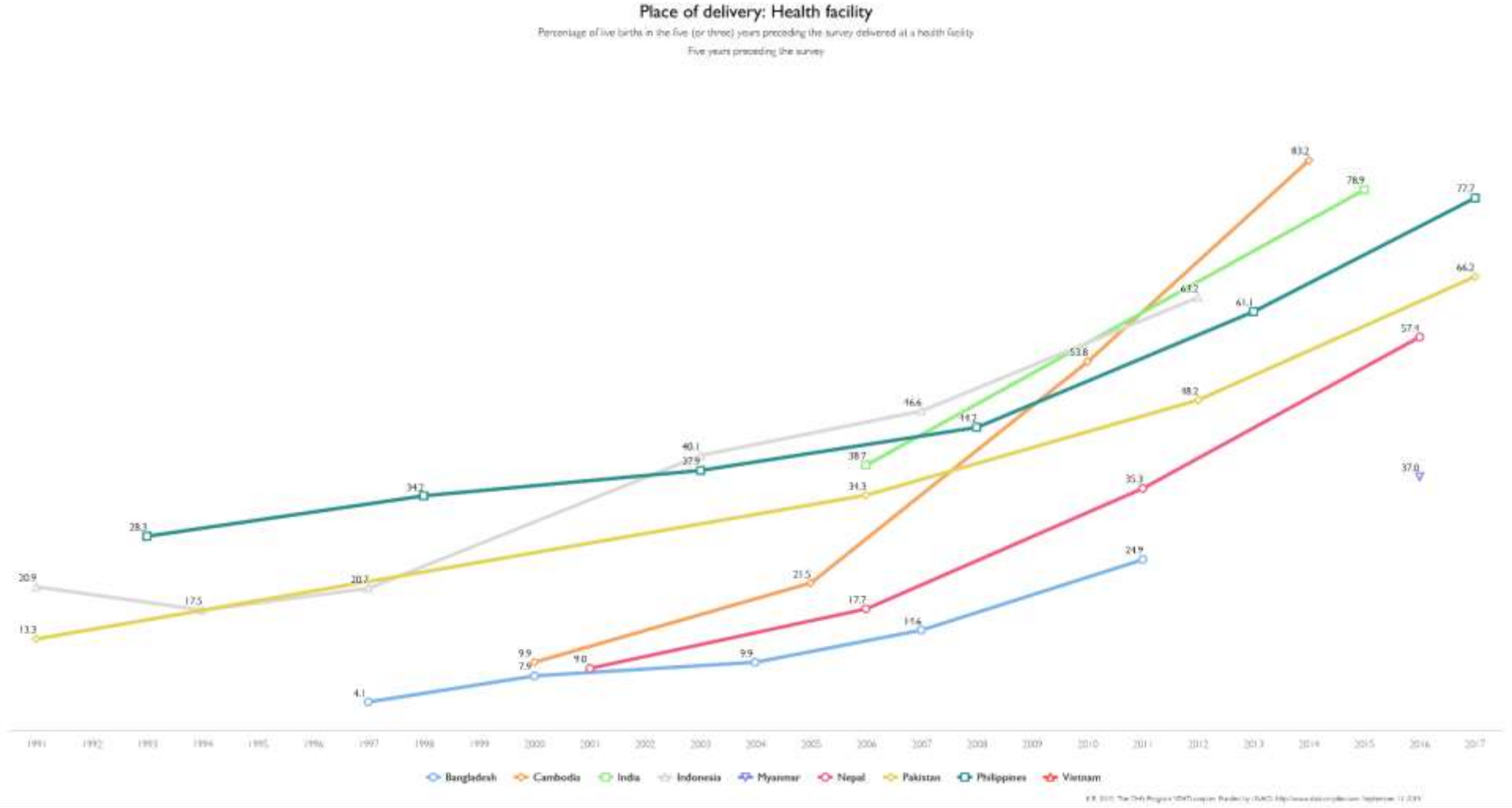


Assumptions for various epidemiological parameters based on World Bank estimates and literature for SSA

Economic value associated with successful prevention or treatment of all cases of neonatal sepsis in SSA over 1 year (2014): US$10-470 billion

Ranjeva SL et al. BMJ Global Health. 2018; 3: e000347

Proportion of deliveries taking place in healthcare facilities



FOOD AND DRUGS › GLOBAL SUPERBUGS

BABIES HIT THE HARDES ANTIBIOTIC RESISTANCE

We tell the stories that matter. To help defend quality reporting and

Baby Manu had been in
city of Jaipur for 10 days
infection. Her mother w

Three premature babies die in Bremen

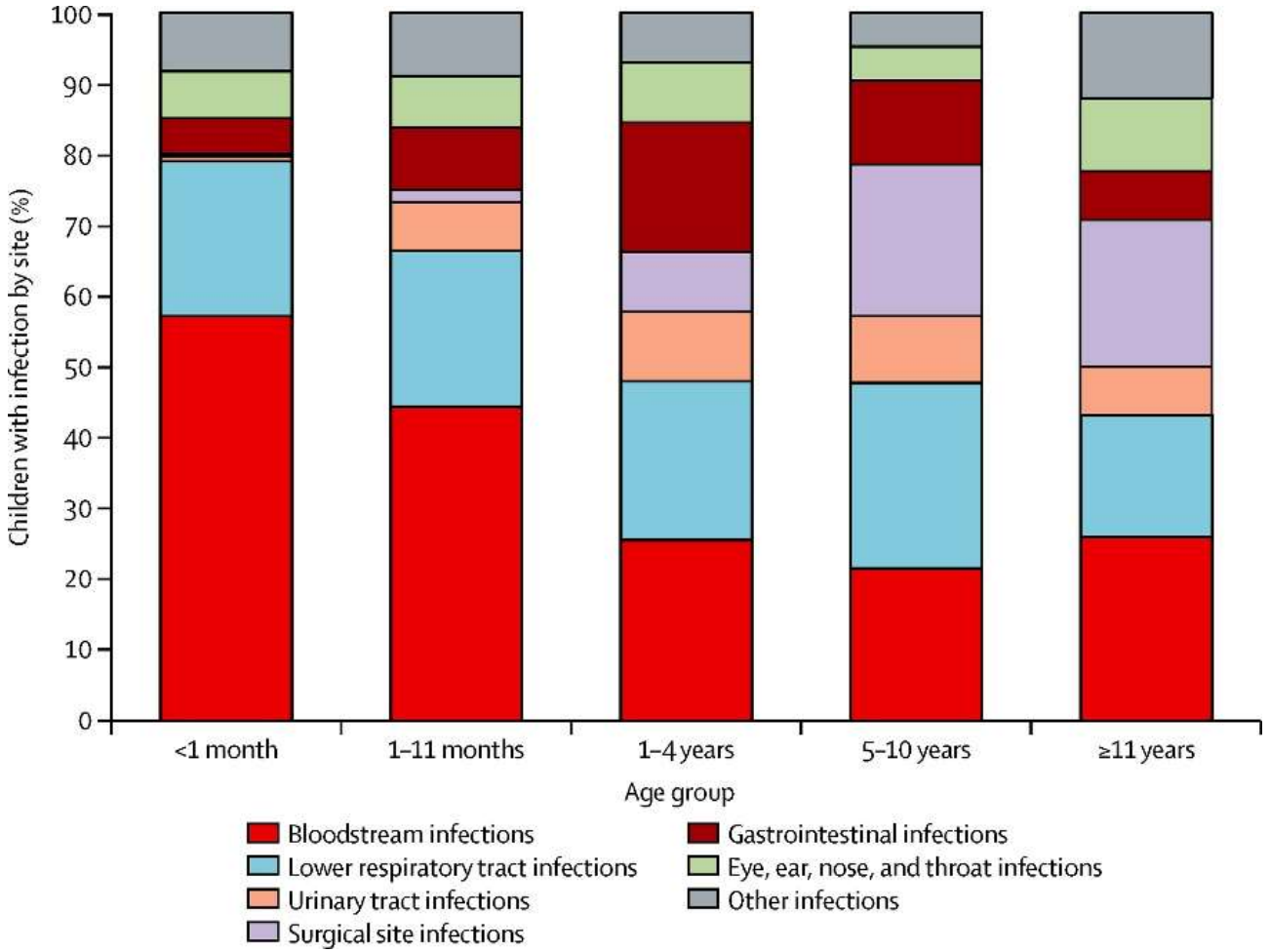
Photo: DPA

The Local
news@thelocal.de
@thelocalgermany

3 November 2011 | 11:02 CET+01:00

Three premature babies have died in a Bremen clinic in northern Germany, after being infected with bacteria resistant to antibiotics.

Hospital-acquired infections



Zingg et al. Lancet ID. 2017: 17.

Newborns being looked after in NICUs in Asia-Pacific...

... and in an African NICU

AB use in NICU

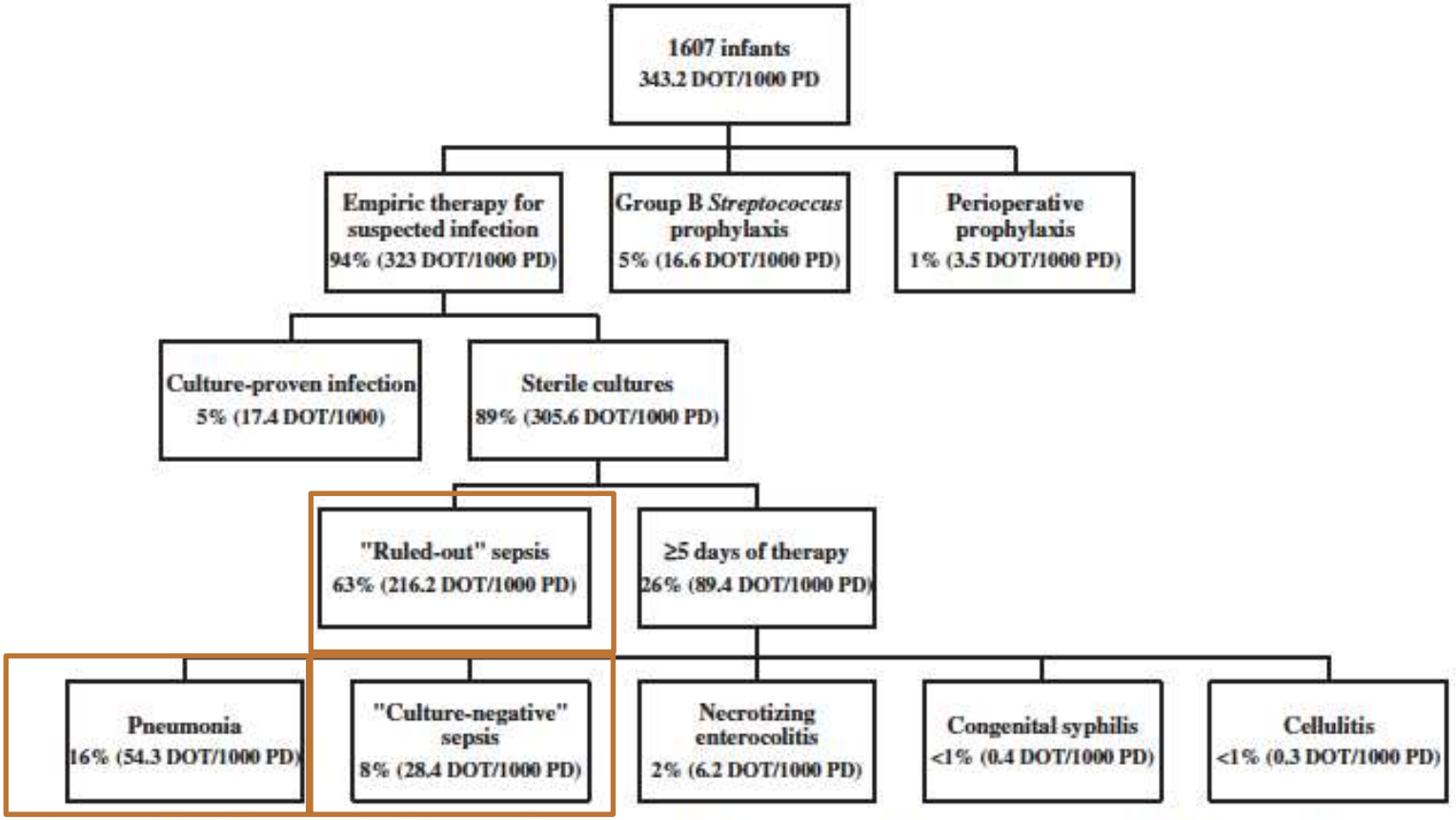
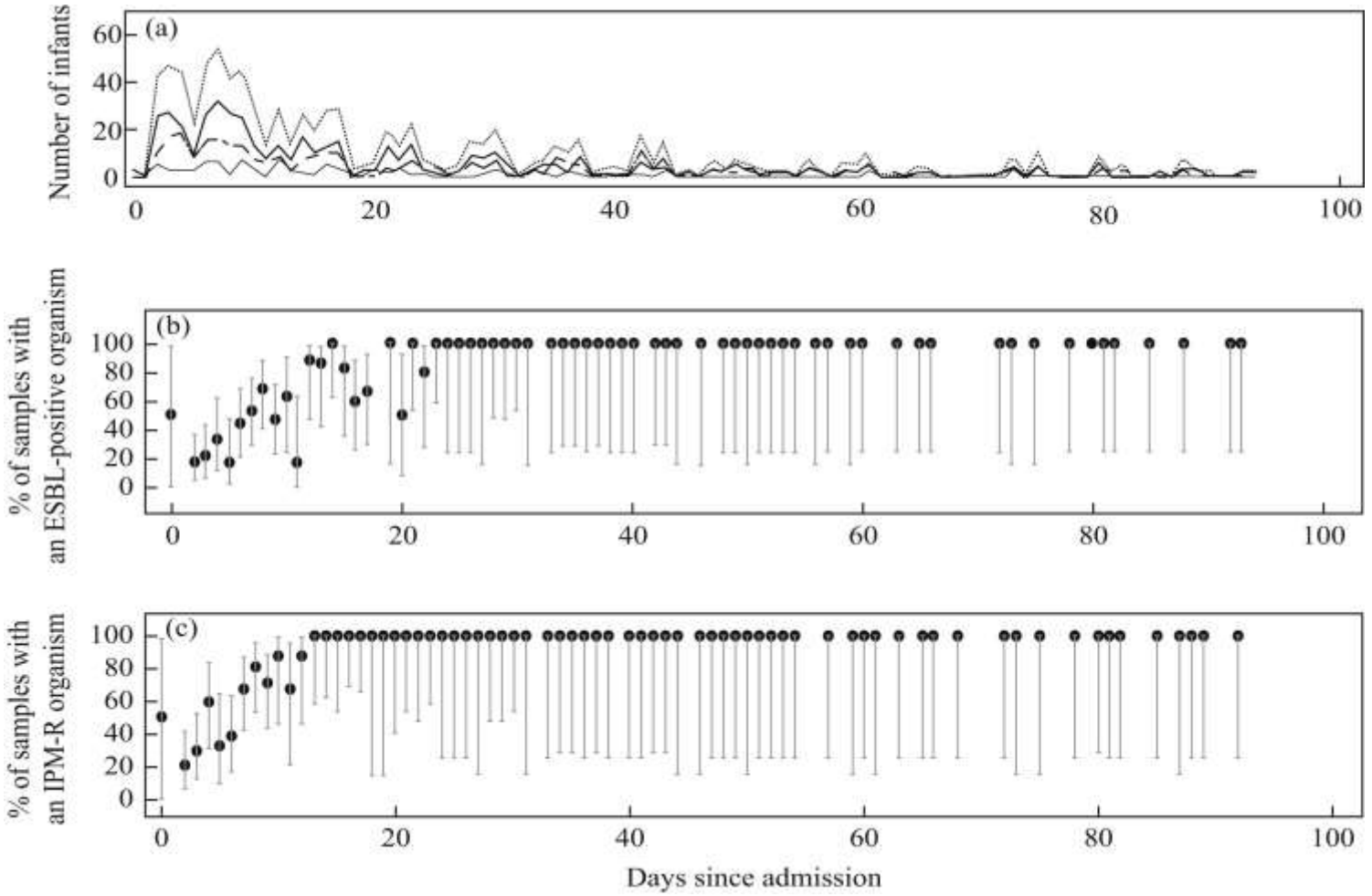


FIGURE 2. Flowchart of all antibiotic DOT (N = 9165) per 1000 PD administered to infants during the study period.

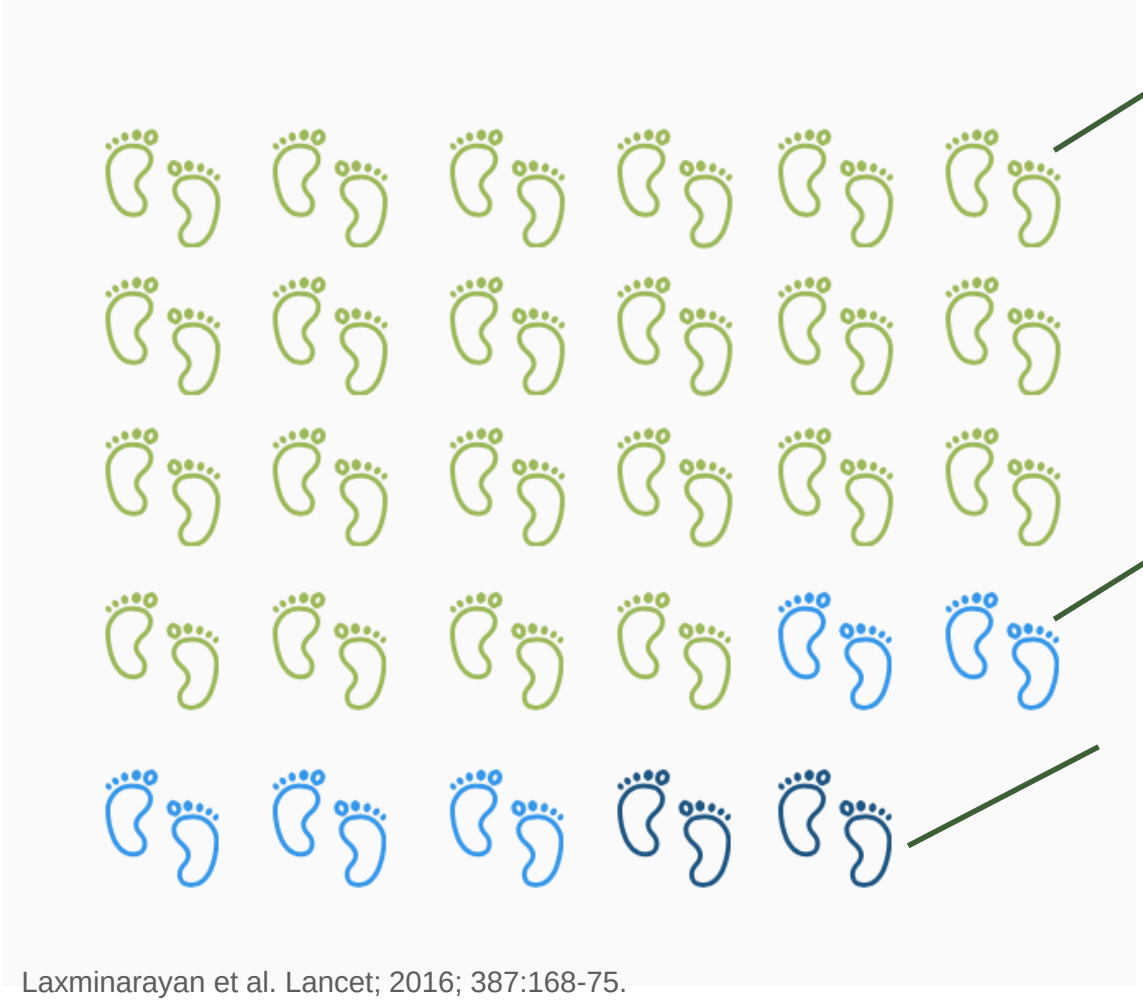
Cantey JB et al. PIDJ. 2015; 34: 267-272

Risk of resistant bacterial colonization in NICU



Roberts et al. JHI. 2019; 103(2):151-55

The role of antimicrobial resistance in global childhood mortality - neonates



100’000 neonatal deaths

Neonatal sepsis deaths

Neonatal sepsis deaths related to AMR

Laxminarayan et al. Lancet; 2016; 387:168-75.

Pathogens observed in newborns with sepsis

	Total sepsis	Culture-positive sepsis	Culture-negative sepsis	Meningitis
Incidence*				
Overall (n=13 530)	1934 (14·3%; 13·8–14·9)	840 (6·2%; 5·8–6·6)	1094 (8·1%; 7·6–8·6)	200 (1·5%; 1·3–1·7)
Site 1 (n=9239)	1237 (13·4%; 12·7–14·1)	502 (5·4%; 5·0–5·9)	735 (8·0%; 7·4–8·5)	119 (1·3%; 1·1–1·5)
Site 2 (n=2657)	502 (18·9%; 17·4–20·4)	279 (10·5%; 9·4–11·7)	223 (8·4%; 7·4–9·5)	67 (2·5%; 1·9–3·2)
Site 3 (n=1634)	195 (11·9%; 10·4–13·6)	59 (3·6%; 2·7–4·6)	136 (8·3%; 7·0–9·8)	14 (0·9% 0·5–1·4)
Incidence density†				
Overall (n=80 427)	1980 (24·6; 23·6–25·7)	847 (10·5; 9·8–11·3)	1133 (14·1; 13·3–14·9)	200 (2·5; 2·2–2·8)
Site 1 (n=42 419)	1246 (29·4; 27·8–31·0)	502 (11·8; 10·8–12·9)	744 (17·5; 16·3–18·8)	119 (2·8; 2·3–3·3)
Site 2 (n=21 342)	517 (24·2; 22·2–26·4)	281 (13·2; 11·7–14·8)	236 (11·1; 9·7–12·5)	64 (3·0; 2·3–3·8)
Site 3 (n=16 666)	217 (13·0; 11·3–14·8)	64 (3·8; 2·9–4·9)	153 (9·2; 7·8–10·7)	14 (0·8; 0·4–1·4)
Case fatality rate‡				
Overall	496/1934 (25·6%; 23·7–27·7)	400/840 (47·6%; 44·2–51·0)	96/1094 (8·8%; 7·2–10·6)	102/200 (51·0%; 43·8–58·1)
Site 1	248/1237 (20·0%; 17·8–22·4)	200/502 (39·8%; 35·5–44·3)	48/735 (6·5%; 4·8–8·6)	45/119 (37·8%; 29·1–47·2)
Site 2	226/502 (45·0%; 40·6–49·5)	188/279 (67·4%; 61·5–72·8)	38/223 (17·0%; 12·3–22·6)	56/67 (83·6%; 72·5–91·5)
Site 3	22/195 (11·3%; 7·2–16·6)	12/59 (20·3%; 11·0–32·8)	10/136 (10·4%; 3·6–13·1)	1/14 (7·1 %; 0·2–33·8)

*Among those admitted to neonatal intensive care. Data are number of cases (%; 95% CI). †Data are
95% CI). ‡Data are number of deaths/number of cases (%; 95% CI).

Table 2: Incidence and case fatality of neonatal sepsis

Commonest isolated pathogens: *Acinetobacter* spp. and *Klebsiella* spp with high degree of TGC and CP resistance

DeNIS collaboration. Lancet Glob Health 2016;4: e752–60

WHO recommended antibiotic regimens for neonatal sepsis

5. Management of neonatal sepsis

Prophylactic antibiotics for prevention of sepsis

- A neonate with risk factors for infection (i.e. membranes ruptured >18 hours before delivery, mother had fever >38 °C before delivery or during labour, or amniotic fluid was foul smelling or purulent) should be treated with the prophylactic antibiotics ampicillin (Intramuscular – IM – or intravenously, IV) and gentamicin for at least two days. After two days, the neonate should be reassessed and treatment continued only if there are signs of sepsis or a positive blood culture.

  (Weak recommendation, very low quality evidence) Source

Empirical antibiotics for suspected neonatal sepsis

- Neonates with signs of sepsis should be treated with ampicillin (or penicillin) and gentamicin as the first line antibiotic treatment for at least 10 days.

  (Strong recommendation, low quality evidence Source

- If a neonate with sepsis is at greater risk of staphylococcus infection (e.g. extensive skin pustules, abscess, or omphalitis in addition to signs of sepsis), they should be given cloxacillin and gentamicin instead of penicillin and gentamicin.

  (Strong recommendation, quality of evidence not graded) Source

- Where possible, blood cultures should be obtained before starting antibiotics. If an infant does not improve in two to three days, antibiotic treatment should be changed, or the infant should be referred for further management.

  (Strong recommendation, quality of evidence not graded) Source

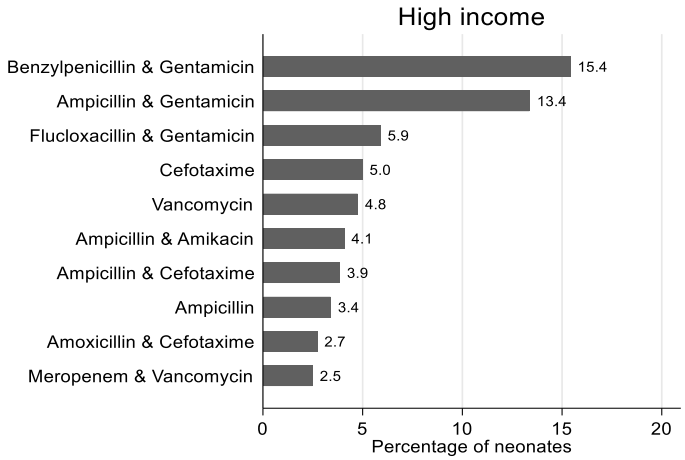
Antibiotic prescribing to neonates in different regions

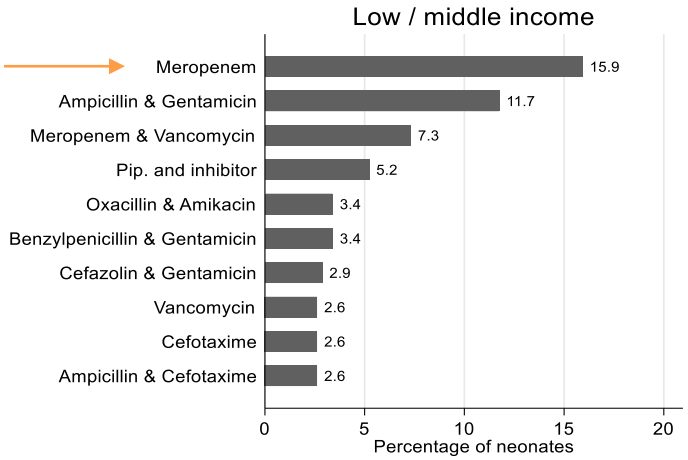
Africa [countries=4; hospitals=10] (n=479 prescriptions)		Americas [countries=7; hospitals=66] (n=1884 prescriptions)		Eastern Mediterranean [countries=6; hospitals=11] (n=194 prescriptions)		Europe [countries=28; hospitals=116] (n=1,890 prescriptions)		South-East Asia [countries=2; hospitals=12] (n=509 prescriptions)		Western Pacific [countries=6; hospitals=28] (n=1298 prescriptions)	
Gentamicin	28·8%	Ampicillin	29·1%	Ampicillin	23·7%	Gentamicin	19·6%	Ampicillin	17·3%	Amoxicillin/inhib.	16·5%
Ampicillin	16·5%	Gentamicin	22·0%	Cefotaxime	14·4%	Ampicillin	16·8%	Gentamicin	15·7%	Ceftizoxime	15·0%
Meropenem	12·7%	Vancomycin	6·5%	Gentamicin	11·3%	Benzylpenicillin	9·3%	Amikacin	14·2%	Meropenem	10·2%
Ceftriaxone	8·6%	Cefotaxime	5·5%	Vancomycin	9·3%	Vancomycin	7·9%	Meropenem	11·4%	Latamoxef	8·5%
Cefotaxime	5·0%	Cefazolin	5·5%	Amikacin	8·3%	Amikacin	7·4%	Piperacillin/inhib.	8·5%	Benzylpenicillin	6·9%
Benzylpenicillin	5·0%	Piperacillin/inhib.	3·6%	Meropenem	7·7%	Cefotaxime	6·8%	Cefotaxime	6·3%	Gentamicin	6·6%
Amikacin	3·3%	Ceftazidime	3·4%	Ceftriaxone	4·6%	Meropenem	4·1%	Vancomycin	4·7%	Cefotaxime	4·0%
Vancomycin	3·1%	Amikacin	3·1%	Penicillins comb.	3·6%	Amoxicillin	3·6%	Cefoperazone comb.	3·1%	Ceftazidime	3·3%
Ciprofloxacin	1·9%	Amoxicillin	2·8%	Metronidazole	3·1%	Metronidazole	2·0%	Ceftriaxone	3·0%	Vancomycin	3·0%
Metronidazole	1·7%	Cefepime	2·7%	Ceftazidime	2·6%	Flucloxacillin	2·0%	Ciprofloxacin	2·6%	Ceftriaxone	2·5%
Cefuroxime	1·7%	Metronidazole	2·1%	Ampicillin comb.	2·6%	Tobramycin	1·9%	Colistin	2·0%	Ampicillin	2·4%
Ceftazidime	1·7%	Meropenem	2·1%	Teicoplanin	1·6%	Piperacillin/inhib.	1·8%	Ofloxacin	1·6%	Flucloxacillin	2·3%
		Clindamycin	1·9%	Ofloxacin	1·6%	Amoxicillin/inhib.	1·8%			Erythromycin	2·1%
				Cloxacillin	1·0%	Ceftriaxone	1·6%			Piperacillin/inhib.	1·9%
				Azithromycin	1·0%	Netilmicin	1·5%			Cefepime	1·8%
				Amoxicillin	1·0%	Cefuroxime	1·3%			Cefoperazone comb.	1·6%
				Piperacillin/inhib.	0·5%	Teicoplanin	1·1%			Mezlocillin/sulbactam	1·4%
				Imipenem/inhib.	0·5%						
				Erythromycin	0·5%						
				Clarithromycin	0·5%						
				Ciprofloxacin	0·5%						

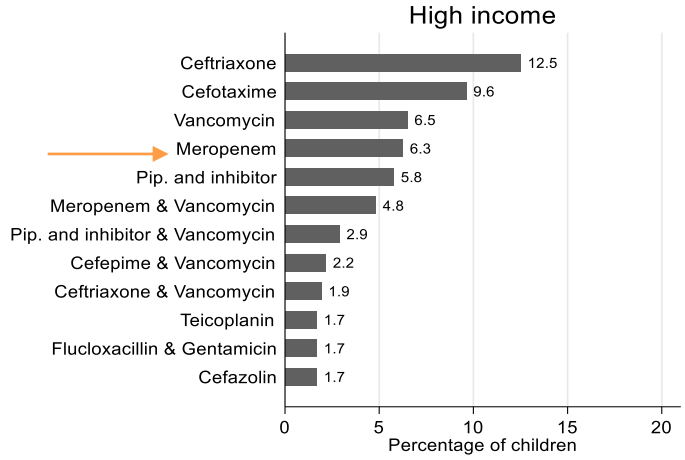
Abbreviations: Sulfa, sulfamethoxazole; inhib, β-lactamase inhibitor; comb., combination. Access antibiotics; Watch antibiotics; Reserve antibiotics; Unclassified antibiotics.

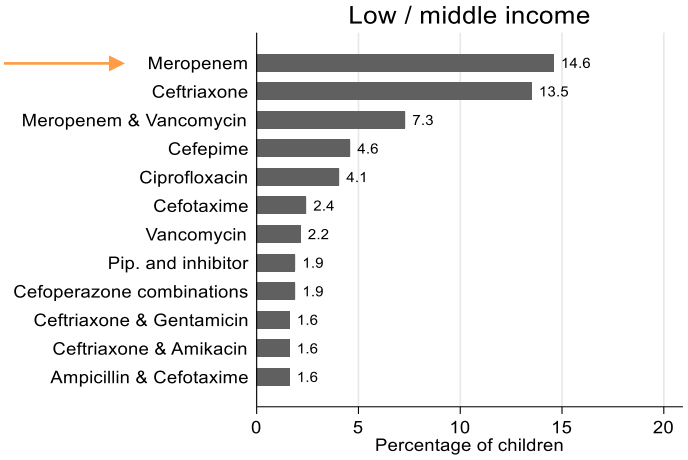
Hsia, Bielicki et al. Lancet Glob Health 2019;7(7): 861-871

Empiric treatment regimens for childhood sepsis



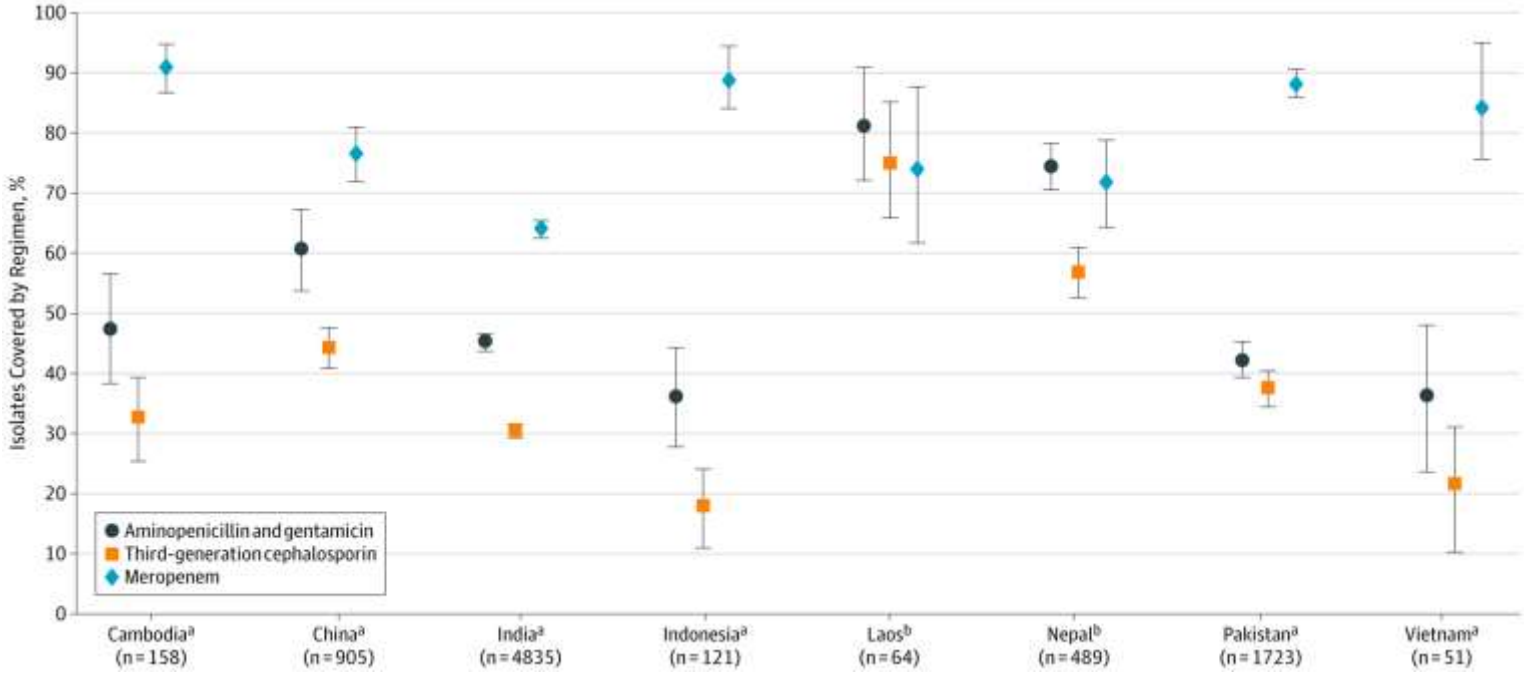






Jackson, Bielicki et al. PIDJ 2019; doi 10.1097/INF.0000000000002433

Is the high use of broad-spectrum agents justified?



Bielicki et al. JAMA Network Open 2020;3(2):e1921124

Conclusions

AMR hits the youngest patients very hard

System change to improve survival also increases the risk of resistant infections

Better evidence for IPC and AS interventions urgently needed